228-97262B
Jan. 2026

Shimadzu Liquid Chromatograph

Nexera CL series

Maintenance Guide

Read this manual thoroughly before you use the product.
Keep this manual for future reference.

This page is intentionally left blank.

Introduction

Read this Instruction Manual thoroughly before using the product.

Thank you for purchasing this product.

This manual describes overall system user maintenance guidelines. For information about how to use individual components or information about accessories or optional products, refer to the instruction manual for the respective components. For information about the product warranty, after-sales service, and various precautions for ensuring the product is used safely, refer to the separate Safety Guideline booklet or PDF.

Read this manual thoroughly before using the product and operate the product in accordance with the instructions in this manual. Keep this manual for future reference.

IMPORTANT

- If the user or usage location changes, ensure that this manual is always kept together with the product.
- If this manual, other instruction manual, or a product warning label of a component is lost or damaged, immediately contact your Shimadzu representative to request a replacement.
- The Safety Guideline specify important precautions for ensuring the system is operated safely. Be sure to read the Safety Guideline before using the product.
- To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, re-installation (after the product is moved), or repair is required.

©2022-2026 Shimadzu Corporation. All rights reserved.
Original version is approved in English.

Notice

- Information in this manual is subject to change without notice and does not represent a commitment on the part of the vendor.
- Any errors or omissions which may have occurred in this manual despite the utmost care taken in its production will be corrected as soon as possible, although not necessarily immediately after detection.
- All rights are reserved, including those to reproduce this manual or parts thereof in any form without permission from Shimadzu Corporation.
- Illustrations in this manual may differ from the actual product used.
- Third-party trademarks and trade names may be used in this publication to refer to either the entities or their products/services, whether or not they are used with trademark symbol "TM"or "®".

Instruction Manual Components

The instruction manuals for the product comprise the following documents.

Please use them according to the given operating objectives or other criteria.

■ Maintenance Guide

This manual describes the maintenance for each component.

■ Safety Guideline

This provides information about the product warranty, after-sales service, and various precautions for ensuring the product is used safely. Be sure to read it before using the product.

■ System Guide

It describes overall instructions for using the system, hardware validation, installation guidelines, and so on.

■ Instruction Manuals Included with Respective Components

These describe the accessories and options for each component, the name and function of various parts of the component, how to prepare, operate, and maintain the component, and so on.

Indications Used in This Manual

Warnings, cautions, and notes are indicated using the following conventions:

Indication	Meaning
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
Note	Emphasizes additional information that is provided to ensure the proper use of this product.

The following symbols are used in this manual:

Indication	Meaning
	Indicates an action that must not be performed.
	Indicates an action that must be performed.
Hint	Indicates information provided to improve product performance.
Reference	Indicates the location of related reference information.

Operating Nexera CL System

■ Intended Use

This system is designed to perform qualitative and quantitative analysis of target compounds in a sample matrix and can be used as a liquid chromatograph for general in vitro diagnostic applications. This instrument operates with reduced technician involvement and automation of some, but not all, procedural steps. However, only personnel who have received appropriate training on use of the system can use it for these purposes.

■ Calibration

A calibration curve should be generated for each analyte in appropriate methods. At least four out of six non-zero standards should meet the appropriate criteria, including the calibration standard lower than the assumed LOQ and the calibration standard at the highest concentration.

■ Quality Control

Implement quality control of the instrument by routinely measuring at least one each of four types of quality-control samples (a sample with a normal concentration level, a sample with a concentration level higher than normal as well as a sample lower than normal, and a blank sample). Check the selectivity/specificity in the matrix used for the actual sample, the accuracy, correctness, recovery rate, dynamic range, linearity, and lower limit of quantitation.

Based on these assessment results, check that the results are within the permissible range. If the assessment results are out of range, the measured data may be invalid, so do not use analysis results obtained from the instrument in question until it can be confirmed that it is functioning normally. When, for example, analyzing samples that contain complex sample matrices such as serum, plasma or urine, it may be possible to obtain stabilized data by using an appropriate pre-treatment or an internal standard.

Table of Contents

Introduction i

Instruction Manual Components iii

Indications Used in This Manual iii

Operating Nexera CL System iv

1 LC-40D X3 CL / LC-40D XR CL 1

1.1 Periodic Inspection and Maintenance 1

1.1.1 Prior to Inspection and Maintenance 1

1.1.2 List of Periodic Inspection and Maintenance 3

1.1.3 Check after Inspection and Maintenance 4

1.2 Removing the Right Panel Cover and the Filter Holder 5

1.3 Removing/Installing the Pump Heads 6

1.4 Replacing the Plunger Seal 14

1.4.1 Replacing the Plunger Seal and Backup Ring 14

1.4.2 Resetting the Delivery Amount 21

1.4.3 Check after Replacement 21

1.5 Cleaning/ Replacing the Plunger and Diaphragm 22

1.5.1 Removing the Pump Head and the Head Holder 23

1.5.2 Cleaning and Replacement of the Plunger and the Diaphragm 25

1.6 Rinsing the Check Valve 29

1.7 Performing an Ultrasonic Cleaning of the Check Valve 31

1.8 Replacing the Check Valve 33

1.9 Inspecting the Line Filter 34

1.10 Replacing the Line Filter 35

1.11 Cleaning/Replacing the Suction Filter 37

1.12 Replacing the Drain Valve 39

1.13 Replacing the Air Filter (Right Panel) 40

1.14 Cleaning of the Leak Tray 42

1.15 Cleaning the Exterior 42

1.15.1 Usual cleaning 42

1.15.2 Decontamination cleaning 43

1.16 Cleaning of the Automatic Rinsing Kit 43

2 LC-40B X3 CL 44

2.1 Periodic Inspection and Maintenance 44

2.1.1 Prior to Inspection and Maintenance 45

2.1.2 List of Periodic Inspection and Maintenance 46

2.1.3 Check after Inspection and Maintenance 47

2.2 Removing/Installing the Pump Heads 48

2.3 Replacing the Plunger Seal 54

2.3.1 Replacing the Plunger Seal and Backup Ring 55

2.3.2 Resetting the Delivery Amount 61

2.3.3 Check after Replacement 61

2.4 Cleaning/ Replacing the Plunger and Diaphragm 62

2.4.1 Removing the Pump Head and the Head Holder 62

2.4.2 Cleaning and Replacement of the Plunger and the Diaphragm 64

2.5 Rinsing the Check Valve 68

2.6 Performing an Ultrasonic Cleaning of the Check Valve 70

2.7 Replacing the Check Valve 72

2.8 Inspecting the Line Filter 73

2.9 Replacing the Line Filter 74

2.10 Cleaning/Replacing the Suction Filter 75

2.11 Replacing the Drain Valve 77

2.12 Cleaning of the Leak Tray 78

2.13 Cleaning the Exterior 79

2.13.1 Usual cleaning 79

2.13.2 Decontamination cleaning 79

2.14 Cleaning of the Automatic Rinsing Kit 80

3 DGU-405 CL 81

3.1 Periodic Inspection and Maintenance 81

3.1.1 Prior to Inspection and Maintenance 81

3.1.2 List of Periodic Inspection and Maintenance 82

3.1.3 Installing/Removing Right Panel 83

3.2 Maintenance Work 84

3.3 Cleaning the Exterior 85

3.3.1 Usual cleaning 85

3.3.2 Decontamination cleaning 85

4 SPD-40 CL 86

4.1 Periodic Inspection and Maintenance 86

4.1.1 Prior to Inspection and Maintenance 86
4.1.2 List of Periodic Inspection and Maintenance 87
4.1.3 Post-Inspection/Maintenance Leakage Check 87
4.2 Removing/Installing the Flow Cell 88
4.2.1 Removing the Flow Cell 88
4.2.2 Installing the Flow Cell 89
4.3 Flow Cell Inspection/Cleaning 90
4.4 Disassembling and Simple Cleaning the Flow Cell 93
4.5 Replacing a Flow Cell Part 97
4.6 Storing the Flow Cell 100
4.7 Replacing the Lamp 101
4.7.1 Removal of Top Cover and Radiating Fin Assembly 102
4.7.2 Deuterium Lamp Replacement 103
4.8 Wavelength Accuracy Calibration 107
4.9 Absorbance Accuracy Calibration 108
4.10 Leak Sensor Calibration 108
4.11 Exterior Cleaning 108
4.11.1 Usual cleaning 108
4.11.2 Decontamination cleaning 109

5 CBM-40 CL 110

5.1 Periodic Inspection 110
5.2 Cleaning the Exterior 111
5.2.1 Usual cleaning 111
5.2.2 Decontamination cleaning 111

6 CTO-40C CL 112

6.1 Periodic Inspection and Maintenance 112
6.1.1 Prior to Inspection and Maintenance 113
6.1.2 List of Periodic Inspection and Maintenance 113
6.1.3 Check After Inspection and Maintenance 114
6.2 Temperature Accuracy Calibration 115
6.3 Gas Sensor Calibration 115
6.4 Leak Sensor Calibration 116
6.5 Cleaning the Leak Tray 116
6.6 Replacing the Air Filter 117
6.7 Cleaning the Exterior 118
6.7.1 Usual cleaning 118

6.7.2 Decontamination cleaning 118

7 SIL-40C XR CL / SIL-40C X3 CL 119

7.1 Regular Inspection and Maintenance 119

7.1.1 Prior to Inspection and Maintenance 120

7.1.2 List of Periodic Inspection and Maintenance 121

7.1.3 Check after Inspection and Maintenance 122

7.2 Removing amd Installing the Front Panel 123

7.2.1 Removing and Installing the Front Panel (Lower) 123

7.2.2 Removing and Installing the Front Panel (Upper) 124

7.3 Replacing the High Pressure Valve Rotor and Stator (Inspection) 128

7.3.1 Before Removing the High Pressure Valve 129

7.3.2 Removing the High Pressure Valve Rotor and Stator 131

7.3.3 Installing the High Pressure Valve Rotor and Stator 134

7.3.4 Installing the High Pressure Valve to the Instrument 138

7.3.5 Resetting the Number of Uses 139

7.4 Replacing the Low Pressure Valve Rotor and Stator (Inspection) 141

7.4.1 Before Removing the Low Pressure Valve Rotor and Stator 141

7.4.2 Removing the Low Pressure Valve Rotor and Stator 142

7.4.3 Installing the Low Pressure Valve Rotor and Stator 144

7.4.4 Resetting the Number of Uses 147

7.5 Replacing the Plunger Seal of the Measuring Pump 148

7.5.1 Before Removing the Pump Head 148

7.5.2 Removing the Pump Head 150

7.5.3 Replacing the Plunger Seal 151

7.5.4 Installing the Pump Head 153

7.6 Replacing the Plunger of the Measuring Pump 154

7.6.1 Before Removing the Measuring Pump Plunger 154

7.6.2 Replacing the Measuring Pump Plunger 155

7.6.3 Installing the Measuring Pump Plunger 156

7.6.4 Installing the Pump Head 156

7.7 Replacing the Needle Seal 157

7.7.1 Removing the Needle Seal 157

7.7.2 Installing the Needle Seal 159

7.8 Replacing the Needle 161

7.8.1 Before Removing the Needle 161

7.8.2 Removing the Needle 162

7.8.3 Installing the Needle 163

7.8.4 After Installing the Needle 165

7.9 Replacing the Sample Loop 167
7.9.1 Before Removing the Sample Loop 167
7.9.2 Removing the Sample Loop 168
7.9.3 Installing the Sample Loop 171
7.9.4 After Installing the Sample Loop 174
7.10 Replacing the Outlet Tubing 176
7.10.1 Before Removing the Outlet Tubing 177
7.10.2 Replacing the Outlet Tubing 177
7.11 Replacing the Injection Port Tubing 178
7.11.1 Before Removing the Injection Port Tubing 178
7.11.2 Replacing the Injection Port Tubing 179
7.12 Cleaning/Replacing the Suction Filter 182
7.13 Replacing the Rinse Port Cap 184
7.13.1 Before Replacing the Rinse Port Cap 184
7.13.2 Replacing the Rinse Port Cap 185
7.14 Cleaning the Flow Lines 187
7.14.1 Rinsing the Needle and the Sample Loop 187
7.15 Calibrating the Leak Sensor 188
7.16 Cleaning the Leak Tray 188
7.17 Cleaning the Exterior 189
7.17.1 Usual cleaning 189
7.17.2 Decontamination cleaning 189

8 PLATE CHANGER CL 190

8.1 Periodic Inspection and Maintenance 190
8.1.1 Prior to Inspection and Maintenance 190
8.1.2 List of Periodic Inspection and Maintenance 191
8.1.3 Check After Inspection and Maintenance 191
8.2 Cleaning or Replacing the Air Filter 192
8.3 Cleaning the Exterior 193
8.3.1 Usual cleaning 193
8.3.2 Decontamination cleaning 193
8.4 For Long-Time Storage 193

9 FCV-S CL 194

9.1 Periodic Inspection and Maintenance 194
9.1.1 Prior to Inspection and Maintenance 194
9.1.2 List of Periodic Inspection and Maintenance 195
9.2 Cleaning the Exterior 195

9.2.1 Usual cleaning 195
9.2.2 Decontamination cleaning 196

10 Addendum 197

10.1 Component Parts 197
10.2 Optional Parts 204
10.3 Maintenance Parts 225
10.4 Specifications 233

1 LC-40D X3 CL / LC-40D XR CL

1.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠WARNING

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.
Fire, electric shock or malfunction may occur.

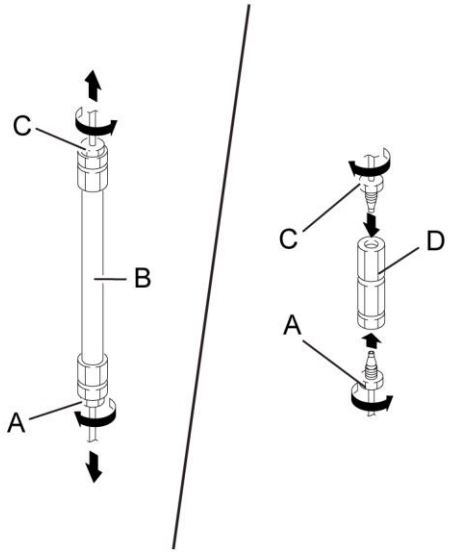
⚠CAUTION

For parts replacement, use parts and tools listed in Component Parts LC-40D X3 CL ／ LC-40D XR CL (P.197) and Maintenance Parts LC-40D X3 CL ／ LC-40D XR CL (P.225).
If any other parts or tools are used, part damage, injury, and malfunction may occur.

Never remove the cover.
This may cause injury or a malfunction of the device.
Contact your Shimadzu representative if the cover must be removed.

1.1.1 Prior to Inspection and Maintenance

- Loosen the male nuts (A and C) on the column inlet and outlet with an 8-mm wrench and then remove the column (B) from the flow path. Attach the coupling (D) to the male nut (A and C), and tighten it with an 8 mm wrench.
- Replace the mobile phase in the flow lines with at least 20mL of water.
  When normal phase solvent was used, replace the internal channel with 2-propanol and then with water.
- Wipe away any dirt from the front panel and the main cover.
- Remove the right panel cover and filter holder before starting the work. Release the tubes bound at the front right from the tube holder to prevent them from interfering with the work.



Reference 1.2 Removing the Right Panel Cover and the Filter Holder (P.5)

■ Standard Reagents for Maintenance

Solvent	Description	Inspection/Maintenance Item
2-propanol	Used for cleaning parts.	1.4 Replacing the Plunger Seal (P.14) 1.5 Cleaning/ Replacing the Plunger and Diaphragm (P.22) 1.6 Rinsing the Check Valve (P.29) 1.7 Performing an Ultrasonic Cleaning of the Check Valve (P.31) 1.11 Cleaning/Replacing the Suction Filter (P.37) 1.12 Replacing the Drain Valve (P.39) 1.16 Cleaning of the Automatic Rinsing Kit (P.43)

■ Hardware Maintenance Supplies

Note that in addition to the following tools and parts are also required. The tools and parts required for the maintenance of each part are listed at the beginning of each section.

Item	Description	Inspection/Maintenance Item
Protective glasses	Glasses and gloves before the maintenance.	ALL Inspection/Maintenance
Gloves		
Wiping paper	Used for wiping and cleaning parts.	1.4 Replacing the Plunger Seal (P.14) 1.5 Cleaning/ Replacing the Plunger and Diaphragm (P.22)
Beaker	Used for cleaning parts.	1.4 Replacing the Plunger Seal (P.14)
Ultrasonic bath	Used for cleaning parts.	1.4 Replacing the Plunger Seal (P.14) 1.7 Performing an Ultrasonic Cleaning of the Check Valve (P.31) 1.11 Cleaning/Replacing the Suction Filter (P.37) 1.16 Cleaning of the Automatic Rinsing Kit (P.43)
Tweezers	Used for gripping the plunger seal and backup ring.	1.4 Replacing the Plunger Seal (P.14)

1.1.2 List of Periodic Inspection and Maintenance

Note	The maintenance and replacement periods listed in this table are presented only as guidelines. These are not guarantee periods. These will vary depending on usage conditions.

<table>
<tr><th>Inspection/ Maintenance Item</th><th>Replacement Periods</th><th>Remark</th><th>Ref.</th></tr>
<tr><td>Replacement of Plunger Seal</td><td>1 year</td><td>• Sealing efficiency decreases when seals are worn.
• As a guideline, seals should be replaced after delivery of the respective volumes listed below. (VP fuction, [L(R)SEAL USED], shows the total delivered volume.)
(LC-40D X3 CL)<table><tr><th>Pumping Pressure</th><th>Total Delivery</th></tr><tr><td>80 MPa (816 kgf/cm²)</td><td>30 L</td></tr></table>Repeating high-pressure (above 100 MPa) and low-pressure (below 10 MPa) pumping could shorten the life of seals.
(LC-40D XR CL)<table><tr><th>Pumping Pressure</th><th>Total Delivery</th></tr><tr><td>30 MPa (306 kgf/cm²)</td><td>60 L</td></tr><tr><td>60 MPa (612 kgf/cm²)</td><td>30 L</td></tr></table>Repeating high-pressure (above 60 MPa) and low-pressure (below 10 MPa) pumping could shorten the life of seals.</td><td>1.4 Replacing the Plunger Seal (P.14)</td></tr>
<tr><td>Replacement of Plunger</td><td>1 year</td><td>Replace the plunger seal and the diaphragm when the plunger is replaced.</td><td rowspan="2">1.5 Cleaning/ Replacing the Plunger and Diaphragm (P.22)</td></tr>
<tr><td>Replacement of Diaphragm</td><td>1 year</td><td>-</td></tr>
<tr><td>Replacement of Outlet Check Valve</td><td>1 year</td><td>-</td><td>1.8 Replacing the Check Valve (P.33)</td></tr>
<tr><td>Replacement of Inlet Check Valve</td><td>1 year</td><td>-</td><td>1.8 Replacing the Check Valve (P.33)</td></tr>
<tr><td>Replacement of Line Filter</td><td>2 years</td><td>Replace when particulates in mobile phase clog the filter.</td><td>1.9 Inspecting the Line Filter (P.34)
1.10 Replacing the Line Filter (P.35)</td></tr>
<tr><td>Replacement of Suction Filter</td><td>2 years</td><td>Replace when particulates in mobile phase clog the filter.</td><td>1.11 Cleaning/Replacing the Suction Filter (P.37)</td></tr>
</table>

Inspection/ Maintenance Item	Replacement Periods	Remark	Ref.
Replacement of Drain Valve	3 years	Replace when there is a fluid leak from the drain valve.	1.12 Replacing the Drain Valve (P.39)
Replacement of Air Filter (for Right Panel)	1 year	-	1.13 Replacing the Air Filter (Right Panel) (P.40)
Replacement of Air Filter (for FAN)	1 year	Contact your Shimadzu representative.	-
Pump ASSY lubrication	3 years	Contact your Shimadzu representative.	-
Replacement of Fuse	3 years	Contact your Shimadzu representative.	-
Cleaning of the Automatic Rinsing Kit	1 year	-	1.6 Rinsing the Check Valve (P.29)
Replacement of Pump Head	(2 years)	Pumping mobile phase mixtures containing acids such as trifluoroacetic acid or formic acid can cause leakage due to internal damage in the pump head. In such cases, replace the pump head every two years, as a general guideline. (Pump heads do not need to be replaced if only mobile phases without acid are pumped.)	-

■ Optional Parts

Inspection/ Maintenance Item	Replacement Periods	Remark	Ref.
Replacing the Air Filter of Low Pressure Gradient Kit	1 year	Contact your Shimadzu representative.	-

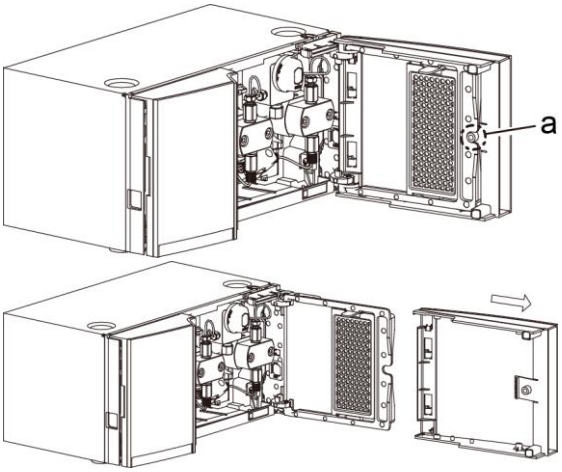
1.1.3 Check after Inspection and Maintenance

- After inspection and maintenance, check any leakage during pumping.
- Return the right panel cover, filter holder and tubes after completing the work.

Note	When the parts management tool (PARTS MGMT TOOL) is not used, input the part number when replacing a part not registered in the PARTS MGMT TOOL. LC-40D CL Series Instruction Manual "3.6.3 Inputting a replacement part number《PART REPLACEMENT》"

1.2 Removing the Right Panel Cover and the Filter Holder

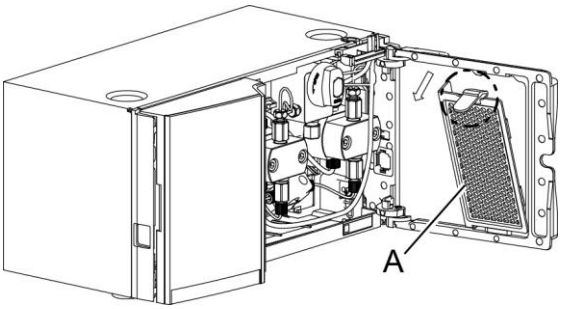
1 **Open the right panel.**



2 **Remove the right panel cover.**

While lightly pressing the cylinder-shaped projection (a) inside the right panel cover, slide the cover to the front.

3 **While pressing the knob at the top of the filter holder (A), remove it toward the front.**



1.3 Removing/Installing the Pump Heads

This section will explain how to remove and re-attach the right-side pump head.
Removing and re-attaching the left-side pump head is also the same procedure.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06
Allen wrench (M5)	1	086-03805
Syringe	1	046-00038-01
Syringe needle	1	228-18216-91

■ Prior to the maintenance Perform the preparatory work.

Reference 1.1.1 Prior to Inspection and Maintenance (P.1)

■ Removing the pump head

1 **Perform either of the following to prevent the mobile phase solvent from flowing out of the suction tube or pump head when removing the tubes around the pump.**

- Place the reservoir bottle at a position lower than the pump inlet.
- Empty the reservoir bottle and suction tube of the mobile phase solvent, loosen the bushing of the suction filter, and remove it from the pump inlet.

2 **Press [CE] to display the initial screen.**



3 **Press [→] twice.**



4 **Press [↓] once, move the cursor to [CONTROL], and press [→].**

[PLUNGER SET] menu is displayed.



5 **Press [Enter].**

The cursor blinks at the input position.



6 **Press [2] and [Enter]. (To replace the left plunger seal, press [1] and [Enter].)**

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.



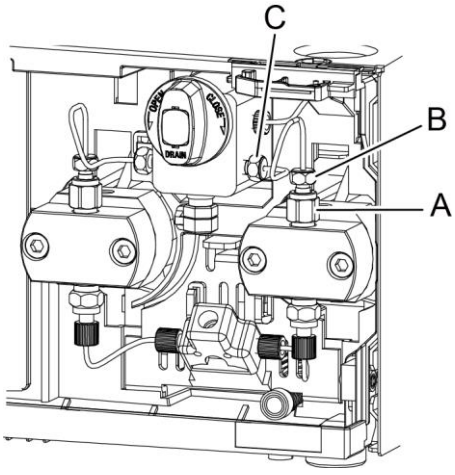
In the conditions, remove the right pump head.

Before attaching the right pump head, perform steps 2 to 6 as well.

7 **Follow the instructions below to remove the tube (SUS pipe R) connecting the check valve OUT and the pressure sensor.**

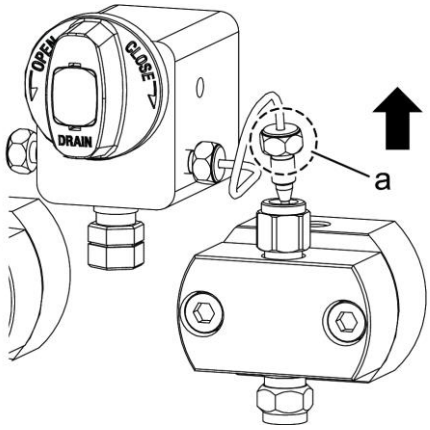
(LC-40D X3 CL)

1 While holding the check valve OUT (A) with a 10-mm wrench, loosen the check valve OUT side male nut (B) of the SUS pipe R with an 8-mm wrench.



2 Loosen the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.

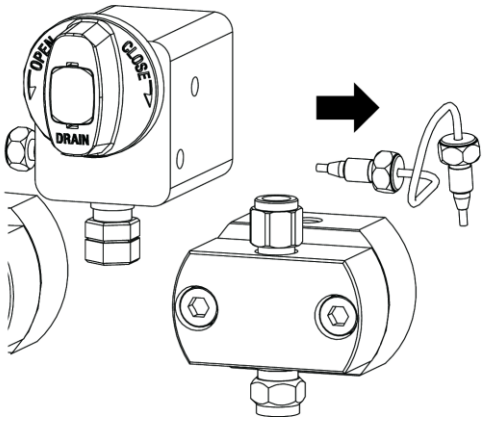
3 Hold the check valve OUT side male nut ("a" in the figure) of the SUS pipe R and then slightly lift and pull out the SUS pipe R.



4 Pull the SUS pipe R to the right to remove it from the pressure sensor.

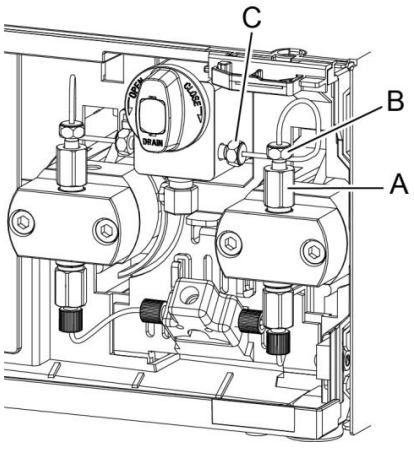
Hint

Though the orientation is opposite to the right one (SUS pipe R), remove the left tube (SUS pipe L) in the same procedure.



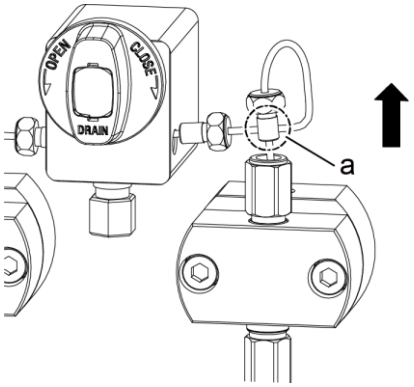
(LC-40D XR CL)

1 While holding the check valve OUT (A) with a 10-mm wrench, loosen the check valve OUT side male nut (B) of the SUS pipe R with an 8-mm wrench.



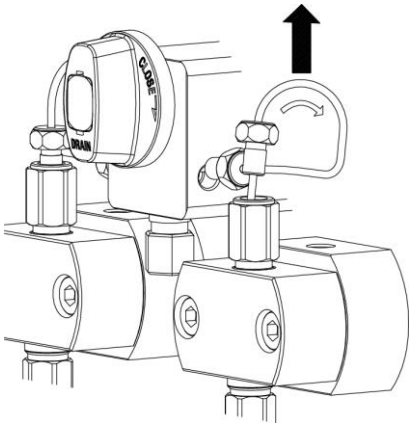
2 Loosen the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.

3 Hold the check valve OUT side male nut ("a" in the figure) of the SUS pipe R and then slightly lift the SUS pipe R.

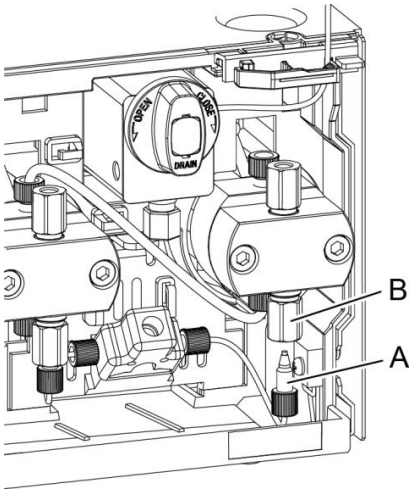


4 Slightly lean backwards the SUS pipe R to pull it out upward.

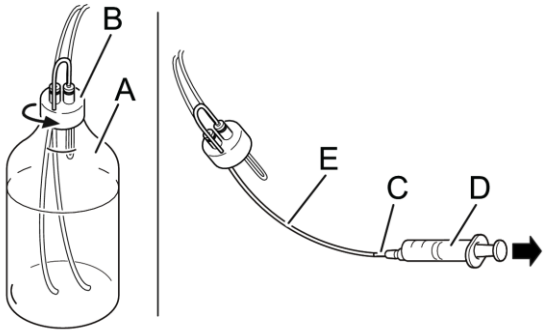
Hint Though the orientation is opposite to the right one (SUS pipe R), remove the left tube (SUS pipe L) in the same procedure.



8 Loosen the male nut PEEK (A) of the inlet tube by hand and remove it from the check valve IN (B).



9 **If the seal rinsing kit is attached, remove the cap (B) of the seal rinsing kit from the rinse solution bottle (A).**



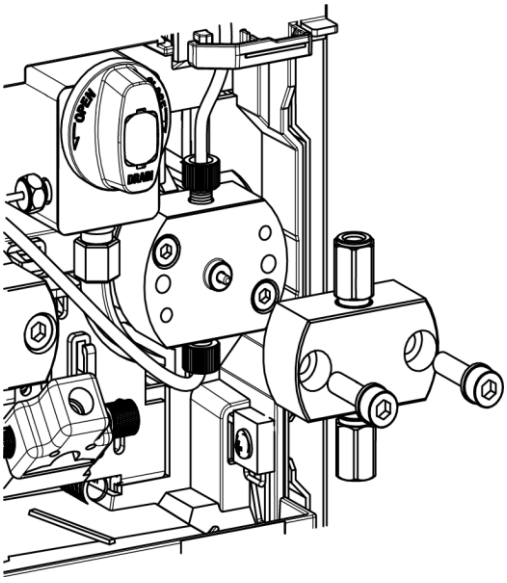
10 **Attach the syringe needle (C) to the end of the outlet tubing (E) (upward U-shape), and use the syringe (D) to suction out the rinse fluid from the rinse flow line.**

11 **Place the removed cap (B) and rinse solution bottle on the reservoir tray on the top of the instrument.**

12 **Gradually loosen the 2 hexagonal socket screws using an Allen wrench (M5) by alternating between the left and right screw, and remove the pump head.**

CAUTION

Gently pull the pump head horizontally along the plunger.
The plunger may be damaged if the pump head is forcefully removed.

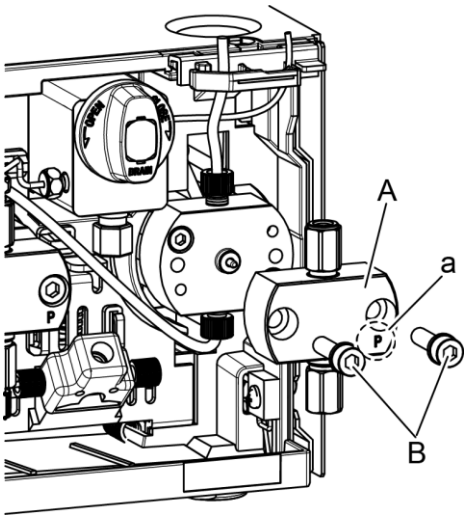


■ Installing the pump head

1 **Set the plunger position by following steps 2 to 6 in Removing the pump head (P.6).**

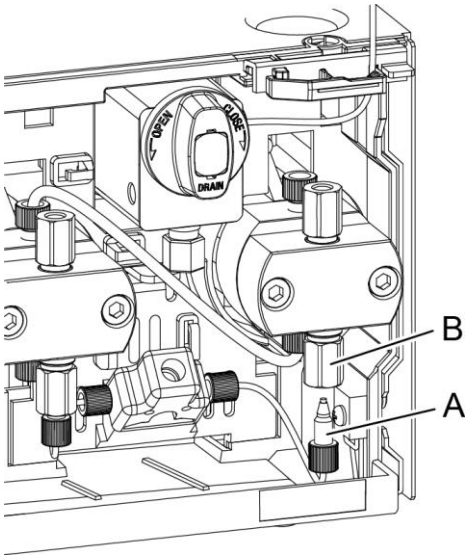
2 **Hold the pump head with the mark (a) coming at the bottom right, tighten the 2 hexagonal socket screws (B) with an Allen wrench (M5) by tightening the right and left screws alternately, and attach the pump head (A).**

CAUTION
Gently inset the pump head horizontally along the plunger. The plunger may be damaged if the pump head is forcefully inserted.



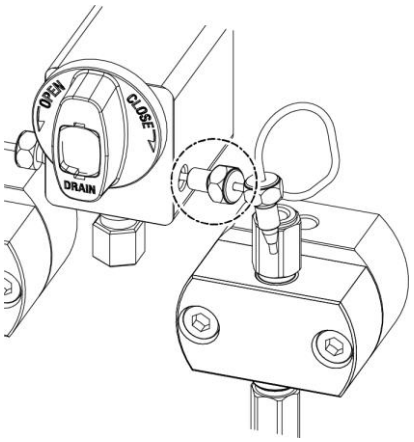
Note	Tighten the left and right hexagonal socket screws 90 degrees at a time, and then firmly tighten using the long side of the Allen wrench.

3 **Tighten the male nut PEEK (A) of the inlet tube to the inlet check valve (B) by hand.**

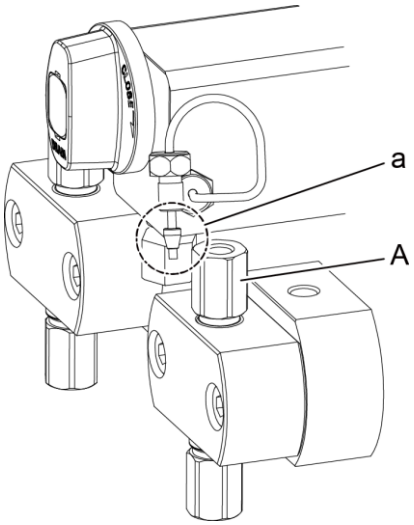


4 Follow the instructions below to attach the tube (SUS pipe R) connecting the check valve OUT and the pressure sensor.

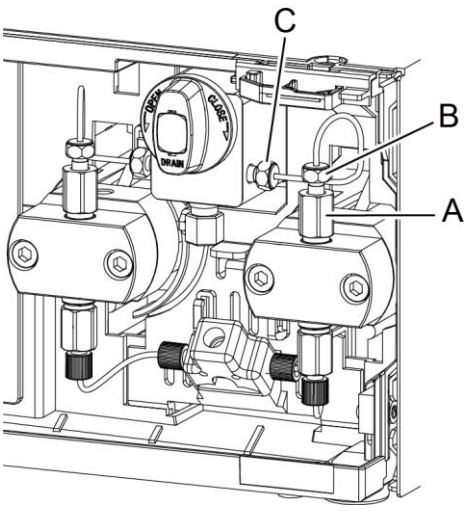
1 Insert the end of the SUS pipe R into the hole of the pressure sensor.



2 Hold the check valve side end of the SUS pipe R ("a" in the figure) and then insert the male nut into the check valve OUT (A).



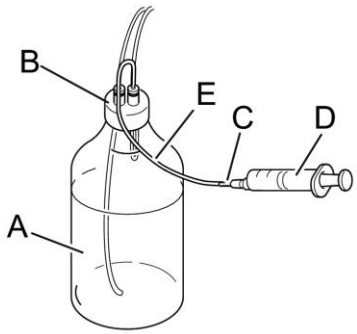
3 While holding the check valve OUT (A) with a 10-mm wrench, tighten the SUS pipe R male nut on the check valve OUT side with an 8-mm wrench (B).



4 Tighten the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.

Hint Though the orientation is opposite to the right one (SUS pipe R), attach the left tube (SUS pipe L) in the same procedure.

5 Attach the original rinsing kit cap (B) to the rinse solution bottle (A), and then remove the outlet tubing (E) (upward U-shape) from the rinse solution bottle.



6 Attach the syringe needle (C) to the end of the tubing (E), and use the syringe (D) to suction out the rinse solution from the rinse flow line.

7 Return the rinsing kit to the reservoir tray.

1.4 Replacing the Plunger Seal

A plunger seal and backup ring are attached inside the left and right pump heads. The following section will explain the method for replacing the plunger seal and backup ring on the right side (when viewed from the front).

Replacing the plunger seal and backup ring on the left side are also the same procedure.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06
Allen wrench (M5)	1	086-03805
Seal Installer/Remover	1	228-62458-41

Necessary parts

Part Name	Part Type	Part No.
Plunger Seal (UHP) (supplied with backup ring)	Consumable part	228-52711-93

■ Prior to the maintenance Perform the preparatory work.

Reference 1.1.1 Prior to Inspection and Maintenance (P.1)

1.4.1 Replacing the Plunger Seal and Backup Ring

1 **Remove the pump head, SUS pipe, and inlet tube by following the instructions in Removing the pump head (P.6).**

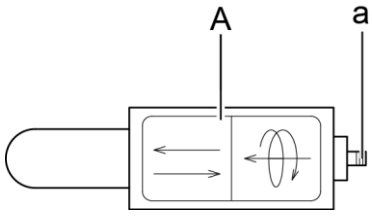
2 **Perform the following steps to replace the plunger seal and backup ring.**

The plunger seal and the backup ring are installed inside the pump head. Use the provided seal installer/remover to remove them.

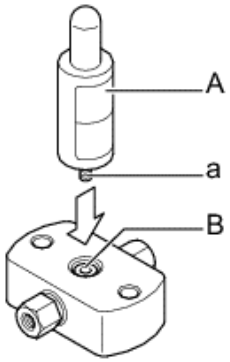
CAUTION

Do NOT drop the seal installer/remover when using it.
Seal installer/remover may be damaged.

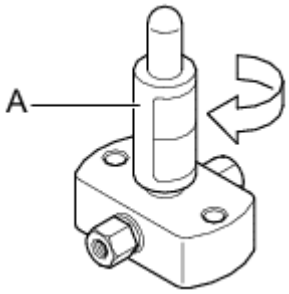
1 Wipe off the threaded tip on the metal part (a) of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



2 With the metal part (a) of the seal installer/remover (A) facing downward, insert the seal installer/remover (A) vertically into the backup ring (B).



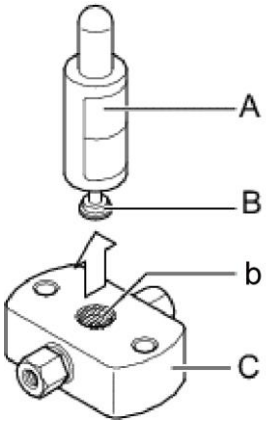
3 Turn the seal installer/remover (A) 180 degrees to 360 degrees clockwise.



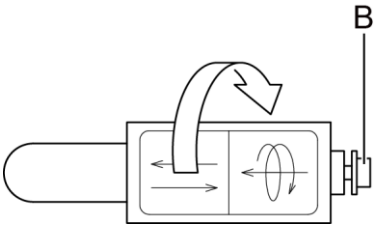
4 Pull out the seal installer/remover (A) upward.

The backup ring (B) will come off from the plunger seal hole (b) of the pump head (C).

Note	If the backup ring is still stuck, return to step 3 and turn the seal installer/remover 180 degrees more, then retry this step.

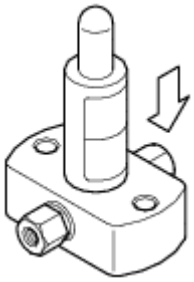


5 Grip the backup ring (B) with two fingers and turn the seal installer/remover counterclockwise, then remove the backup ring from the seal installer/remover.

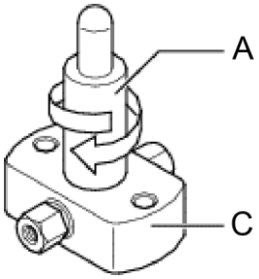


6 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

7 With the metal part of the seal installer/remover facing downward, place the seal installer/remover vertically above the plunger seal and push it slightly into the seal.

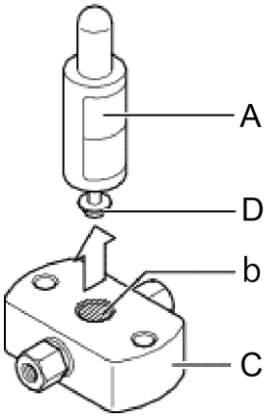


8 Turn the seal installer/remover (A) clockwise until it comes into contact with the pump head (C).



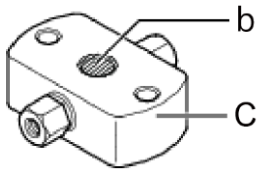
9 Pull out the seal installer/remover (A) upward.

The plunger seal (D) will come off from the plunger seal hole (b) of the pump head (C).



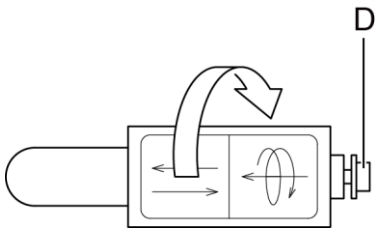
10 Place the pump head into a clean beaker containing 2-propanol, and clean it for 10 minutes using an ultrasonic bath.

11 Use a piece of wiping paper soaked in 2-propanol to wipe the plunger attachment portion (b) inside the pump head (C).



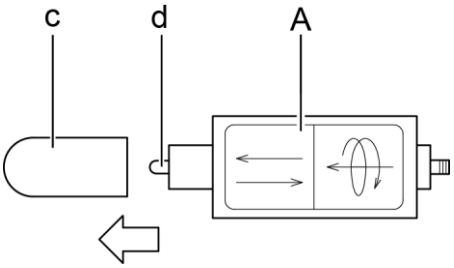
Note	• If seal material adheres to the plunger attachment portion of the pump head, the airtightness cannot be maintained. • If any scratches are found on the plunger attachment portion of the pump head, replace the pump head.

12 Grip the plunger seal (D) with two fingers and turn the seal installer/remover counterclockwise, then remove the plunger seal from the seal installer/remover.



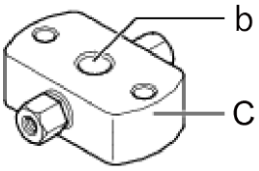
13 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

14 Remove the cap (c) from the seal installer/remover (A).



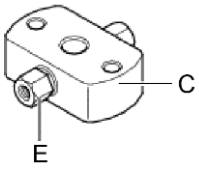
15 Wipe off the white protrusion (d) and the surrounding area of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.

16 Put some drops of 2-propanol in the plunger seal hole (b) of the pump head (C) while paying attention to spillage of 2-propanol.



CAUTION

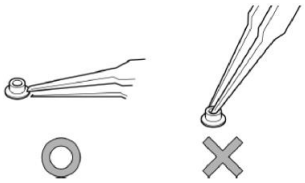
Before putting in 2-propanol, screw the check valves (E) into the pump head (C) so that 2-propanol does not leak from the holes for the check valve.



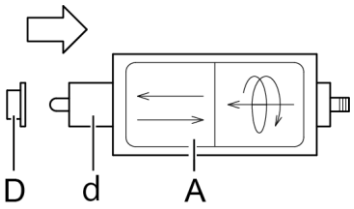
17 Soak a new plunger seal and a new backup ring in 2-propanol in a clean beaker.

CAUTION

When gripping the plunger seal with tweezers, do NOT touch the internal hole surface. Also, to prevent damage, do NOT grip the plunger seal and the backup ring tightly with tweezers.



18 Take the new plunger seal (D) out of the beaker and put it on the white protrusion (d) of the seal installer/remover (A).

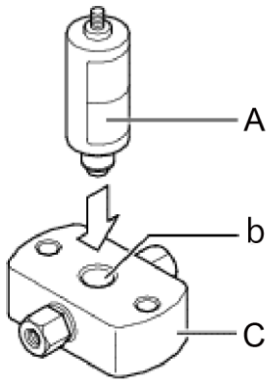


CAUTION

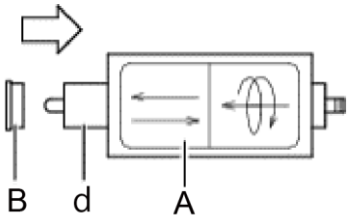
Be sure that the plunger seal is moistened with 2-propanol when putting it on the seal installer/remover.

19 Insert the seal installer/remover (A) vertically all the way into the plunger seal hole (b) of the pump head (B) and slowly pull out the seal installer/remover upward.

The plunger seal will be installed in the pump head.



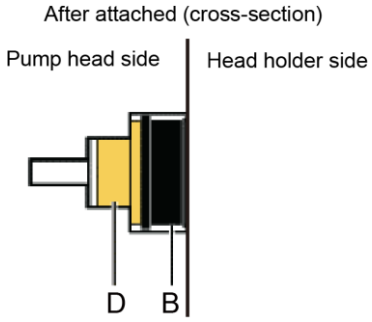
20 Take the new backup ring (B) out of the beaker and, with the smaller diameter side facing the seal installer/remover (A), put the backup ring on the white protrusion (d).



CAUTION

Be sure to attach the backup ring with the correct orientation.
When the backup ring (B) is attached correctly to the pump head, the larger diameter side comes into contact with the plunger seal (D).

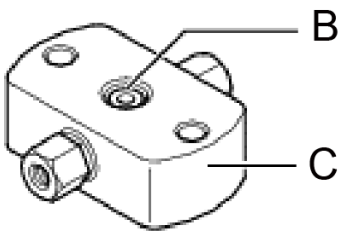
After attached (cross-section)



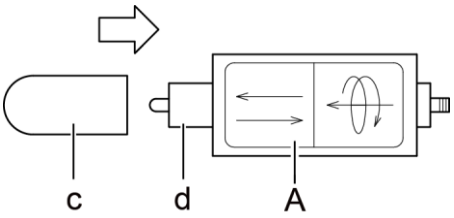
Be sure that the backup ring is moistened with 2-propanol when putting it on the seal installer/remover.

21 Insert the seal installer/remover vertically all the way into the plunger seal and slowly pull out the seal installer/remover upward.

The new backup ring (B) will be installed into the pump head (C).



22 Put the cap (c) on the white protrusion (d) of the seal installer/remover.



3 **Attach the pump head, SUS pipe, and inlet tube by following the instructions in Installing the pump head (P.11).**

1.4.2 Resetting the Delivery Amount

Note	When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL.

1 **Display the [MAINTENANCE] information group of the VP function.**

Reference LC-40D CL Series Instruction Manual "3.3 Types of Screens"



2 **Press [↓] several times until [R SEAL USED] is displayed.**

3 **Press [del].**

The delivery amount of the plunger seal before replacement is reset and the reset date is recorded in the maintenance log.



Reference LC-40D CL Series Instruction Manual "3.6.3 Maintenance Information Group (MAINTENANCE)/Displaying the delivery amount of the right plunger seal《R SEAL USED》"

Hint To replace the left plunger seal, display [L SEAL USED] and press [del].

1.4.3 Check after Replacement

After replacing the plunger seal, check the following:

- Is the pumping (pressure) stable?
- Is fluid leaking from the gap between the pump head and the head holder?
- Is fluid leaking from the rinse flow line?

Note	If the above occurs even after replacing the plunger seal, it is possible that there are scratches on the surface of the plunger. If there are scratches on the plunger, replace it with a new plunger.

Reference 1.5 Cleaning/ Replacing the Plunger and Diaphragm (P.22)

1.5 Cleaning/ Replacing the Plunger and Diaphragm

A plunger and a diaphragm are attached to the left and right pump body. The following section will explain the method for cleaning/ Inspection (replacing) the plunger and the diaphragm on the right side (when viewed from the front). Replacing the plunger and a diaphragmthe on the left side are also the same procedure.

When replacing the plunger, be sure to also replace the plunger seal and the diaphragm.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06
Allen wrench M4	1	086-03804
Allen wrench M5	1	086-03805
Box driver	1	228-28767-91
Diaphragm jig	1	228-54852
Plunger press plate	1	228-70388

Necessary parts

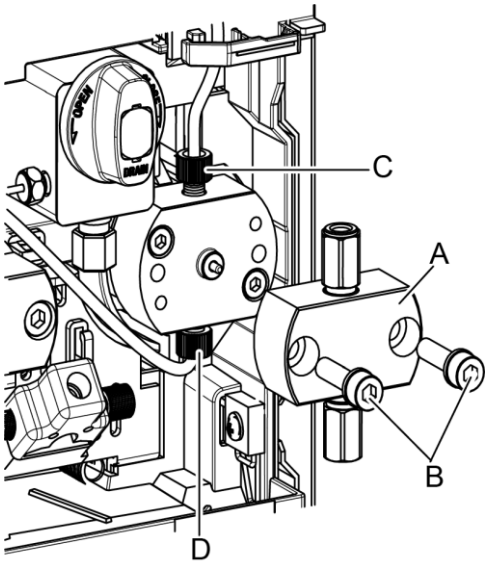
Part Name	Part Type	Part No.	Remark
Plunger Holder Assy	Consumable part	228-52069-44	Supplied with a diaphragm

■ Prior to the inspection and the maintenance Perform the preparatory work.

Reference 1.1.1 Prior to Inspection and Maintenance (P.1)

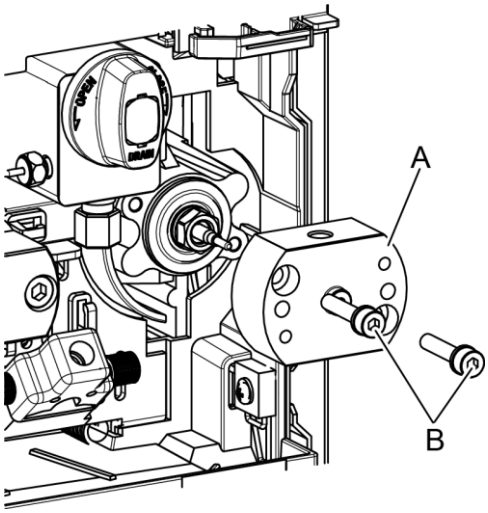
1.5.1 Removing the Pump Head and the Head Holder

1 **Remove the pump head, SUS pipe, and inlet tube by following the instructions in Removing the pump head (P.6).**



2 **Loosen the head holder top and bottom fittings (C and D), and remove the rinse tube.**

3 **Gradually loosen the 2 hexagonal socket screws (B) of the head holder (A) using an Allen wrench (M4) by alternating between the left and right screw.**



4 **Remove the head holder.**

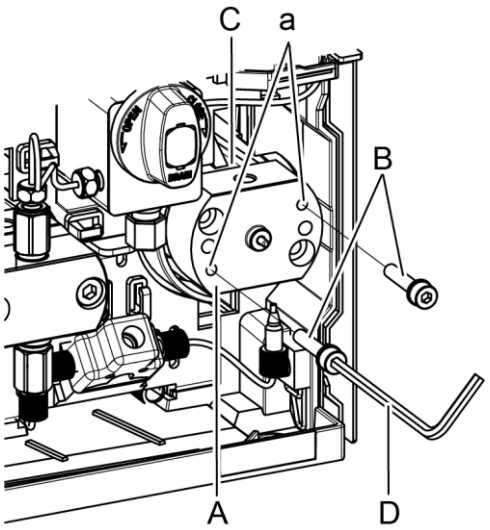
CAUTION

Gently pull the head holder horizontally along the plunger.
If the head holder is not removed carefully, the plunger may become damaged.

■ In the case the head holder is difficult to remove

Insert into the head holder M4 bolt hole (a) the 2 hexagonal socket screws (B) that were removed, and tighten the left and right sides gradually using an Allen wrench (M4) (D).

The head holder (A) can be loosened by pushing the pump body (C) using the 2 hexagonal socket screws (B).



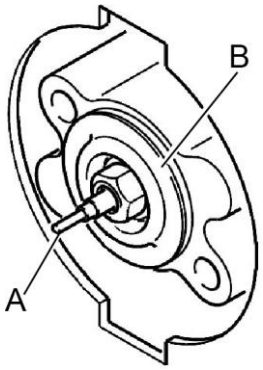
1.5.2 Cleaning and Replacement of the Plunger and the Diaphragm

Note	When replacing the plunger, be sure to replace the plunger seal and the diaphragms.

1 Perform the following steps to clean or replace the plunger and diaphragm.

1 Wipe plunger with a sheet of wiping pape soaked with 2-propanol to remove any portion of the seal or dirt attached to the plunger (A).

Note	If small pieces of the plunger seal material adheres to the surface, the airtightness cannot be maintained.



2 Check that there are no visible scratches on the plunger (A) or the diaphragm (B).

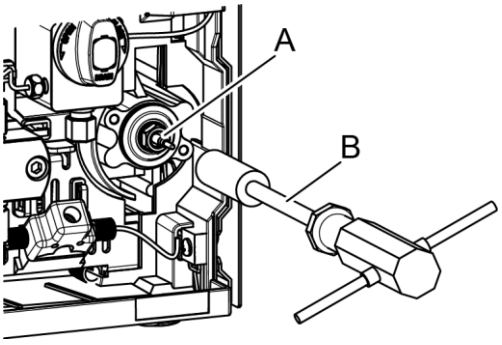
- If scratches are found through visual inspection, replace with a new plunger. Proceed to the next procedure 3.
- If no scratches are found through visual inspection, proceed to step 2.

⚠CAUTION

Do NOT allow foreign particles or crystals into the head holder.
Foreign particles from the mobile phase solution or crystals from the buffer solution getting into the head holder may cause scratches on the surface of the plunger.

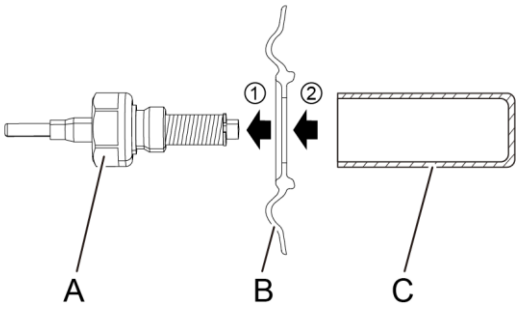
3 Insert the box driver (B) to the plunger holder (A), then rotate counter-clockwise to remove the plunger holder with the diaphragm.

CAUTION
Gently insert the box driver to the plunger holder. The plunger may become damaged if the box driver is forcefully inserted.

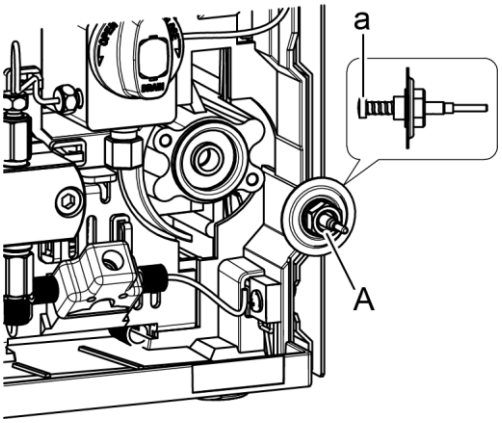


4 Attach a new diaphragm (B) to the new plunger holder (A) using the diaphragm jig (C).

Note	Confirm the direction of the diaphragm when attaching.

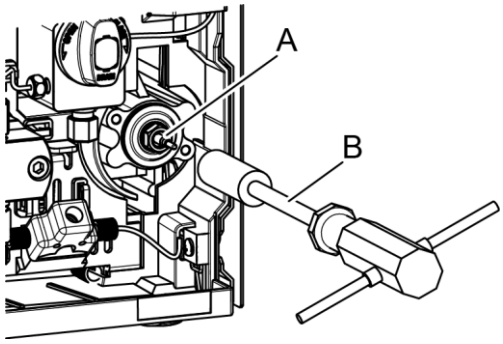


5 After applying the grease (black: approximately 5 mm square size) provided with the plunger holder ASSY to the rear end surface of the plunger (a), insert the plunger holder (A) to which the diaphragm was attached in Procedure 4 into the pump body.



Note	• Be careful not to get any grease on the diaphragm or the body. • Attach the diaphragm so that it will not become detached from the plunger holder. If the diaphragm becomes detached, wipe away any grease and perform from Procedure 4 again.

6 Tighten the plunger holder (A) using the box driver (B).



7 Pinch the end of the plunger with your two fingers, move it up, down, right, left, clockwise, and counterclockwise five times each so that the grease applied to the rear end of the plunger holder can spread evenly. Then wipe off the plunger surface with wiper paper soaked in 2-propanol to clean it.

2 In the [PLUNGER SET] screen of the control setting group, press [2] and [Enter]. (To replace the left plunger, press [1] and [Enter].)

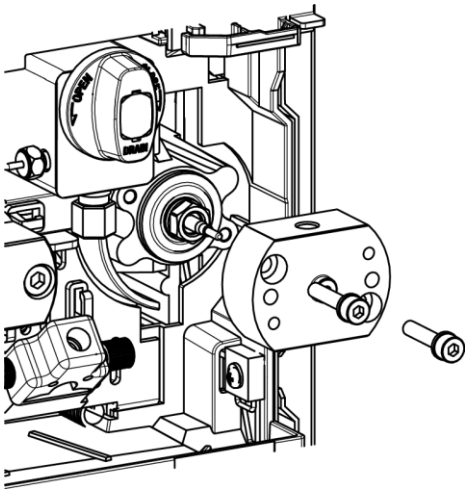
[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference LC-40D CL Series Instruction Manual "3.5.3 [CONTROL] Setting Group/Setting the plunger stop position《PLUNGER SET》"

3 Attach the head holder to the pump body.

CAUTION

Slowly push in the head holder along the plunger.
Pushing in the head holder forcibly may break the plunger.



4 Attach the 2 hexagonal socket screws to the head holder and tighten them with an Allen wrench.

Note	Tighten the right and left hexagon socket screws alternately in 90° increments. Finally hold the longer part of the hex wrench and tighten them securely.

5 Attach rinse tubes to the top and bottom of the head holder.

6 **In the [PLUNGER SET] screen, press [1] and [Enter].**

(To replace the left plunger, press [2] and [Enter].)

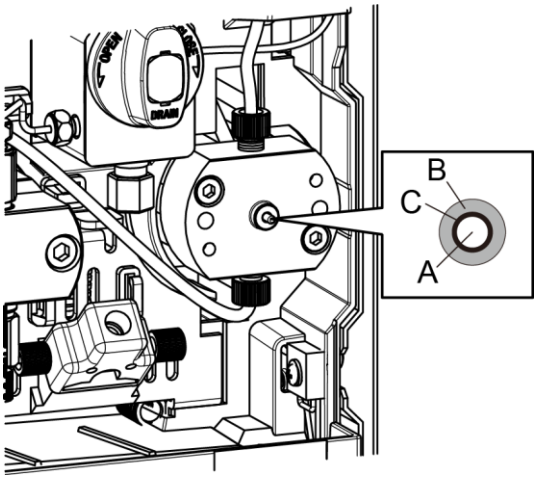
[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the frontmost position.

Reference LC-40D CL Series Instruction Manual "3.5.3 [CONTROL] Setting Group/Setting the plunger stop position《PLUNGER SET》"

7 **Pinch the end of the plunger that is projecting from the head holder with your fingers and adjust its position to make the gap (C) around the plunger (A) inside the hole of the projection (B) of the head holder even. While keeping the plunger in place, wipe off the plunger surface with clean wiper paper soaked in 2-propanol.**

CAUTION

Move the plunger gently.
Moving the plunger too abruptly could scratch the plunger surface or cause it to break off.



8 **In the [PLUNGER SET] screen, press [2] and [Enter]. (To attach the left plunger seal, backup ring and pump head, press [1] and [Enter].)**

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference LC-40D CL Series Instruction Manual "3.5.3 [CONTROL] Setting Group/Setting the plunger stop position《PLUNGER SET》"

Note	When replacing the plunger, be sure to replace the plunger seal and the diaphragms.1.4 Replacing the Plunger Seal (P.14).

9 **Attach the pump head, SUS pipe, and inlet tube and set the seal rinsing kit back in place by following the instructions in Removing the pump head (P.6).**

1.6 Rinsing the Check Valve

This section will explain how to pump 2-propanol to rinse the check valve.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

Necessary parts

Part Name	Part Type	Part No.	Quantity
RESISTANCE TUBE,COIL FOR CLEANING	Replacement part	228-57908-41	1

1 **After using buffer solution as the mobile phase, replace the solvent in the reservoir bottle with water.**

CAUTION

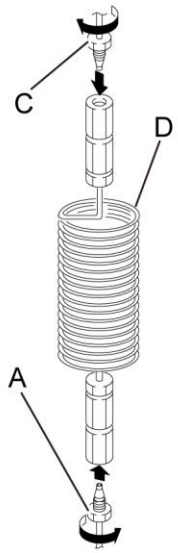
After using buffer solution as the mobile phase, do NOT replace with an organic solvent such as 2-propanol without first replacing with water.

When using a buffer solution in the reservoir bottle, replace with distilled water or purified water, and after pumping at least 20 mL into the instrument, replace with new 2-propanol. If the buffer solution is directly replaced with 2-propanol, crystals will be precipitated, which can cause damage to the plunger seal or cause problems with the check valve.

Reference System Guide "Precautions When Replacing the Mobile Phase"

2 **Replace the solvent in the reservoir bottle with 2-propanol.**

3 **Loosen the male nuts on the column inlet and outlet with an 8-mm wrench and then remove the coupling from the flow path.**



4 **Attach the male nut (A and C) of the coupling inlet and outlet that was removed to the resistor tube (D), and tighten it with an 8 mm wrench.**

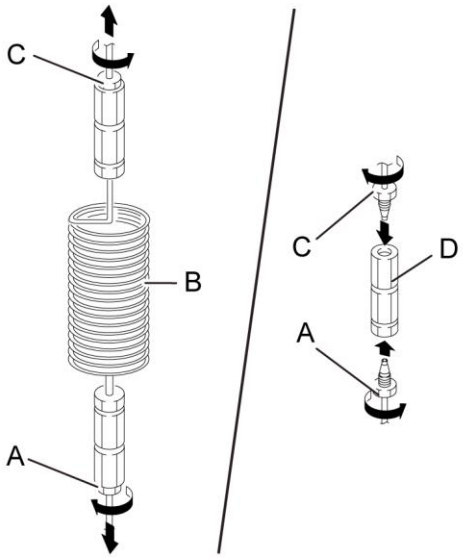
5 **Press [CE] to display the initial screen.**

6 **Press [Enter] once.**
The cursor blinks at the [FLOW] input position.

7 **Press [2], [.], [0] and [Enter].**
[FLOW] is set to "2.0000" and confirmed.

8 **Press [PUMP].**
[PUMP] on the display is highlighted and delivery of 2-propanol starts at 2 mL/min.
Continue delivery at least 1 hour.

9 **Loosen the male nut (A and C) of the resistor tube inlet and outlet with an 8 mm wrench, and remove the resistor tube (B) from the flow line.**



10 **Attach the removed male nut (A and C) of the resistor tube inlet and outlet to the coupling (D) with an 8 mm wrench and tighten it with the 8 mm wrench.**

11 **Check the pumping stability after cleaning the check valves.**

Reference LC-40D CL Series Instruction Manual "3.6.4 Validation Support Information Group (VALIDATION)/Checking the pulse《PULSE CHECK》 "

12 **Replace the solvent in reservoir bottle with the original mobile phase.**

Reference System Guide "Precautions When Replacing the Mobile Phase"

1.7 Performing an Ultrasonic Cleaning of the Check Valve

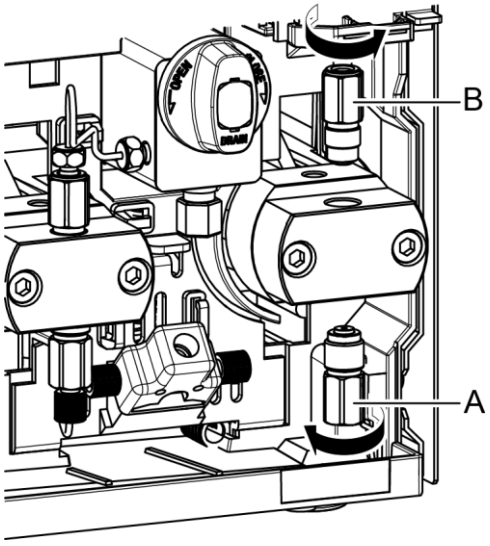
Check valves are attached to the left and right pump heads. The following section will explain the method for performing an ultrasonic cleaning of the check valves on the right side (when viewed from the front). Performing an ultrasonic cleaning of the check valves on the left side are also the same procedure.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

1 **Remove the SUS pipe and inlet tube by following the instructions in Removing the pump head (P.6).**

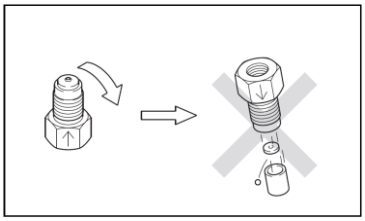
2 **Use a 10 mm wrench to remove the inlet check valve (A) and the outlet check valve (B).**



CAUTION

Never disassemble the check valve.
Performance cannot be guaranteed if disassembled.

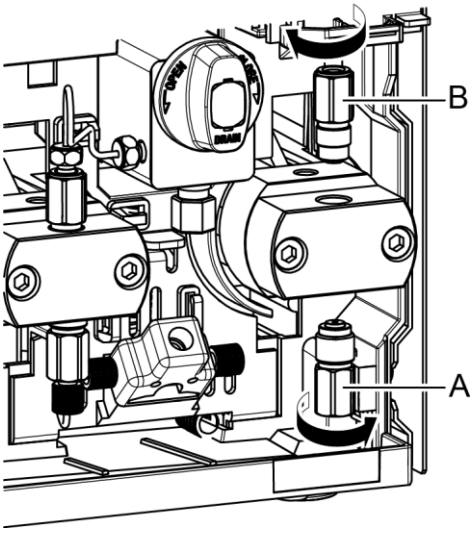
(For LC-40D X3 CL) Do NOT turn the inlet check valve (A) upside down.
If you do, the internal parts will fall out.



3 **Immerse the inlet check valve (A) and outlet check valve (B) into 2-propanol, and clean for 5 minutes using an ultrasonic bath.**

4 **Rotate the inlet check valve (A) and the outlet check valve (B) clockwise to attach them to the pump head, and after tightening by hand, use a 10 mm wrench to tighten them as follows.**

- Inlet check valve
  - LC-40D X3 CL:
    Hand tightening and 120° with wrench
  - LC-40D XR CL:
    Hand tightening and 90° with wrench
- Outlet check valve
  - LC-40D X3 CL:
    Hand tightening and 60 to 90° with wrench
  - LC-40D XR CL:
    Hand tightening and 90° with wrench



5 **Attach the SUS pipe and inlet tube by following the instructions in Installing the pump head (P.11).**

1.8 Replacing the Check Valve

Check valves are attached to the left and right pump heads. The following section will explain the method for Inspection (Replacing) of the check valves.

Inspection (Replacing) of the check valves on the left side are also the same procedure.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

Necessary parts

Target Model	Part Name	Part Type	Part No.
LC-40D X3 CL	Inlet check valve ASSY	Consumable parts	228-52964-42
LC-40D XR CL			228-48249-96
LC-40D XR CL	Inlet check valve ASSY, 2 pieces		228-48249-97
LC-40D X3 CL	Outlet Check Valve ASSY		228-53334-96
LC-40D XR CL			228-45705-43

1 Check the pumping stability.

Reference LC-40D CL Series Instruction Manual "3.6.4 Validation Support Information Group (VALIDATION)/Checking the pulse《PULSE CHECK》 "

If the result of the system check is "Pass", it is considered normal.

If the result of the system check is "Fail", 1.6 Rinsing the Check Valve (P.29) . If the pumping (pressure) is still unstable, 1.7 Performing an Ultrasonic Cleaning of the Check Valve (P.31), and then check the pumping stability again. If the result of the system check is "Fail", proceed to the following procedure.

2 Remove the check valve and install a new one by following the instructions in Step 2 of 1.7 Performing an Ultrasonic Cleaning of the Check Valve (P.31).

3 Attach the SUS pipe and inlet tube by following the instructions in Installing the pump head (P.11).

4 Turn the drain valve counterclockwise to open it.

5 Press [Enter] once.

The cursor blinks at the [FLOW] input position.

6 Press [2], [.], [0], and [Enter].

[FLOW] is set to "2.0000" and confirmed.

7 Press [PUMP] and confirm the solvent continues to flow out from the drain valve.

[PUMP] on the display is highlighted and the solvent flows out of the drain tube.

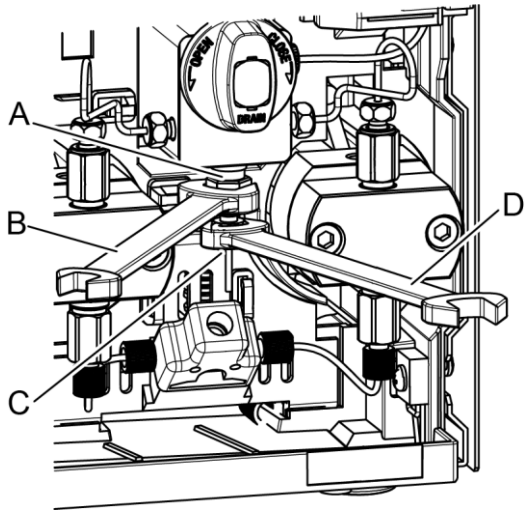
There is no problem with the valve if the solvent continues to flow out.

1.9 Inspecting the Line Filter

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

1 **Fix the line filter (A) with a 10 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with an 8 mm wrench (D) to remove it.**



2 **Pour water into a reservoir bottle and set the flow rate to 1 mL/min.**

3 **In a no load state, pump water at a rate of 1 mL/min.**

- If the pressure is 0.3 MPa or less, it is considered normal.
- If the pressure is more than 0.3 MPa, replace the line filter.

Note	When a mobile phase additive such as trifluoroacetic acid is used, a ghost peak may be generated from the line filter. In this case, perform the following procedure to rinse the line filter. • Deliver a 17% phosphoric acid solution at a flow rate of 1 mL/min for about 30 minutes. (Pumping pressure: 1 MPa to 5 MPa) For example, attach a stainless tube with ID0.1 x 2000mm (Part No.: 228-57908-41). • Deliver purified water at a flow rate of 10 mL/min for about 30 minutes. (Pumping pressure: 1 MPa to 5 MPa) For example, attach a stainless tube with ID0.3 x 2000mm*1. *1: Stainless tubing ID0.3 x 1000mm (Part No.: 228-53184-96) 2pc and Coupling (Part No.: 228-16004-13) 1pc can be substituted.

1.10 Replacing the Line Filter

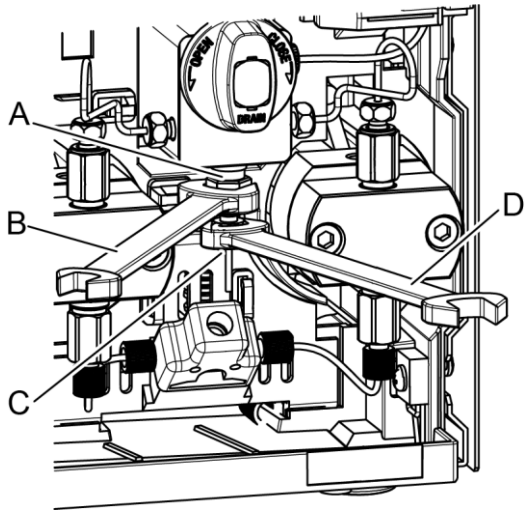
Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

Necessary parts

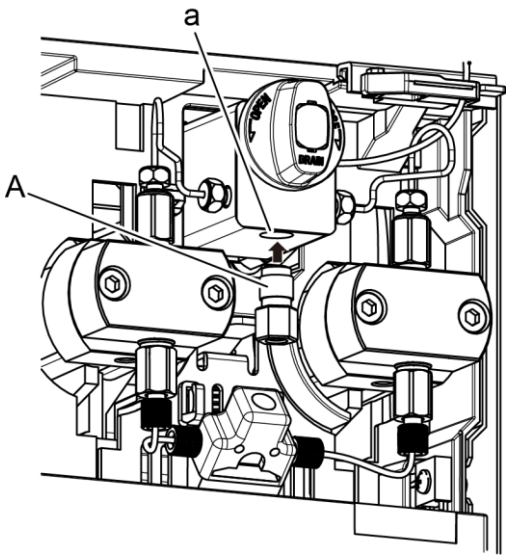
Target Model	Part Name	Part Type	Part No.
LC-40D X3 CL	Line Filter	Consumable part	228-57501-92
LC-40D XR CL			228-35871-96

1 **Fix the line filter (A) with a 10 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with an 8 mm wrench (D) to remove it.**



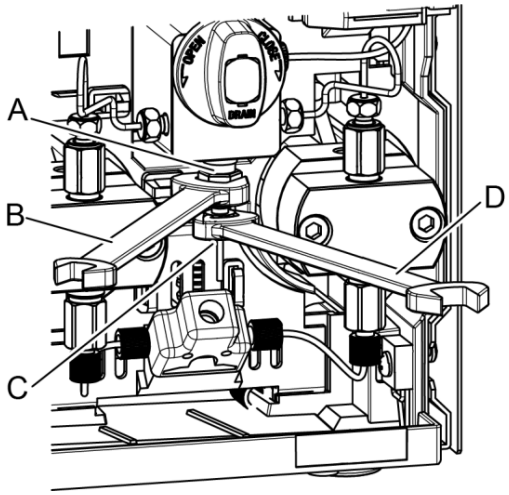
2 **Loosen the line filter (A) with 10 mm wrench to remove it.**

3 **Wipe with a cotton swab, etc., to wipe away any dirt from the line filter port (a).**



4 **Attach the new line filter (A) to the line filter port (a) by hand, and tighten it 45° using a 10 mm wrench.**

5 **Attach the male nut (C) of the pump outlet tube to the line filter (A) by hand.**



6 **Fix the line filter (A) with a 10 mm wrench (B) and tighten the male nut (C) of the pump outlet tube with an 8 mm wrench (D).**

Note	When using in the front end of LC-MS, carry out the cleaning process described as follows to reduce background noise. Pump 50% methanol solution at a pressure of approx.10 MPa for approx. 30 min. (For example, attach a stainless steel tube with ID 0.1 x 2000 mm (Part No.: 228-57908-41) and adjust the flow rate.)

1.11 Cleaning/Replacing the Suction Filter

Necessary Parts

Part Name	Part Type	Part No.	Quantity
SUS Filter Element, w/PTFE Fitting	Consumable part	228-45707-91	1

Hint Use the SUCTION FILTER with tube and fittings for pump inlet (Part No. 228-45708-91) or SUCTION FILTER with tube and fittings for the low pressure gradient kit or the degassing unit (Part No. 228-61905-49) as necessary.

Note	Contamination of suction filters can lead to contamination of mobile phase solvents and bottles, causing background rise and ghost peaks. Even if you are wearing gloves, do not touch the metal parts of the suction filter as much as possible. Hold the non-metal part of the filter element.

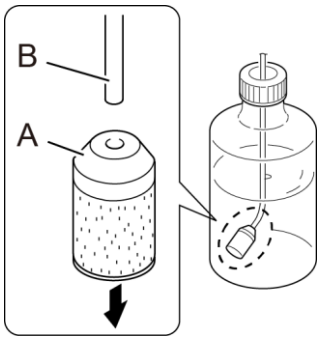
CAUTION

After using the buffer solution as the mobile phase, do NOT replace with an organic solvent such as 2-propanol without first replacing with water.

When using a buffer solution, replace it with distilled water or purified water, and after pumping at least 20 mL into the instrument, replace it with new 2-propanol. If the buffer solution is directly replaced with 2-propanol, crystals will be precipitated, which can cause damage to the plunger seal or cause problems with the check valve.

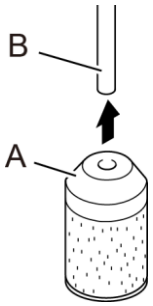
Reference System Guide "Precautions When Replacing the Mobile Phase"

1 Pull the suction filter (A) from the suction tubing (B).



2 Place the suction filter into a clean container with 2-propanol, and clean it for 5 minutes using an ultrasonic bath.

3 **Insert the suction tubing (B) into the suction filter (A).**



4 **Replace the solvent in reservoir bottle with water, and place the suction tubing back into the bottle.**

5 **Press [CE] to display the initial screen.**

6 **Deliver water at 1 mL/min for 10 minutes.**

7 **Check for air bubbles inside the suction tubing.**

Replace the suction filter if air bubbles are present.

Note	If Ghost peaking occurs, rinse the suction filter. Refer to System Guide "5.3.2 Symptoms Presumably Due to an Error, Based on a Chromatogram".

1.12 Replacing the Drain Valve

Necessary tools

Part Name	Quantity	Part No.
Phillips screwdriver	1	-

Necessary parts

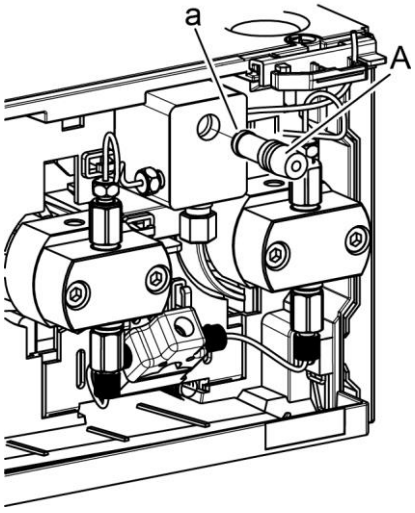
Part Name	Part Type	Part No.
DRAIN VALVE ASSY,TP	Replacement part	228-51229-93

1 **Rotate the drain valve ASSY counter-clockwise at least 3 complete rotations and pull it off straight.**

Note	Check the hole for foreign objects.

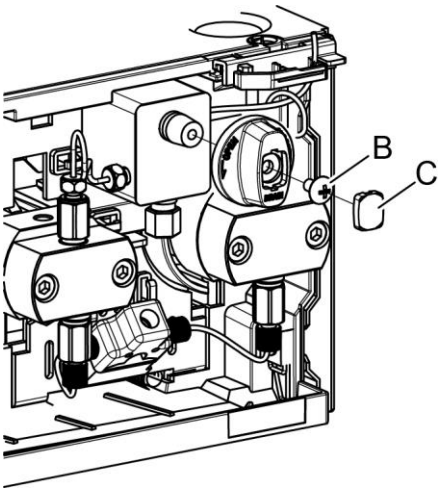
2 **Wet the seal portion (a) of the new drain valve ASSY (A) with 2-propanol, etc., and insert it into the hole.**

Note	If the drain valve ASSY is forcefully inserted or is not inserted straight, the seal portion may become deformed, resulting in leakage.



3 **Tighten the drain valve ASSY clockwise.**

4 **After tightening the drain valve ASSY, attach the knob with the screw (B) using a phillips screwdriver so that it is vertical, and then attach the cap (C).**



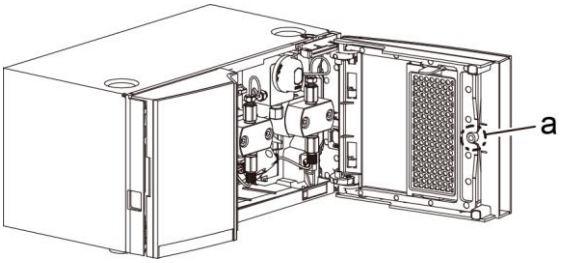
1.13 Replacing the Air Filter (Right Panel)

This section explains about replacement on the air filter of the right panel.

Necessary parts

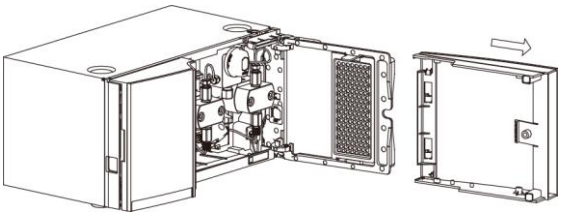
Part Name	Part Type	Part No.
Air Filter Element, Non Woven, for Right Panel	Consumable part	228-53924-06

1 **Open the right panel.**

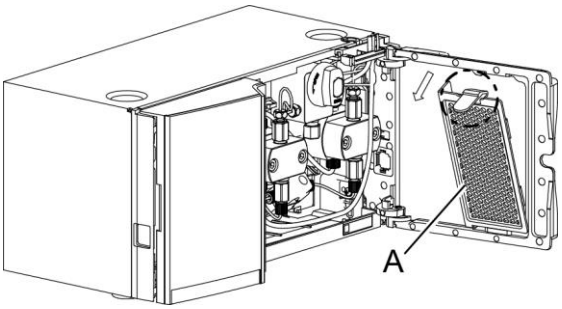


2 **Remove the right panel cover.**

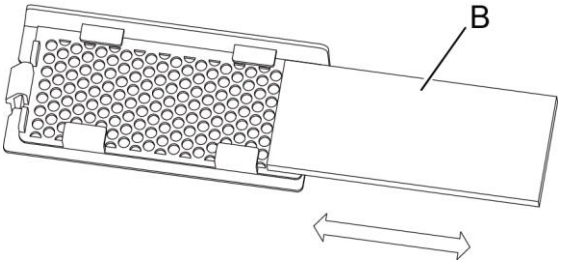
While lightly pressing the cylinder-shaped projection (a) inside the right panel cover, slide the cover to the front.



3 **While pressing the knob at the top of the filter holder (A), remove it toward the front.**



4 **Slide the air filter (B) to attach/remove it.**



5 **Attach the filter holder and the right panel.**

1.14 Cleaning of the Leak Tray

Note	If a leak occurred, wipe off the leak in the leak tray completely as below. Leak of mobile phase solution used as buffer solution may dry and crystallize, clogging the leak tray. If the leak tray is contaminated by such crystallized buffer solution, wipe off the leak tray with paper wiper soaked in water in the same manner as below.

1 **Wipe off leak around the leak sensor or on the leak tray completely with wiper paper.**

Note	• Do not bend or pull the leak sensor. • If there is contamination such as crystallized buffer solution, wipe it off with wiper paper soaked in water.

1.15 Cleaning the Exterior

1.15.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or tissue paper.
If it is very dirty, clean it as below.

1 **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**

2 **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

CAUTION
Do NOT leave any part wet nor use thinner for cleaning. Doing so may cause rust or discoloration.

1.15.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1 Turn off the power of the column oven.

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

1.16 Cleaning of the Automatic Rinsing Kit

Necessary parts

Part Name	Part Type	Part No.	Quantity
WASHING PUMP SEAL KIT	Replacement part	228-56201-41	1

Note	If the 10% 2-propanol water in the rinse solution bottle is dirty, replace with new solution. If getting significantly dirty, replace with new solution once a day. Even if it does not appear dirty, replace with new solution once a week.

1 Remove the rinse cap of the automatic rinsing kit from the rinse solution bottle.

2 Pour distilled water into the rinse solution botte and clean the inside of the rinse solution bottle using a brush, etc.

3 Pour distilled water into the rinse solution bottle and rinse the inside of the rinse solution bottle for about 5 minutes using an ultrasonic bath.

4 Pour new 10% 2-propanol water into the rinse solution bottle, and return the cap and rinse solution bottle back to their original positions.

5 Replace the rinse tube if the inside is dirty.

2 LC-40B X3 CL

2.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

This chapter takes pump A as an example to describe the maintenance and inspection procedures of the instrument.

⚠WARNING

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.
Fire, electric shock or malfunction may occur.

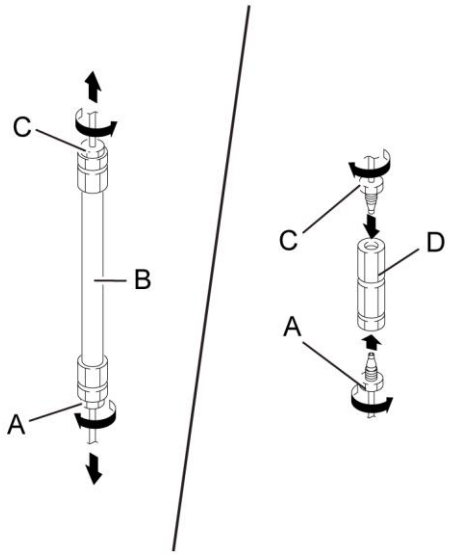
⚠CAUTION

For parts replacement, use parts and tools listed in Component Parts LC-40B X3 CL (P.197) **and Maintenance Parts LC-40B X3 CL** (P.228)**".**
If any other parts or tools are used, part damage, injury, and malfunction may occur.

Never remove the cover.
This may cause injury or a malfunction of the device.
Contact your Shimadzu representative if the cover must be removed.

2.1.1 Prior to Inspection and Maintenance

- Loosen the male nuts (A and C) on the column inlet and outlet with an 8-mm wrench and then remove the column (B) from the flow path. Attach the coupling (D) to the male nut (A and C), and tighten it with an 8 mm wrench.



- Replace the mobile phase in the flow lines with at least 20mL of water. When normal phase solvent was used, replace the internal channel with 2-propanol and then with water.
- Wipe away any dirt from the front panel and the main cover.

■ Standard Reagents for Maintenance

Solvent	Description	Inspection/Maintenance Item
2-propanol	sed for cleaning parts.	2.3 Replacing the Plunger Seal (P.54) 2.4 Cleaning/ Replacing the Plunger and Diaphragm (P.62) 2.5 Rinsing the Check Valve (P.68) 2.6 Performing an Ultrasonic Cleaning of the Check Valve (P.70) 2.10 Cleaning/Replacing the Suction Filter (P.75) 2.11 Replacing the Drain Valve (P.77) 2.14 Cleaning of the Automatic Rinsing Kit (P.80)

■ Hardware Maintenance Supplies

Note that in addition to the following tools and parts are also required. The tools and parts required for the maintenance of each part are listed at the beginning of each section.

Item	Description	Inspection/Maintenance Item
Protective glasses	glasses and gloves before the maintenance.	ALL Inspection/Maintenance
Gloves		
Wiping paper	Used for wiping and cleaning parts.	2.3 Replacing the Plunger Seal (P.54) 2.4 Cleaning/ Replacing the Plunger and Diaphragm (P.62)

Item	Description	Inspection/Maintenance Item
Beaker	Used for cleaning parts.	2.3 Replacing the Plunger Seal (P.54)
Ultrasonic bath	Used for cleaning parts.	2.3 Replacing the Plunger Seal (P.54) 2.6 Performing an Ultrasonic Cleaning of the Check Valve (P.70) 2.10 Cleaning/Replacing the Suction Filter (P.75) 2.14 Cleaning of the Automatic Rinsing Kit (P.80)
Tweezers	Used for gripping the plunger seal and backup ring.	2.3 Replacing the Plunger Seal (P.54)

2.1.2 List of Periodic Inspection and Maintenance

Note	The maintenance and replacement periods listed in this table are presented only as guidelines. These are not guarantee periods. These will vary depending on usage conditions.

<table>
<tr><th>Inspection/ Maintenance Item</th><th>Replacement Periods</th><th>Remark</th><th>Ref.</th></tr>
<tr><td>Replacement of Plunger Seal</td><td>1 year</td><td>• Sealing efficiency decreases when seals are worn.
• As a guideline, seals should be replaced after delivery of the respective volumes listed below. (VP fuction, [L(R)SEAL USED], shows the total delivered volume.)<table><tr><th>Pumping Pressure</th><th>Total Delivery</th></tr><tr><td>80 MPa (816 kgf/cm^2)</td><td>30 L</td></tr></table>Repeating high-pressure (above 100 MPa) and low-pressure (below 10 MPa) pumping could shorten the life of seals.</td><td>2.3 Replacing the Plunger Seal (P.54)</td></tr>
<tr><td>Replacement of Plunger</td><td>1 year</td><td>Replace the plunger seal and the diaphragm when the plunger is replaced.</td><td rowspan="2">2.4 Cleaning/ Replacing the Plunger and Diaphragm (P.62)</td></tr>
<tr><td>Replacement of Diaphragm</td><td>1 year</td><td>-</td></tr>
<tr><td>Replacement of Outlet Check Valve</td><td>1 year</td><td>-</td><td>2.7 Replacing the Check Valve (P.72)</td></tr>
<tr><td>Replacement of Inlet Check Valve</td><td>1 year</td><td>-</td><td>2.7 Replacing the Check Valve (P.72)</td></tr>
<tr><td>Replacement of Line Filter</td><td>2 years</td><td>Replace when particulates in mobile phase clog the filter.</td><td>2.8 Inspecting the Line Filter (P.73)</td></tr>
</table>

Inspection/ Maintenance Item	Replacement Periods	Remark	Ref.
Replacement of Suction Filter	2 years	Replace when particulates in mobile phase clog the filter.	2.10 Cleaning/Replacing the Suction Filter (P.75)
Replacement of Drain Valve	3 years	Replace when there is a fluid leak from the drain valve.	2.11 Replacing the Drain Valve (P.77)
Replacement of Air Filter (for FAN)	1 year	Contact your Shimadzu representative.	-
Pump ASSY lubrication	3 years	Contact your Shimadzu representative.	-
Replacement of Fuse	3 years	Contact your Shimadzu representative.	-
Cleaning of the Automatic Rinsing Kit	1 year	-	2.14 Cleaning of the Automatic Rinsing Kit (P.80)
Replacement of Pump Head	(2 years)	Pumping mobile phase mixtures containing acids such as trifluoroacetic acid or formic acid can cause leakage due to internal damage in the pump head. In such cases, replace the pump head every two years, as a general guideline. (Pump heads do not need to be replaced if only mobile phases without acid are pumped.)	-

■ Optional Parts

Inspection/ Maintenance Item	Replacement Periods	Remark	Ref.
Replacing Air Filter of Low Pressure Gradient Kit	(1 years)	Pumping mobile phase mixtures containing acids such as trifluoroacetic acid or formic acid can cause leakage due to internal damage in the pump head. In such cases, replace the pump head every two years, as a general guideline. (Pump heads do not need to be replaced if only mobile phases without added acid are pumped.)	-

2.1.3 Check after Inspection and Maintenance

- After inspection and maintenance, check any leakage during pumping.
- Return tubes after completing the work.

Note	When the parts management tool（PARTS MGMT TOOL）is not used, input the part number when replacing a part not registered in the PARTS MGMT TOOL. LC-40B X3 CL Instruction Manual "3.6.3 [SYSTEM] Setting Group/Inputting a replacement part number《PART REPLACEMENT A/B》"

2.2 Removing/Installing the Pump Heads

This section explains how to remove and re-attach the right pump head of pump A. Removing and re-attaching the left-side pump head is also the same procedure.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06
Allen wrench (M5)	1	086-03805
Syringe	1	046-00038-01
Syringe needle	1	228-18216-91

■ Prior to the maintenance perform the preparatory work.

2.1.1 Prior to Inspection and Maintenance (P.45)

■ Removing the pump head

1 **Perform either of the following to prevent the mobile phase solvent from flowing out of the suction tube or pump head when removing the tubes around the pump.**

- Place the reservoir bottle at a position lower than the pump inlet.
- Empty the reservoir bottle and suction tube of the mobile phase solvent, loosen the bushing of the suction filter, and remove it from the pump inlet.

2 **Press [CE] to display the initial screen.**



3 **Press [→] twice.**



4 **Press [↓] once, move the cursor to [CONTROL], and press [→].**

[PLUNGER SET] menu is displayed.



5 **Press [Enter].**

The cursor blinks at the input position.



6 Press [2] and [Enter]. (To replace the left plunger seal, press [1] and [Enter].)

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

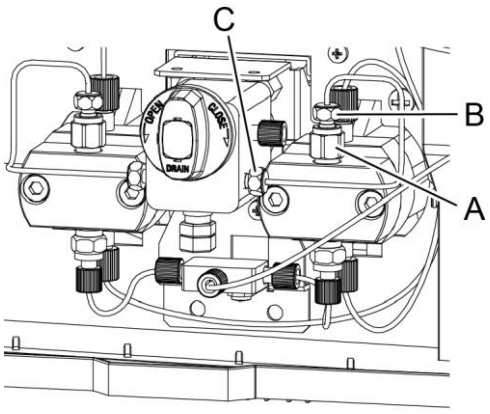
In the conditions, remove the right pump head.

Before attaching the right pump head, perform steps 2 to 6 as well.



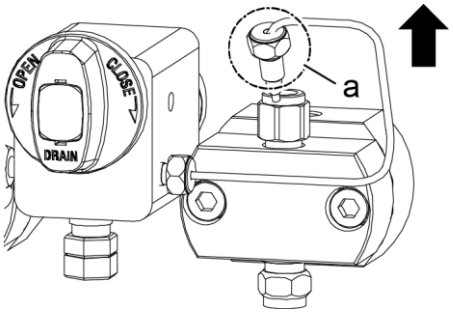
7 Follow the instructions below to remove the tube (SUS pipe R) connecting the check valve OUT and the pressure sensor.

1 While holding the check valve OUT (A) with a 10-mm wrench, loosen the check valve OUT side male nut (B) of the SUS pipe R with an 8-mm wrench.



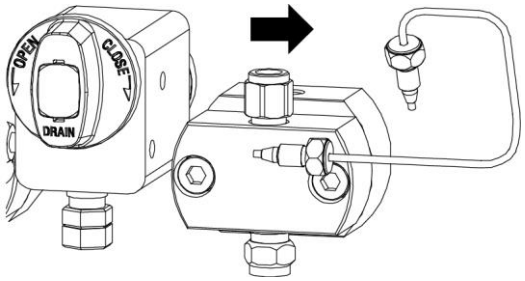
2 Loosen the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.

3 Hold the check valve OUT side male nut ("a" in the figure) of the SUS pipe R and then slightly lift and pull out the SUS pipe R.

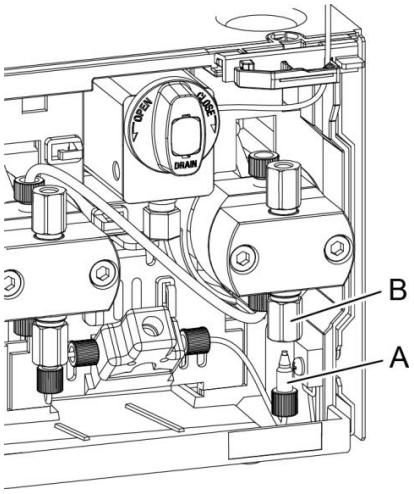


4 Pull the SUS pipe R to the right to remove it from the pressure sensor.

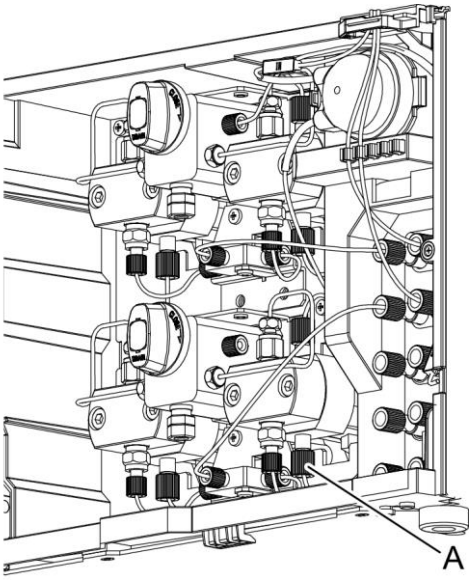
Hint Though the orientation is opposite to the right one (SUS pipe R), remove the left tube (SUS pipe L) in the same procedure.



8 Loosen the male nut PEEK (A) of the inlet tube by hand and remove it from the check valve IN (B).



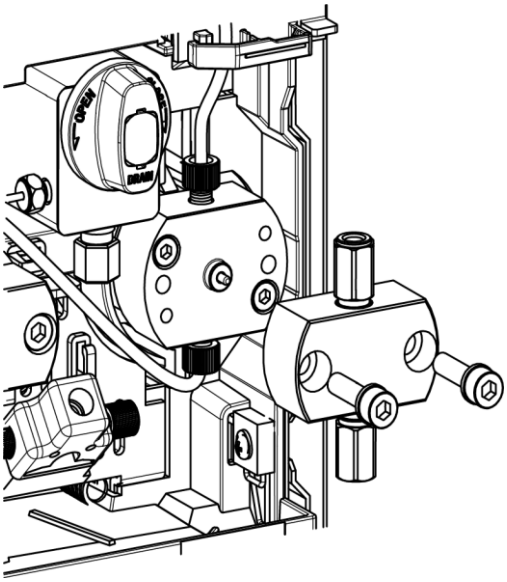
9 **Make sure that the drain tube of the rinse flow line is inserted into the drain bottle located below the pump, and loosen the joint (A). Confirm that the rinse solution inside the rinse flow line is discharged, and tighten the joint (A).**



10 **Gradually loosen the 2 hexagonal socket screws using an Allen wrench (M5) by alternating between the left and right screw, and remove the pump head.**

CAUTION

Gently pull the pump head horizontally along the plunger.
The plunger may be damaged if the pump head is forcefully removed.

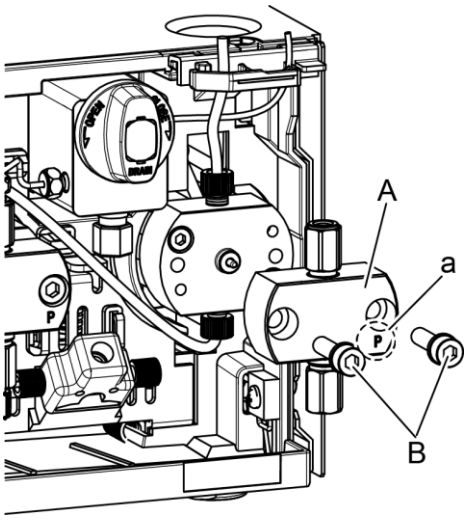


■ Installing the pump head

1 **Set the plunger position by following steps 2 to 6 in Removing the pump head (P.48).**

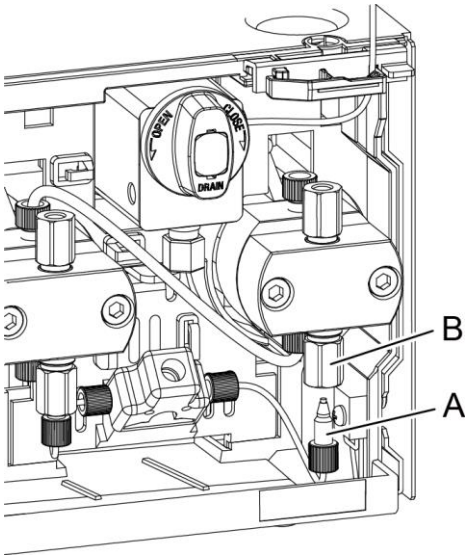
2 **Hold the pump head with the mark (a) coming at the bottom right, tighten the 2 hexagonal socket screws (B) with an Allen wrench (M5) by tightening the right and left screws alternately, and attach the pump head (A).**

CAUTION
Gently inset the pump head horizontally along the plunger. The plunger may be damaged if the pump head is forcefully inserted.



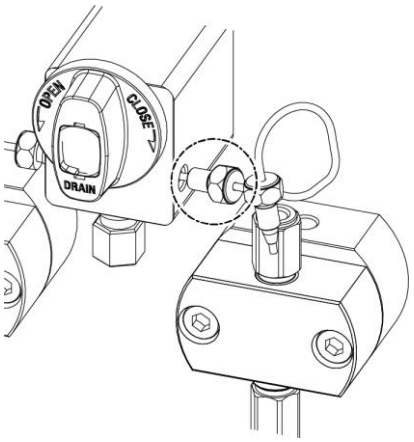
Note	Tighten the left and right hexagonal socket screws 90 degrees at a time, and then firmly tighten using the long side of the Allen wrench.

3 **Tighten the male nut PEEK (A) of the inlet tube to the inlet check valve (B) by hand.**

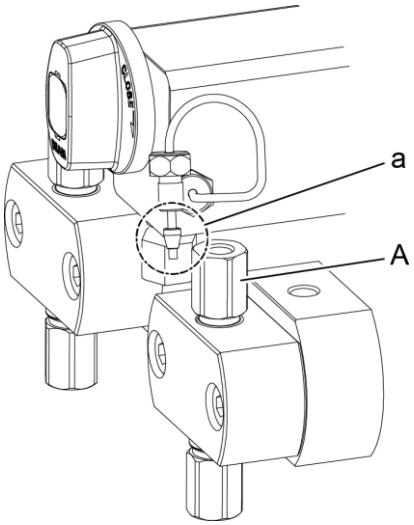


4 Follow the instructions below to attach the tube (SUS pipe R) connecting the check valve OUT and the pressure sensor.

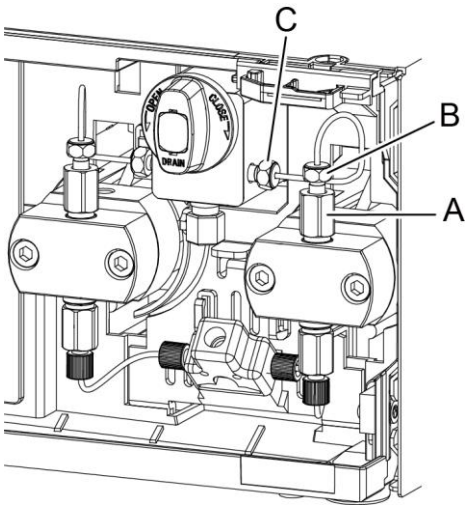
1 Insert the end of the SUS pipe R into the hole of the pressure sensor.



2 Hold the check valve side end of the SUS pipe R ("a" in the figure) and then insert the male nut into the check valve OUT (A).



3 While holding the check valve OUT (A) with a 10-mm wrench, tighten the SUS pipe R male nut on the check valve OUT side with an 8-mm wrench (B).



4 Tighten the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.

Hint Though the orientation is opposite to the right one (SUS pipe R), attach the left tube (SUS pipe L) in the same procedure.

5 **Set the delivery amount of the rinsing pump to [5].**

Reference LC-40B X3 CL Instruction Manual "3.5.2 [PARAMETER] Setting Group/Setting the delivery amount of the rinsing pump 《RINSING OPERATE》 "



6 **Set the total flow rate to [0], set the concentration for pump B to [0], press the [PUMP] key, and then press the [ENTER] key.**

The rinsing pump operates. Wait approximately 10 minutes for the rinse fluid to exit from the outlet of the rinse flow line.

Reference LC-40B X3 CL Instruction Manual "3.1.2 Setting Flow Rate "
LC-40B X3 CL Instruction Manual "3.2.2 Operation in Constant Flow Delivery Mode "



2.3 Replacing the Plunger Seal

A plunger seal and backup ring are attached inside the left and right pump heads. The following section will explain the method for replacing the plunger seal on the right side (when viewed from the front).

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06
Allen wrench (M5)	1	086-03805
Seal Installer/Remover	1	228-62458-41

Necessary parts

Part Name	Part Type	Part No.
Plunger Seal (UHP) (supplied with backup ring)	Consumable part	228-52711-93

■ **Prior to the maintenancePerform the preparatory work.**

2.1.1 Prior to Inspection and Maintenance (P.45)

2.3.1 Replacing the Plunger Seal and Backup Ring

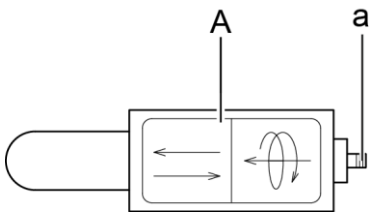
1 **Remove the pump head, SUS pipe, and inlet tube according to the procedure described in Removing the pump head (P.48).**

2 **Perform the following steps to replace the plunger seal and backup ring.**

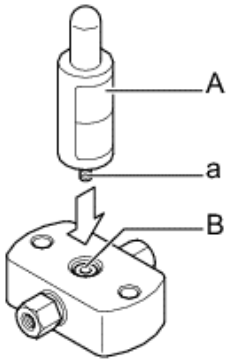
The plunger seal and the backup ring are installed inside the pump head. Use the provided seal installer/remover to remove them.

> ⚠ CAUTION
>
> **Don't drop the seal installer/remover when using it.**
> Seal installer/remover may be damaged.

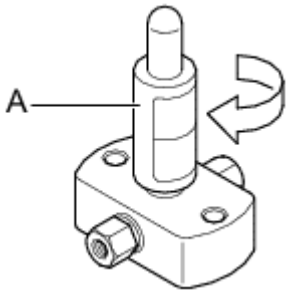
1 Wipe off the threaded tip on the metal part (a) of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



2 With the metal part (a) of the seal installer/remover (A) facing downward, insert the seal installer/remover (A) vertically into the backup ring (B).

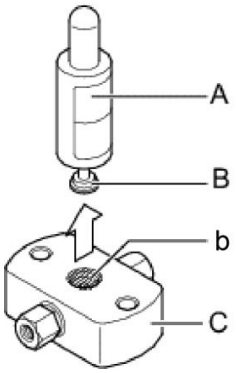


3 Turn the seal installer/remover (A) 180 degrees to 360 degrees clockwise.



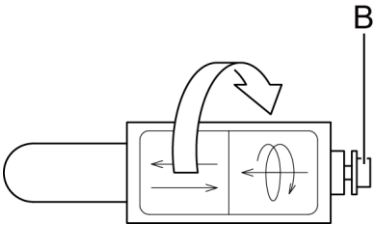
4 Pull out the seal installer/remover (A) upward.

The backup ring (B) will come off from the plunger seal hole (b) of the pump head (C).



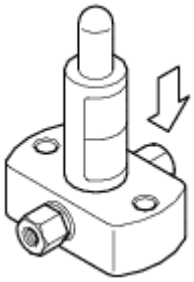
Note	If the backup ring is still stuck, return to step 3 and turn the seal installer/remover 180 degrees more, then retry this step.

5 Grip the backup ring (B) with two fingers and turn the seal installer/remover counterclockwise, then remove the backup ring from the seal installer/remover.

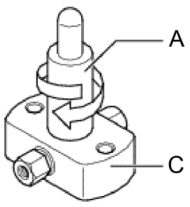


6 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

7 With the metal part of the seal installer/remover facing downward, place the seal installer/remover vertically above the plunger seal and push it slightly into the seal.

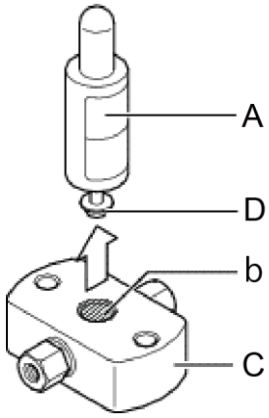


8 Turn the seal installer/remover (A) clockwise until it comes into contact with the pump head (C).



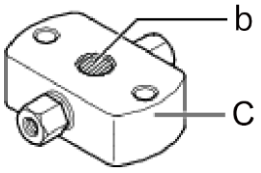
9 Pull out the seal installer/remover (A) upward.

The plunger seal (D) will come off from the plunger seal hole (b) of the pump head (C).



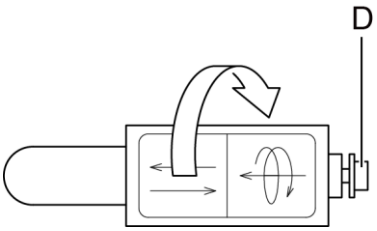
10 Place the pump head into a clean beaker containing 2-propanol, and clean it for 10 minutes using an ultrasonic bath.

11 Use a piece of wiping paper soaked in 2-propanol to wipe the plunger attachment portion (b) inside the pump head (C).



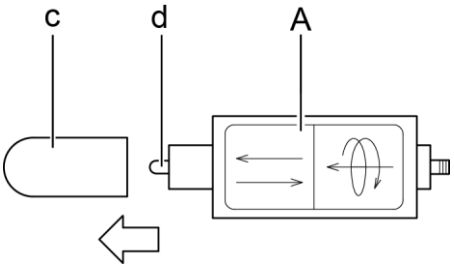
Note	• If seal material adheres to the plunger attachment portion of the pump head, the airtightness cannot be maintained. • If any scratches are found on the plunger attachment portion of the pump head, replace the pump head.

12 Grip the plunger seal (D) with two fingers and turn the seal installer/remover counterclockwise, then remove the plunger seal from the seal installer/remover.



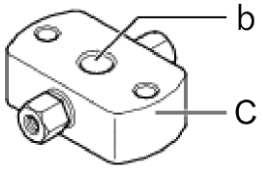
13 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

14 Remove the cap (c) from the seal installer/remover (A).



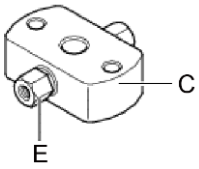
15 Wipe off the white protrusion (d) and the surrounding area of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.

16 Put some drops of 2-propanol in the plunger seal hole (b) of the pump head (C) while paying attention to spillage of 2-propanol.



CAUTION

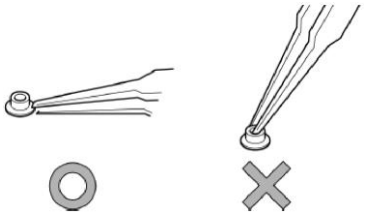
Before putting in 2-propanol, screw the check valves (E) into the pump head (C) so that 2-propanol does not leak from the holes for the check valve.



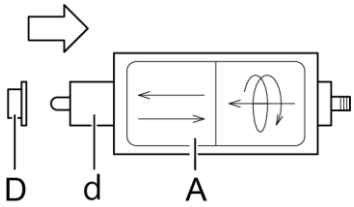
17 Soak a new plunger seal and a new backup ring in 2-propanol in a clean beaker.

CAUTION

When gripping the plunger seal with tweezers, do not touch the internal hole surface. Also, to prevent damage, do not grip the plunger seal and the backup ring tightly with tweezers.



18 Take the new plunger seal (D) out of the beaker and put it on the white protrusion (d) of the seal installer/remover (A).

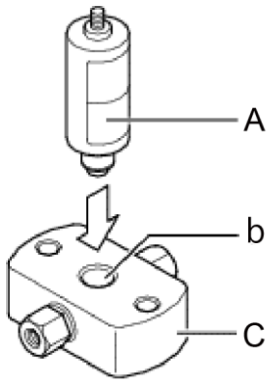


CAUTION

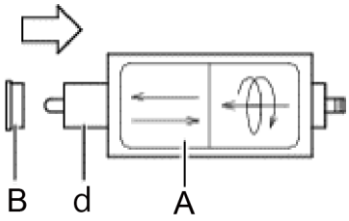
Be sure that the plunger seal is moistened with 2-propanol when putting it on the seal installer/remover.

19 Insert the seal installer/remover (A) vertically all the way into the plunger seal hole (b) of the pump head (B) and slowly pull out the seal installer/remover upward.

The plunger seal will be installed in the pump head.



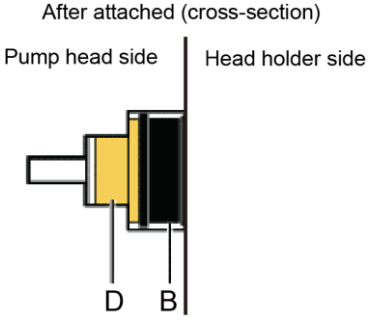
20 Take the new backup ring (B) out of the beaker and, with the smaller diameter side facing the seal installer/remover (A), put the backup ring on the white protrusion (d).



CAUTION

Be sure to attach the backup ring with the correct orientation.
When the backup ring (B) is attached correctly to the pump head, the larger diameter side comes into contact with the plunger seal (D).

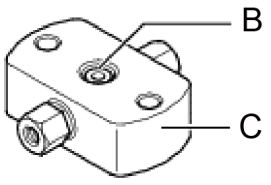
After attached (cross-section)



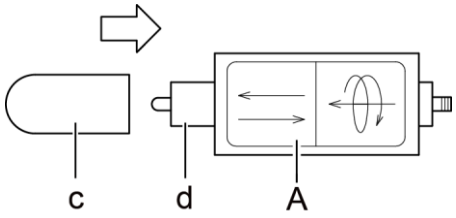
Be sure that the backup ring is moistened with 2-propanol when putting it on the seal installer/remover.

21 Insert the seal installer/remover vertically all the way into the plunger seal and slowly pull out the seal installer/remover upward.

The new backup ring (B) will be installed into the pump head (C).



22 Put the cap (c) on the white protrusion (d) of the seal installer/remover.



3 **Attach the pump head, SUS pipe, and inlet tube by following the instructions in Installing the pump head (P.52).**

2.3.2 Resetting the Delivery Amount

Note	When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL.

1 **Display the [MAINTENANCE] information group of the VP function.**

Reference LC-40B X3 CL Instruction Manual "3.3 Types of Screens "



2 **Press [↓] several times until [R SEAL USED A] is displayed.**

3 **Press [del].**

The delivery amount of the plunger seal before replacement is reset and the reset date is recorded in the maintenance log.



Reference LC-40B X3 CL Instruction Manual "3.6.3 [SYSTEM] Setting Group/Displaying the delivery amount of the left/right plunger seal《L/R SEAL USED A》《L/R SEAL USED B》 "

Hint To replace the left plunger seal, display [L SEAL USED A] and press [del].

2.3.3 Check after Replacement

After replacing the plunger seal, check the following:

- Is the pumping (pressure) stable?
- Is fluid leaking from the gap between the pump head and the head holder?
- Is fluid leaking from the rinse flow line?

Note	If the above occurs even after replacing the plunger seal, it is possible that there are scratches on the surface of the plunger. If there are scratches on the plunger, replace it with a new plunger.

Reference 2.4 Cleaning/ Replacing the Plunger and Diaphragm (P.62)

2.4 Cleaning/ Replacing the Plunger and Diaphragm

A plunger and a diaphragm are attached to the left and right pump body. The following section will explain the method for cleaning/inspecting (replacing) the plunger and the diaphragm on the right side (when viewed from the front).

When replacing the plunger, be sure to also replace the plunger seal and the diaphragm.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06
Allen wrench M4	1	086-03804
Allen wrench M5	1	086-03805
Box driver	1	228-28767-91
Diaphragm jig	1	228-54852
Plunger press plate	1	228-70388

Necessary parts

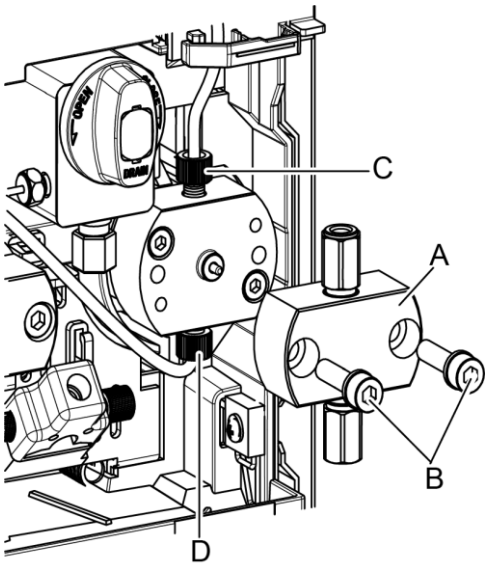
Part Name	Part Type	Part No.	Remark
Plunger Holder Assy	Consumable part	228-52069-44	Supplied with a diaphragm

■ **Prior to the inspection and the maintenancePerform the preparatory work.**

2.1.1 Prior to Inspection and Maintenance (P.45)

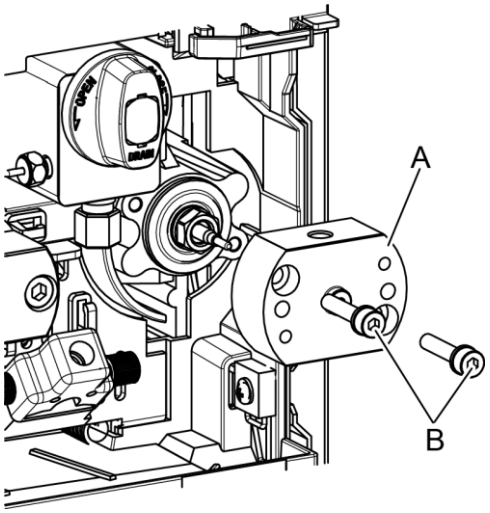
2.4.1 Removing the Pump Head and the Head Holder

1 **Remove the pump head, SUS pipe, and inlet tube according to the procedure described in Removing the pump head (P.48).**



2 **Loosen the head holder top and bottom fittings (C and D), and remove the rinse tube.**

3 **Gradually loosen the 2 hexagonal socket screws (B) of the head holder (A) using an Allen wrench (M4) by alternating between the left and right screw.**



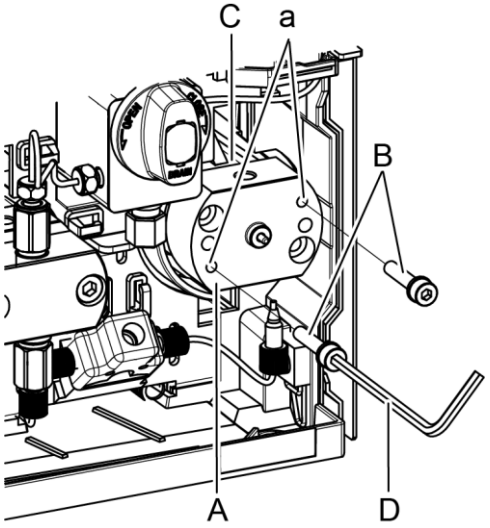
4 **Remove the head holder.**

CAUTION
Gently pull the head holder horizontally along the plunger. If the head holder is not removed carefully, the plunger may become damaged.

■ In the case the head holder is difficult to remove

Insert into the head holder M4 bolt hole (a) the 2 hexagonal socket screws (B) that were removed, and tighten the left and right sides gradually using an Allen wrench (M4) (D).

The head holder (A) can be loosened by pushing the pump body (C) using the 2 hexagonal socket screws (B).



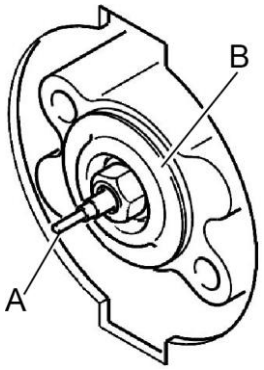
2.4.2 Cleaning and Replacement of the Plunger and the Diaphragm

Note	When replacing the plunger, be sure to replace the plunger seal and the diaphragms.

1 Perform the following steps to clean or inspect (replace) the plunger and diaphragm.

1 Wipe plunger with a sheet of wiping pape soaked with 2-propanol to remove any portion of the seal or dirt attached to the plunger (A).

Note	If small pieces of the plunger seal material adheres to the surface, the airtightness cannot be maintained.



2 Check that there are no visible scratches on the plunger (A) or the diaphragm (B).

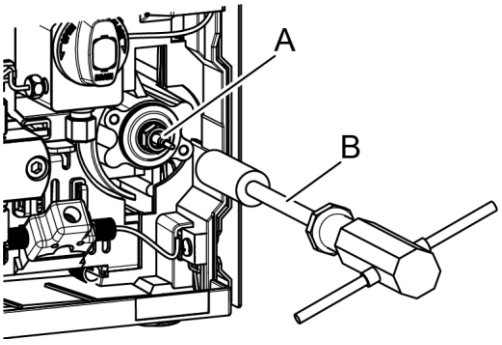
- If scratches are found through visual inspection, replace with a new plunger. Proceed to the next procedure 3.
- If no scratches are found through visual inspection, proceed to step 2.

CAUTION

Do NOT allow foreign particles or crystals into the head holder.
Foreign particles from the mobile phase solution or crystals from the buffer solution getting into the head holder may cause scratches on the surface of the plunger.

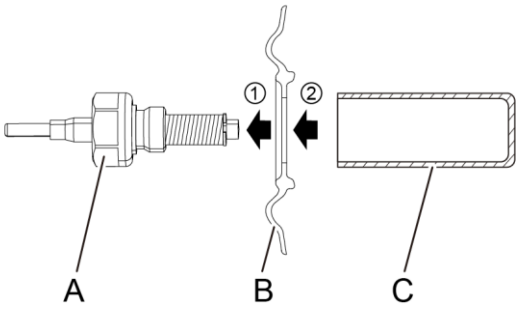
3 Insert the box driver (B) to the plunger holder (A), then rotate counter-clockwise to remove the plunger holder with the diaphragm.

CAUTION
Gently insert the box driver to the plunger holder. The plunger may become damaged if he box driver is forcefuly inserted.

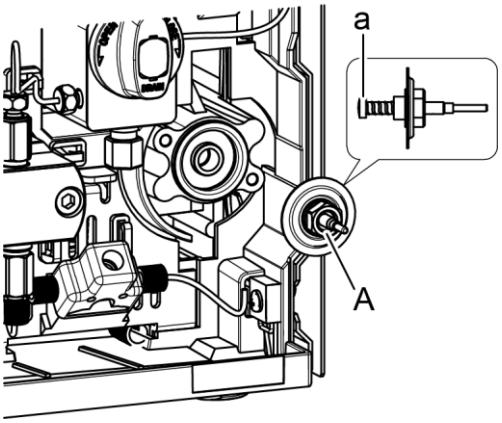


4 Attach a new diaphragm (B) to the new plunger holder (A) using the diaphragm jig (C).

Note	Confirm the direction of the diaphragm when attaching.

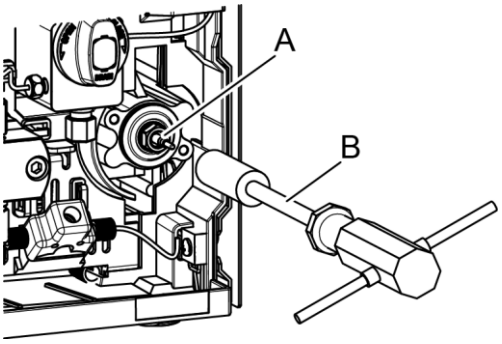


5 After applying the grease (black: approximately 5 mm square size) provided with the plunger holder ASSY to the rear end surface of the plunger (a), insert the plunger holder (A) to which the diaphragm was attached in Procedure 4 into the pump body.



Note	• Be careful not to get any grease on the diaphragm or the body. • Attach the diaphragm so that it will not become detached from the plunger holder. If the diaphragm becomes detached, wipe away any grease and perform from Procedure 4 again.

6 Tighten the plunger holder (A) using the box driver (B).



7 Pinch the end of the plunger with your two fingers, move it up, down, right, left, clockwise, and counterclockwise five times each so that the grease applied to the rear end of the plunger holder can spread evenly. Then wipe off the plunger surface with wiper paper soaked in 2-propanol to clean it.

2 In the [PLUNGER SET A] screen of the control setting group, press [2] and [Enter]. (To replace the left plunger, press [1] and [Enter].)

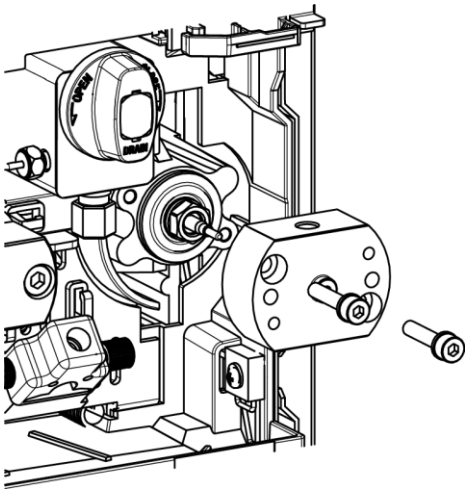
[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference LC-40B X3 CL Instruction Manual "3.5.3 [CONTROL] Setting Group/Setting the plunger stop position《PLUNGER SET A/B》 "

3 Attach the head holder to the pump body.

CAUTION

Slowly push in the head holder along the plunger.
Pushing in the head holder forcibly may break the plunger.



4 Attach the 2 hexagonal socket screws to the head holder and tighten them with an Allen wrench.

Note	Tighten the right and left hexagon socket screws alternately in 90° increments. Finally hold the longer part of the hex wrench and tighten them securely.

5 Attach rinse tubes to the top and bottom of the head holder.

6 **In the [PLUNGER SET A] screen, press [1] and [Enter].**

(To replace the left plunger, press [2] and [Enter].)

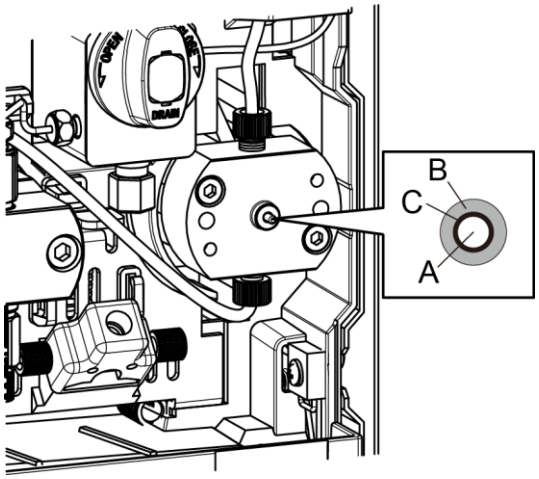
[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the frontmost position.

Reference LC-40B X3 CL Instruction Manual "3.5.3 [CONTROL] Setting Group/Setting the plunger stop position《PLUNGER SET A/B》 "

7 **Pinch the end of the plunger that is projecting from the head holder with your fingers and adjust its position to make the gap (C) around the plunger (A) inside the hole of the projection (B) of the head holder even. While keeping the plunger in place, wipe off the plunger surface with clean wiper paper soaked in 2-propanol.**

CAUTION

Move the plunger gently.
Moving the plunger too abruptly could scratch the plunger surface or cause it to break off.



8 **In the [PLUNGER SET A] screen, press [2] and [Enter]. (To attach the left plunger seal, backup ring and pump head, press [1] and [Enter].)**

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference LC-40B X3 CL Instruction Manual "3.5.3 [CONTROL] Setting Group/Setting the plunger stop position《PLUNGER SET A/B》 "

Note	When replacing the plunger, be sure to replace the plunger seal and the diaphragms. 2.3 Replacing the Plunger Seal (P.54).

9 **Attach the pump head, SUS pipe, and inlet tube and set the seal rinsing kit back in place by following the instructions in Installing the pump head (P.52).**

2.5 Rinsing the Check Valve

This section will explain how to pump 2-propanol to rinse the check valve.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm)	2	086-03047-06

Necessary parts

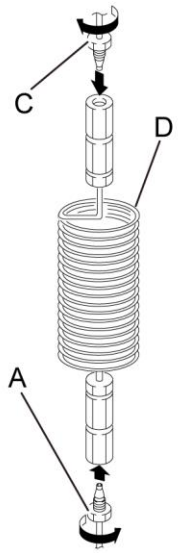
Part Name	Part Type	Part No.	Quantity
RESISTANCE TUBE, COIL FOR CLEANING	Replacement part	228-57908-41	1

1 **After using buffer solution as the mobile phase, replace the solvent in the reservoir bottle with water.**

> **CAUTION**
>
> **After using buffer solution as the mobile phase, do NOT replace with an organic solvent such as 2-propanol without first replacing with water.**
> When using a buffer solution in the reservoir bottle, replace with distilled water or purified water, and after pumping at least 20 mL into the instrument, replace with new 2-propanol. If the buffer solution is directly replaced with 2-propanol, crystals will be precipitated, which can cause damage to the plunger seal or cause problems with the check valve.
>
> Reference System Guide "Precautions When Replacing the Mobile Phase"

2 **Replace the solvent in the reservoir bottle with 2-propanol.**

3 **Loosen the male nuts on the coupling inlet and outlet with an 8-mm wrench and then remove the coupling from the flow path.**



4 **Attach the male nut (A and C) of the column inlet and outlet that was removed to the resistor tube (D), and tighten it with an 8 mm wrench.**

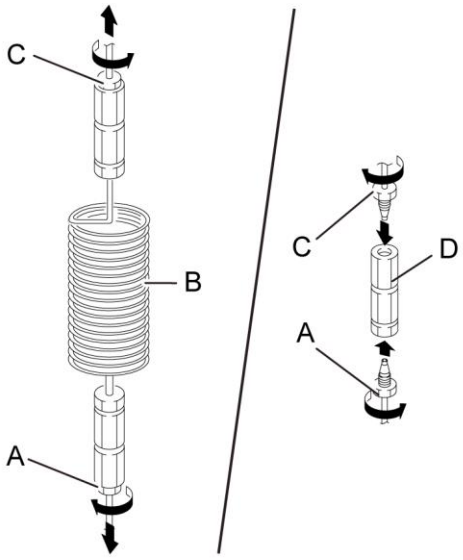
5 **Press [CE] to display the initial screen.**

6 **Press [Enter] once.**
The cursor blinks at the [FLOW] input position.

7 **Press [2], [.], [0] and [Enter].**
[FLOW] is set to "2.0000" and confirmed.

8 **Press [PUMP].**
[PUMP] on the display is highlighted and delivery of 2-propanol starts at 2 mL/min.
Continue delivery at least 1 hour.

9 **Loosen the male nut (A and C) of the resistor tube inlet and outlet with an 8 mm wrench, and remove the resistor tube (B) from the flow line.**



10 **Attach the removed male nut (A) of the resistor tube inlet and outlet to the coupling with an 8 mm wrench and tighten it with the 8 mm wrench.**

11 **Check the pumping stability after cleaning the check valves.**

Reference LC-40B X3 CL Instruction Manual "3.6.4 Validation Support Information Group (VALIDATION)/Checking the pulse《PULSE CHECK A/B》 "

12 **Replace the solvent in reservoir bottle with the original mobile phase.**

Reference System Guide "Precautions When Replacing the Mobile Phase "

2.6 Performing an Ultrasonic Cleaning of the Check Valve

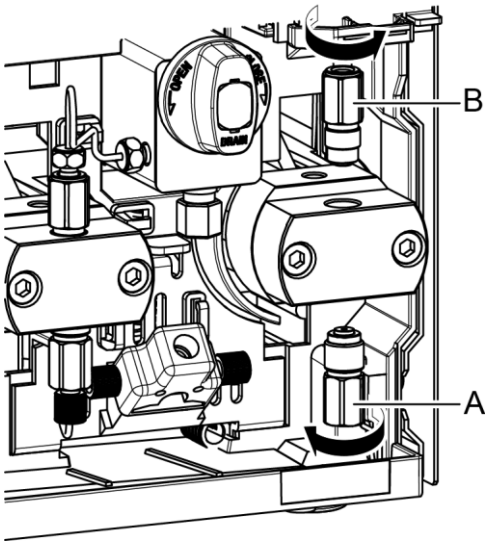
Check valves are attached to the left and right pump heads. The following section will explain the method for performing an ultrasonic cleaning of the check valves on the right side (when viewed from the front).

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

1 **Remove the SUS pipe and inlet tube by following the instructions in Removing the pump head (P.48).**

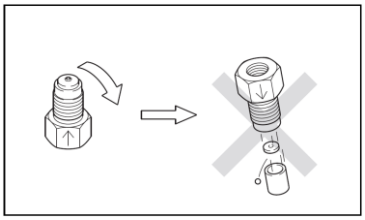
2 **Use a 10 mm wrench to remove the inlet check valve (A) and the outlet check valve (B).**



CAUTION

Never disassemble the check valve.
Performance cannot be guaranteed if disassembled.

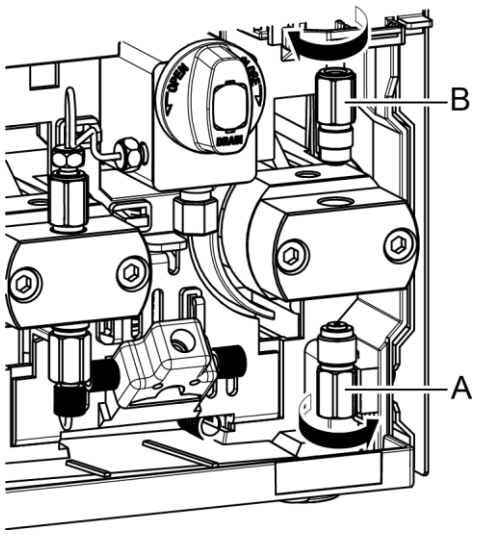
Do NOT turn the inlet check valve (A) upside down.
If you do, the internal parts will fall out.



3 **Immerse the inlet check valve (A) and outlet check valve (B) into 2-propanol, and clean for 5 minutes using an ultrasonic bath.**

4 **Rotate the inlet check valve (A) and the outlet check valve (B) clockwise to attach them to the pump head, and after tightening by hand, use a 10 mm wrench to tighten them as follows.**

- Inlet check valve : Hand tightening and 120° with wrench
- Outlet check valve : Hand tightening and 60 to 90° with wrench



5 **Attach SUS pipe and inlet tube by following the instructions in Installing the pump head (P.52).**

2.7 Replacing the Check Valve

Check valves are attached to the left and right pump heads. The following section will explain the method for Inspecting (Replacing) of the check valves.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

Necessary parts

Part Name	Part Type	Part No.
Inlet check valve ASSY	Consumable parts	228-52964-42
Outlet check valve ASSY,XR		228-53334-96

1 **Check the pumping stability.**

Reference LC-40B X3 CL Instruction Manual "3.6.4 Validation Support Information Group (VALIDATION)/Checking the pulse《PULSE CHECK A/B》 "

If the result of the system check is "Pass", it is considered normal.

If the result of the system check is "Fail", perform 2.5 Rinsing the Check Valve (P.68) or 2.6 Performing an Ultrasonic Cleaning of the Check Valve (P.70), and then check the pumping stability again. If the pumping (pressure) is still unstable, proceed to the following procedure.

2 **Remove the check valve and install a new one by following the instructions in 2.6 Performing an Ultrasonic Cleaning of the Check Valve (P.70).**

3 **Attach SUS pipe and inlet tube by following the instructions in Installing the pump head (P.52).**

4 **Turn the drain valve counterclockwise to open it.**

5 **Press [Enter] once.**

The cursor blinks at the [FLOW] input position.

6 **Press [2], [.], [0], and [Enter].**

[FLOW] is set to "2.0000" and confirmed.

7 **Press [PUMP] and confirm the solvent continues to flow out from the drain valve.**

[PUMP] on the display is highlighted and the solvent flows out of the drain tube.

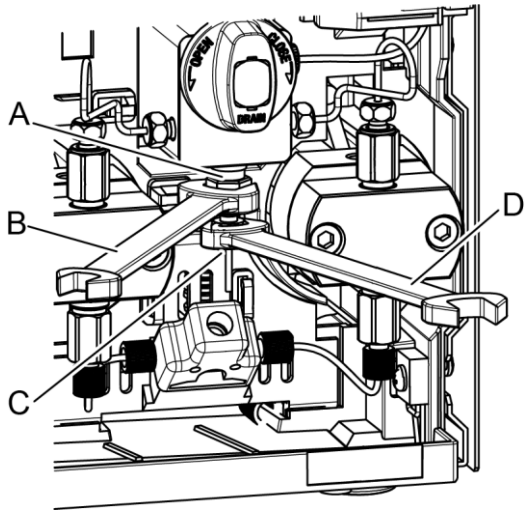
There is no problem with the valve if the solvent continues to flow out.

2.8 Inspecting the Line Filter

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

1 **Fix the line filter (A) with a 10 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with an 8 mm wrench (D) to remove it.**



2 **Pour water into a reservoir bottle and set the flow rate to 1 mL/min.**

3 **In a no load state, pump water at a rate of 1 mL/min.**

- If the pressure is 0.3 MPa or less, it is considered normal.
- If the pressure is more than 0.3 MPa, replace the line filter.

Note	When a mobile phase additive such as trifluoroacetic acid is used, a ghost peak may be generated from the line filter. In this case, perform the following procedure to rinse the line filter. • Deliver a 17% phosphoric acid solution at a flow rate of 1 mL/min for about 30 minutes. (Pumping pressure: 1 MPa to 5 MPa) For example, attach a stainless tube with ID0.1 x 2000mm (Part No.: 228-57908-41). • Deliver purified water at a flow rate of 10 mL/min for about 30 minutes. (Pumping pressure: 1 MPa to 5 MPa) For example, attach a stainless tube with ID0.3 x 2000mm*1. *1: Stainless tubing ID0.3 x 1000mm (Part No.: 228-53184-96) 2pc and Coupling (Part No.: 228-16004-13) 1pc can be substituted.

2.9 Replacing the Line Filter

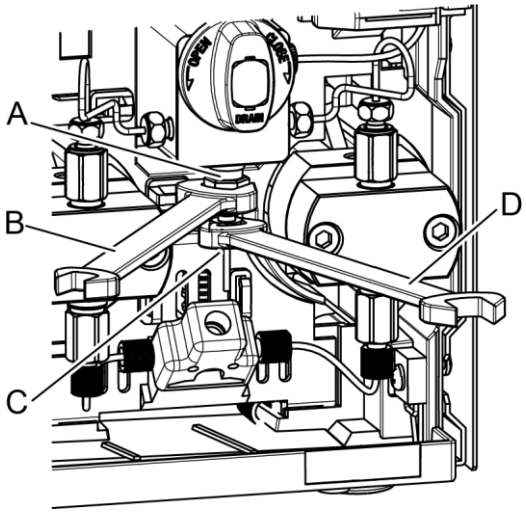
Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03047-06

Necessary parts

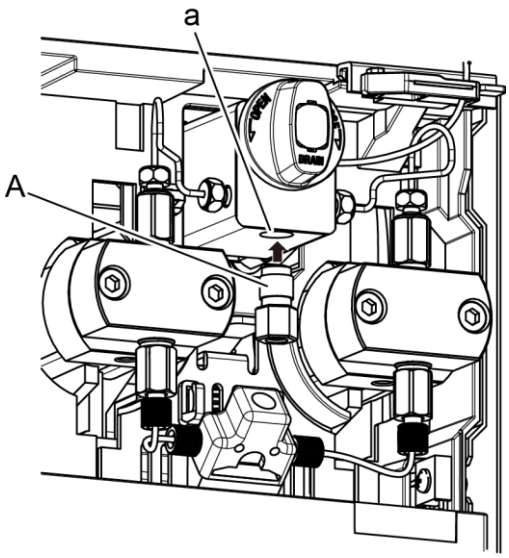
Part Name	Part Type	Part No.
Line Filter	Consumable part	228-57501-92

1 **Fix the line filter (A) with a 10 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with an 8 mm wrench (D) to remove it.**



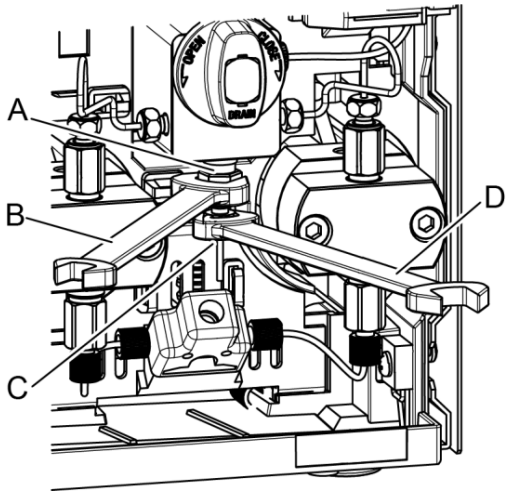
2 **Loosen the line filter (A) with 10 mm wrench to remove it.**

3 **Wipe with a cotton swab, etc., to wipe away any dirt from the line filter port (a).**



4 **Attach the new line filter (A) to the line filter port (a) by hand, and tighten it 45° using a 10 mm wrench.**

5 **Attach the male nut (C) of the pump outlet tube to the line filter (A) by hand.**



6 **Fix the line filter (A) with a 10 mm wrench (B) and tighten the male nut (C) of the pump outlet tube with an 8 mm wrench (D).**

Note	When using in the front end of LC-MS, carry out the cleaning process described as follows to reduce background noise. Pump 50% methanol solution at a pressure of approx.10 MPa for approx. 30 min. (For example, attach a stainless steel tube with ID 0.1 x 2000 mm (PartNo.: 228-57908-41) and adjust the flow rate.)

2.10 Cleaning/Replacing the Suction Filter

Necessary Parts

Part Name	Part Type	Part No.	Quantity
SUS Filter Element, w/PTFE Fitting	Consumable part	228-45707-91	1

Hint Use the SUCTION FILTER with tube and fittings for pump inlet (Part No. 228-45708-91) or SUCTION FILTER with tube and fittings for the the degassing unit (Part No. 228-61905-49) as necessary.

Note	Contamination of suction filters can lead to contamination of mobile phase solvents and bottles, causing background rise and ghost peaks. Even if you are wearing gloves, do not touch the metal parts of the suction filter as much as possible. Hold the non-metal part of the filter element.

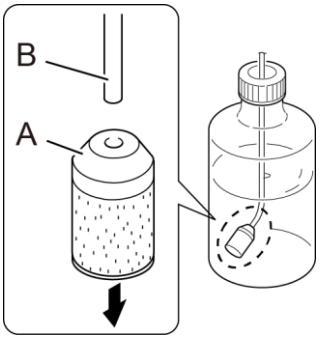
CAUTION

After using the buffer solution as the mobile phase, do NOT replace with an organic solvent such as 2-propanol without first replacing with water.

When using a buffer solution, replace it with distilled water or purified water, and after pumping at least 20 mL into the instrument, replace it with new 2-propanol. If the buffer solution is directly replaced with 2-propanol, crystals will be precipitated, which can cause damage to the plunger seal or cause problems with the check valve.

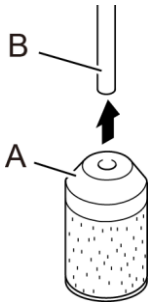
Reference System Guide "Precautions When Replacing the Mobile Phase"

1 **Pull the suction filter (A) from the suction tubing (B).**



2 **Place the suction filter into a clean container with 2-propanol, and clean it for 5 minutes using an ultrasonic bath.**

3 **Insert the suction tubing (B) into the suction filter (A).**



4 **Replace the solvent in reservoir bottle with water, and place the suction tubing back into the bottle.**

5 **Press [CE] to display the initial screen.**

6 **Deliver water at 1 mL/min for 10 minutes.**

7 **Check for air bubbles inside the suction tubing.**

Replace the suction filter if air bubbles are present.

Note	If Ghost peaking occurs, rinse the suction filter. Refer to System Guide "5.3.2 Symptoms Presumably Due to an Error, Based on a Chromatogram".

2.11 Replacing the Drain Valve

Necessary tools

Part Name	Quantity	Part No.
Phillips screwdriver	1	-

Necessary parts

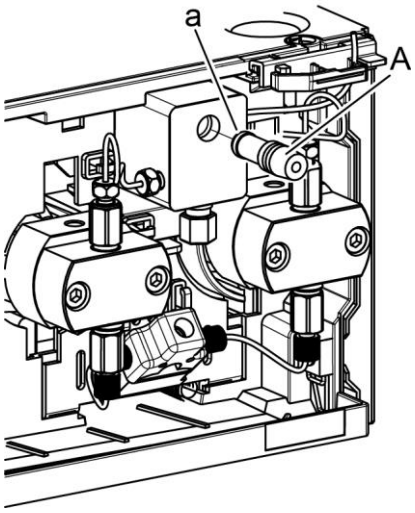
Part Name	Part Type	Part No.
DRAIN VALVE ASSY,TP	Replacement part	228-51229-93

1 **Rotate the drain valve ASSY counter-clockwise at least 3 complete rotations and pull it off straight.**

Note	Check the hole for foreign objects.

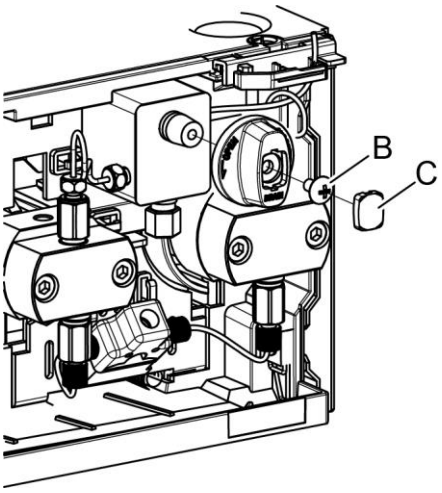
2 **Wet the seal portion (a) of the new drain valve ASSY (A) with 2-propanol, etc., and insert it into the hole.**

Note	If the drain valve ASSY is forcefully inserted or is not inserted straight, the seal portion may become deformed, resulting in leakage.



3 **Tighten the drain valve ASSY clockwise.**

4 **After tightening the drain valve ASSY, attach the knob with the screw (B) using a phillips screwdriver so that it is vertical, and then attach the cap (C).**



2.12 Cleaning of the Leak Tray

Note	If a leak occurred, wipe off the leak in the leak tray completely as below. Leak of mobile phase solution used as buffer solution may dry and crystallize, clogging the leak tray. If the leak tray is contaminated by such crystallized buffer solution, wipe off the leak tray with wiper paper soaked in water in the same manner as below.

1 **Wipe off leak around the leak sensor or on the leak tray completely with wiper paper.**

Note	• Do not bend or pull the leak sensor. • If there is contamination such as crystallized buffer solution, wipe it off with wiper paper soaked in water.

2.13 Cleaning the Exterior

2.13.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or paper wiper.
If it is very dirty, clean it as below.

1 **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**

2 **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

CAUTION
Do NOT leave any part wet nor use thinner for cleaning. Doing so may cause rust or discoloration.

2.13.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1 **Turn off the power of the column oven.**

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 **Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.**

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

2.14 Cleaning of the Automatic Rinsing Kit

■ Necessary parts

Part Name	Part Type	Part No.
WASHING PUMP SEAL KIT	Replacement part	228-70612-41

Note	If the 10% 2-propanol water in the rinse solution bottle is dirty, replace with new solution. If getting significantly dirty, replace with new solution once a day. Even if it does not appear dirty, replace with new solution once a week.

1 **Pour distilled water into the rinse solution botte and clean the inside of the rinse solution bottle using a brush, etc.**

2 **Pour distilled water into the rinse solution bottle and rinse the inside of the rinse solution bottle for about 5 minutes using an ultrasonic bath.**

3 **Pour new 10% 2-propanol water into the rinse solution bottle, and return it back to its original positions.**

4 **Replace the rinse tube if the inside is dirty.**

3 DGU-405 CL

3.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service representatives on a contractual basis.

For maintenance and inspection contracts, contact your Shimadzu representative.

⚠ WARNING

Turn off the main power switch on the back of the solvent derivery unit and unplug the power cable prior to maintenance when instructed.
Failure to do so may cause a fire, electric shock, or breakdown.

⚠ CAUTION

Never remove the main cover.
Otherwise, injury or malfunction may occur.
If it is necessary to remove the main cover for repair, contact your Shimadzu representative.

When replacing parts, use the parts described in Component Parts DGU-405 CL (P.198).
If any other parts are used, injury or malfunction may occur.

3.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase in the channel with water.
- Wipe away any dirt from the front panel or the main cover.

3.1.2 List of Periodic Inspection and Maintenance

Consult your Shimadzu service personnel regarding inspection/change.

Replacement and inspection may be required earlier than the described replacement cycles. The described interval is not necessarily guaranteed.

These cycles differ depending on the usage environment.

Inspection/Maintenance Item	1 year	2 years	3 years	Remarks
Inspection/replacement of the filter of the resistance tube	√			Replace the filter if it is not white.
Replacement of vacuum pump		√		Degradation of the vacuum pump components may cause the degassing unit to stop in error.
Inspection/replacement of vacuum tube *1			√	Replace the vacuum tube if it is hardened or cracked.
Replacement of degassing chamber		√		Depending on the operating conditions, leakage may occur if the degassing chamber is used for a long period of time.

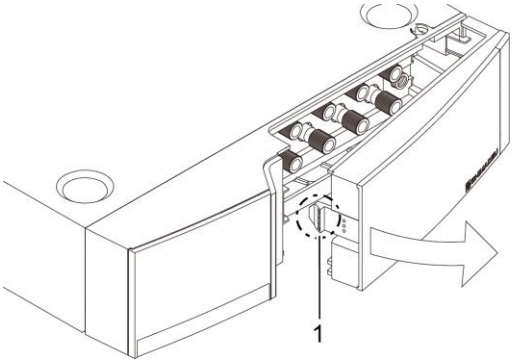
*1 Check every year after three years of use.

3.1.3 Installing/Removing Right Panel

When installing piping from the reservoir or solvent delivery module to the instrument, remove/attach the right panel from/to the front of the instrument as follows.

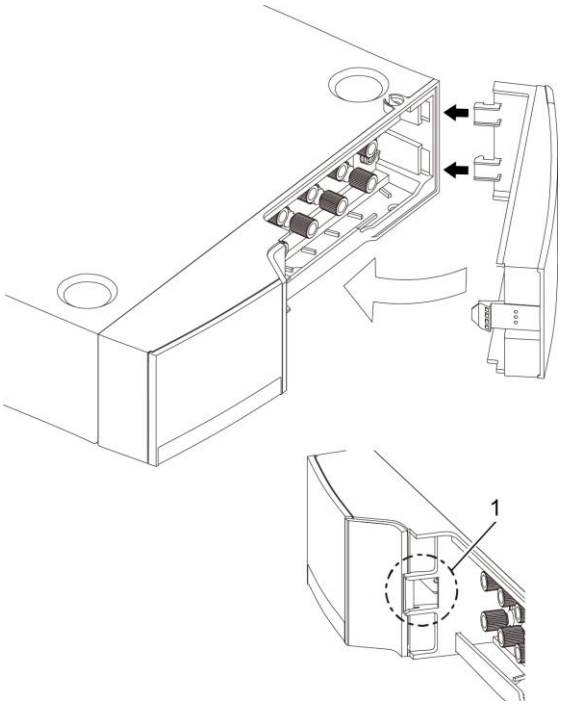
■ Removing the right panel

1 Remove the right panel by pressing (1).



■ Installing the right panel

1 Align the two protruding parts on the right side of the right panel with the notches on the instrument.



2 Hook the right panel claw onto (1) of the instrument.

3.2 Maintenance Work

If the solvent delivery module is not used for a long time, turn "OFF" the power to the unit and perform the following tasks.

Note	Particularly after using a buffer solution, the solvent can cause the precipitation of salt and the growth of algae and microorganisms inside the instrument (at the membrane). After use, thoroughly wash the interior with distilled water or ion exchanged water and then pour in methanol or the like to replace it. (Only suction operation using a device such as solvent delivery module is allowed.)

- Remove the inlet tube and completely withdraw the liquid from inside the instrument with a syringe or the like.
- After withdrawing the liquid, operate the degassing unit for at least 30 minutes to dry the inside of the instrument with the stop joint of the liquid inlet/outlet ports removed.
- Finally, plug the liquid inlet/outlet ports with the stop joints.

CAUTION

Be sure to withdraw the liquid inside the instrument by drawing it. Do NOT pressurize the instrument.

When withdrawing liquid with a syringe or the like, slowly withdraw it at a flow rate of 10 mL/min or less. A high flow rate may cause the degassing membrane to be overloaded, resulting in shorter lifetime of the degassing chamber.

3.3 Cleaning the Exterior

3.3.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or paper wiper.
If it is very dirty, clean it as below.

1 **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**

2 **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

CAUTION
Do NOT leave any part wet nor use thinner for cleaning. Doing so may cause rust or discoloration.

3.3.2 Decontamination cleaning

After handling the hazardous substances, use the following procedure.

1 **Turn off the power of the column oven.**

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 **Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.**

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

4 SPD-40 CL

4.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service representatives on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠WARNING

Do not throw away parts after replacement indiscriminately.

When using biohazardous substances or toxic substances, the following parts may have been contaminated.

・Flow cell

・Male nut

・Coupling

When disposing of the these parts, contact your Shimadzu representative. If you dispose of them yourself, do so in accordance with the processing standards determined by law, separately from general industrial waste and household garbage.

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.

Otherwise, fire, electric shock or malfunction may occur.

Ensure that the appropriate safety gear (for example, protective goggles, gloves, and mask) are used when handling hazardous substances or infectious material.

⚠CAUTION

Never remove the main cover.

Otherwise, injury or malfunction may occur. Contact your Shimadzu representative to remove the main cover.

When replacing parts, use only the parts listed in Component Parts SPD-40 CL (P.199) and Maintenance Parts SPD-40 CL (P.229)

If any other parts are used, injury or malfunction may occur.

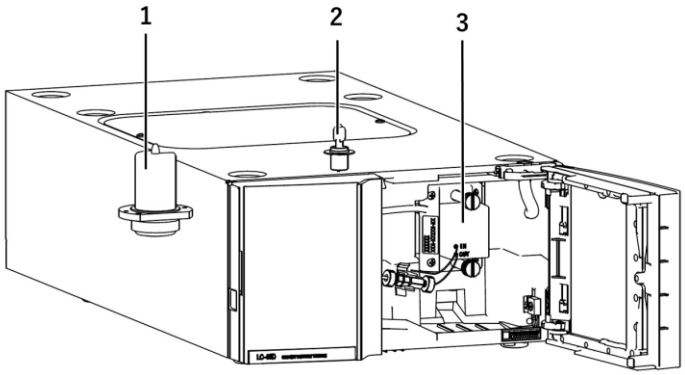
4.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase in the flow lines with water.
- Wipe away any dirt from the front panel and the main cover.
- Wipe away any dirt from the keypad with paper wiper or a soft cloth moistened with water.

Reference System Guide "5.3 Troubleshooting and Corrective Action"

4.1.2 List of Periodic Inspection and Maintenance

The replacement and maintenance periods listed in this table are presented only as guidelines. These are not guarantee periods. These will vary depending on usage conditions.



Inspection/Maintenance Item	1 year	2 year	3 year	Remark	Ref.
D2 lamp replacement	√	√	√	Replace at about 2000 hours of total illumination time.	4.7 Replacing the Lamp (P.101)
Dismantling, cleaning & inspection of flow cell	-	√	-	Replace the flow cell if it is unclean and light intensity is low even after cleaning it.	4.4 Disassembling and Simple Cleaning the Flow Cell (P.93)
Flow cell gasket replacement	-	√	-	Replace the gaskets after disassembling and cleaning the flow cell.	4.5 Replacing a Flow Cell Part (P.97)
Flow cell lens replacement	-	√	-	Replace the lenses when some dirt remains after disassembling and cleaning the flow cell.	
Inspection of Wavelength Accuracy	√	-	-	Every six to twelve months	Nexera CL seires System Guide "4.9.2 Wavelength Accuracy Test"
Inspection of Leak Sensor	√	-	-	Every six to twelve months	SPD-40 CL Instruction Manual "3.7.5 Validation Support Information Group / LEAK SENSOR CHECK"

4.1.3 Post-Inspection/Maintenance Leakage Check

After inspection and maintenance, check any leakage during pumping.

If leakage occurs from the flow cell window, wipe off the leakage with a paper wipe, for example, and then tighten the cell window fastening screws by turning them clockwise with a regular screwdriver. (The slot in cell window fastening screws is 1 mm wide and 8 mm long. The regular screwdriver part number is 086-10504-18.) If tightening the cell window fastening screws does not resolve the leak, contact a Shimadzu representative.

4.2 Removing/Installing the Flow Cell

Note	Be sure to turn off the power of the instrument when plugging or unplugging the flow cell cable connector.

CAUTION

Do not use this function in the CL model.
Wavelength calibration operation after installing the flow cell is executed by service personnel.

Note	When replacing with another cell, wavelength calibration is required after replacement. Wavelength calibration is performed by the service personnel, so contact your Shimadzu representative.

4.2.1 Removing the Flow Cell

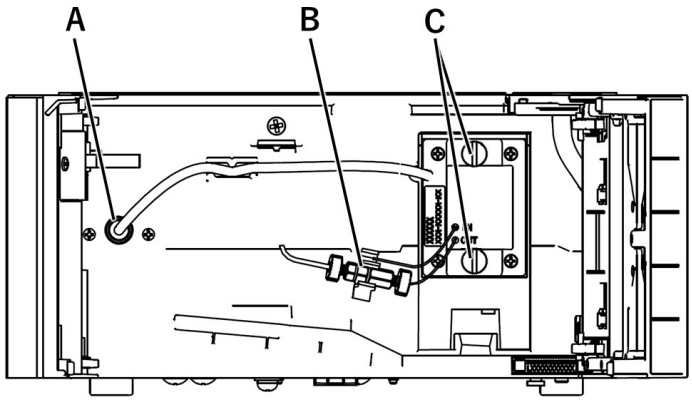
1 **Open the front cover.**

2 **Remove the coupling from the coupling holder (B).**

3 **Disconnect the connector (A).**

Note	Turn off the equipment before unplugging the connector.

4 **Loosen the 2 cell mounting screws (C) and remove the cell.**



4.2.2 Installing the Flow Cell

1 **Insert the flow cell to the instrument so that the connector is on the left.**

2 **While holding the flow cell fitted to the installation surface, tighten the two cell mounting screws (C) alternately.**

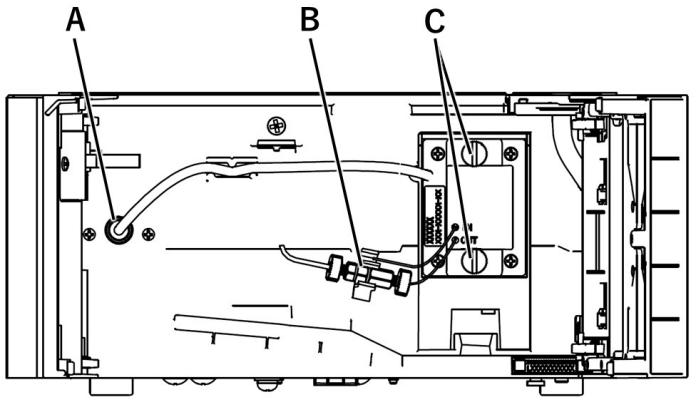
3 **Insert the connector (A) into the instrument. With the coupling holder (B), fix the coupling to the instrument.**

Note	Make sure that the equipment is turned off before plugging the connector.

4 **Via the coupling, connect the outlet tubing of the flow cell to the drain tubing.**

Note	When performing the above operation, do not let any air enter the flow lines.

5 **Close the front cover.**



4.3 Flow Cell Inspection/Cleaning

If the baseline shows a large noise or large drift, check the flow cell. If the check finds some bubbles or dirt, try the simple cleaning.

After cleaning the flow cell with the syringe according to the following procedure, if the light intensity is not improved, replace the column with the coupling and pump a rinsing solution (2-propanol) into the flow cell assembly at the flow rate of 1 ml/min or less for 2 hours.

CAUTION

Pump a solution from the inlet tubing into the flow cell.
If pumped from the outlet tubing to the inlet tubing, the flow cell may get damaged and become unusable.

Necessary Parts

Part Name	Type	Part No.
Syringe, 1ML	Standard accessory	228-57028
Syringe needle	Standard accessory	228-57027
Coupling 1.6-0.8C	Standard accessory	228-40998-10
Male nut 0.8MN-PEEK	Standard accessory	228-46363
2-propanol	–	–

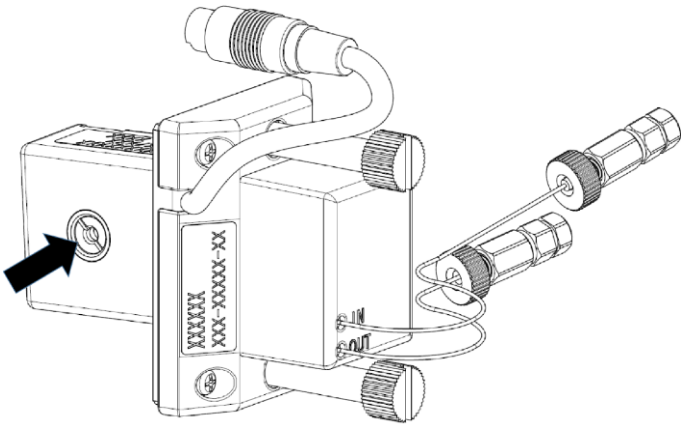
1 **Remove the flow cell with connecting inlet / outlet piping.**

Reference 4.2.1 Removing the Flow Cell (P.88)

2 **Set the flow rate to 1 mL/min and then start pumping.**

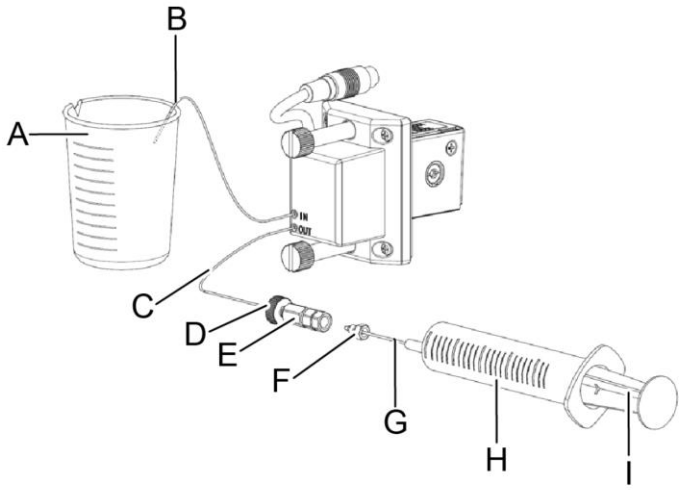
Note	Remove the column before starting pumping.

3 **While the mobile phase is flowing, look at the inside of the flow cell in the direction of the arrow to check that no bubble or dirt is in the cell.**



If some bubbles or dirt is in the cell, proceed to the simple cleaning.

Note	No simple cleaning is needed if no bubble or dirt is in the cell.



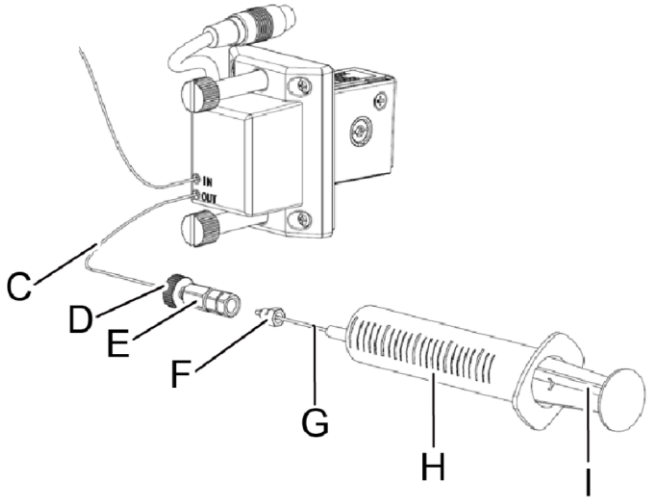
Sign	Name	Sign	Name
A	Waste container	F	Male nut 0.8MN-PEEK
B	Cell inlet tubing	G	Syringe needle
C	Cell outlet tubing	H	Syringe
D	Male nut ETFE	I	Plunger
E	Coupling 1.6-0.8C		

4 **Insert the syringe needle (G) on the tip of the syringe (H) and turn the syringe (H) clockwise to fix.**

5 **Remove the tubing on the cell outlet tubing (with a coupling) end.**

6 **Draw the 2-propanol into the syringe (H).**

7 **Connect the syringe (H) to the cell outlet tubing (C). (Attach the male nut 0.8MN-PEEK (F) to the syringe needle and connect the coupling 1.6-0.8C (E).)**



8 **Gently push in the syringe's plunger (I).**

The liquid will be injected into the cell interior and clean the cell.

> **CAUTION**
>
> **If an aqueous solvent (especially a solvent containing buffer salts) is used as the mobile phase, purge the solvent in the cell with water before flushing with 2-propanol.**
> If an organic solvent is mixed with salts, crystals will form and clog the tubing.

9 **Flush the flow cell with distilled water or deionized water using a syringe to purge the rinsing solution (2-propanol).**

10 **Perform step 3 to check for bubbles and dirt.**

4.4 Disassembling and Simple Cleaning the Flow Cell

If dirt and air bubbles cannot be removed by performing a simple cleaning, disassemble and clean the flow cell. Also, disassembling and cleaning the flow cell is recommended every 2 years.

Necessary tools

Part Name	Part No.
Flathead screwdriver	086-10504-18
Plastic tweezers (with no dirt on the end)	-
Air blower(for the lens)	086-78801-02

If plastic tweezers are not available, use some kind of alternative item such as a toothpick for removing. In this case, use something soft so that it does not scratch the lens or cell window.

Necessary parts

Part Name	Part Type	Part No.	Remarks
Gasket	Consumable part	228-35097-95 (2PC)	Be sure to replace when disassembling and cleaning the flow cell.
2-Propanol	-	-	-
(Mobile Phase Solution Used for Analysis)	-	-	-

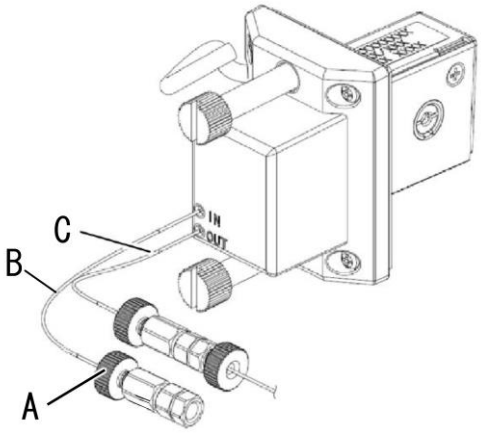
Note	If use of the gaskets is continued without replacing, fluid may begin to leak.

1 Remove the flow cell.

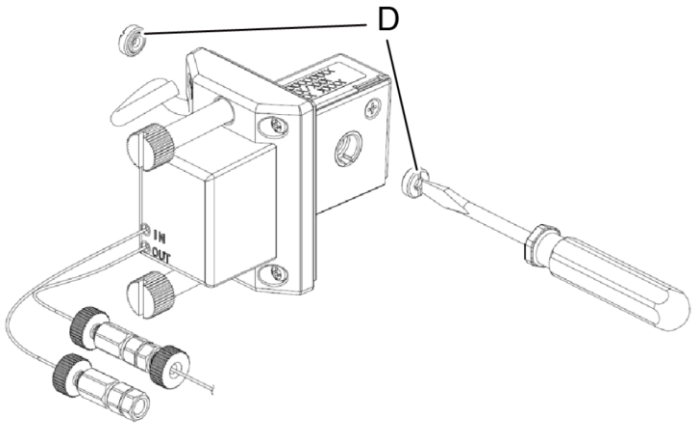
Reference 4.2.1 Removing the Flow Cell (P.88)

2 Remove the lenses and cell gaskets.

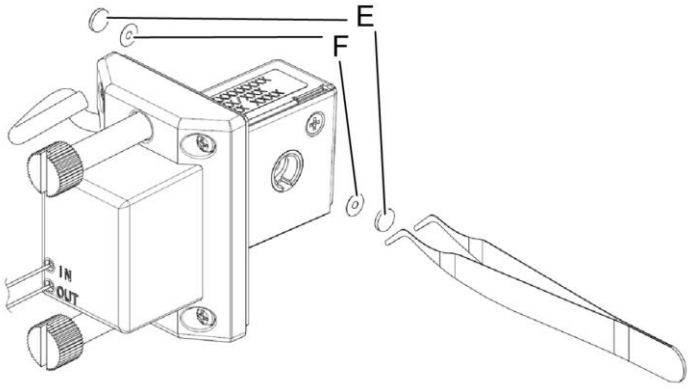
1 Loosen the male nut (A) on the column side, and remove the flow cell inlet tubing (B). Remove the flow cell outlet tubing (C) in the same way.



2 Remove the left and right setscrews (D) using a flathead screwdriver.



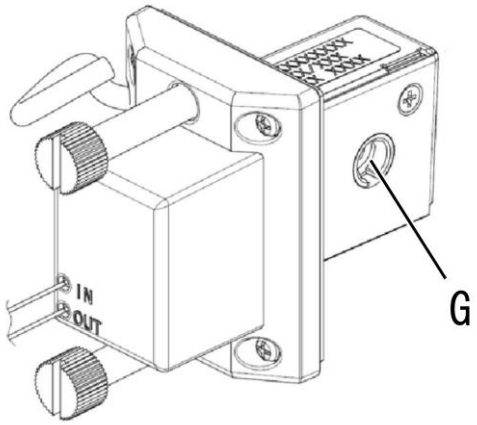
3 Remove the lens (E) and gasket (F) using plastic tweezers.



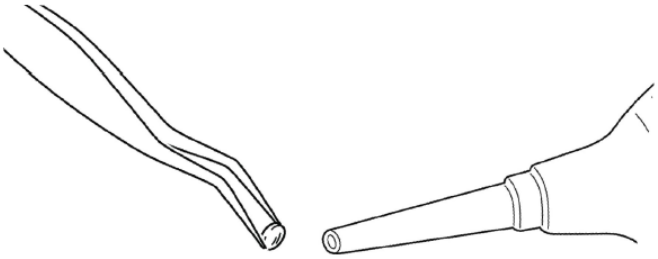
3 Put the removed lenses in 2-propanol and clean them with an ultrasonic bath for 5 minutes.

4 Attach the cleaned lenses and two new cell gaskets to the cell.

1 Use a piece of wiping paper soaked in 2-propanol to remove dirt inside the cell housing (G).



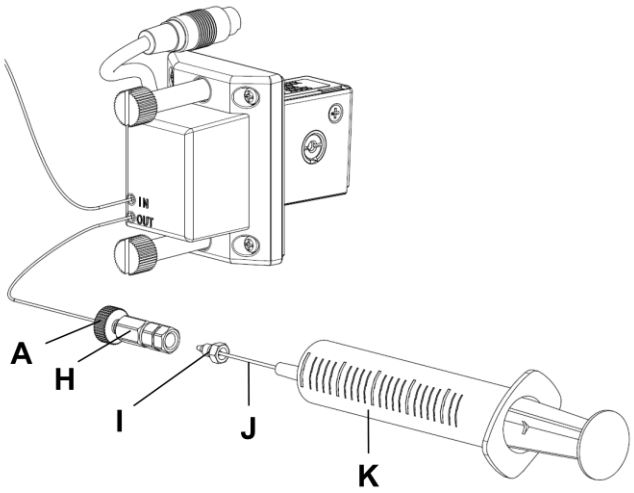
2 If dust is attached to the lenses or gaskets, remove it using an airblower (for the lens) while securing the lenses or gaskets with plastic tweezers so as not to be blown away by the air.



Hint If an air blower (for the lens) is not available, use a piece of wiping paper soaked in 2-propanol to remove the dust.

3 Attach the new gaskets and lenses in that order using plastic tweezers, and attach the setscrews using a flathead screwdriver.

4 Connect the syringe adapter to the flow cell outlet tubing. (Attach the male nut 0.8MN-PEEK (I) to the syringe needle(J) and connect the coupling 1.6-0.8C (H).)
Connect the flow cell inlet tubing to the tubing to the drain.



5 Attach the syringe (K) with mobile phase solution for analysis to the syringe needle, and slowly push the plunger to check for a fluid leak.

Note	If there is a fluid leak, rinse the lenses again, and then tighten the setscrews again so that they are not loose.

6 Loosen the male nut (A), then remove the coupling 1.6-0.8C (H) and the syringe needle.

5 Attach the flow cell.

Reference 4.2.2 Installing the Flow Cell (P.89)

4.5 Replacing a Flow Cell Part

It is necessary to replace the lens or cell window if dirt on the lens or cell window cannot be removed after disassembling and cleaning the flow cell. The gaskets should be replaced at the same time. Also, it is recommended to replace the lenses or cell window every 2 years.

Necessary tools

- Flathead screwdriver (Part No.: 086-10504-18)
- Plastic tweezers (with no dirt on the end)
- Air blower (for the lens) (Part No.: 086-78801-02)

Hint If plastic tweezers are not available, use some kind of alternative item such as a toothpick for removing. In this case, use something soft so that it does not scratch the lens or cell window.

Necessary parts

Part Name	Part Type	Part No.	Remarks
Gasket	Consumable part	228-35097-95 (1 pcs) 228-35097-01 (1 pc)	Be sure to replace when disassembling and cleaning the flow cell.
Lens	Maintenance part	228-73281-41 (2 pcs) 228-14572 (1 pc)	-
2-propanol	-	-	-

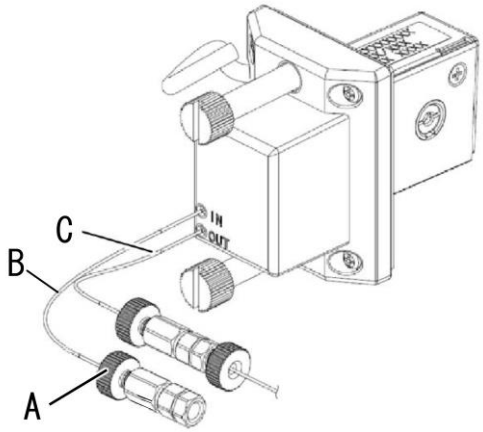
Note	If use of the gaskets is continued without replacing, fluid may begin to leak.

1 **Remove the flow cell.**

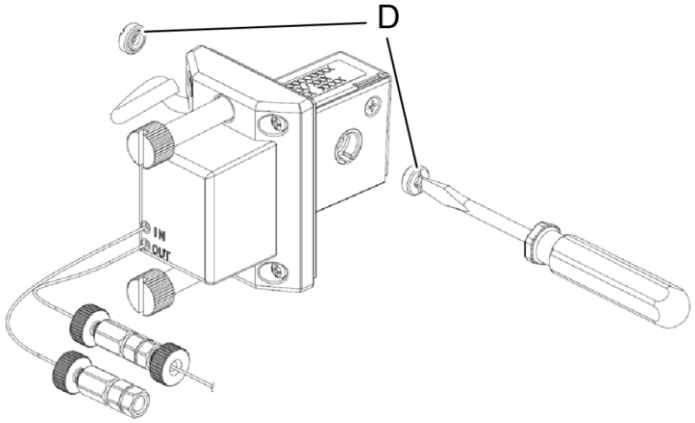
Reference 4.2.1 Removing the Flow Cell (P.88)

2 Remove the lenses and cell gaskets.

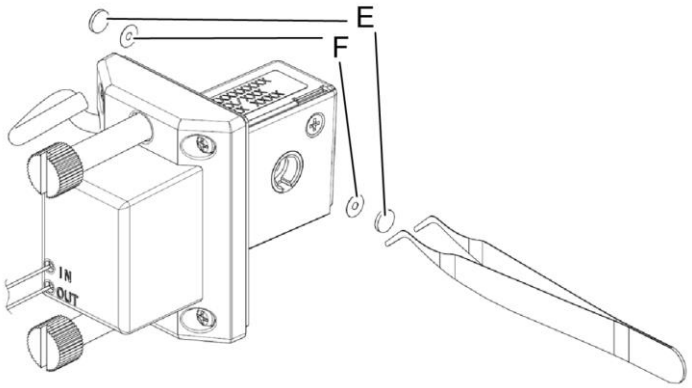
1 Loosen the male nut (A) on the column side, and remove the flow cell inlet tubing (B). Remove the flow cell outlet tubing (C) in the same way.



2 Remove the left and right setscrews (D) using a flathead screwdriver.

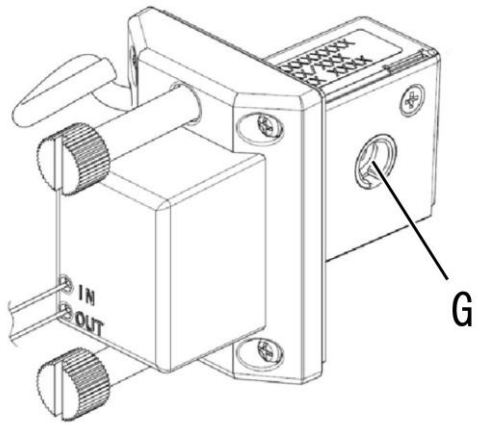


3 Remove the lens (E) and gasket (F) using plastic tweezers.

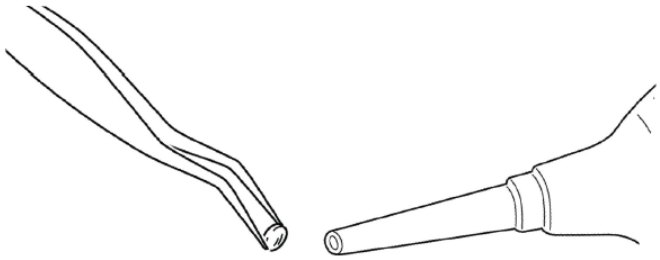


3 Attach the new lenses and 2 new cell gaskets.

1 Use a piece of wiping paper soaked in 2-propanol to remove dirt inside the cell housing (G).



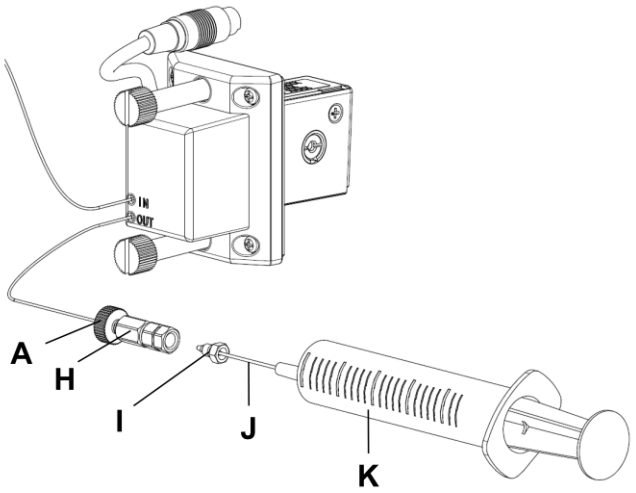
2 If dust is attached to the lenses, cell window or new gaskets, remove it using an air blower (for the lens) while securing the lenses or new gaskets with plastic tweezers so as not to be blown away by the air.



Hint If an air blower (for the lens) is not available, use a piece of wiping paper soaked in 2-propanol to remove the dust.

3 Attach the new gaskets and lenses in that order using plastic tweezers, and attach the setscrews using a flathead screwdriver.

4 Connect the syringe adapter to the flow cell outlet tubing. (Attach the male nut 0.8MN-PEEK (I) to the syringe needle(J) and connect the coupling 1.6-0.8C (H).)
Connect the flow cell inlet tubing to the tubing to the drain.



5 Attach the syringe (K) with mobile phase solution for analysis to the syringe needle, and slowly push the plunger to check for a fluid leak.

Note	If there is a fluid leak, rinse the lenses again, and then tighten the setscrews again so that they are not loose.

6 Loosen the male nut (A), then remove the coupling 1.6-0.8C (H) and the syringe needle.

4 Attach the flow cell.

Reference 4.2.2 Installing the Flow Cell (P.89)

4.6 Storing the Flow Cell

Before storing the flow cell, pump methanol into it. Keep the cell filled with methanol or aspirate the methanol in the flow cell with a syringe to dry it. Then, seal and inlet and outlet pipes of the cell with stop plugs.

4.7 Replacing the Lamp

The SPD-40 CL has a D2 lamp. The lamps need to be replaced periodically.

As the D2 lamp in this detector approach the end of their life, their intensity decreases and baseline noise increases. Replace the lamps with new ones using the guaranteed service life as a guide.

■ Guaranteed Service Life of the Lamp

Guaranteed service life of the D2 lamp : 2000 hours

Note	The guaranteed service life of the D2 lamp is 2000 hours of use or 1 year from the date of purchase, whichever is the shorter.

⚠WARNING

Before replacing a lamp, turn the detector main power switch OFF and unplug the power supply cable.

Failing to do so may result in fire, electric shock, or malfunction.

Allow the instrument to cool down adequately before performing the lamp replacement procedure.

The lamp compartment is extremely hot just after turning off the lamp.

⚠CAUTION

When replacing the lamp, be careful not to touch the glass portion of the lamp directly with your fingers.

Wrap the lamp in cotton gauze when carrying it. If the lamp becomes dirty, wipe it with an ethanol-moistened lens cleaner.

Be careful not to break the lamp.

Do not impart shocks or vibrations to the lamp.

Be sure to install the lamp cover before switching on the lamp.

The lamp cannot be switched on while the lamp cover is removed.

If the lamp cover is removed without switching off the lamp, the lamp is extinguished automatically.

During replacement work, be sure to keep the surface of the mirror clean.

A dirty surface of the mirror prevents accurate detection.

Necessary Tools

Phillips-head screwdriver (#2)

Necessary Parts

Part Name	Part Type	Part No.	Remarks
D2 lamp	Consumable part	228-73407	–

4.7.1 Removal of Top Cover and Radiating Fin Assembly

1 **Turn OFF the main power switch on the back of the instrument.**

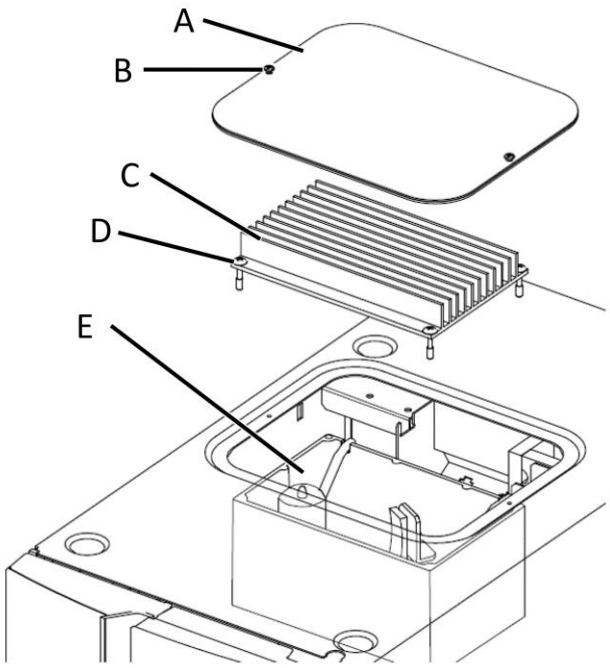
2 **Unscrew the two top cover installation screws (B), and remove the top cover (A).**

Note	The top cover assembly's two screws cannot be removed.

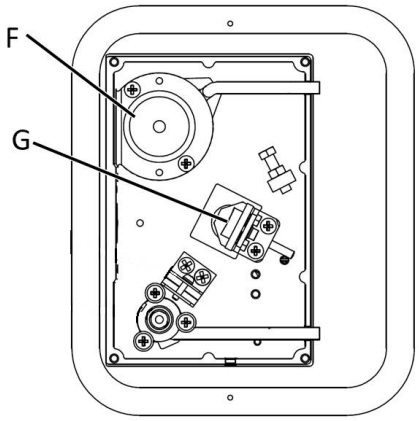
3 **Loosen the four screws (D) holding the radiating fin assembly in the lamp compartment, and remove the fin assembly (C).**

The D2 lamp (F) and mirror (G) will now be visible inside the lamp housing (E).

Note	The fin assembly's four screws cannot be removed.

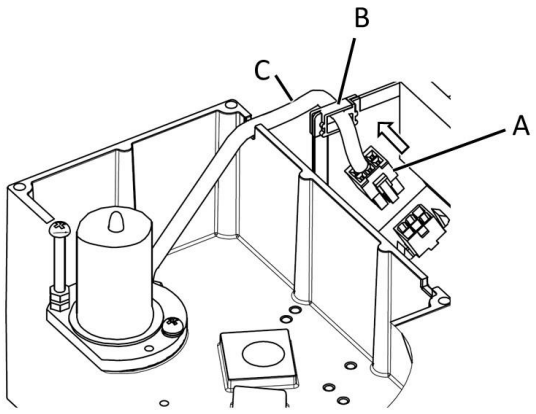


Lamp installation layout



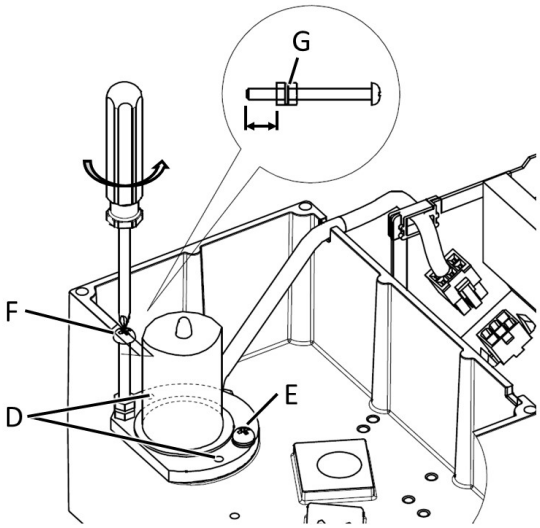
4.7.2 Deuterium Lamp Replacement

1 **Remove the connector (A) of the D2 lamp and then the lead wire (C) from the clamp (B).**



2 Loosen the short screw (E) and long screw (F) fastening the D2 lamp and then remove the D2 lamp.

Note	• The nut on the long screw (G) has been set to a particular position. Do not loosen or move it. • Avoid dropping the screws into the detector chassis; it is difficult to retrieve them. However, be sure to retrieve them if they are dropped. • If the D2 lamp is tight and it is difficult to remove it, screw in screws in two screw holes (D) gradually and evenly to remove the D2 lamp from the lamp housing.



WARNING

Before replacing a lamp, turn the detector main power switch OFF by the rear switch.
Failing to do so may result in fire, electric shock, or malfunction.

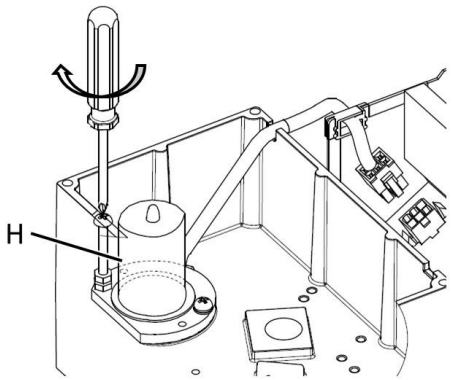
Allow the instrument to cool down adequately before performing the lamp replacement procedure.
The lamp compartment is extremely hot just after turning off the lamp.

CAUTION

Be careful not to break the lamp.
Do not impart shocks or vibrations to the lamp.

During replacement work, be sure to keep the surfaces of the mirror clean.
A dirty surface of the mirror prevents accurate detection.

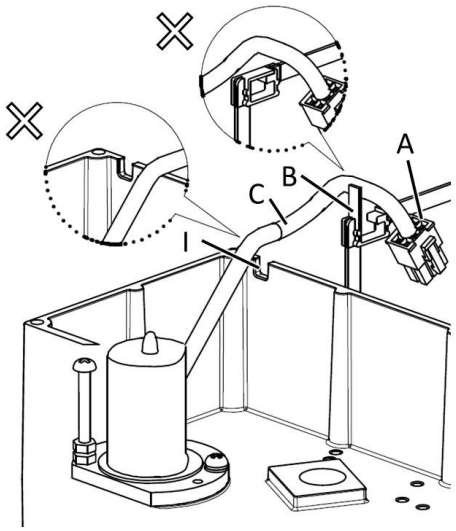
3 **Fit the new D2 lamp (H) in place, and secure it with the screws.**



CAUTION

Be careful not to touch the glass parts directly with your hands when replacing the lamp.
Wrap the lamp in cotton gauze when carrying it. Accurate readings cannot be taken when the glass surface is dirty.
When the lamp is dirty, wipe it off with lens paper soaked in ethanol.

4 **Put the lead wire (C) in the notch (I) and then fix it with the clamp (B) before connecting the connector (A) back.**



CAUTION

Ensure that the cable (C) is fitted into the notch (I) in the lamp housing, with the 3-pin connector (A) located outside the housing.
If the cable is not in the notch, it could be broken, resulting in shorting or lamp failure.

Be sure to fix the lead wire (C) with the clamp (B).
Failure to do so may cause the lead wire to be broken and result in malfunction.

5 **Attach the fin assembly and top cover of the lamp housing and detector respectively, and tighten the screws.**

CAUTION

Securely tighten the screw of the radiation fin.
A loose screw may worsen the performance.

■ Checking the total illumination time

1 **Insert the power plug to the outlet and turn ON the main power switch on the back.**
The initial screen will be displayed in a while.

2 **Press [↓] several times to display [D2 LAMP USED TIME].**

Reference
- SPD-40 CL Instruction Manual "3.7.2 Displaying the VP Functions"
- SPD-40 CL Instruction Manual "Maintenance Information Group / [D2 LAMP USED TIME]"



3 **Confirm that the left value is 0.**
Confirm that "0/2000h" is displayed.

4 **Press [CE].**
The initial screen is displayed.

4.8 Wavelength Accuracy Calibration

Measure the peak wavelengths in the emission line spectra produced by the deuterium lamp, and calibrate them to minimize wavelength variance.

CAUTION

Do not use this function in the CL model.
Recalibration operation is executed by service personnel.

4.9 Absorbance Accuracy Calibration

Calibrate absorbance accuracy so as to minimize the difference between the absorbance value displayed on the instrument when the tested absorbance calibration filter is in place and the absorbance value of the filter.

> **CAUTION**
>
> **Do not use this function in the CL model.**
> Recalibration operation is executed by service personnel.

4.10 Leak Sensor Calibration

Re-calibration is required if the result of [LEAK SENSOR CHECK] fails the component validation.

Reference SPD-40 CL Instruction Manual "Validation Support Group /[LEAK SENSOR CHECK] "

> **CAUTION**
>
> **Do not use this function in the CL model.**
> Recalibration operation is executed by service personnel.

Note	The leak sensor detects leaked mobile phase when the tubing causes the leakage. When the output value from the sensor exceeds the level set at "threshold value", an error occurs and temperature control stops.

4.11 Exterior Cleaning

4.11.1 Usual cleaning

If the instrument cover or front panel becomes dirty, wipe it clean with a soft dry cloth or paper wiper.

For persistent stains, clean the exterior using the following procedure.

1. **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**
2. **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

> **CAUTION**
>
> **Do NOT leave any part wet nor use thinner for cleaning.**
> These can cause rusting and discoloration.

4.11.2 Decontamination cleaning

After handling the hazardous substances, use the following procedure.

1 Turn off the power of the column oven.

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.

CAUTION

Do not leave metal surfaces wet.
This can cause rusting and discoloration.

5 CBM-40 CL

CAUTION

Never remove the main body cover.
If repairing that removes the main body cover is necessary, please contact our sales office or designated Shimadzu representative.

When replacing components, the parts described in CBM-40 CL Instruction Manual "1.2 Component Parts" should be used.
Use of parts not specified may cause injury or malfunction.

5.1 Periodic Inspection

It is not necessary to perform periodic inspections of this instrument.

5.2 Cleaning the Exterior

5.2.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or tissue paper.
If it is very dirty, clean it as below.

1 Clean with a cloth soaked in diluted neutral detergent and wrung tightly.

2 Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.

CAUTION
Do NOT leave any part wet nor use thinner for cleaning. Doing so may cause rust or discoloration.

5.2.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1 Turn off the power of the column oven.

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

6 CTO-40C CL

6.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠WARNING

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.
Otherwise, fire, electric shock or malfunction may occur.

Ensure that the appropriate safety gear (for example, protective goggles, gloves, and mask) are used when handling hazardous substances or infectious material.

⚠CAUTION

Never remove the cover.
This may cause injury or a malfunction of the device. Contact your Shimadzu representative if the main cover must be removed.

For parts replacement, use parts and tools listed in Component Parts CTO-40C CL (P.200) and Maintenance Parts CTO-40C CL (P.230).
If any other parts or tools are used, part damage, injury, and malfunction may occur.

6.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase solvent in the flow lines with water.
- Wipe away any dirt from the left and right doors and the main cover.
- Wipe away any dirt from the control pannel with tissue paper or a soft cloth moistened with water.

6.1.2 List of Periodic Inspection and Maintenance

Note	The maintenance and replacement periods listed in this table are presented only as guidelines. These are not guarantee periods. These will vary depending on usage conditions.

Inspection/ Maintenance Item	1 Year	2 Years	3 Years	Remark	Ref.
Air filter replacement	√				6.6 Replacing the Air Filter (P.117)
Inspection of Temperature Accuracy	√			Every six to twelve months	Nexera CL seires System Guid e "4.8.2 Testing the Temperature Adjustment Function"
Inspection of Gas Sensor	√			Every six to twelve months	CTO-40C CL Instruction Manual "3.5.4 Validation Support Information Group (VALIDATION) / Checking the gas sensor 《GAS SENSOR CHECK》"
Inspection of Leak Sensor	√			Every six to twelve months	CTO-40C CL Instruction Manual "3.5.4 Validation Support Information Group (VALIDATION) / Checking the gas sensor 《LEAK SENSOR CHECK》

■ Optional Parts

Parts Name	Inspection/ Maintenance Item	Maintence Timing	Remark
FCV-0206H	Valve rotor/stator replacement	Replace after approximately 50,000 cycles of use.*1	Contact your Shimadzu representative.
FCV-0206H3		Replace the valve rotor after approximately 10,000 cycles of use.*1 Replace the valve stator after approximately 20,000 cycles of use.*1	
FCV-0607H		Replace after approximately 25,000 cycles of use.*1	
FCV-0607H3		Replace the valve rotor after approximately 5,000 cycles of use.*1 * Replace the valve stator after approximately 10,000 cycles of use.*1	
FCV-36AH	Valve head assy replacement	2 Years*2	Contact your Shimadzu representative.

*1 Only when mixed solution of water and organic solvent is used. The lifetime may be extended or shortened depending on the type of delivered solvent and the delivery pressure. The use of a solvent such as chloroform and THF as the mobile phase or the continuous delivery of pure water with 80 % or higher concentrations at a high pressure may shorten the lifetime. Long time storage of the instrument after the use of a buffer solution that dries and leaves crystals and insoluble matter as the mobile phase may extremely shorten the lifetime of the rotor. Thoroughly rinse the flow lines with distilled water or deionized water.

*2 Replace at 10,000 revolutions.

6.1.3 Check After Inspection and Maintenance

After inspection and maintenance, check any leakage during pumping.

Note	When the parts management tool（PARTS MGMT TOOL）is not used, input the part number when replacing a part not registered in the PARTS MGMT TOOL. CTO-40C CL Instruction Manual "3.5.3 Maintenance Information Group (MAINTENANCE)/ Inputting a replacement part number《PART REPLACEMENT》"

6.2 Temperature Accuracy Calibration

Re-calibration is required if the temperature accuracy of [TEMPERATURE CHECK] fails the temperature control function test of the component validation.

Reference CTO-40C CL Instruction Manual "3.5.3 Maintenance Information Group (MAINTENANCE)/ Checking the temperature control accuracy《TEMPERATURE CHECK》"

CAUTION

Do not use this function in the CL model.
Recalibration operation is executed by service personnel.

1-point calibration or 2-point calibration can be performed at any temperature. If the oven is always to be used at the same temperature, 1-point calibration at that temperature is sufficient. If the oven is to be used at a wide range of temperatures, 2-point calibration is recommended.

The first calibration temperature must be no greater than 60 °C and the second calibration temperature must be at least 20 °C higher than the first calibration temperature. Before shipment, the CTO-40C CL is calibrated at 40 °C and 80 °C respectively.

6.3 Gas Sensor Calibration

Re-calibration is required if the result of [GAS SENSOR CHECK] fails the component validation.

Reference CTO-40C CL Instruction Manual "3.5.3 Maintenance Information Group (MAINTENANCE)/ Checking the temperature control accuracy《TEMPERATURE CHECK》"

CAUTION

This function is not used in the CL model.
Recalibration operation is executed by service personnel.

Note	The gas sensor detects volatile gas generated from leaked organic solvents when the tubing such as a column causes a leakage. When the output value from the sensor exceeds the level set at "threshold value", an error occurs and temperature control stops. The gas sensor is influenced by the concentration of organic solvent gas around the instrument.

6.4 Leak Sensor Calibration

Re-calibration is required if the result of [LEAK SENSOR CHECK] fails the component validation.

Reference CTO-40C CL Instruction Manual "3.5.3 Maintenance Information Group (MAINTENANCE)/ Checking the leak sensor《LEAK SENSOR CHECK》"

CAUTION

This function is not used in the CL model.
Recalibration operation is executed by service personnel.

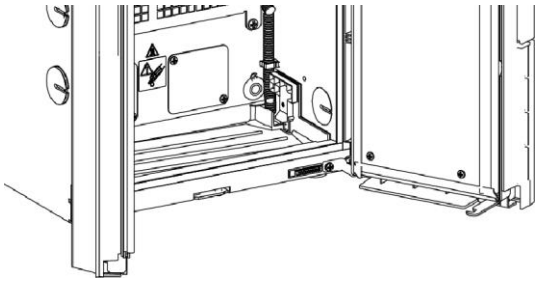
Note	The leak sensor detects leaked mobile phase when the tubing such as a column causes the leakage. When the output value from the sensor exceeds the level set at "threshold value", an error occurs and temperature control stops.

6.5 Cleaning the Leak Tray

Note	If leak occurred, wipe off leak in the leak tray completely as below. Leak of mobile phase solution used as buffer solution may dry and crystallize, clogging the leak tray. If the leak tray is contaminated by such crystallized buffer solution, wipe off the leak tray with wiper paper soaked in water in the same manner as below.

1 Wipe off leak around the leak sensor or on the leak tray completely with wiper paper.

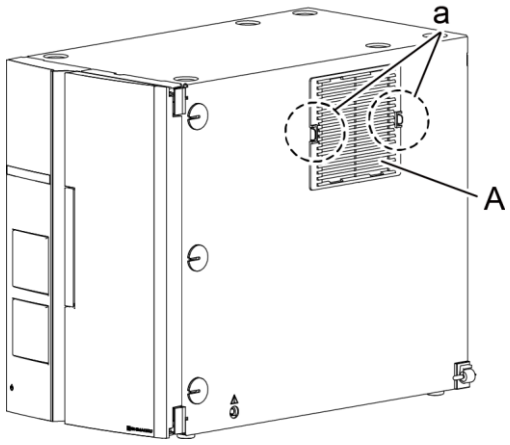
Note	Do not bend or pull the leak sensor. If there is contamination such as crystallized buffer solution, wipe it off with wiper paper soaked in water.



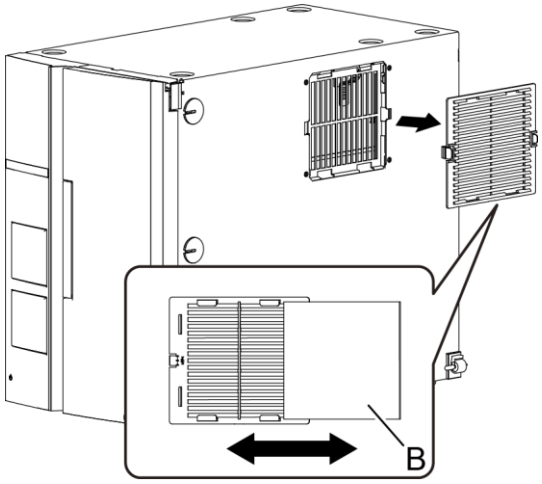
6.6 Replacing the Air Filter

This section explains how to replace the air filter on the right side of the instrument.

1 **Remove the filter holder (A) on the right side by pressing its right and left knobs (a).**

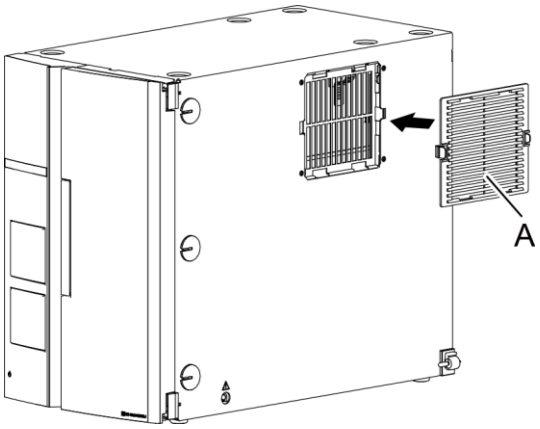


2 **Remove the air filter (B) and then attach a new air filter (B) to the filter holder (A).**



3 **Attach the filter holder (A) to the right side.**

Note	The filter holder (A) has its upper side and lower side and therefore can be attached only in a certain orientation.



6.7 Cleaning the Exterior

6.7.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or paper wiper.
If it is very dirty, clean it as below.

1. **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**
2. **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

> ⚠ CAUTION
>
> **Do NOT leave any part wet nor use thinner for cleaning.**
> Doing so may cause rust or discoloration.

6.7.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1. **Turn off the power button.**
2. **Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.**

> ⚠ CAUTION
>
> **Do not leave metal surfaces wet.**
> This can cause rusting and discoloration.

7 SIL-40C XR CL / SIL-40C X3 CL

7.1 Regular Inspection and Maintenance

The safe use of this instrument requires regular inspection.

Regular inspection service by Shimadzu service personnel is available to customers who sign a maintenance and inspection agreement with Shimadzu.

For the maintenance and inspection agreement, contact your Shimadzu representative.

⚠WARNING

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.

Failure to follow the above instructions may cause fire, electric shock, or failure.

Ensure that the appropriate safety gear (for example, protective goggles, gloves, and mask) are used when handling hazardous substances or infectious material.

Do not throw away parts after replacement indiscriminately. When using biohazardous substances or toxic substances, the following parts may have been contaminated.

- Needle
- Needle seal
- High pressure valve
- Sample loop
- Rinsing port cap
- UHPLC fitting

When disposing of these parts, contact your Shimadzu representative. If you dispose of them yourself, do so in accordance with the processing standards determined by law, separately from general industrial waste and household garbage.

⚠CAUTION

Use parts listed in Optional Parts SIL-40 XR /X3 CL (P.211) or Maintenance Parts SIL-40C XR CL/SIL-40C X3 CL (P.230) when replacing parts.

Using a part other than the listed ones may damage the part and cause injury or failure.

Never remove the main unit cover.

Doing so may cause injury or failure.

If you need to remove the main unit cover to repair this instrument, contact your Shimadzu representative.

7.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase in the flow lines with water.
- When using biohazardous substances or toxic substances, purge the flow line with 2-propanol before replacing Needle, Needle seal, High pressure valve, Sample loop and UHPLC fitting.

Note	The rinse port cap cannot be cleaned while it is attached to the device.

- Clean the front panel and the main unit cover.
- If the operation panel is dirty, wipe the panel with a soft cloth or tissue paper damp with water.
- Stop the delivery of the pump before starting work.
- When performing delivery at the end of work, be sure to install the front panel in advance.

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

- Be sure to perform inspection and maintenance by following the instructions.
- Use the tools included in the optional tool kit (228-57647-43).

7.1.2 List of Periodic Inspection and Maintenance

The replacement and inspection cycles in this table are just for your reference. They are not warranty periods.

The cycles vary depending on the conditions of use.

■ Maintenance items to conduct based on the number of uses

Inspection and Maintenance Item	Estimate for Maintenance	Remarks	Ref.
Replacement of the high pressure valve rotor	• For SIL-40C XR CL: Approximately 50,000 uses • For SIL-40C X3 CL: Approximately 10,000 uses	(Only when mixed solution of water and organic solvent is used)*1	7.3 Replacing the High Pressure Valve Rotor and Stator (Inspection) (P.128)
Replacement of the high pressure valve stator	• For SIL-40C XR CL: Approximately 50,000 uses • For SIL-40C X3 CL: Approximately 20,000 uses	(Only when mixed solution of water and organic solvent is used)*1	7.3 Replacing the High Pressure Valve Rotor and Stator (Inspection) (P.128)
Replacement of the low pressure valve rotor	Approximately 1,000,000 uses		7.4 Replacing the Low Pressure Valve Rotor and Stator (Inspection) (P.141)
Replacement of the low pressure valve stator	Approximately 1,000,000 uses		7.4 Replacing the Low Pressure Valve Rotor and Stator (Inspection) (P.141)
Replacement of the needle seal	Approximately 100,000 injections		7.7 Replacing the Needle Seal (P.157)
Replacement of the needle	Approximately 100,000 injections		7.8 Replacing the Needle (P.161)
Replacement of the sample loop	Approximately 100,000 injections	When using the optional sample loop (500 µL: PN228-45405-45 or 2000 µL: 228-45405-46), contact your Shimadzu representative.	7.9 Replacing the Sample Loop (P.167)
Replacement of the flow rinse pump	Approximately 700,000 seconds of use	Contact your Shimadzu representative.	-

*1 The lifetime may be extended or shortened depending on the type of delivered solvent and the delivery pressure.
The use of a solvent such as chloroform and THF as the mobile phase or the continuous delivery of pure water with 80 % or higher concentrations at a high pressure may shorten the lifetime.
Long time storage of the instrument after the use of a buffer solution that dries and leaves crystals and insoluble matter as the mobile phase may extremely shorten the lifetime of the rotor.
Thoroughly rinse the flow lines with distilled water or deionized water.

■ Maintenance items to conduct based on the years of use

Inspection and Maintenance Item	Estimate for Maintenance			Remarks	Ref.
	1 Year	2 Years	3 Years		
Replacement of the plunger seal of the measuring pump			√	*1	7.5 Replacing the Plunger Seal of the Measuring Pump (P.148)
Replacement of the plunger of the measuring pump			√	*1	7.6 Replacing the Plunger of the Measuring Pump (P.154)
Replacement of the outlet tubing	√			Do this if you cannot remove clogs from the tubing	7.10 Replacing the Outlet Tubing (P.176)
Replacement of the injection port tubing	√			Do this if you cannot remove clogs from the tubing	7.11 Replacing the Injection Port Tubing (P.178)
Inspection (replacement) of the suction filter		√		Replace it if it is clogged with solid matter from the autosampler rinse solution.	7.12 Cleaning/Replacing the Suction Filter (P.182)
Cleaning and lubrication of the driving part			√	Contact your Shimadzu representative.	-

*1 When using the pretreatment function or the needle inner surface rinse function, replace the part about once a year.

7.1.3 Check after Inspection and Maintenance

After inspection and maintenance, check any leakage.

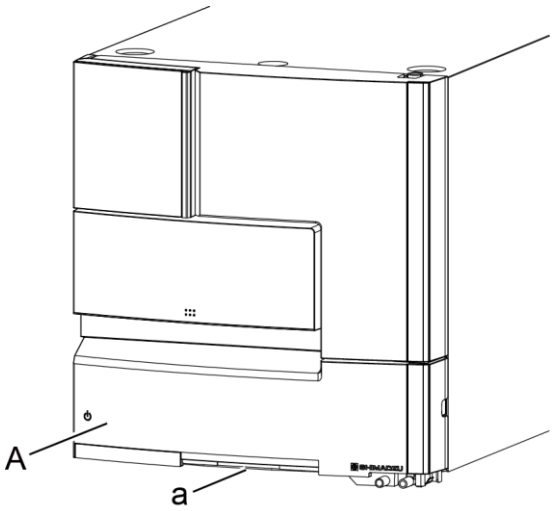
Note	When the parts management tool（PARTS MGMT TOOL）is not used, input the part number when replacing a part not registered in the PARTS MGMT TOOL. SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group/Entering the number of the replaced part《PART REPLACEMENT》"

7.2 Removing amd Installing the Front Panel

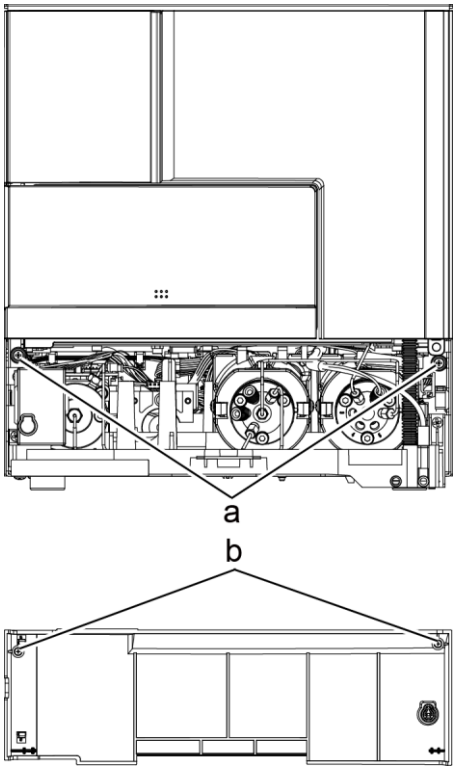
7.2.1 Removing and Installing the Front Panel (Lower)

1 **Put your finger into the notch (a) of the front panel (lower) (A) and pull it toward you.**

The magnets come off and you can remove the front panel (lower).



2 **To install the front panel (lower), align its magnets (b) with the magnets (a) of the frame.**



7.2.2 Removing and Installing the Front Panel (Upper)

Note	The front panel (upper) cannot be removed with the sample rack and the front panel (lower) installed.

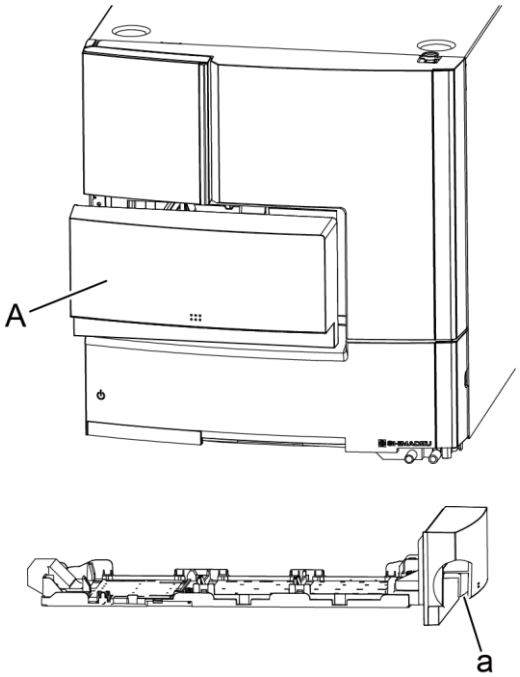
1 Pull out the sample rack (A).

Pulling the lever (a) in the grip toward you unlocks the rack.

CAUTION

When pulling out the sample rack, be sure to unlock it by pulling the lever.

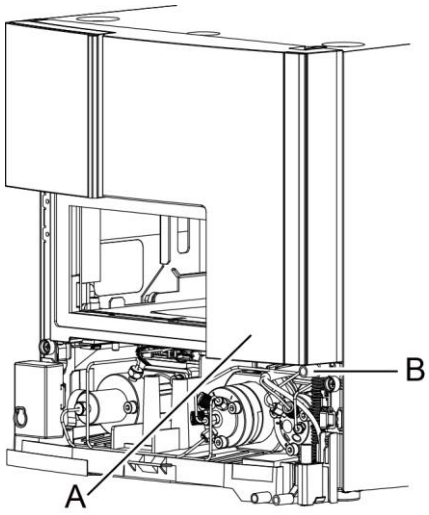
Failure to do so may damage the part and cause failure.



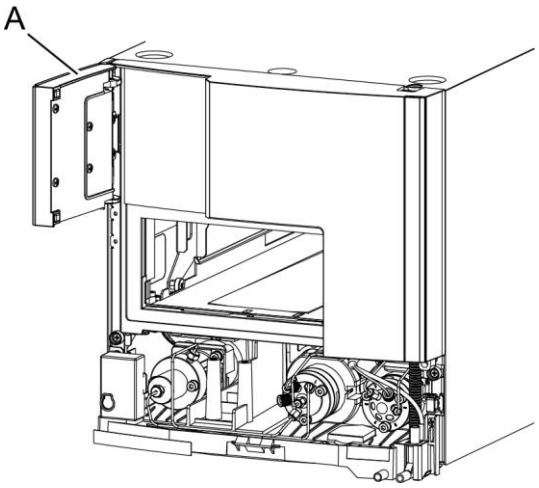
2 Remove the front panel (lower).

Reference 7.2.1 Removing and Installing the Front Panel (Lower) (P.123)

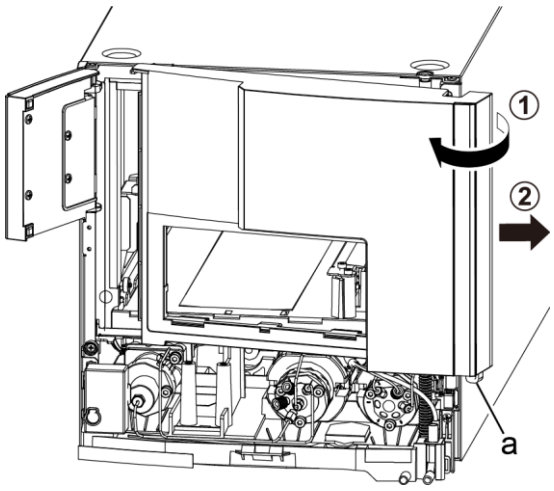
3 **Remove the knurled screw (B) on the bottom right of the front panel (upper) (A).**



4 **Open the operation panel (A).**

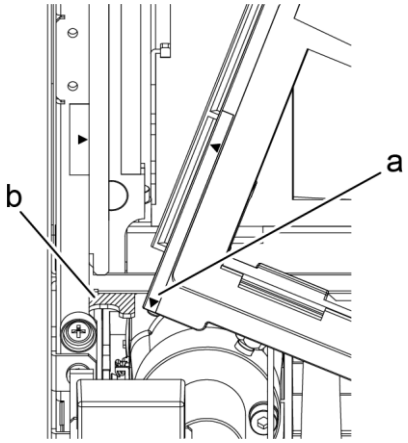


5 **While pushing up the button (a), turn the front panel (upper) toward you to remove it.**

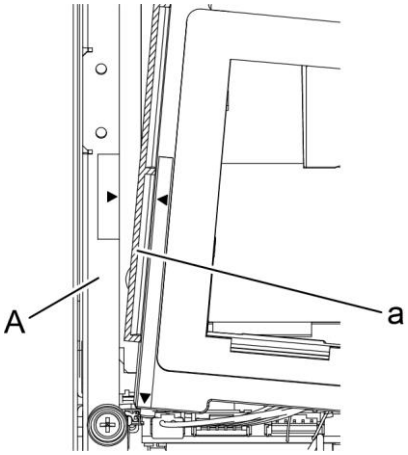


6 To install the front panel (upper), follow the instructions below.

1 Put the down arrow (a) of the yellow label, which is on the left side of the front panel (upper), onto the installation surface (b) of the frame.

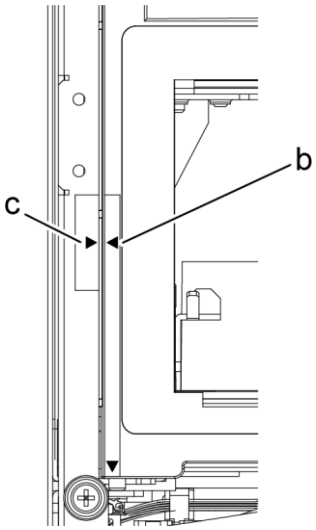


2 Insert the left side (a) of the front panel (upper) behind the frame (A) and push the panel to the left.



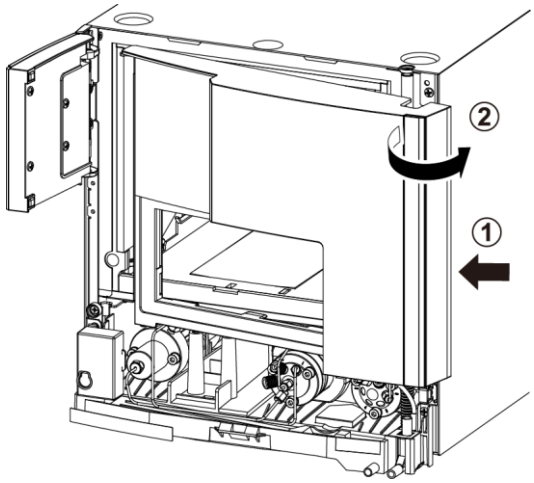
Hint

The left arrow (b) of the yellow label on the left side of the front panel (upper) aligns with the right arrow (c) of the yellow label on the frame.



3 While pushing the front panel (upper) to the left, turn it to attach it to the frame.

Hint When the gasket pushes back, firmly hold the panel to lock it.



7.3 Replacing the High Pressure Valve Rotor and Stator (Inspection)

■ Tools to use

Part Name	Part Number	Remarks
SPANNER, DOUBLE OPEN END 6×8	086-03047-01	
SPANNER, HEX (3 mm)	086-03804	
High pressure valve rotor replacement jig	228-48899-91	Included in the tool kit (228-57647-43).
Syringe	228-18216	Included in the accessory kit of the solvent delivery pump.
Syringe needle	228-18216-91	Included in the accessory kit of the solvent delivery pump. The ferral is not used.

■ Parts to use

Part Name	Part Type	Part Number	Remarks
Rotor, 2 position 6 port	Consumable	228-71780-42	
Stator, 2 position 6 port	Consumable	228-48858-46	
2-propanol	-	-	
Wiping paper	-	-	Used for wiping and cleaning parts.

7.3.1 Before Removing the High Pressure Valve

1 **Press [ZHOME] on the initial screen.**

This lifts the needle and moves it to the center of the instrument.

Reference SIL-40 CL Series Instruction Manual "2.4.2 Operation Area "

2 **Turn off by the power button on the front of the instrument, then turn off the main power switch on the rear of the instrument.**

Note	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2.1 Front "
SIL-40 CL Series Instruction Manual "2.3 Back "

CAUTION

Be sure to shut off the main power.

The instrument that is not shut off is in the standby state.

Removing the high pressure valve in this state may result in malfunction or failure of the instrument.

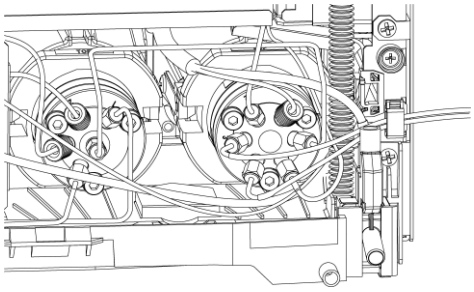
Also, the soft switch may unexpectedly react and start the instrument during the procedure.

3 **Lower the mobile phase bottle below the main unit.**

4 **Remove the sample rack, front panel (lower), and front panel (upper).**

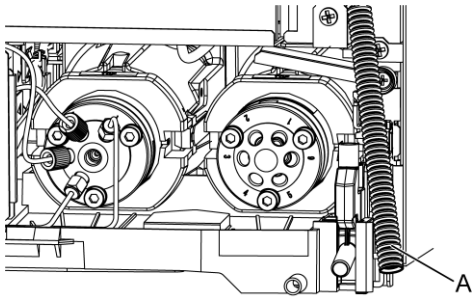
Reference 7.1.3 Check after Inspection and Maintenance (P.122)

5 **Loosen all male nuts of the flow line tubing and then remove the tubing from the high pressure valve.**

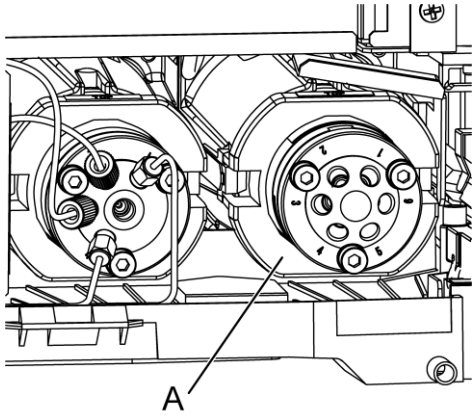


Note	For how to remove and tighten the UHPLC fittings, refer to the system guide "7.3.3 Connecting Tubing for High-Pressure Flow Channels (Connection Methods) - Connecting UHPLC Fittings ".

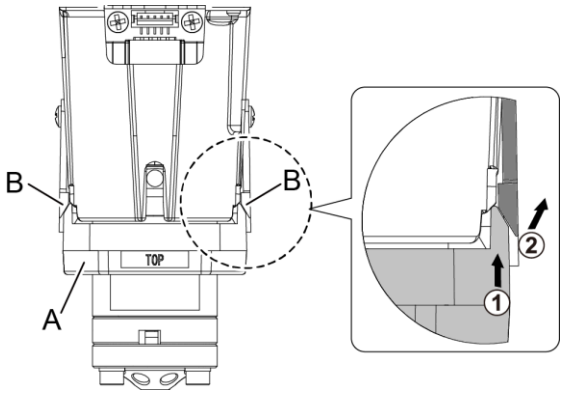
6 **Move aside the drain tube (A), which is in the right front of the high pressure valve, beside the tray.**



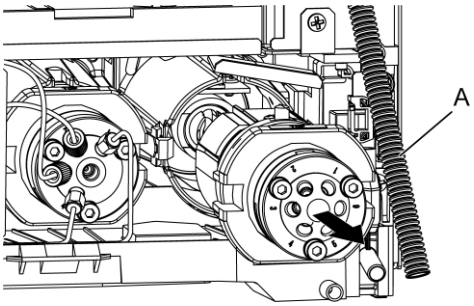
7 **Push in the black ring (A) of the high pressure valve assembly to unlock the high pressure valve assembly.**



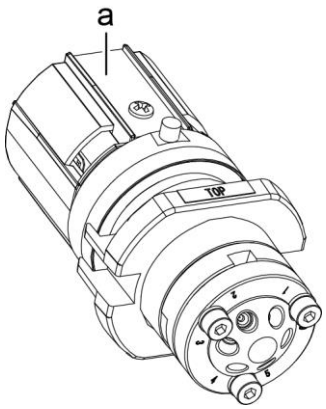
Pushing in the black ring unlocks the right and left catches (B) and lets the high pressure valve slightly jut out.



8 **Grasp the high pressure valve unit (A) and pull it out of the instrument toward you.**



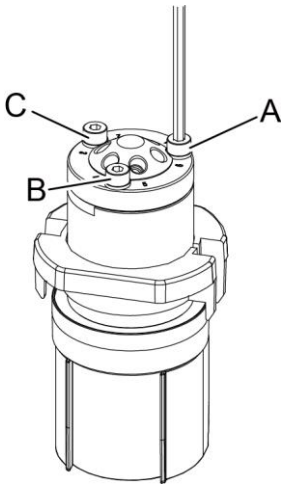
Note	Take care not to touch the board (a) during the procedure.



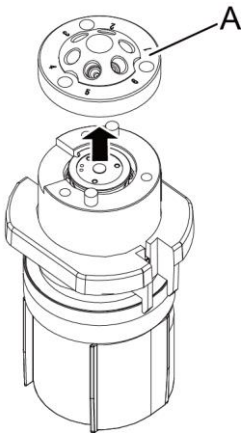
7.3.2 Removing the High Pressure Valve Rotor and Stator

1 **Loosen the three hexagon socket screws (A), (B), and (C), which are fixing the high pressure valve stator, 60° each with a 3-mm hex wrench in the order of (A), (B), and (C).**

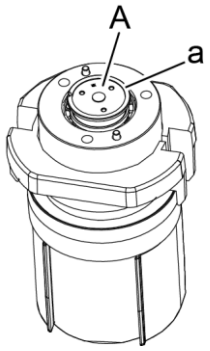
Note	Loosening only a socket screw may tilt the high pressure valve stator and cause a screw to burr or may makes it impossible to remove the high pressure valve stator.



2 **Hold and remove the high pressure valve stator (A).**

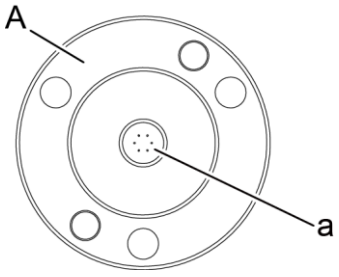


3 **Pull out the high pressure valve rotor (A) by holding its perimeter (a) firmly with your fingers.**



4 **Check that there is no damage to the frictional surface (a) of the high pressure valve stator (A).**

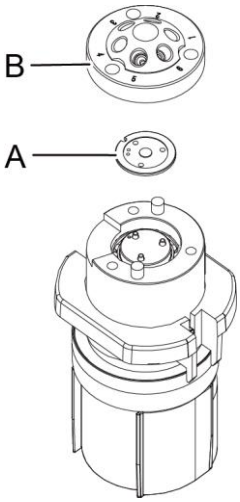
Note	If there is visible damage, replace the high pressure valve rotor and the high pressure valve stator with new ones.



5 When reusing the high pressure valve stator (B) that is not damaged, carefully wipe the frictional surface with a piece of wiper paper wet with 2-propanol.

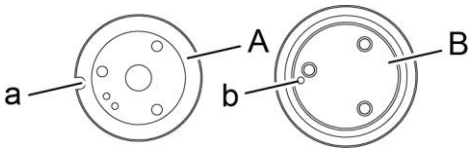
If the dirt is hard to remove, put the high pressure valve stator in 2-propanol and clean it with an ultrasonic bath for 5 minutes.

Note	Do not reuse the high pressure valve rotor. Replace it with a new one.



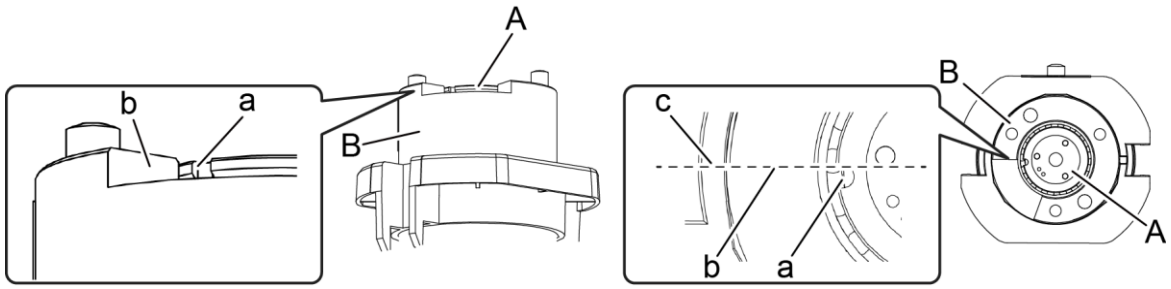
7.3.3 Installing the High Pressure Valve Rotor and Stator

1 **Align the notch (a) of the high pressure valve rotor (A) with the alignment mark (b) of the shaft (B) and then insert it in parallel all the way in securely.**

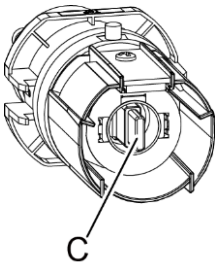


Note	For the high pressure valve rotor, avoid touching a part other than the perimeter as much as possible. After installing it, wipe the frictional surface coming in contact with the high pressure valve stator by using a piece of wiper paper wet with 2-propanol.

2 **Turn the high pressure valve rotor (A) and then align the notch (a) of the high pressure valve rotor with the left side (b) of the opening of the high pressure valve unit.**



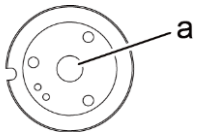
Note	You can adjust the position of the rotor by holding and turning the joint (C) by hand. Recheck the position of the rotor before installing the high pressure valve stator.



Hint

Adjust the position so that one of the edges of the notch (a) of the high pressure valve rotor is aligned with the line (c) drawn on the left side (b) of the opening of the ring.

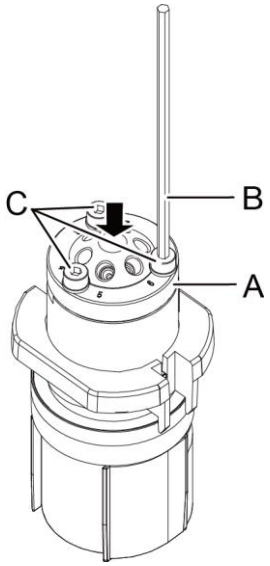
3 **Drip a few drops (about 5 µL) of 2-propanol on the frictional surface (a) at the center of the high pressure valve rotor with a clean pipetter or syringe.**



Note	Do not drip too many drops of 2-propanol. They may leak into the mechanism inside the high pressure valve unit and hinder correct operation.

4 **Put the high pressure valve stator (A) on the high pressure valve unit, then lightly hold down the center of the housing vertically with a finger so that the high pressure valve stator is placed horizontally.**

CAUTION
Do NOT install the high pressure valve stator at a tilt. Installing the high pressure valve stator at a tilt may damage the frictional surfaces of the high pressure valve stator and the high pressure valve rotor and result in liquid leak.

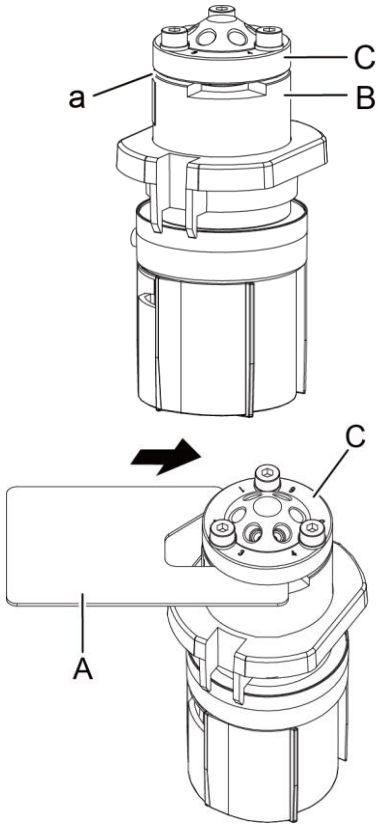


Note	
	• Install the high pressure valve stator before the 2-propanol dripped on the frictional surface at the center of the high pressure valve rotor dries. • Immediately before installing the high pressure valve stator assembly, wipe the frictional surface with a piece of wiper paper wet with 2-propanol.

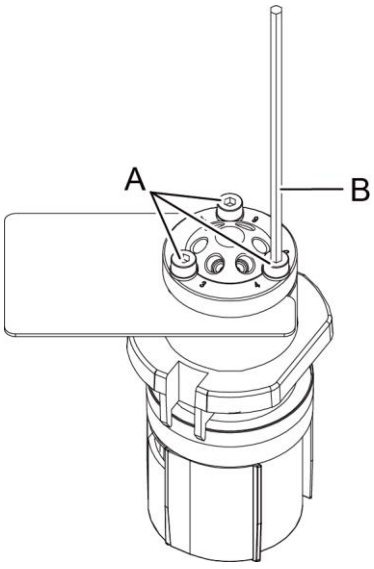
5 **While holding down the high pressure valve stator (A), insert the longer part of the 3-mm hex wrench (B) into the three hexagon socket screws (C) and lightly turn them until their screw heads come in contact with the assembly.**

6 **Insert the high pressure valve rotor replacement jig (A) all the way into the gap (a) between the high pressure valve unit (B) and the high pressure valve stator (C).**

> **CAUTION**
>
> **Be sure to use the jig.**
> Not using the jig makes it difficult to tightly and evenly attach the high pressure valve stator to the high pressure valve rotor, which may cause liquid to leak or the high pressure valve rotor to be worn in a short time.

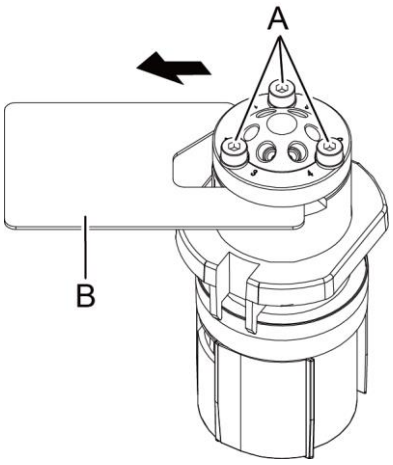


7 **Insert the longer part of the 3-mm hex wrench (B) into the three hexagon socket screws (A) and tighten them until they turn no further.**



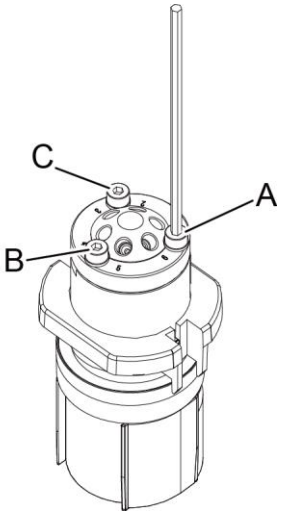
8 **Loosen the three hexagon socket screws (A) 45° each and pull out the high pressure valve rotor replacement jig (B).**

Note	If the high pressure valve rotor replacement jig is hard to pull out, loosen the three hexagon socket screws another 45° each.



9 **With the 3-mm hex wrench, tighten the three hexagon socket screws 45° each in the order of (A), (B), and (C).**

Note	Securely tighten the screws by holding the longer part of the hex wrench.

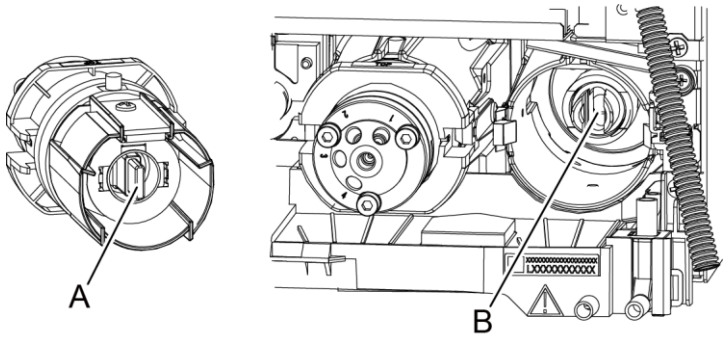


10 **Repeat loosening the three hexagon socket screws, which are completely tightened, 45° each in the order of (C), (B), and (A) four times. (Loosen them 180° in total.)**

11 **Repeat tightening the screws 45° each in the order of (A), (B), and (C) to completely tighten them.**

7.3.4 Installing the High Pressure Valve to the Instrument

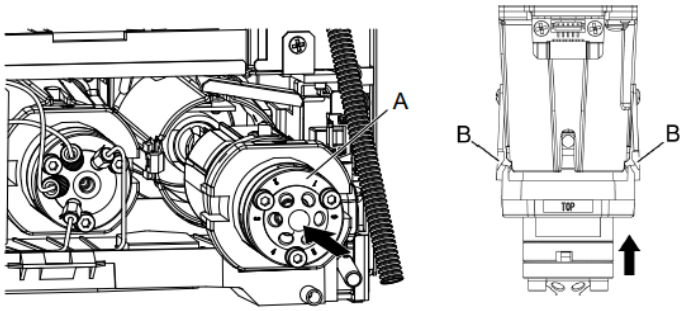
1 **Check that the joint (A) (protrusion) of the valve is positioned so that it fits into the joint (B) (hollow) of the driving part. If it is not positioned in this way, turn joints (A) and (B) to the correct position with pliers.**



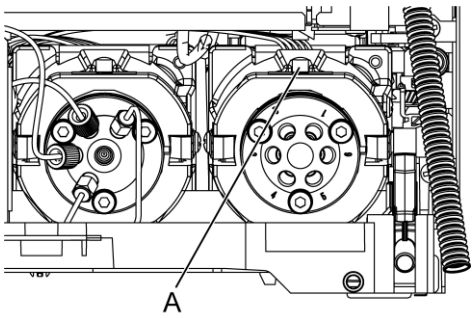
2 **Push and install the high pressure valve assembly (A) into the main unit of the instrument.**

Pushing it all the way in causes the right and left catches (B) to click into the high pressure valve and get locked.
If they do not get locked, check step 1 again.

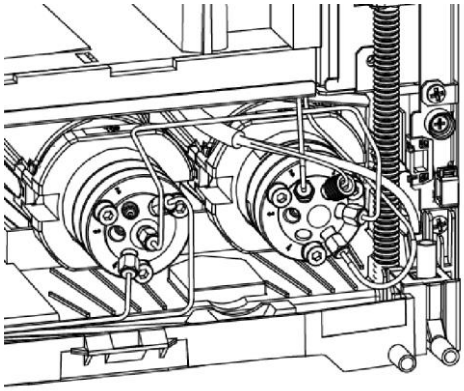
Note	With the side marked "TOP" turned upward, insert the valve assembly straight into the main unit.



Note	With the positioning pin (A) of the valve at the top, insert the assembly straight at the minimum tilt.



3 **Referring to the illustration below, install the tubing of each port of the high pressure valve back in place.**



4 **Set the drain tube back in place. Install the front panel (upper), the front panel (lower), and the sample rack.**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

5 **Set the mobile phase bottle back in place.**

7.3.5 Resetting the Number of Uses

Note	Reset the number of uses for the component that was installed. Reset both if the stator and rotor were replaced. When using PARTS MGMT TOOL, the number of uses cannot be reset from the operation panel. Reset it from PARTS MGMT TOOL.

1 **Turn on the main power to the instrument.**

Reference SIL-40 CL Series Instruction Manual "2.3 Back"

2 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [HPV ROTOR USED] or [HPV STATOR USED] appears.**

The number of uses and the reference value for replacement appear.

Reference SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group "

3 **Press [0] and then [Enter].**

This resets the number of uses to 0.

Note	Reset the number of uses for the component that was installed. Reset both if the stator and rotor were replaced. When using PARTS MGMT TOOL, the number of uses cannot be reset from the operation panel. Reset it from PARTS MGMT TOOL.

4 **Deliver 2-propanol at the flow rate of about 2 mL/min by the delivery pump.**

5 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [HPV ROTATION] appears.**

6 **Press [Enter].**

The high pressure valve switches every several seconds. The second line shows the number of remaining rotations.

Note	• Once the operation starts, it cannot be stopped halfway until 50 cycles are completed. • Be sure to remove the column before starting the operation. Initial wear particles may be produced. • Check that no liquid is leaking from a gap of the high pressure valve.

7 **Press [CE] repeatedly until the initial screen appears after HPV rotation.**

8 **Put the reservoir bottle back where it was and press [purge].**

This starts the purge of the flow lines.

7.4 Replacing the Low Pressure Valve Rotor and Stator (Inspection)

■ Tools to use

Part Name	Part Number
SPANNER, DOUBLE OPEN END 6×8	086-03047-01
SPANNER, HEX (3 mm)	086-03804

■ Parts to use

Part Name	Part Type	Part Number
Rotor for low pressure valve	Repair part	228-71780-43
Stator for low pressure valve	Repair part	228-71782-41
2-propanol	-	-
Wiping paper	-	-

7.4.1 Before Removing the Low Pressure Valve Rotor and Stator

1 **Press [ZHOME] on the initial screen.**

This lifts the needle and moves it to the center of the instrument.

Reference SIL-40 CL Series Instruction Manual "2.4.2 Operation Area"

2 **Turn off by the power button on the front of the instrument, then turn off the main power switch on the rear of the instrument.**

Note	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2.1 Front "
SIL-40 CL Series Instruction Manual "2.3 Back "

CAUTION

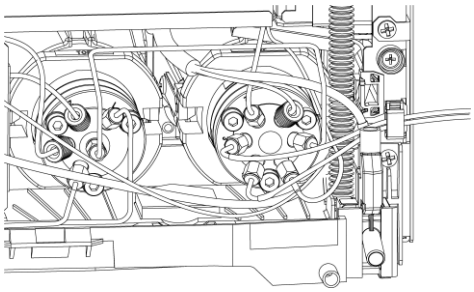
Be sure to shut off the main power.
The instrument that is not shut off is in the standby state.
Removing the low pressure valve in this state may result in malfunction or failure of the instrument.
Also, the soft switch may unexpectedly react and start the instrument during the procedure.

3 **Lower the rinse solution bottle below the main unit.**

4 **Remove the sample rack, front panel (lower), and front panel (upper).**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

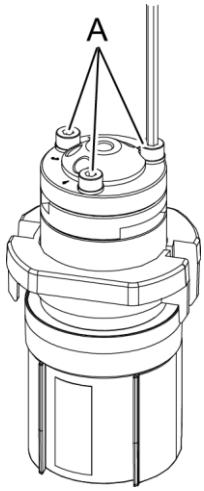
5 **Loosen all male nuts of the flow line tubing with a wrench and then remove the tubing from the low pressure valve.**



Hint You do not have to remove the high pressure valve tubes except for those connected to the low pressure valve.

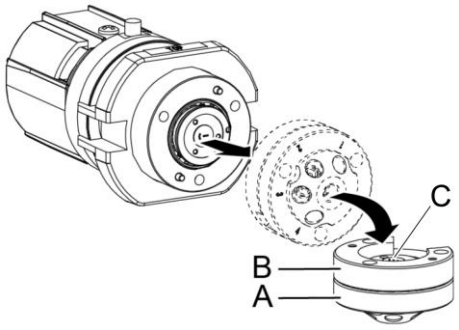
7.4.2 Removing the Low Pressure Valve Rotor and Stator

1 **Remove the three hexagon socket screws (A) with a 3-mm hex wrench.**

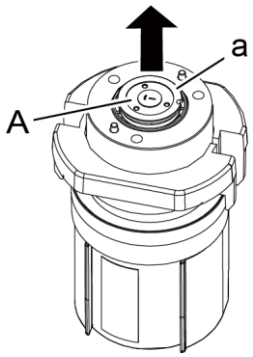


2 **While taking care not to let the ring (B) fall, remove the low pressure valve stator assembly (A) and the ring (B), then put them down with the ring side turned upward.**

Note	The stator portion of the low pressure valve is divided into the ring and the low pressure valve stator assembly. It is possible for the low pressure valve stator (C) of the low pressure valve stator assembly to fall off. Remove the ring and the low pressure valve stator assembly slowly so that the low pressure valve unit turned sideways as shown in the figure.



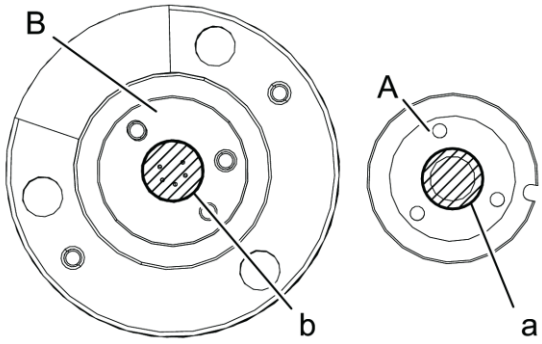
3 **Remove the low pressure valve rotor (A) by holding its perimeter (a).**



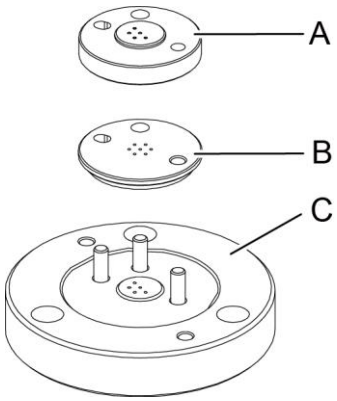
4 **Check that there is no damage to the rotating frictional surfaces (a) and (b) of the low pressure valve rotor (A) and the low pressure valve stator (B).**

If there is visible damage, replace the low pressure valve rotor and the low pressure valve stator with new ones.

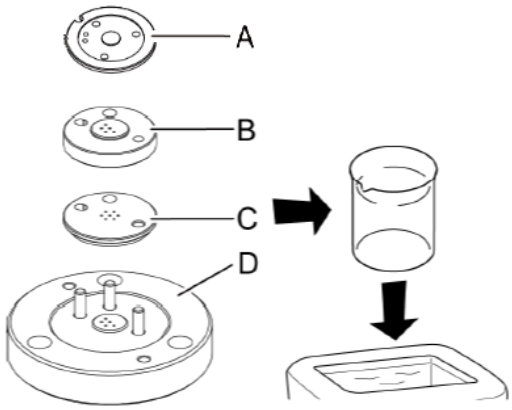
Note	The parts will be worn in a short time if one of them is damaged.



5 **Disassemble the low pressure valve stator assembly into the low pressure valve stator (A), the gasket (B), and the housing (C).**



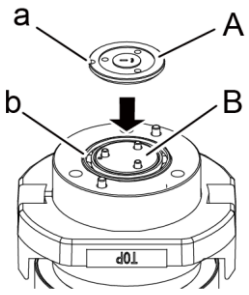
6 **Put the low pressure valve rotor (A), the low pressure valve stator (B), the gasket (C), and the housing (D) in a beaker containing 2-propanol and clean them with an ultrasonic bath for 5 minutes.**



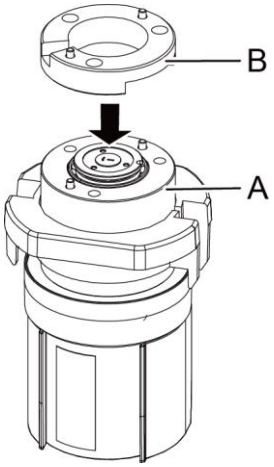
7.4.3 Installing the Low Pressure Valve Rotor and Stator

1 **Hold the perimeter of the low pressure valve rotor (A), align the notch (a) of the low pressure valve rotor (A) with the alignment mark (b) of the shaft (B), then insert it in parallel all the way down.**

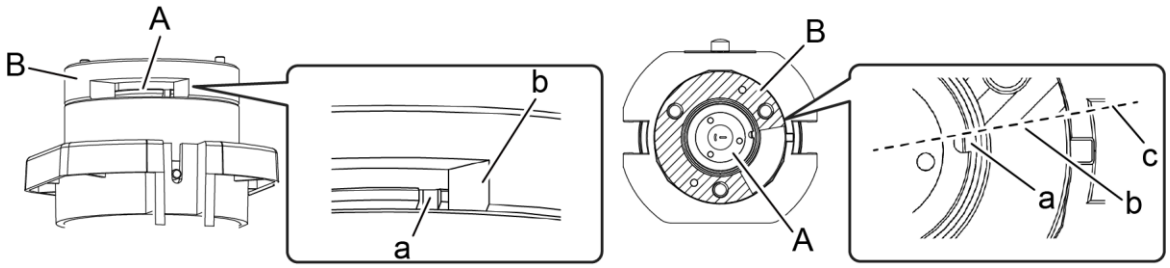
Note	For the low pressure valve rotor, avoid touching a part other than the perimeter as much as possible. After installing it, wipe the frictional surface coming in contact with the low pressure valve stator with 2-propanol.



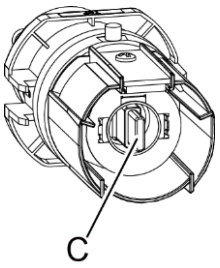
2 **Install the ring (B) to the low pressure valve unit (A).**



3 **Turn the low pressure valve rotor (A) and then align the notch (a) of the low pressure valve rotor with the right side (b) of the opening of the ring (B).**



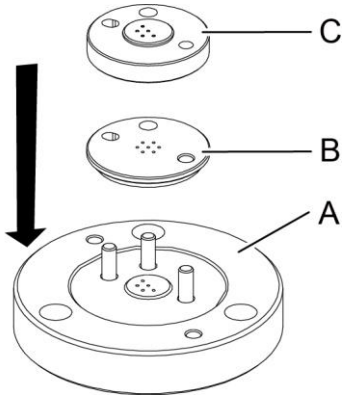
Note	You can adjust the position of the rotor by holding and turning the joint (C) by hand. Recheck the position of the rotor before installing the low pressure valve stator assembly.



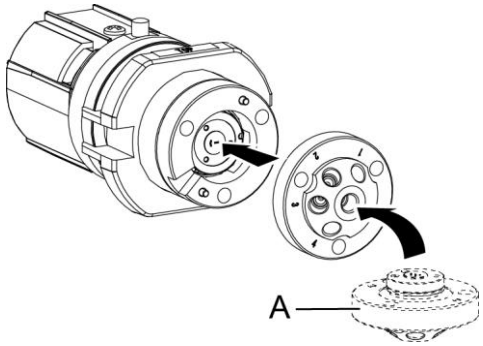
Hint

Adjust the position so that one of the edges of the notch (a) of the low pressure valve rotor is aligned with the line (c) drawn on the right side (b) of the opening of the ring.

4 **Install the gasket (B) and then the low pressure valve stator (C) to the housing (A) to assemble the low pressure valve stator assembly.**

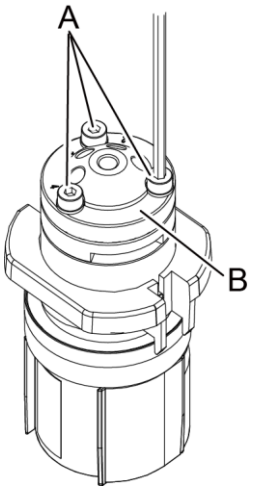


5 **Hold the low pressure valve stator assembly (A) with the housing side turned downward, then insert the assembly into the main unit while taking care not to let the gasket and the low pressure valve stator fall.**



6 **Install the three hexagon socket screws (A) to the housing (B) and tighten them in turn little by little with a 3-mm hex wrench.**

Note	Alternately tighten the three hexagon socket screws 60° each, then hold the longer part of the hex wrench and tighten them securely. Avoid tightening the hexagon socket screws unevenly.



7 **Install the low pressure valve assembly to the main unit.**

Install it by the same procedure as the high pressure valve.

Reference 7.3.4 Installing the High Pressure Valve to the Instrument (P.138)

8 **Set the tubing back in place, then install the front panel (upper), the front panel (lower), and the sample rack.**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

7.4.4 Resetting the Number of Uses

Note	Reset the number of uses for the component that was installed. Reset both if the stator and rotor were replaced. When using PARTS MGMT TOOL, the number of uses cannot be reset from the operation panel. Reset it from PARTS MGMT TOOL.

1 **Turn on the main power on the rear of the instrument.**

Reference SIL-40 CL Series Instruction Manual "2.3 Back "

2 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [LPV ROTOR USED] or [LPV STATOR USED] appears.**

The number of uses and the reference value for replacement appear.

Reference SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group"

3 **Press [0] and then [Enter].**

This resets the number of uses to 0.

4 **Press [CE] repeatedly until the initial screen appears.**

5 **Put the reservoir bottle back where it was and press [purge].**

This starts the purge of the flow lines.

7.5 Replacing the Plunger Seal of the Measuring Pump

■ Tools to use

Part Name	Part Number	Remarks
SPANNER, DOUBLE OPEN END 6×8	086-03047-01	
ALLEN WRENCH 3 LONG (Special type)	670-18928-04	
Seal replacement jig	228-25142-01	Included in the tool kit (228-57647-43).

■ Parts to use

Part Name	Part Type	Part Number
Plunger Seal	Consumable	228-35145
Plunger Seal (PE)	Consumable (optional)	228-21975-91

7.5.1 Before Removing the Pump Head

1 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [PLUNGER SET] appears.**

Reference SIL-40 CL Series Instruction Manual "4.1 Types of Screens "
SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group/Moving the plunger position of the measuring pump 《PLUNGER SET》"

2 **Press [Enter].**

This moves the plunger all the way in.

3 **Turn off by the power button on the front of the instrument, then turn off the main power switch on the rear of the instrument.**

Note	
	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2.1 Front"
SIL-40 CL Series Instruction Manual "2.3 Back"

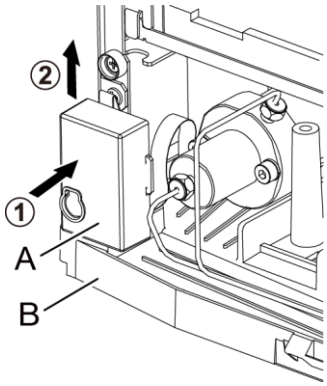
⚠CAUTION

Be sure to shut off the main power.
Not shutting off the main power may cause the soft switch to react unexpectedly, which may start the instrument during the procedure.

4 **Remove the sample rack, front panel (lower), and front panel (upper).**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

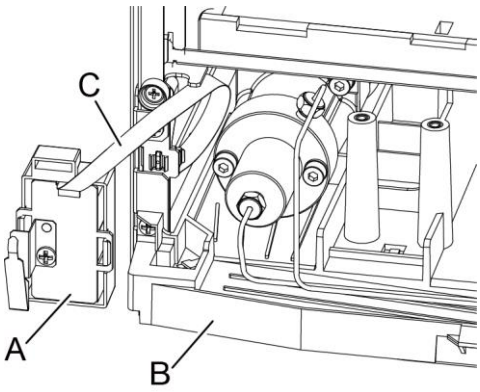
5 **Push in and pull up the soft switch (A) to remove it from the tray (B) and put it beside the instrument so that it does not get in the way.**



CAUTION

Do NOT pull hard on the soft switch.

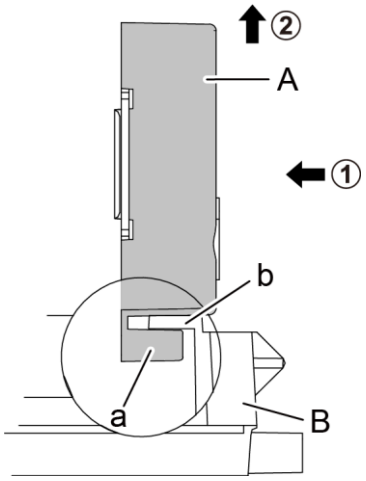
The flat cable (C) is connected to the soft switch. Pulling hard on the switch after removing it from the tray may break the flat cable.



Hint

The soft switch (A) is fixed to the catch (b) of the tray (B) by the hook (a) at the bottom. Pushing in the switch releases the hook from the tray and enables you to pull up the switch.

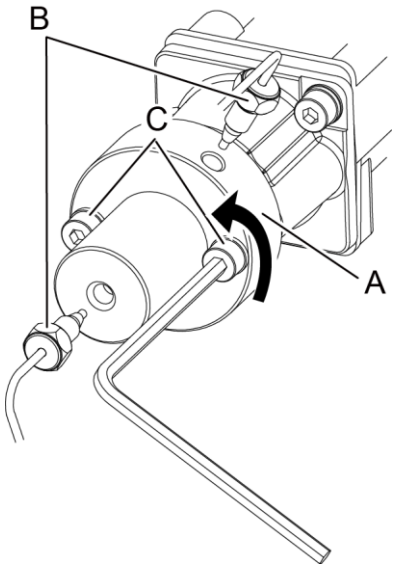
- The figure is the left side view of the instrument.



7.5.2 Removing the Pump Head

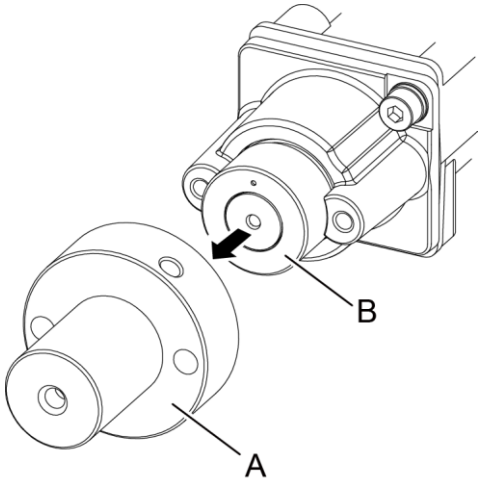
1 **Loosen the male nuts (B) of the flow line tubing of the pump head (A) with an 8-mm wrench and remove them.**

2 **Loosen the two hexagon socket screws (C) of the pump head (A) with a 3-mm hex wrench.**



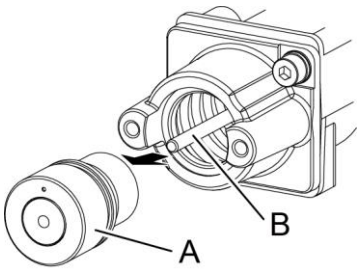
3 **Along the seal holder (B), pull out the pump head (A) slowly and horizontally.**

> **CAUTION**
>
> **Do NOT tilt the pump head when pulling it out.**
> Tilting the pump head when pulling it out may break the plunger.

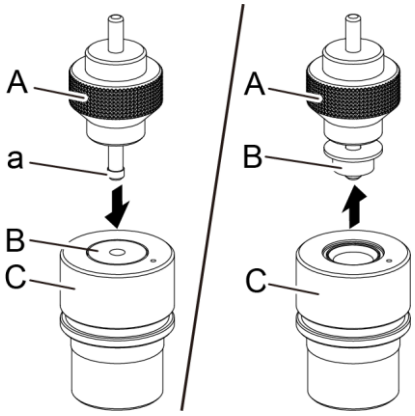


7.5.3 Replacing the Plunger Seal

1 **Along the plunger (B), pull out the seal holder (A) slowly and horizontally.**



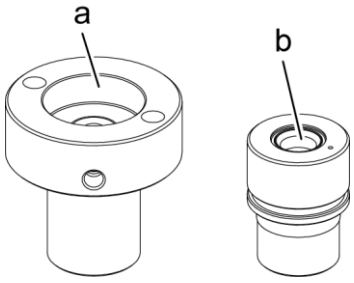
2 **Insert the thick end (a) of the seal installer/remover (A) vertically into the plunger seal (B).**



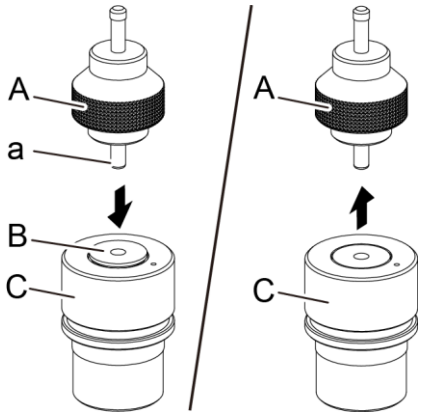
3 **Pull out the seal installer/remover (A) vertically to remove the plunger seal (B) from the seal holder (C).**

4 **If the inside (a) of the pump head and inside of the seal holder (b) are dirty, clean them with a piece of wiper paper wet with 2-propanol.**

Note	A seal residue on the pump head and the plunger seal adversely affects the air tightness and causes early liquid leakage.



5 **Put the new plunger seal (B) on the seal holder (C), then insert the straight end (a) of the seal installer/remover (A) vertically all the way into the plunger seal (B).**

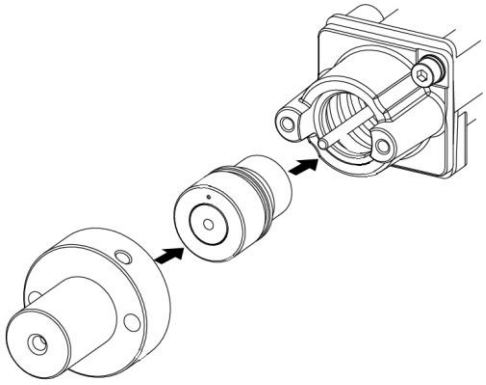


6 **Pull out the seal installer/remover (A) vertically.**

7.5.4 Installing the Pump Head

1 **Along the plunger (A), slowly push in the seal holder (B) with the alignment mark (a) at the top, then push in the pump head (C) slowly and horizontally.**

Note	Pushing hard on the pump head may break the plunger.

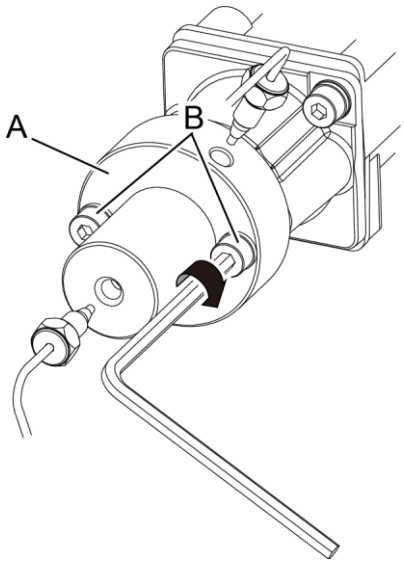


Hint

- When you are pushing the seal holder, the plunger seal may come off the seal holder. Hold the plunger seal with a piece of wiper paper wet with 2-propanol when pushing in the seal holder, which helps prevent the plunger seal from coming off.
- Attach the pump head with the tubing connection hole facing towards the upper right.

2 **Install the two hexagon socket screws (B) to the pump head (A) and tighten them with a 3-mm hex wrench.**

Note	Alternately tighten the right and left hexagon socket screws 90° each, then tighten them securely with a hex wrench.



3 **Set the tubing of the pump head back in place and fix it with an 8-mm hex wrench.**

4 **Set the soft switch back in place, then install the front panel (upper), the front panel (lower), and the sample rack.**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

5 **Plug the power supply cable and turn on the main power to the instrument.**

Reference SIL-40 CL Series Instruction Manual "2.3 Back"

6 **Put the reservoir bottle back where it was and press [purge].**

This starts the purge of the flow lines. Check that there is no liquid leak from a gap between the pump head and the head holder or a connection of the tubing.

Note	If the liquid leak is not solved by replacing the plunger seal, the surface of the plunger of the measuring pump may be damaged. If damaged, replace the plunger with a new one.

Reference 7.6 Replacing the Plunger of the Measuring Pump (P.154)

7.6 Replacing the Plunger of the Measuring Pump

■ Tools to use

Part Name	Part Number	Remarks
SPANNER, DOUBLE OPEN END 6×8	086-03047-01	
ALLEN WRENCH 3 LONG (Special type)	670-18928-04	
TOOL PLUNGER	228-28767-41	Included in the tool kit (228-57647-43).

■ Parts to use

Part Name	Part Type	Part Number
Plunger Assy	Repair part	228-35010-92
2-propanol	-	-
Wiping paper	-	-

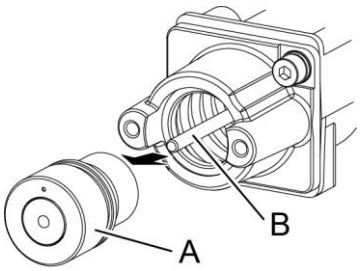
7.6.1 Before Removing the Measuring Pump Plunger

Remove the pump head by referring to the replacement procedure for the measuring pump plunger seal.

Reference 7.5.1 Before Removing the Pump Head (P.148)
7.5.2 Removing the Pump Head (P.150)

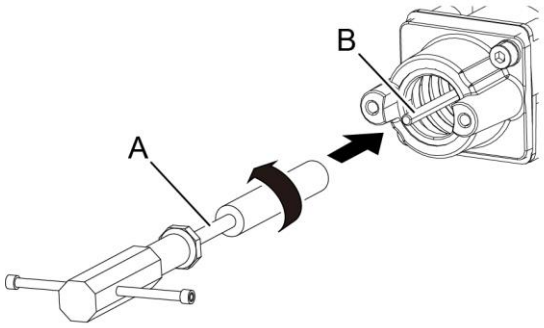
7.6.2 Replacing the Measuring Pump Plunger

1 **Along the plunger (B), pull out the seal holder (A) slowly and horizontally.**



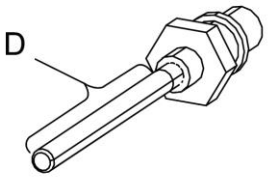
2 **Put the plunger tool (A) on the plunger (B) and turn it counterclockwise to remove the plunger.**

Note	When putting the plunger tool on the plunger, take care not to break the plunger.



3 **Check if the plunger (D) is not damaged or dirty.**

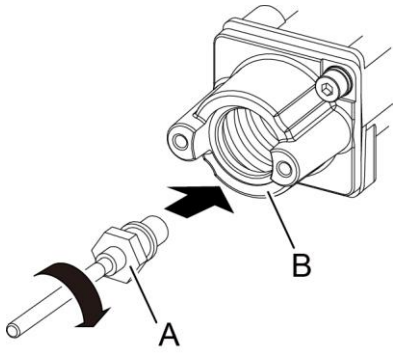
- If there is visible damage, replace the plunger with a new one.
- If the plunger is dirty, wipe the inside of the pump head and the plunger seal socket with a piece of wiper paper wet with 2-propanol.



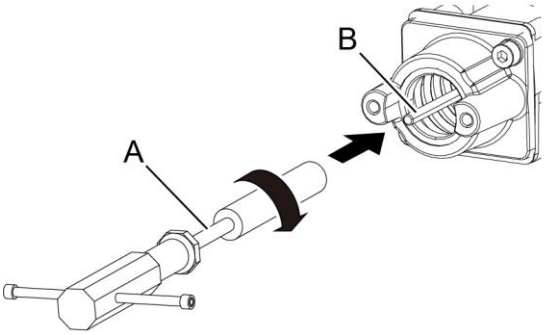
Note	A seal residue on the plunger may reduce the measuring accuracy.

7.6.3 Installing the Measuring Pump Plunger

1 **Grasp the plunger (A) with a piece of wiper paper and attach it to the measuring pump unit (B) before tightening it lightly by hand.**



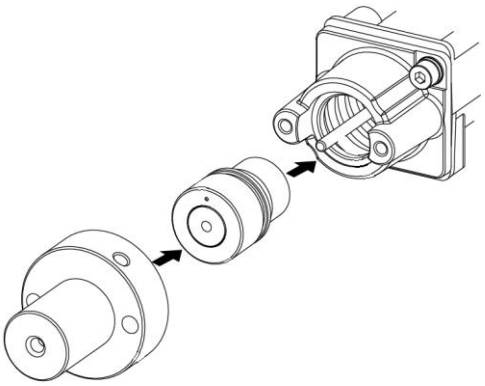
2 **Put the plunger tool (A) on the plunger (B) and then tighten the plunger.**



7.6.4 Installing the Pump Head

Install the pump head by referring to the replacement procedure for the measuring pump plunger seal.

Reference 7.5.4 Installing the Pump Head (P.153)



7.7 Replacing the Needle Seal

■ Tools to use

Part Name	Part Number
SPANNER, DOUBLE OPEN END 6×8	086-03047-01
SPANNER, DOUBLE OPEN END 8×10	086-03047-06

■ Parts to use

Part Name	Part Type	Part Number
NEEDLE SEAL ASSY	Consumable	228-64364-42
2-propanol	-	-
Wiping paper	-	-

7.7.1 Removing the Needle Seal

1 **From the VP functions screen, select [CALIBRATION], then press [↓] repeatedly until [ERASE ADJUST INJ.P] appears.**

Reference SIL-40 CL Series Instruction Manual "4.1 Types of Screens "
SIL-40 CL Series Instruction Manual "6.5 Calibration Support Group/Deleting the position adjustment data of the injection port《ERASE ADJUST INJ. P》"

2 **Press [Enter].**

This initializes the data to adjust the position of the needle for the injection port.

3 **Press [ZHOME] on the initial screen.**

This lifts the needle to the top position and moves it to the center of the instrument.

4 **Turn off by the power button on the front of the instrument, and turn off the main power switch on the rear of the instrument. Then, unplugging the power supply cable.**

Note	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2 Parts Identification and Function "

5 **From the VP functions screen, select [CALIBRATION], then press [↓] repeatedly until [ADJUST INJ.P] appears.**

Reference SIL-40 CL Series Instruction Manual "4.1 Types of Screens"
SIL-40 CL Series Instruction Manual "6.5 Calibration Support Group/Adjusting the injection port position《ADJUST INJ. P》"

6 Adjust the position of the needle for the injection port.

Reference SIL-40 CL Series Instruction Manual "6.5 Calibration Support Group/Adjusting the injection port position《ADJUST INJ. P》"

7 Remove the sample rack, front panel (lower), and front panel (upper).

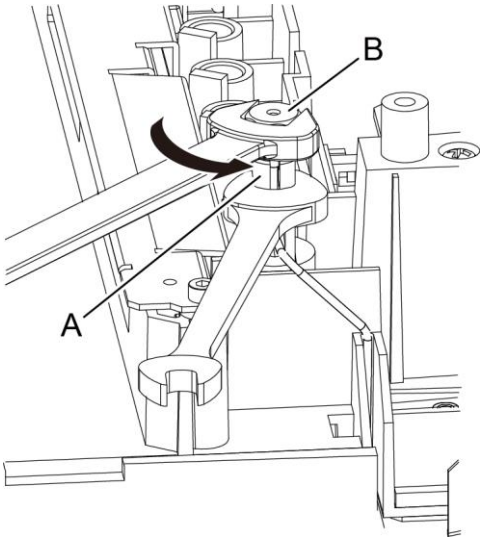
Reference 7.1.3 Check after Inspection and Maintenance (P.122)

8 While holding the needle seal housing (A) with an 8-mm wrench, turn and loose the needle seal cap (B) with a 10-mm wrench.

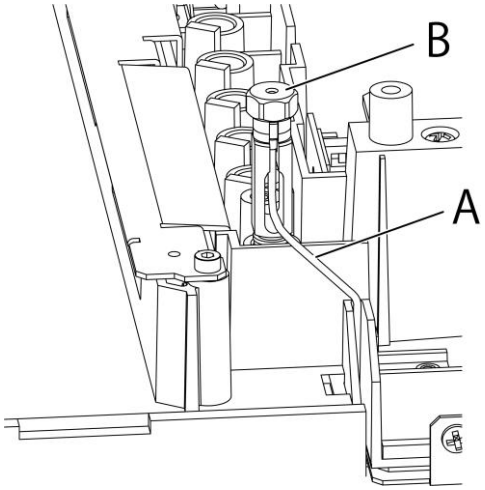
CAUTION

Be sure to hold the needle seal housing with a wrench.

Failure to observe this instruction may cause damage to the base parts supporting the needle seal or other failure of the instrument.

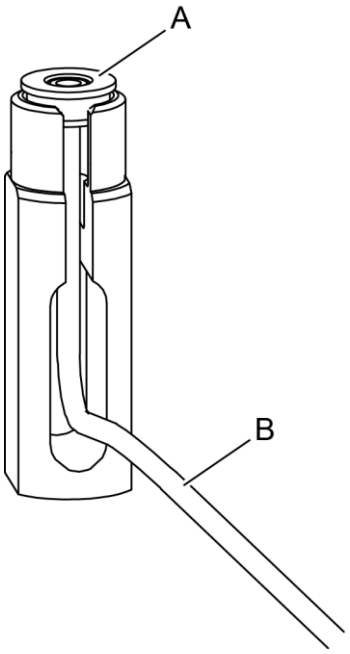


9 To prevent the needle seal from coming off, turn the needle seal cap (B) by hand while pushing down the injection port tubing (A), and remove the cap.



10 **Remove the needle seal (A) while pushing down the injection port tubing (B).**

Note	If it is difficult to remove, push up the injection port tubing (B) a little to lift the needle seal. The needle seal is a small part. Take care not to let it fall in the instrument when removing it.



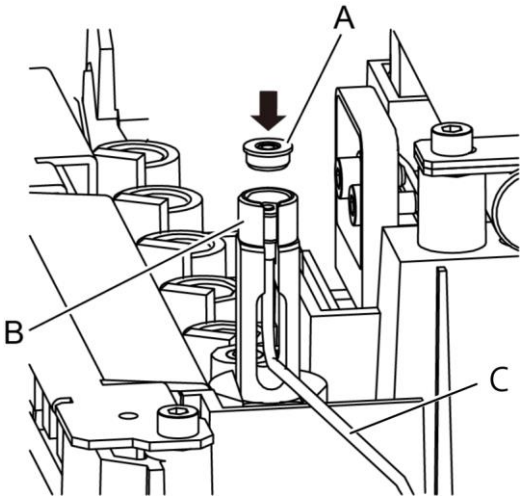
7.7.2 Installing the Needle Seal

1 **While pushing down the injection port tubing (C), install the new needle seal (A) to the injection port (B).**

CAUTION

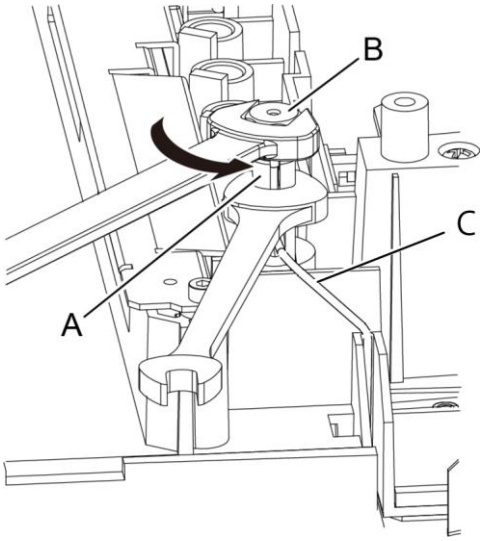
Hold the needle seal by the metal perimeter.

If the resin part are dirty, gently wipe with wiper paper soaked in IPA. If the dirt remains, the analysis may not be performed correctly.



2 **While pushing down the injection port tubing (C), tighten the needle seal cap (B) by hand until it is hard to tighten further. Then, while holding the needle seal housing (A) with an 8-mm wrench, tighten the needle seal cap (B) another 90° with a 10-mm wrench.**

> **CAUTION**
>
> **Be sure to hold the needle seal housing with a wrench.**
> Failure to observe this instruction may cause damage to the base parts supporting the needle seal or other failure of the instrument.



3 **Install the front panel (upper), the front panel (lower), and the sample rack.**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

4 **Plug the power supply cable and turn on the main power to the instrument.**

Reference SIL-40 CL Series Instruction Manual "2.3 Back"

5 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [NDL SEAL USED] appears.**

The number of uses of the needle seal and the reference value for replacement appear.

Reference SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group"

6 **Press [0] and then [Enter].**

This resets the number of uses to 0.

Note	When using PARTS MGMT TOOL, the number of uses cannot be reset from the operation panel. Reset it from PARTS MGMT TOOL.

7.8 Replacing the Needle

■ Tools to use

Part Name	Part Number
SPANNER, DOUBLE OPEN END 6×8	086-03047-01
SPANNER, DOUBLE OPEN END 8×10	086-03047-06

■ Parts to use

Part Name	Part Type	Part Number	Compatible Model
Needle, SIL40	Consumable	228-64909-98	SIL-40C XR CL SIL-40C X3 CL

7.8.1 Before Removing the Needle

1 **From the VP functions screen, select [CALIBRATION], then press [↓] repeatedly until [ERASE ADJUST INJ.P] appears.**

Reference SIL-40 CL Series Instruction Manual "4.1 Types of Screens "
SIL-40 CL Series Instruction Manual "6.5 Calibration Support Group/Deleting the position adjustment data of the injection port 《ERASE ADJUST INJ. P》"

2 **Press [Enter].**

This initializes the data to adjust the position of the needle for the injection port.

3 **Press [ZHOME] on the initial screen.**

This lifts the needle to the top position and moves it to the center of the instrument.

4 **Turn off by the power button on the front of the instrument, and turn off the main power switch on the rear of the instrument. Then, unplugging the power supply cable.**

Note	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

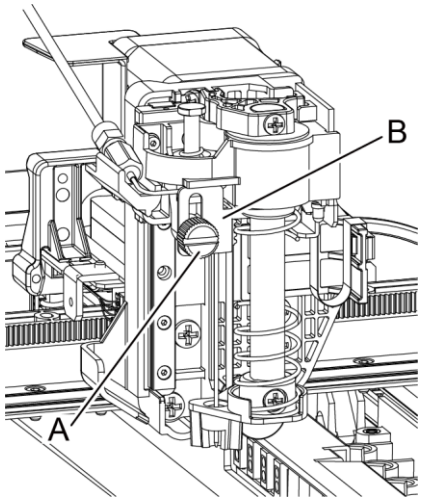
Reference SIL-40 CL Series Instruction Manual "2 Parts Identification and Function "

5 **Remove the rack and the front panel (upper).**

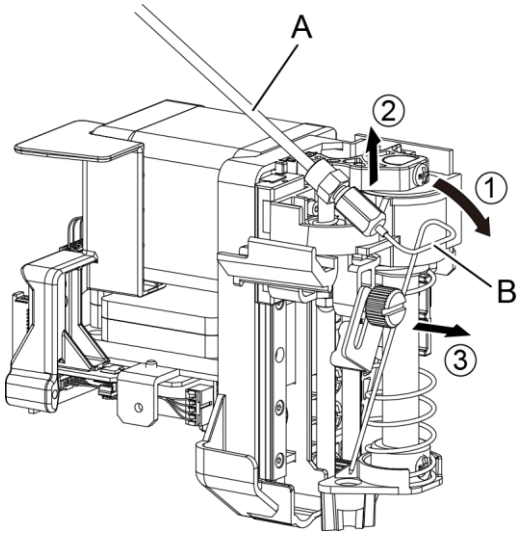
Reference 7.2.2 Removing and Installing the Front Panel (Upper) (P.124)

7.8.2 Removing the Needle

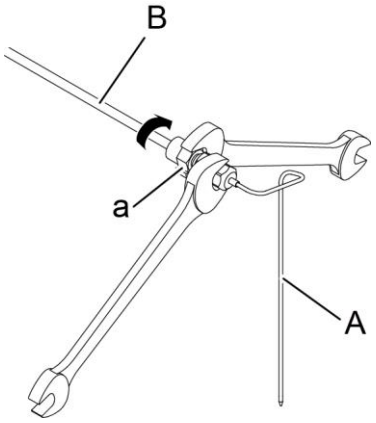
1 **Loosen the knurled screw (A) to release the needle fastening plate (B).**



2 **With the needle (B) connected to the sample loop (A), tilt the needle toward you and then lift it a little before pulling it out toward you.**

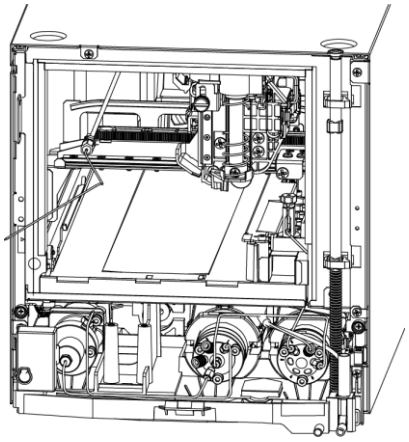


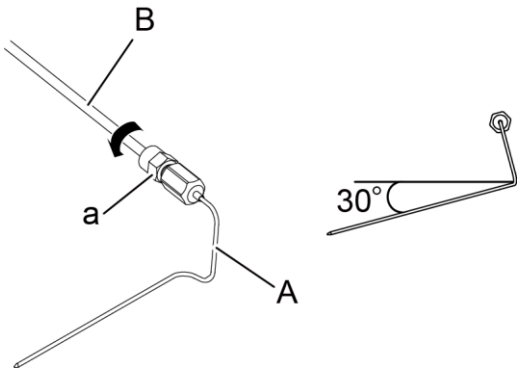
3 **Loosen the connection (a) of the needle (A) and the sample loop (B) with two wrenches, then remove the needle from the sample loop.**



7.8.3 Installing the Needle

1 **Connect the new needle (A) to the sample loop (B) and turn the nut (a) of the sample loop lightly.**

Note	When connecting the needle and the sample loop, keep them as shown in the figure with the sample loop in the horizontal position. 

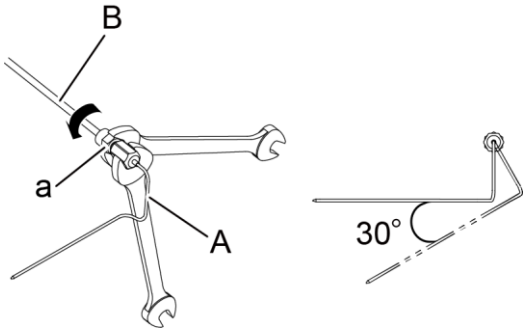


2 **Keep the needle (A) in the position that is 30° lower than the left horizontal direction, then tighten the nut (a) of the sample loop (B) by hand.**

Note	If you replaced the sample loop with a new one, keep the needle in the position that is 60° lower than the left horizontal direction.

3 **While holding the nut (a) of the sample loop (B) with an 8-mm wrench so that it does not turn, hold the joint of the needle with an 8-mm wrench, then turn the wrench closer to the needle 30° clockwise to tighten the needle.**

Note	If you replaced the sample loop with a new one, turn the wrench 60° to tighten the needle. The needle will turn horizontal after being tightened.



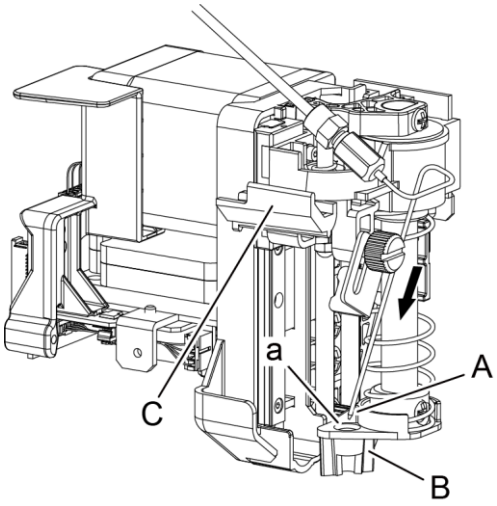
4 Install the needle to the needle mount.

1 With the joint for the sample loop as the rotation axis, turn the needle, which is in the horizontal position, 90° counterclockwise to the vertical position.
This twists the sample loop 90° counterclockwise.

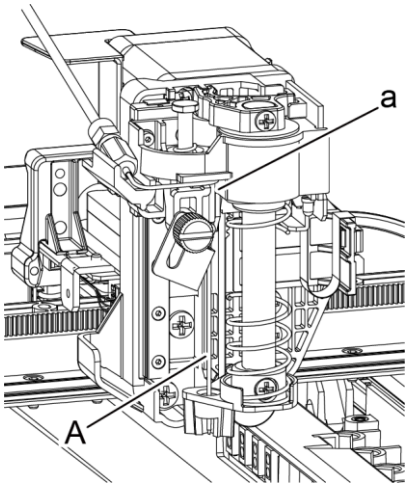
2 Insert the end of the needle (A) in the opening (a) of the vial detection block (B).

Hint Lowering the needle mount (C) by hand makes it easy to install the needle.

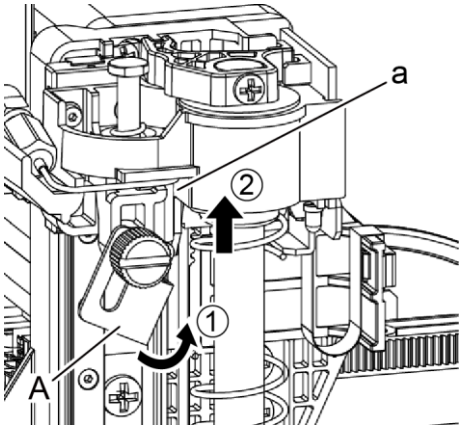
Note	Take as much care as possible not to let the tip of the needle come in contact with the vial detection block. There is no problem when you feel resistance from the twisted sample loop.



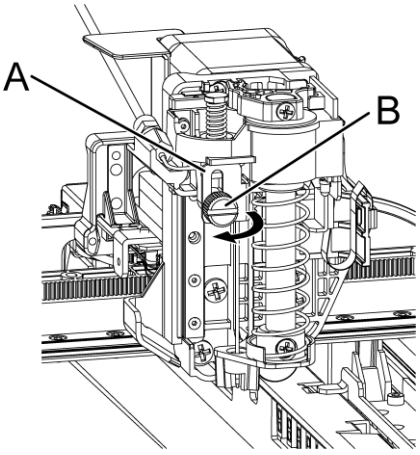
3 Insert the needle (A) into the vertical groove (a) of the needle mount.



4 Turn the needle fastening plate (A) and lift it before inserting it into the vertical groove (a) of the needle mount. Hold down the needle at the end of the needle fastening plate (A).



5 Tighten the knurled screw (B) by hand to fix the needle fastening plate (A).



7.8.4 After Installing the Needle

1 Install the front panel (upper) and the sample rack.

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

2 Plug the power supply cable and turn on the main power to the instrument.

3 From the VP functions screen, select [CALIBRATION], then press [↓] repeatedly until [ADJUST INJ.P] appears.

Reference SIL-40 CL Series Instruction Manual "4.1 Types of Screens"
SIL-40 CL Series Instruction Manual "6.5 Calibration Support Group/Adjusting the injection port position《ADJUST INJ. P》"

4 Adjust the position of the needle for the injection port.

Reference SIL-40 CL Series Instruction Manual "6.5 Calibration Support Group/Adjusting the injection port position《ADJUST INJ. P》"

5 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [NEEDLE USED] appears.**

The screen displays the number of uses of the needle seal and the reference value for replacement.

Reference SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group/Displaying the number of uses of the needle《NEEDLE USED》"

6 **Press [0] and then [Enter].**

This resets the number of uses to 0.

Note	When using PARTS MGMT TOOL, the number of uses cannot be reset from the operation panel. Reset it from PARTS MGMT TOOL.

7.9 Replacing the Sample Loop

CAUTION

Do NOT stretch or bend the same part frequently.
Repeatedly bending the same part decreases the strength of the tubing, which may cause a break or a crack and result in solvent leakage. Also it significantly affects the performance of the instrument or the lifetime of the sample loop. Straighten a bent part with your fingers before installation.

■ Tools to use

Part Name	Part Number
SPANNER, DOUBLE OPEN END 6×8	086-03047-01
SPANNER, DOUBLE OPEN END 8×10	086-03047-06

■ Parts to use

Part Name	Part Type	Part Number	Remarks
SAMPLE LOOP 50 µL	Consumable	228-63132-44	0.1 µL to 50 µL
SAMPLE LOOP 100 µL	Optional parts	228-63132-45	0.1 µL to 100 µL

7.9.1 Before Removing the Sample Loop

1 **Press [ZHOME] on the initial screen.**

This lifts the needle and moves it to the center of the instrument.

Reference SIL-40 CL Series Instruction Manual "2.4.2 Operation Area "

2 **Turn off by the power button on the front of the instrument, then turn off the main power switch on the rear of the instrument.**

Note

- Exit LabSolutions before power off the instrument.
- If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system.
  In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

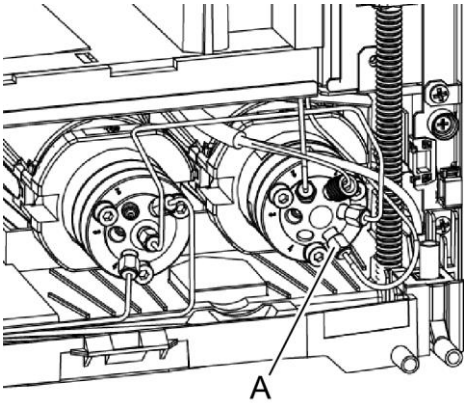
Reference SIL-40 CL Series Instruction Manual "2.1 Front "
SIL-40 CL Series Instruction Manual "2.3 Back "

3 **Remove the sample rack, front panel (lower), and front panel (upper).**

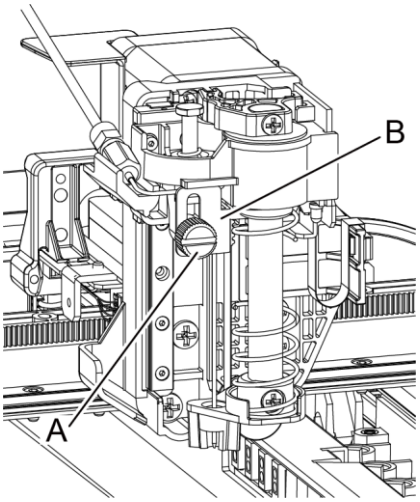
Reference 7.1.3 Check after Inspection and Maintenance (P.122)

7.9.2 Removing the Sample Loop

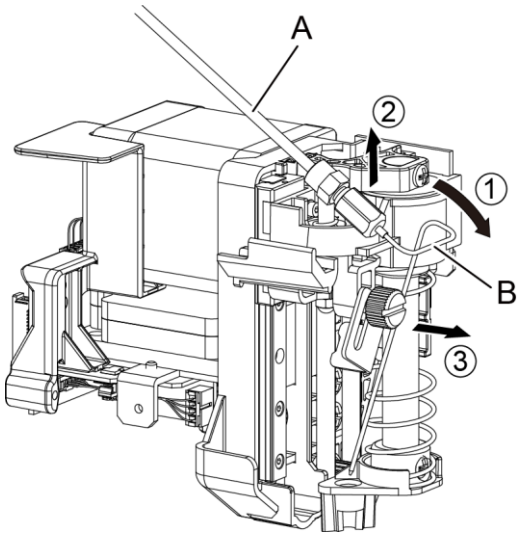
1. **Lower the mobile phase bottle below the main unit.**
2. **Remove the tubing from the high-pressure valve ports 3 and 4 by loosening the fittings.**
3. **Loosen and remove the male nut fixing the sample loop from port 5 (A) of the high pressure valve.**



4. **Loosen the knurled screw (A) to release the needle fastening plate (B).**

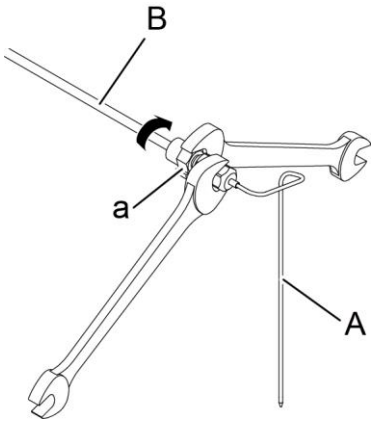


5 **With the needle (B) connected to the sample loop (A), tilt the needle toward you and then lift it a little before pulling it out toward you.**

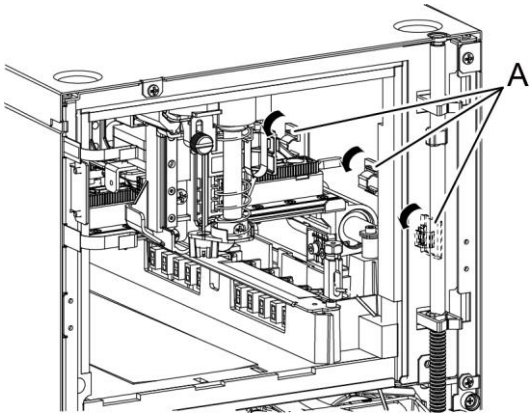


6 **Loosen the connection (a) of the needle (A) and the sample loop (B) with two wrenches, then remove the needle from the sample loop.**

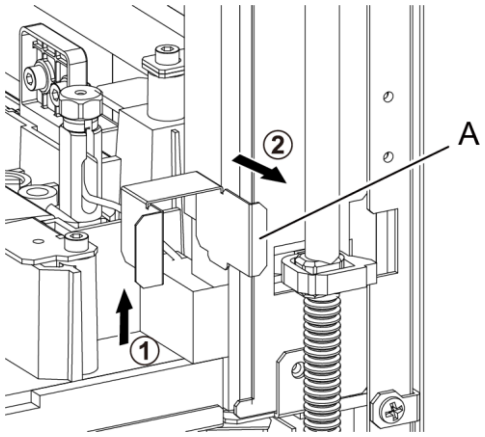
Note	Keep the needle tip away from hard objects.



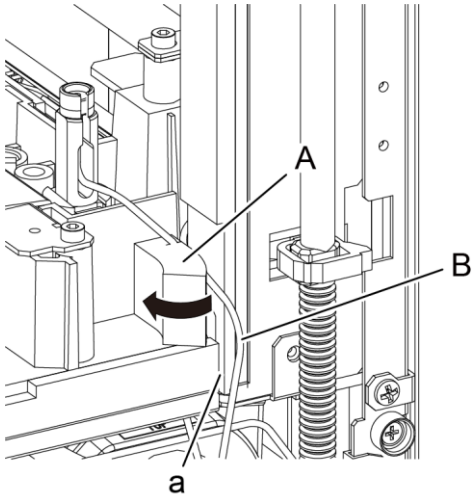
7 **Open the three clamps (A) on the right inner surface of the resin cover inside the instrument and then remove the sample loop from the clamps.**



8 **Lift and pull the heat insulation fastening plate (A) toward you to remove it.**

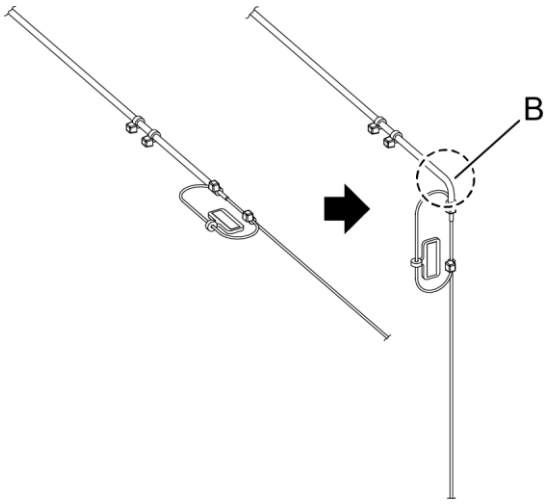


9 **Turn the heat insulation (A) and then pull the sample loop (B) out of the groove (a) of the base.**



7.9.3 Installing the Sample Loop

1 **Bend the sample loop at (B) to a 90° angle.**

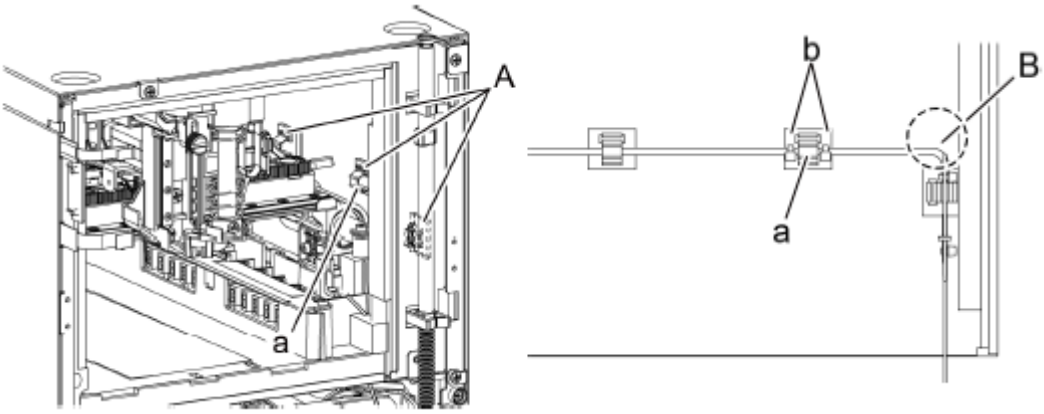


2 **Remove cap (A) from the tip of the sample loop.**

Note	Install the cap (A) when not in use for a long period of time. Leaving the sample loop with cap (A) removed over a long period of time may allow packing (B) to deteriorate, which leads to reduced pressure resistance during use.



3 **Attach the sample loop to the three clamps (A) on the right inner surface of the resin cover, and fix it in place. Fasten the part of the sample loop that is between the fastening portions (b) of the two cable ties to the middle (a) of the three clamps. Attach the sample loop so that the coiled part before the bend (B) is positioned along the front inner surface of the sampler cover.**

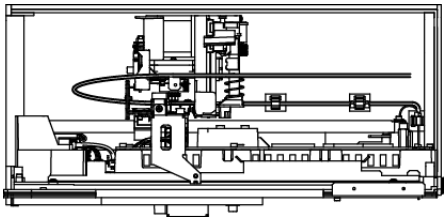


CAUTION

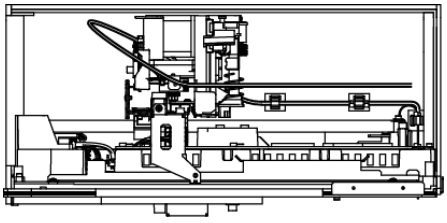
The sample loop partially gets curled when packaged. Install the sample loop to the clamps in such a way that the curly part is straightened horizontally behind the needle mount.

If the curly part is not straightened horizontally, the sample loop may be caught and damaged when the needle mount works.

The sample loop is installed correctly when the curly part is straightened horizontally as shown in the "Correct" figure. In this case, the fastening portions of the cable ties (b) face downward.



Correct



Incorrect

*These are the side internal views of the instrument.

4 **Connect the sample loop to the needle and then install it to the instrument.**

Reference 7.8 Replacing the Needle (P.161)

5 **Hold the needle mount by hand. With the Z driving part lifted to the top position, move the needle mount straight from above the injection port to the left back area of the instrument to check that the sample loop is not caught.**

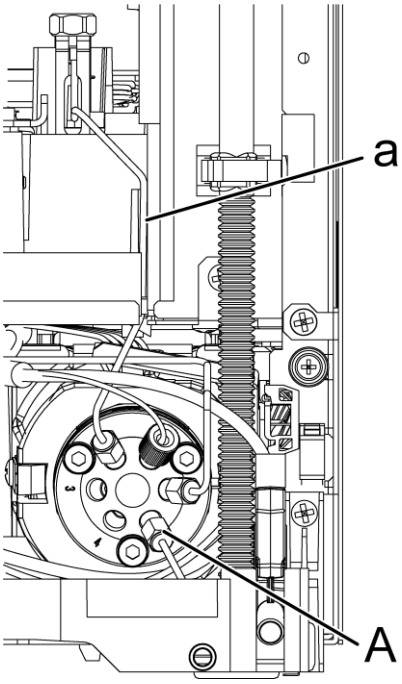
Note	If the sample loop is caught in the needle mount, the tightening angle and the initial angle at which the needle and the sample loop are connected are inappropriate or the arc of the clamped sample loop is not horizontal. Check the above points and then disassemble and reconnect the parts. If the sample loop is bent, straighten it with your fingers.

CAUTION

Do NOT move the needle mount to the right back area (behind the rinse port) of the instrument.

The sample loop may be caught in the inside of the instrument.

6 **Pass the sample loop through the groove (a) of the main base.**



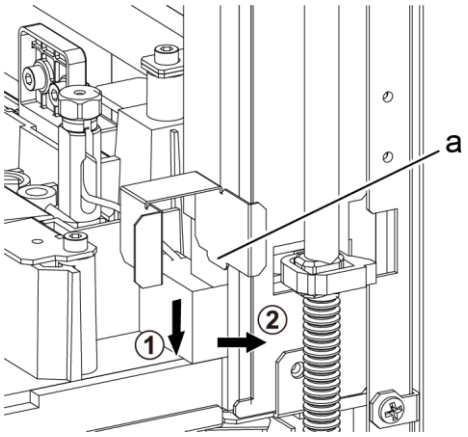
7 **Install the male nut and the ferrule to the sample loop, then tighten the male nut (A) with a wrench to install it to port 5 of the high pressure valve.**

Reference 7.8 Replacing the Needle (P.161)

8 **Set the mobile phase bottle back in place.**

9 **Set the heat insulation fastening plate back in place.**

Note	Push in the injection port tubing and the sample loop all the way until they fit into the notch of the heat insulation. The heat insulation fastening plate has the part (a) that fits into the opening of the base. Install the plate by pushing it to the right so that the part (a) clicks.



7.9.4 After Installing the Sample Loop

1 **Install the front panel (upper), the front panel (lower), and the sample rack.**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

2 **Plug the power supply cable and turn on the main power to the instrument.**

3 **After initialization, open the front panel (upper) and check that the sample loop is not caught in the needle mount.**

Note	If the sample loop is caught in the needle mount, the tightening angle and the initial angle at which the needle and the sample loop are connected are inappropriate or the arc of the clamped sample loop is not horizontal. Check the above points and then disassemble and reconnect the parts. If the sample loop is bent, straighten it with your fingers.

4 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [SAMPLE LOOP USED] appears.**

The screen displays the number of uses of the sample loop and the reference value for replacement.

Reference SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group/Displaying the number of uses of the needle《NEEDLE USED》"

5 **Press [0] and then [Enter].**

This resets the number of uses to 0.

Note	When using PARTS MGMT TOOL, the number of uses cannot be reset from the operation panel. Reset it from PARTS MGMT TOOL.

6 Change the maximum injection volume based on the type of the installed sample loop.

Reference SIL-40 CL Series Instruction Manual "5.4 [SYSTEM] Settings Group/ Setting the maximum injection volume《MAX INJ VOLUME》"

CAUTION

When using a 50 µL sample loop assembly, set the sample speed to 5 µL/sec or less.
A fast sample speed may lead to poor injection volume accuracy and injection volume reproducibility.

Reference SIL-40 CL Series Instruction Manual "5.2 [PARAMETER] Settings Group/ Settting the sample drawing speed《SAMPLE SPEED》"

7.10 Replacing the Outlet Tubing

CAUTION

Do NOT stretch or bend the same part frequently.
Repeatedly bending the same part decreases the strength of the tubing, which may cause a break or a crack and result in solvent leakage.

Do NOT bend the tubing at an acute angle with pliers nor bend the tubing excessively by pinching and crushing it.
Bending stainless tubing with a small bending arc (bending radius) distorts the inner diameter, which may cause clogging of the tubing and an increase in pressure.

Note	The shape of a tubing connection of a column may differ depending on the type and the manufacturer. After the replacement of the column, if the difference in the shape increases cross contamination or affects peak shapes, replace the current outlet tubing with a new one.

■ Tools to use

Part Name	Part Number
SPANNER, DOUBLE OPEN END 6×8	086-03047-01

■ Parts to use

Part Name	Part Type	Part Number	Remarks
SUS Piping, 0.1×600	Consumable	228-53184-91	This is not included in the instrument.
SUS Piping, 0.3×600	Optional parts	228-53184-49	
SUS Piping, 0.17×600	Optional parts	228-53184-48	

7.10.1 Before Removing the Outlet Tubing

1 **Press [ZHOME] on the initial screen.**

This lifts the needle and moves it to the center of the instrument.

Reference SIL-40 CL Series Instruction Manual "2.4.2 Operation Area "

2 **Turn off by the power button on the front of the instrument, and turn off the main power switch on the rear of the instrument. Then, unplugging the power supply cable.**

Note	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2.1 Front "
SIL-40 CL Series Instruction Manual "2.3 Back"

3 **Remove the front panel (lower).**

Reference 7.2.1 Removing and Installing the Front Panel (Lower) (P.123)

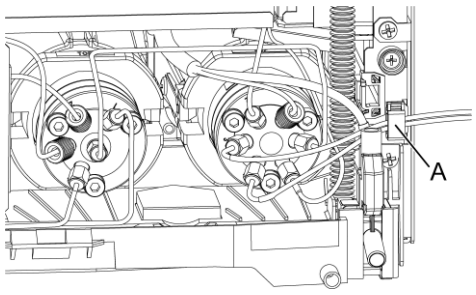
7.10.2 Replacing the Outlet Tubing

1 **Loosen the fitting connected to port 3 of the high pressure valve and then remove the outlet tubing.**

2 **Connect the new outlet tubing to port 3 of the high pressure valve.**

Note	For how to tighten the fitting, refer to the instruction manual included in the tubing.

3 **Fix the new outlet tubing to the clamp (A) on the lower right of the instrument.**



4 **Insert the outlet tubing into the column oven and connect it to the column.**

5 **Set the front panel (lower) back in place.**

Reference 7.2.1 Removing and Installing the Front Panel (Lower) (P.123)

7.11 Replacing the Injection Port Tubing

CAUTION

If applying pressure to clogged tubing does not remove clogs, replace the tubing with a new one by the following procedure.

Reference 7.11.1 Before Removing the Injection Port Tubing (P.178)
7.11.2 Replacing the Injection Port Tubing (P.179)

■ Tools to use

Part Name	Part Number
SPANNER, DOUBLE OPEN END 6×8	086-03047-01
SPANNER, DOUBLE OPEN END 8×10	086-03047-06

■ Parts to use

Part Name	Part Type	Part Number	Remarks
INJ-HPV pipe, Φ0.1 ID	Consumable	228-64106-44	This part is covered with a red tube for identification.
INJ-HPV pipe, Φ0.3 ID	Optional parts	228-64106-42	This part is covered with a blue tube for identification.
INJ-HPV pipe, Φ0.17 ID	Optional parts	228-64106-46	This part is covered with a green tube for identification.

7.11.1 Before Removing the Injection Port Tubing

1 Press [ZHOME] on the initial screen.

This lifts the needle and moves it to the center of the instrument.

Reference SIL-40 CL Series Instruction Manual "2.4.2 Operation Area "

2 Turn off by the power button on the front of the instrument, and turn off the main power switch on the rear of the instrument. Then, unplugging the power supply cable.

Note	
	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2.1 Front "
SIL-40 CL Series Instruction Manual "2.3 Back "

3 Remove the sample rack, front panel (lower), and front panel (upper).

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

7.11.2 Replacing the Injection Port Tubing

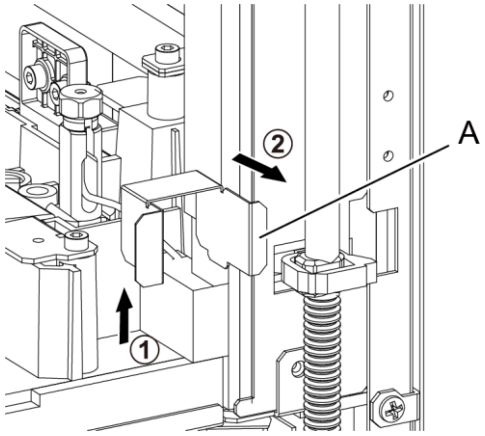
1 **Loosen and remove the male nut (fitting) connected to port 2 of the high pressure valve with a wrench (6×8).**

2 **Remove the needle seal.**

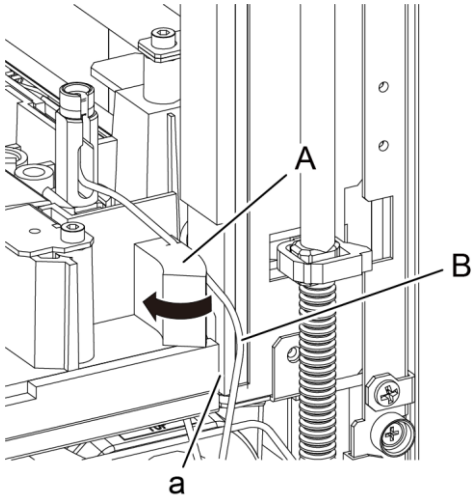
Reference 7.7.1 Removing the Needle Seal (P.157)

Note	Pay attention to the notes provided in the reference to avoid failure of this instrument.

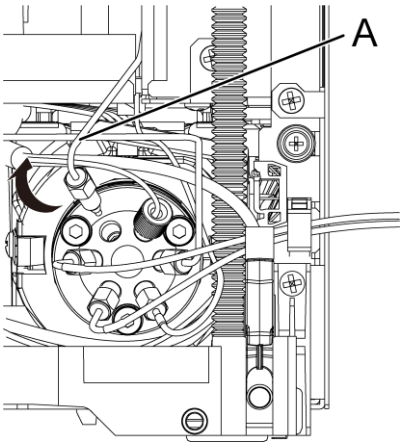
3 **Lift and pull the heat insulation fastening plate (A) toward you to remove it.**



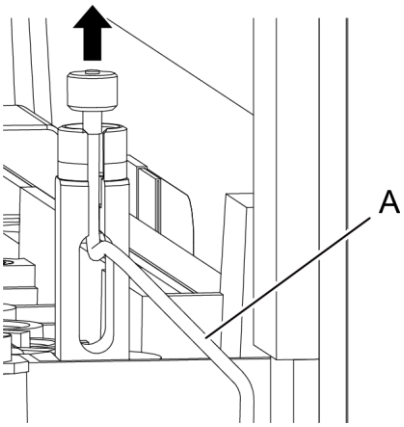
4 **Turn the heat insulation (A) and then pull the sample loop (B) out of the groove (a) of the base.**



5 **With the heat insulation turned, pull the injection port tubing (A) out of the groove while slightly lifting and bending it.**



6 **Lift the injection port tubing (A) and remove it from the injection port.**



7 **Install the new injection port tubing to the injection port by the reverse procedure of the removal.**

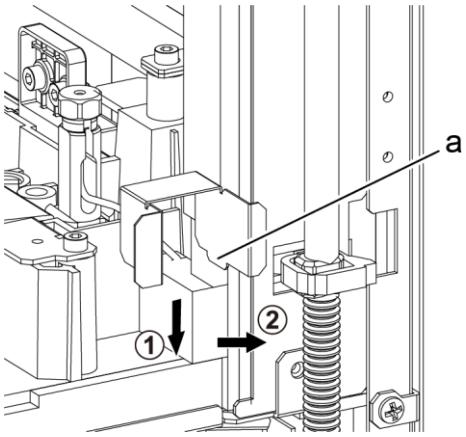
Note	When installing it, turn the joint side upward and then insert it into the top of the injection port.

8 **Set the needle seal back in place.**

Reference 7.7.2 Installing the Needle Seal (P.159)

9 **Set the sample loop back in the groove of the base and set the heat insulation fastening plate back in place.**

Note	Push in the injection port tubing and the sample loop all the way until they fit into the notch of the heat insulation. The heat insulation fastening plate has the part (a) that fits into the opening of the base. Install the plate by pushing it to the right so that the part (a) clicks.



10 **Connect the new injection port tubing to port 2 of the high pressure valve and tighten the male nut (fitting) with a wrench.**

11 **Install the front panel (upper), the front panel (lower), and the sample rack.**

Reference 7.1.3 Check after Inspection and Maintenance (P.122)

7.12 Cleaning/Replacing the Suction Filter

■ Hardware Maintenance Supplies

Note that in addition to the following are also required.

Item	Description
Beaker	Used for cleaning parts.
Ultrasonic bath	Used for cleaning parts.

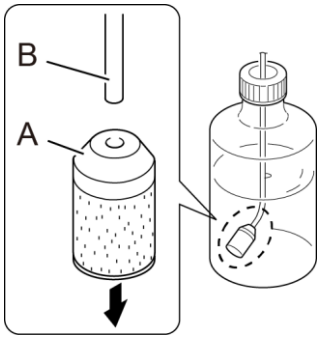
■ Parts to use

Part Name	Part Type	Part Number
SUS Filter Element	Consumable	228-45707-91
2-propanol	-	-

Hint Use the SUCTION FILTER with tube and fittings for the degassing unit (Part No. 228-61905-49) as necessary.

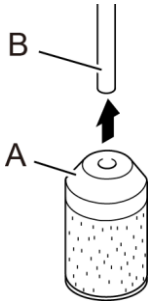
Note	Contamination of suction filters can lead to contamination of rinse solution and bottles, causing background rise and ghost peaks. Even if you are wearing gloves, do not touch the metal parts of the suction filter as much as possible. Hold the non-metal part of the filter element.

1 **Pull the suction filter (A) from the suction tubing (B).**



2 **Place the suction filter into a clean container with 2-propanol, and clean it for 5 minutes using an ultrasonic bath.**

3 **Insert the suction tubing (B) into the suction filter (A).**



4 **Place the suction tubing back into the rinse solution bottle.**

5 **Press [purge].**

This starts the purge of the flow lines.

6 **Check for air bubbles inside the suction tubing.**

Replace the suction filter if air bubbles are present.

Note	If Ghost peaking occurs, rinse the suction filter refer to System Guide "5.3.2 Symptoms Presumably Due to an Error, Based on a Chromatogram".

7.13 Replacing the Rinse Port Cap

Note	A dirty cap causing carryover needs to be replaced with a new rinse port cap.

■ Parts to use

Part Name	Part Type	Part Number	Remarks
Rinsing port cap 10 pieces (without hole)	Consumable	228-67725-41	For rinse solutions containing highly-volatile acids (Example: formic acid, TFA, and acetic acid)
Rinsing port cap 10 pieces (with hole)	Consumable	228-67725-42	For solutions other than the above (If carryover must be taken into consideration, use the rinse port cap with hole for the above solutions as well.)

7.13.1 Before Replacing the Rinse Port Cap

1 **Press [ZHOME] on the initial screen.**

This lifts the needle to the top position and moves it to the center of the instrument.

2 **Turn off by the power button on the front of the instrument, and turn off the main power switch on the rear of the instrument. Then, unplugging the power supply cable.**

Note	• Exit LabSolutions before power off the instrument. • If CBM-40 CL is used, pressing the power button of the pump turns off the power of the entire system. In case of a system with multiple pumps, press the power button of the pump with th lowest LINK ADDRESS number to turn off the system power.

Reference SIL-40 CL Series Instruction Manual "2 Parts Identification and Function "

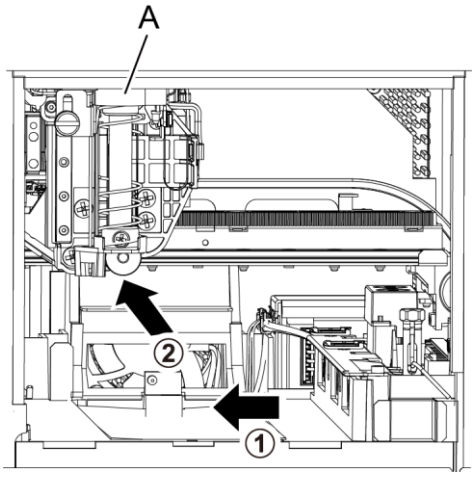
3 **Remove the rack and the front panel (upper).**

Reference 7.2.2 Removing and Installing the Front Panel (Upper) (P.124)

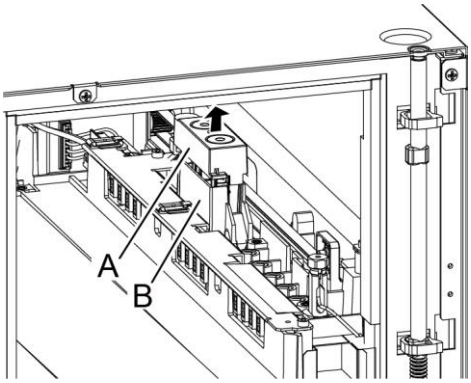
7.13.2 Replacing the Rinse Port Cap

1 **Hold the needle mount (A) by hand and then move it to the left back area.**

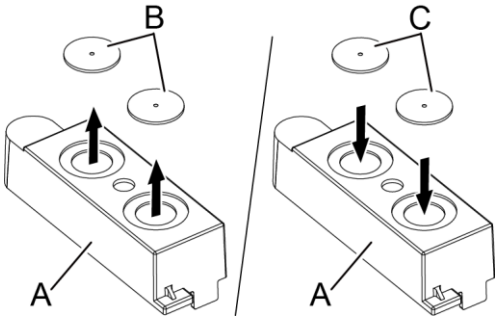
> **CAUTION**
>
> **Be sure to move the needle mount to the left before moving it to the back.**
> Moving it to the back before the left may cause the sample loop to be caught in the instrument and damaged.



2 **Remove the rinse port cover (A) from the rinse port (B).**



3 **Remove the two caps (B) from the rinse port cover (A).**

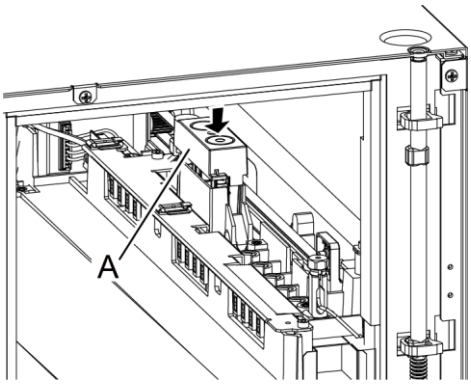


4 **Attach the two new caps (C) to the rinse port cover (A).**

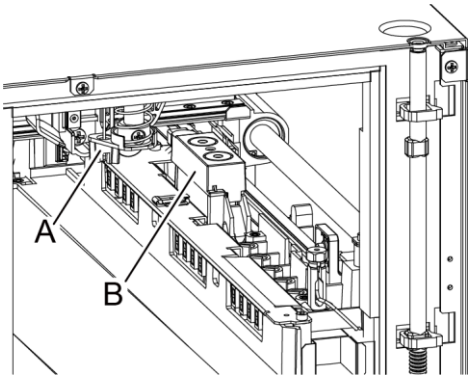
> **CAUTION**
>
> **Attach the caps securely all the way in.**
> If lifted, they may come in contact with the needle mount.

5 **Set the rinse port cover (A) back in place.**

> **CAUTION**
>
> **Attach the cover securely all the way in.**
> If lifted, it may come in contact with the needle mount.



6 **Slightly move the needle mount (A) by hand to check that it does not interfere with the rinse port cover (B).**



7 **Attach the front panel (upper).**

Reference 7.2.2 Removing and Installing the Front Panel (Upper) (P.124)

8 **Plug the power supply cable and turn on the main power to the instrument.**

Reference SIL-40 CL Series Instruction Manual "2.3 Back "

7.14 Cleaning the Flow Lines

When the needle or the sample loop is clogged or when the surface of the needle is dirty, you can rinse the inner and the outer surfaces of the needle with the mobile phase.

7.14.1 Rinsing the Needle and the Sample Loop

1 **From the VP functions screen, select [MAINTENANCE], then press [↓] repeatedly until [NEEDLE FLUSH] appears.**

Reference SIL-40 CL Series Instruction Manual "6.3 Maintenance Information Group"

2 **Press [Enter].**

The needle moves to the rinse port and the high pressure valve switches.
(The delivery pump, the needle, and the sample loop are connected.)

3 **Deliver the mobile phase solvent from the delivery pump so that the clogs and the dirt are rinsed away from the needle.**

Note	If the clogs cannot be removed from the inside of the needle or if the dirt cannot be removed, replace the needle.

Reference 7.8 Replacing the Needle (P.161)

4 **When the rinse of the inner surface of the needle is completed, press the [pump] key of the delivery pump to stop the pump.**

5 **Press [Enter].**

The needle returns to the injection port.

6 **Press [CE] repeatedly until the initial screen appears.**

7.15 Calibrating the Leak Sensor

Re-calibration is required if the result of [LEAK SENSOR CHECK] fails the component validation.

Reference SIL-40C XR CL / SIL-40C X3 CL Instruction Manual "6.4 Validation Support Group / Executing a leak sensor test 《LEAK SENSOR CHECK》"

CAUTION
This function is not used in the CL model. Recalibration operation is executed by service personnel.

Note	The leak sensor detects leaked mobile phase when the tubing causes the leakage. When the output value from the sensor exceeds the level set at "threshold value", an error occurs and temperature control stops.

7.16 Cleaning the Leak Tray

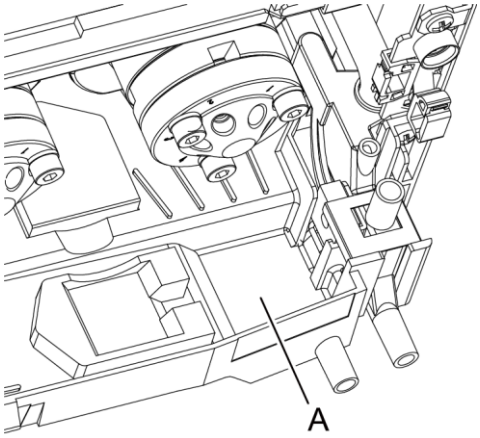
Clean the leak tray if it is wet with liquid.

1 **Identify where liquid is leaking and take action.**

Check if liquid is leaking from loose tubing or consumables such as the valves and the measuring pump. Take action such as re-tightening the tubing and replacing a consumable.

2 **Wipe away the solvent collected in the leak tray (A) with a dry soft cloth or tissue paper.**

Note	Wipe away the solvent thoroughly, otherwise another leak error may occur.



7.17 Cleaning the Exterior

7.17.1 Usual cleaning

If the main unit cover or the front door is dirty, clean them with a dry soft cloth or paper wiper.
If they are very dirty, clean the dirt as follows.

1 Wipe with a cloth damp with diluted neutral detergent.

2 Wipe off the detergent with a cloth damp with water and then wipe off the water with a dry cloth.

CAUTION
Do NOT leave any part wet nor thinner for cleaning. Doing so may cause rust or discoloration.

7.17.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1 Turn off the power of the column oven.

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

8 PLATE CHANGER CL

8.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠WARNING

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.
Otherwise, fire, electric shock or malfunction may occur.

Ensure that the appropriate safety gear (for example, protective goggles, gloves, and mask) are used when handling hazardous substances or infectious.

⚠CAUTION

Never remove the cover.
This may cause injury or a malfunction of the device. Contact your Shimadzu representative if the main cover must be removed.

For parts replacement, use parts and tools listed in Component Parts PLATE CHANGER CL (P.202) or Maintenance Parts PLATE CHANGER CL (P.232).
If any other parts or tools are used, part damage, injury, and malfunction may occur.

8.1.1 Prior to Inspection and Maintenance

Clean the front panel and main unit cover, removing the dirt.

8.1.2 List of Periodic Inspection and Maintenance

Note	The replacement and maintenance periods listed in this table are an estimate when the plate changer exchanges the plate approximately 1000 times a year. These are not guarantee periods. These will vary depending on usage conditions.

Inspection/ Maintenance Item	1 Year	3 Years	6 Years	Remarks
Cleaning/Replacement of air filter	√			Clean or replace the filter when it is clogged by dust or dirt. Reference 8.2 Cleaning or Replacing the Air Filter (P.192)
Replacement of packing in the front door			√	Replace the packing when condensation occurs in or near the front door. For this maintenance procedure, contact your Shimadzu representative.
Replacement of the pad in the driving unit chuck			√	Replace the pad when the chuck fails to correctly hold a sample plate. For this maintenance procedure, contact your Shimadzu representative.

8.1.3 Check After Inspection and Maintenance

After completing inspection and maintenance, turn on both the plate changer and the autosampler to confirm that the initial operations can be successfully completed.

When the initial operations are completed, the autosampler's status indicator lights up in green.

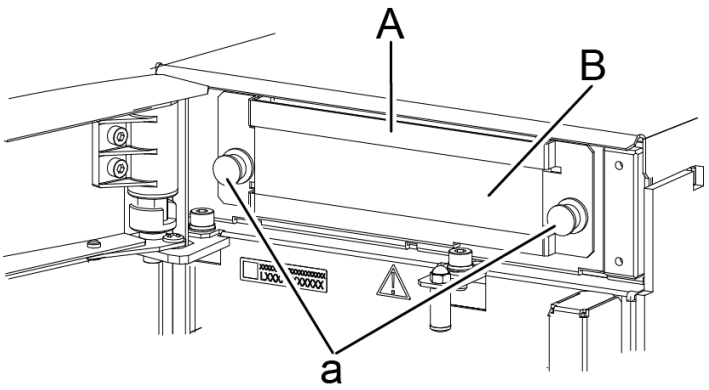
If initialization fails, investigate the cause and take corrective action. If the cause and remedy are unclear, contact your shimadzu representative.

8.2 Cleaning or Replacing the Air Filter

Part Name	Part No.	Remarks
Air filter	228-53924-06	The recommended replacement cycle is one year. Clean or replace the filter when it is clogged by dust or dirt.

1 **Open the front door.**

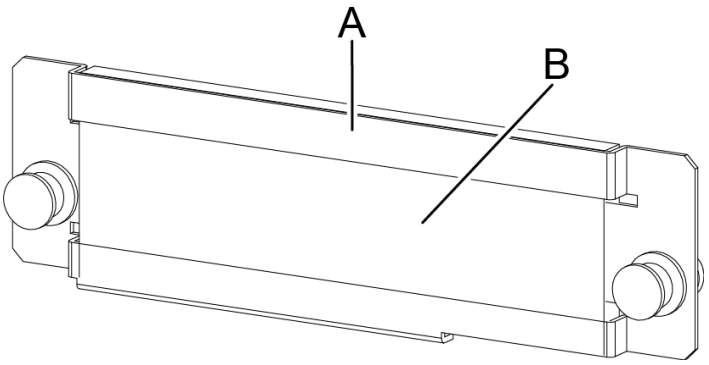
2 **Pull the two latch knobs (a) forward to remove the filter cover (A) and filter (B).**



3 **If the filter is covered with dust or dirt, clean it.**

Note	If cleaning is not possible, replace it with a new filter.

4 **Attach the filter (B) to the filter cover (A), and return it to the plate changer.**



5 **Push in the two latch knobs to secure the filter unit.**

8.3 Cleaning the Exterior

8.3.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or wiper paper.
If it is very dirty, clean it as below.

1 Clean with a cloth soaked in diluted neutral detergent and wrung tightly.

2 Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.

CAUTION
Do NOT leave any part wet nor use thinner for cleaning. Doing so may cause rust or discoloration.

8.3.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1 Turn off the power of the column oven.

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

8.4 For Long-Time Storage

If the plate changer is not going to be in use for more than a week, remove all sample plates from the plate changer.

9 FCV-S CL

9.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠WARNING

Turn off the main power switch on the back of the instrument and unplug the power cable prior to maintenance when instructed.

Otherwise, fire, electric shock or malfunction may occur.

Ensure that the appropriate safety gear (for example, protective goggles, gloves, and mask) are used when handling hazardous substances or infectious material.

Do not throw away parts after replacement indiscriminately.

When using biohazardous substances or toxic substances, maintenance parts of the optional flow channel selection valve may have been contaminated.

When disposing of the these parts, contact your Shimadzu representative. If you dispose of them yourself, do so in accordance with the processing standards determined by law, separately from general industrial waste and household garbage.

⚠CAUTION

Never remove the cover.

This may cause injury or a malfunction of the device. Contact your Shimadzu representative if the main cover must be removed.

For parts replacement, use parts and tools listed in Component Parts FCV-S CL (P.203) and Maintenance Parts FCV-S CL (P.232).

If any other parts or tools are used, part damage, injury, and malfunction may occur.

9.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase solvent in the flow line with water.
- Clean the operation panel and main unit cover, removing the dirt.
- If the operation panel is dirty, wipe it with tissue paper or soft cloth dampened with water.
- Always stop the pump before starting any inspection or maintenance.
- Follow the instructions in the manual when performing inspection or maintenance.

9.1.2 List of Periodic Inspection and Maintenance

Note	The maintenance and replacement periods listed in this table are presented only as guidelines. These are not guarantee periods. These will vary depending on usage conditions.

■ **Items needing maintenance based on usage**

Parts Name	Inspection/ Maintenance Item	Maintence Timing	Remark
FCV-0206H	Valve rotor/stator replacement	Replace after approximately 50,000 cycles of use.*1	Contact your Shimadzu representative.
FCV-0206H3		Replace the valve rotor after approximately 10,000 cycles of use.*1 Replace the valve stator after approximately 20,000 cycles of use.*1	
FCV-0607H		Replace after approximately 25,000 cycles of use.*1	
FCV-0607H3		Replace the valve rotor after approximately 5,000 cycles of use.*1 * Replace the valve stator after approximately 10,000 cycles of use.*1	

*1 Only when mixed solution of water and organic solvent is used. The lifetime may be extended or shortened depending on the type of delivered solvent and the delivery pressure. The use of a solvent such as chloroform and THF as the mobile phase or the continuous delivery of pure water with 80 % or higher concentrations at a high pressure may shorten the lifetime. Long time storage of the instrument after the use of a buffer solution that dries and leaves crystals and insoluble matter as the mobile phase may extremely shorten the lifetime of the rotor. Thoroughly rinse the flow lines with distilled water or deionized water.

9.2 Cleaning the Exterior

9.2.1 Usual cleaning

If the exterior of the instrument is dirty, clean it with a dry soft cloth or paper wiper.
If it is very dirty, clean it as below.

1 **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**

2 **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

CAUTION
Do NOT leave any part wet nor use thinner for cleaning. Doing so may cause rust or discoloration.

9.2.2 Decontamination cleaning

After handling the hazardous substances, using the following procedure.

1 Turn off the power of the column oven.

Note	The gas sensor may defect volatile gas generated from organic solvent.

2 Clean with a cloth soaked in Aqueous ethanol solution (80%) or aqueous sodium hypochlorite solution (0.05%) and wrung tightly.

CAUTION
Do not leave metal surfaces wet. This can cause rusting and discoloration.

10 Addendum

10.1 Component Parts

■ Component Parts LC-40D X3 CL ／ LC-40D XR CL

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

No.	Part Name	Part No.	Q'ty	Remark
-	Main Unit LC-40D X3 CL/LC-40D XR CL	-	1	
-	Safety Guideline (Booklet)*1	228-97195	1	
-	Instruction manual/ System Guide (CD-ROM)	228-97193-41	1	
-	Bottle, 250 mL	228-74372	1	
1	Suction Filter Assy	228-45708-91	1	Including a tube
2	REMOTE CABLE ASSY	228-28253-91	1	Not used in CL model.
3	DRAIN TUBE SI(L1000)	228-25162-03	1	
4	STOP JOINT ASSY,B,D	228-46054-91	1	
	SYRINGE TUBE ASSY,B,D	228-46055-91	1	
5	SYRINGE,SS-20ESZ	228-66048	1	
	NEEDLE ASSY,FOR SYRINGE	228-18216-91	1	
6	CLAMP,M9120	046-05522-02	1	
7	DRAIN ADAPTER	228-42204	1	
8	STANDARD OUT DRAIN	228-42205	1	
9	CTO OUT DRAIN	228-42206	1	
10	STRAIGHT JOINT	228-28163	1	
11	FITTING,L-TYPE 1253	035-61561-12	1	

*1 It contains cautions for use regarding the instrument.

■ Component Parts LC-40B X3 CL

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

No.	Part Name	Part No.	Q'ty	Remark
-	Main Unit LC-40B X3 CL	-	1	
-	Safety Guideline (Booklet)*1	228-97195	1	
-	Instruction manual (CD-ROM)	228-97193-41	1	
-	Bottle, 250 mL	228-74372	1	
1	Suction Filter Assy	228-45708-91	1	Including a tube
2	REMOTE CABLE ASSY	228-28253-91	1	Not used in CL model.
3	DRAIN TUBE SI (L1000)	228-25162-03	1	

No.	Part Name	Part No.	Q'ty	Remark
4	STOP JOINT ASSY,B,D	228-46054-91	1	
	SYRINGE TUBE ASSY,B,D	228-46055-91	1	
5	SYRINGE,SS-20ESZ	228-66048	1	
	NEEDLE ASSY,FOR SYRINGE	228-18216-91	1	
6	CLAMP,M9120	046-05522-02	1	
7	DRAIN ADAPTER	228-42204	1	
8	STANDARD OUT DRAIN	228-42205	1	
9	CTO OUT DRAIN	228-42206	1	
10	STRAIGHT JOINT	228-28163	1	
11	FITTING,L-TYPE 1253	035-61561-12	1	
12	CABLE,PUMP CJ19-LITE	228-70156-41	1	Not use in CL model.
13	SF Nut,1/8	228-56687-42	3	Used for connecting the rinse path of the auto sampler.
14	SF Ferrule,1/8	228-56687-43	3	
15	CAP ASSY,40B X3 WASHING	228-57084-41	1	Attach to the rinse solution bottle.

*1 It contains cautions for use regarding the instrument.

■ Component Parts DGU-405 CL

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

No.	Part Name	Part No.	Q’ ty
-	Main Unit DGU-405 CL	-	1
-	Safety Guideline (Booklet/PDF) *1	228-97195	1
-	Instruction manual (CD-ROM)	228-97193-41	1
-	STOP PLUG*2	228-81368	10
1	Power cable Dsub 9pin	228-70732-41	1
2	Pressure Signal Cable	228-70733-41	1
3	Ground cable	228-70735-41	1
4	Alarm output cable	228-28253-91	1
5	FLANGELESS NUT	228-82196	10
6	PTFE FERRULE	228-81981	10
7	STANDARD OUT DRAIN	228-42205	1
8	CTO OUT DRAIN	228-42206	1
9	DRAIN TUBE SI (L1000)	228-25162-03	1
10	STRAIGHT JOINT	228-28163	1
11	FITTING, L-TYPE 1253	035-61561-12	1
12	DRAIN ADAPTER	228-42204	1

*1 It contains cautions for use regarding the instrument.

*2 The stop plug is attached to the liquid inlet/outlet port of the degassing unit main body beforehand.

■ Component Parts SPD-40 CL

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

Part Name	Part No.	Q'ty	Remark
Main Unit SPD-40 CL	—	1	
Safety Guideline (Booklet)	228-97195*1	1	
Instruction manual (CD-ROM)	228-97193-41	1	
Syringe,1 ML	228-57028	1	
Syringe needle	228-57027	1	
Male nut PEEK	228-18565	2	
ETFE tubing	228-18495-06	2	
DRAIN TUBE	228-25162-03	1	
Cap, hinge bracket	228-70057	1	
REMOTE CABLE	228-28253-91	1	Not used in CL model.
Drain OUT	228-42205	1	
Drain CTO	228-42206	1	
Straight tubing connector	228-28163	1	
Drain adapter	228-42204	1	
Coupling 1.6-0.8C	228-40998-10	1	
Male nut 0.8MN-PEEK	228-46363	1	

*1 It contains cautions for use regarding the instrument.

■ Component Parts CBM-40 CL

This equipment consists of the following parts: Check the contents and quantity when unpacking.

No.	Part Name	Part No.	Q'ty	Remark
—	CBM-40 CL Main body	—	1	
—	Safety Guideline (Booklet)	228-97195*1	1	
—	Instruction Manual/ Nexera CL Series System Guide (CD-ROM)	228-97193-41	1	
1	LAN Cable	228-61083-41	1	2 m
2	Waste Liquid Tube Silicone	228-25162-03	1	
3	Drain Adapter	228-42204	1	
4	Drain OUT, STD	228-42205	1	
5	Drain OUT, CTO	228-42206	1	
6	L Type Joint	035-61561-12	1	
7	Straight Joint	228-28163	1	

*1 It contains cautions for use regarding the instrument.

■ Component Parts CTO-40C CL

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

No.	Part Name	Part No.	Q'ty	Remark
-	Main Unit CTO-40C CL	-	1	-
-	Safety Guideline (Booklet)	228-97195	1	Contains cautions for use regarding the instrument.
-	Instruction Manual/ System Guide (CD-ROM)	228-97193-41	1	
1	Filter holder	228-72234	1	
2	Air filter	228-72570-01	1	
3	Drain Tube	228-25162-03	1	
4	Rubber column clamp	228-72586	2	
5	Clamp CKN-10-R	072-60330-53	1	
6	Clamp DKN-10GSP	072-60319-01	1	

■ Component Parts SIL-40C XR CL/SIL-40C X3 CL

This instrument includes the parts listed in the table. Check the contents and quantity when unpacking.

Note	Different models have a different number of parts. For models represented by A and B in the table, see the following: • A SIL-40C XR CL • B SIL-40C X3 CL

No.	Part Name	Part Number	Qty.		Remarks
			A	B	
-	Main Unit	-	1	1	
-	Safety Guideline (Booklet)	228-97195*1	1	1	
-	Instruction manual (CD-ROM)	228-97193-41	1	1	
-	Front panel (top)	-	1	1	
-	Knurled screws	-	1	1	Placed on the front panel (upper).
-	Front panel (bottom)	-	1	1	
-	Sample rack	-	1	1	
1	Vial 1.5ML ASSY 10PC	228-38446-96	1	1	
2	1.5 mL vial plate	228-71762-46	1	1	
3	DRAIN TUBE	228-66695	1	1	This is connected to the right drain port.
4	SILICONE RUBBER TUBE(ID6xOD8)	016-31350-02	1000 mm		This is connected to the left drain port.
5	SILICONE RUBBER TUBE (ID9xOD12)	016-31350-22	1000 mm		This is used to extend the drain tube (228-66695) and silicone rubber tube (ID6xOD8) (016-31350-02).

No.	Part Name	Part Number	Qty.		Remarks
			A	B	
6	DRAIN TUBE PTFE (ID9xOD10)	016-37510	600 mm		This is used to extend the drain tube (228-66695). Use this when flushing solvents such as THF and chloroform used in a GPC analysis.
7	DRAIN TUBE CLAMP	228-62077	1	1	This is used to fix the drain tube on the drain tank.
8	Suction Filter ASSY	228-45708-42	1	3	This suction tube is intended for rinse solution.
9	Suction Filter ASSY, R3	228-45708-43	1	1	This suction tube is intended for flow rinse (R3).
10	ETFE TUBE 1.6 × 0.5	228-18495-04	1 m × 1	1 m × 3	This rinse solution tube is intended for use between SIL and DGU.
11	MALE NUT 1.6MN PEEK	228-35403	1	-	This is used to connect the rinse solution tube to the low pressure valve.
12	SF FERRULE P259 1/16	228-44449-26	1	3	This is used to connect the rinse solution tube to DGU.
13	SF NUT P255,PK,1/16	228-44449-28	1	3	This is used to connect the rinse solution tube to DGU.
14	FERRULE 1.6F-T	228-16007-84	-	3	This is used to connect the rinse solution tube to the multi-rinse connection port. 228-16007-84 comes in a set of five.
15	MALE NUT PEEK HEAD	228-67688	-	3	This is used to connect the rinse solution tube to the multi-rinse connection port.
16	Rinsing port cover	228-67725-43	1	1	
17	Rinsing port cap 10 pieces (without hole)	228-67725-41	2	2	For rinse solutions containing highly-volatile acids (Example: formic acid, TFA, and acetic acid)
18	Rinsing port cap 10 pieces (with hole)	228-67725-42	2	2	For solutions other than the above (If cross-contamination must be taken into consideration, use the rinse port cap with an opening for the above solutions as well.)
19	REMOTE CABLE	228-28253-91	1	1	Not used in CL model.
20	USB cable	088-54204-03	1	1	This cable is intended for upgrades.
21	CLAMP, DKN-10GSP	072-60319-01	1	-	This clamp fixes a USB cable to a model without the temperature control function. This is attached on the rear panel. This is not used for models with the temperature control function. * This is not included in SIL-40C X3 CL.
22	CLAMP, RWCS-20B	228-66274-06	1	1	This clamp fixes a USB cable to a model with the temperature control function. This is attached on the rear cover. This is not used for models without the temperature control function.

No.	Part Name	Part Number	Qty.		Remarks
			A	B	
23	Coupler, Y 2007-10	035-61561-04	1	1	This is a Y-joint whose connection's outer diameter is 10 mm.
24	Joint, Straight	228-28163	1	1	This is used to connect the silicone rubber tube (ID6xOD8) to the silicone rubber tube (ID9xOD12).
25	CLAMP, CKN-10-R	072-60330-53	2	2	This secures the tube at the corner of the table so that it does not lift.
26	IM, DRAIN TUBE	-	1	1	Refer to this manual when installing the drain tube.
27	Coupler, Y 2007-8	035-61561-04	2	2	This is a Y-joint whose connection's outer diameter is 8 mm.
28	WIRE MARK 1.6	228-70244-01	1	3	
29	LABEL,R0-R3	228-70249-02	1	1	
30	MODIFICATION PROCEDURE, RACK	-	1	1	When using the PLATE CHANGER CL, it is necessary to partialy mofify the SIL-40C XR CL/SIL-40C X3 CL sample rack. Contact your Shimadzu representative if product installation, adjustment, or re-installing (after the product is moved).

*1 It contains cautions for use regarding the instrument.

Note	• No inlet or outlet tubing are included in this instrument. Purchase a system tubing set according to your system. • No optical link cables are included in this instrument. Purchase a system optical link cable set according to your system.

Reference System Guide

■ Component Parts PLATE CHANGER CL

This product consists of the following parts. After opening the package, check the contents and their quantity.

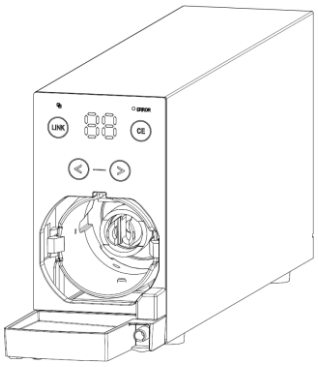
No.	Part Name	Part No.	Q'ty	Remarks
1	Main unit	-	1	
2	Safety guideline	228-97195	1	This describes precautions for using the product.
3	Stack plate	228-66752-42	7	This part is used when using eight or more microplates.
4	SIL fixture	-	1	This part is for connecting with the SIL-40 CL series. It is used during the installation of the plate changer.
5	SIL fixture 2	-	1	
6	Binding screw M3X5	020-37508	4	
	Hex socket head bolt, M4X16	022-27706	3	
	Binding screw, M4X8	020-37512	2	
7	Drain tube (L=2000)	228-25162-04	1	This part is for draining the condensation generated during the temperature control of samples.
8	L-shaped joint	035-61561-11	2	
	Y-shaped joint	035-61561-03	1	
	Straight joint	228-28163	1	

No.	Part Name	Part No.	Q'ty	Remarks
9	Hex wrench 3 mm (ball point type)	-	1	It is used during the installation.
10	Sample rack modification procedure Flat head screw M3X6	-	1	It is used for modification of sample rack of SIL-40 CL during the installation.

■ Component Parts FCV-S CL

This product consists of the following parts. After opening the package, check the contents and their quantity.

Note	Select flow channel selection valves according to application and arrange for them separately.

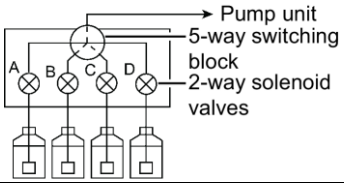
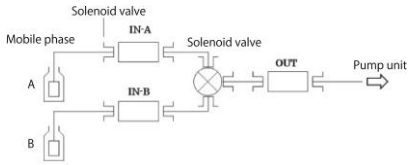


Reference FCV-S CL Instruction Manual "1.3 Optional Parts"

No.	Part Name	Part No.	Q'ty	Remarks
-	Main Unit FCV-S CL	-	1	-
-	Safety Guideline (Booklet)	228-97195	1	This describes precautions for using the product.
-	Instruction Manual/ System Guide (CD-ROM)	228-97193-41	1	
1	DRAIN TUBE FOR SYSTEM	228-66695	1	-
2	REMOTE CABLE ASSY	228-28253-91	1	Not used in CL model.
3	COMMUNICATION CABLE	228-71807-41	1	Use this to remote-control the unit from Autosampler SIL-40 CL series. Reference FCV-S CL Instruction Manual "3.6 Remote-Controlling the Equipment from Autosampler SIL-40 CL series"
4	TERMINAL,177766-1	071-03511-01	3	Not used in CL model.

10.2 Optional Parts

■ Common Optional Parts LC-40D X3 CL ／ LC-40D XR CL

Option	Part No.	Features
Low pressure gradient kit	228-65016-58	Switches between up to 4 liquids of low-pressure gradient or mobile phase. It also can be used for auto rinsing of column flow lines. Installed inside of the instrument. 
Reservoir switching valve	228-65017-58	• Switches between 2 liquids (for example, switches between mobile phase and rinse solution) or two mobile phases. • Installed inside of the instrument. 
Mixer installation kit (MR40 LPGE, to be built in)	(w/ mixer recognition device) 228-65020-41	Gradient mixer (40 µL internal capacity) exclusively for low-pressure gradient analysis. Fixed inside of the instrument.
Mixer MR40 LPGE (fixed inside column oven)	(w/o mixer recognition device) 228-45210-41	Gradient mixer (40 µL internal capacity) exclusively for low-pressure gradient analysis. It can be installed inside of the CTO-40C CL.
Mixer MR300 LPGE	(w/ mixer recognition device) 228-72653-42 (w/o mixer recognition device) 228-45210-42	Gradient mixer (300 µL internal capacity) exclusively for low-pressure gradient analysis. It can be installed inside of the CTO-40C CL. This option can be used for solvents that are hard to mix, such as TFA (trifluoroacetic acid), or for reducing the baseline fluctuation of the photo diode array detector.
Gradient Mixer for High-Pressure Gradient Analysis	▶▶Reference	Gradient Mixer for High-Pressure Gradient Analysis (P.205)
Tool Kit	228-57647-43	Kit containing the necessary tools for preparation, inspection, and maintenance.
SUS Pipe (0.3×600)	228-53184-54	Plumbing for the pump outlet. ID 0.3 mm×600 mm, pre-bent
SUS Pipe HP (0.3×1,000)	228-53184-96	Plumbing for the pump outlet. ID 0.3 mm×1000 mm

Option	Part No.	Features
Plunger Seal GFP	228-52711-94	The maximum available pressure is 44MPa. When using a non-polar organic solvent such as hexane or a solvent of alkyl sulfonic acid with TFA, use the standard plunger seal.
SUCTION FILTER ASSY	228-61905-49	Suction filter with tube and fittings for the low pressure gradient kit or the degassing unit.
RESISTANCE TUBE,COIL	228-57908-41	• Stainless steel tube with ID 0.1 x 2000 mm • Use for cleaning line filters.

Optional Parts for LC-40D X3 CL

Option	Part No.	Features
MAINTENANCE KIT,LC-40D X3	228-53265-45	A set of consumable parts and plumbing parts for LC-40D X3 CL. Reference LC-40D CL Series Instruction Manual "Maintenance Kit for LC-40D X3 CL (Parts No. 228-53265-45)"

Optional Parts for LC-40D XR CL

Option	Part No.	Features
MAINTENANCE KIT, LC-40D XR	228-45593-49	A set of consumable parts and plumbing parts. Reference LC-40D CL Series Instruction Manual "Maintenance Kit for LC-40D XR CL (Parts No. 228-45593-49)"

Gradient Mixer for High-Pressure Gradient Analysis

The following gradient mixers for high-pressure gradient analysis are available for liquid chromatographs.

Part Name	Part No.
MIXER,MR 20 µL	(w/ mixer recognition device) 228-72652-41 (w/o mixer recognition device) 228-45209-41
MIXER,MR 40 µL	(w/ mixer recognition device) 228-72652-42 (w/o mixer recognition device) 228-45209-42
MIXER,MR 100 µL	(w/ mixer recognition device) 228-72652-43 (w/o mixer recognition device) 228-45209-43
MIXER,MR 180 µL Ⅱ	(w/ mixer recognition device) 228-72652-44 (w/o mixer recognition device) 228-45209-44

Mixers described above are packaged in a set

Part Name	Part No.
Set of Two Mixers MR 40 µL and MR 180 µL Ⅱ	228-45292-41
Set of Two Mixers MR 100 µL and MR 180 µL Ⅱ	228-45292-42
Set of Three Mixers MR 40 µL, MR 100 µL and MR 180 µL Ⅱ	228-45292-43

Recommended Mixers

		Mobile Phase		
		Solvent Containing Trifluoroacetic Acid (TFA)	Solvent Containing Formic Acid, Acetic Acid, etc.	Water (Including Buffer Solution), Organic Solvent, or Its Solvent Mixture
Detector	Photo Diode Array Detector	MR 180 µL	MR 180 µL	MR 180 µL
	UV Detector	MR 180 µL	MR 100 µL	MR 40 µL
	LCMS, LCMSMS	-	MR 20 µL	MR 20 µL

Using a mixer with a volume smaller than the recommendation shown above may cause excessive fluctuation of the baseline.

When connecting multiple detectors, use a mixer with the largest volume among the applicable mixers. For example, if using a Photo Diode Array and an LC/MS, the MR 180 µL Ⅱ mixer is recommended.

A larger than recommended mixer can be used to improve mixing performance, but will also increase the gradient delay volume.

Automatic Rinsing Kit

The plunger can be rinsed with the automatic rinsing kit at the back part of the plunger seal. LC-40D X3 CL/LC-40D XR　CL has the automatic rinsing kit as standard. The rinsing pump is a standard unit for LC-40B X3 CL. When using buffer solution, be sure to attach the automatic rinsing kit.

See the table below for the necessity of the automatic rinsing kit and rinsing solution.

Mobile Phase	Necessity	Recommended Rinsing Solution
Buffer Solution	Necessary	10 % 2-propanol water
Normal-phase solvent such as hexane	Not necessary	-
Other Solutions	Necessary	10 % 2-propanol water

Necessary: The rinsing kit is necessary

Not necessary: The rinsing kit should not be used.

Note	• For the application system, refer to the instruction manual of the application system. • If the rinse solution is dirty, replace with new solution. If getting significantly dirty, replace with new solution once a day. Even if it does not appear dirty, replace with new solution once a week. If using distilled water as rinsing solution, replace it once a day.

■ Optional Parts LC-40B X3 CL

Option	Part No.	Features
Gradient Mixer for High-Pressure Gradient Analysis	Reference	Gradient Mixer for High-Pressure Gradient Analysis (P.205) Mixers described above are packaged in a set (P.205) Recommended Mixers (P.206)
Tool Kit	228-57647-43	Kit containing the necessary tools for preparation, inspection, and maintenance.
SUS Pipe (0.3×500)	228-53184-51	Plumbing for the pump inlet. ID 0.3 mm x 500 mm, pre-bent
SUS Pipe HP (0.3×1,000)	228-53184-96	Plumbing for the pump outlet. ID 0.3 mm x 1000 mm

Option	Part No.	Features
Plunger Seal GFP	228-52711-94	The maximum available pressure is 44MPa. When using a non-polar organic solvent such as hexane or a solvent of alkyl sulfonic acid with TFA, use the standard plunger seal.
SUCTION FILTER ASSY	228-61905-49	Suction filter with tube and fittings for degassing unit.
Maintenance Kit for LC-40B X3	228-53265-46	A set of consumables and tubing parts for LC-40B X3 CL. This kit is also used for the instrument. Reference LC-40B X3 CL Instruction Manual "Maintenance Kit for LC-40B X3 CL (Parts No. 228-53265-46)"

Reference Automatic Rinsing Kit (P.206)

■ Optional Parts DGU-405 CL

Part Name	Part No.	Remarks
LINK-CHAMBER KIT	228-61149-41	Use when serially connecting the channels. Reference DGU-405 CL Instruction Manual “LINK-CHAMBER KIT Part No. 228-61149-41”

LINK-CHAMBER KIT FOR DGU-20A Part No. 228-61149-41

Part Name	Part No.	Q’ty
Instruction manual	-	1
PTFE FERRULE	228-81981	10
FLANGELESS NUT	228-82196	10
FEP TUBE 3X1.5 (100 mm)*1	670-10321-05	5

■ Optional Parts CTO-40C CL

Optional parts which can be added to the column oven are listed below. For information about other optional units listed below, contact your Shimadzu representative. For optional parts for the whole LC system, refer to System Guide. For columns, refer to Shimadzu's column catalog.

Parts for the oven

Option	Part No.	Features
Active preheater	228-72084-41	The preheating unit heats the mobile phase before it enters columns by independent heating control. The unit controls the temperature gradient in columns so that sharp peaks are obtained.
Column clamp B5	228-15617-41	Can fix one column with an outer diameter of 6.5 mm to 9.5 mm. (Metal)
Column clamp B8	228-15617-42	Can fix one column with an outer diameter of 9.5 mm to 12.7 mm. (Metal)
Column catch	228-28637-91	Can fix two columns with an outer diameter of 6.5 mm to 12.7 mm. (Metal)

CMD (Column Management Device)

The device stores information on a column and is capable of managing the column in combination with the database of a PC workstation. One CMD chip is required for each column. For details, refer to the instruction manual of LabSolutions chromatography data system.

Reference FCV-S CL Instruction Manual "System Guide 3.9 Column Management"

Option	Part No.	Features
CMD (Column Management Device)	228-37281-41	The device is stored colmun-related infomation. One CMD chip is required for each column.
CMD cable (150 mm)	228-39991	The cable connects a CMD chip with the instrument.
CMD cable (400 mm)	228-39991-01	

Automatic column switch valve

Two valves can be installed with one on the lower-left part and the other on the lower-right part.

Option	Part No.	Features
FCV-0206H	228-65607-58	The valve with two positions and six ports automatically switches between two columns. The withstand pressure is 80 MPa.
FCV-0206H3	228-65624-58	The valve with two positions and six ports automatically switches between two columns. The withstand pressure is 130 MPa.
FCV-0607H	228-65608-58	The valve with six positions and seven ports automatically switches between six columns. The withstand pressure is 80 MPa.
FCV-0607H3	228-65625-58	The valve with six positions and seven ports automatically switches between six columns. The withstand pressure is 130 MPa.
FCV-DR	228-65602-58	The unit drives the previously listed valves. (One unit is required for each valve.)
FCV-36AH	228-45206-58	The valve with two positions and ten ports automatically switches between two columns. The withstand pressure is 100 MPa. (Including the driving unit)
Manifold	228-72436-41	The part joins tubes of column outlets to enable one valve to switch between columns. PEEK resin is used for a wetted part. Reference Safety Guideline "5. Precautions for Mobile Phase Selection and Use"
FCV installation kit (CTO-40C)	228-72589-41	The common installation kit is required for installing the previously listed valves in the instrument. (Only one unit is required for this instrument.)
FCV tubing two-piece kit (ID 0.3)	228-72437-41	The tubing kit is required for installing two columns.
FCV tubing two-piece kit (ID 0.1)	228-72437-42	The tubing kit is required for installing two columns.
FCV tubing two-piece kit (ID 0.1 300 mm Nexlock)	228-72437-49	The tubing kit is required for installing two columns. (This Nexlock tubing comes with finger tight fittings.)
FCV tubing six-piece kit (ID 0.3)	228-72437-43	The tubing kit is required for installing two to six columns.

Option	Part No.	Features
FCV tubing six-piece kit (ID 0.1)	228-72437-44	The tubing kit is required for installing two to six columns.
FCV tubing six-piece kit (ID 0.1 300 mm Nexlock)	228-72437-50	The tubing kit is required for installing two to six columns. (This Nexlock tubing comes with finger tight fittings.)

Gradient mixer

The instrument can store one of the following mixers coming with a mixer detection device. For how to select a mixer, refer to System Guide.

Connecting a mixer detection device to the instrument requires a separate CMD cable (150 mm).

Option	Part No.	Features
MIXER SUS316L ASSY (With a mixer detection device)	228-72654-41	The general-purpose mixer is intended for both high and low pressure gradient analysis. The capacity can switch between three settings of 0.5 mL, 1.7 mL, and 2.6 mL.
MIXER PEEK (With a mixer detection device)	228-72654-42	The non-metal gradient mixer does not contain any metal as a material in its parts that come in contact with liquid. The capacity can switch between two settings of 0.4 mL and 1.6 mL. The mixer can be used for both high and low pressure gradient analysis.
MIXER MR 20 µL (With a mixer detection device)	228-72652-41	The mixer is intended exclusively for high pressure gradient analysis with a small internal capacity of 20 µL.
MIXER MR 40 µL (With a mixer detection device)	228-72652-42	The mixer is intended exclusively for high pressure gradient analysis with a small internal capacity of 40 µL.
MIXER MR 100 µL (With a mixer detection device)	228-72652-43	The mixer is intended exclusively for high pressure gradient analysis with a small internal capacity of 100 µL.
MIXER MR 180 µL II (With a mixer detection device)	228-72652-44	The mixer is intended exclusively for high pressure gradient analysis with a small internal capacity of 180 µL.
MIXER MR 300 LPGE (With a mixer detection device)	228-72653-42	The mixer is intended exclusively for low pressure gradient analysis with an internal capacity of 300 µL"

■ Optional Parts SPD-40 CL

Optional parts available for this instrument are listed below. For information about other optional parts listed below, contact your Shimadzu representative. For features of each optional flow cell part, refer to SPD-40 CL Instruction Manual “1.3.1 Optional Flow Cell”

Part Name	Part No.	Remark
UHPLC cell	228-64724-42	A cell for high speed analysis.
Semi-micro cell	228-64725-42	A cell for semi-micro analysis.

Optional Flow Cell

For details on the specifications, refer to the instruction manual of each optional flow cell.

Flow cell (Standard flow cell for SPD-40 CL) 228-62156-42

Item	Features
Optical path length	10 mm
Capacity	12 µL
Inlet tube	14 µL:I.D. 0.13mm, length 1040 mm (The length out of the cell is 315～340 mm.)
Outlet tube	8 µL:I.D. 0.25 mm, length 160 mm
Wetting part materials	SUS316L, quartz, PFA, PEEK
Cell pressure tolerance	12 MPa
Cell temperature adjustment	○

UHPLC cell 228-64724-42

Item	Features
Optical path length	10 mm
Capacity	8 µL
Inlet tube	4.3 µL:I.D. 0.1mm, length 550 mm (The length out of the cell is 315～340 mm.)
Outlet tube	2.1 µL:I.D. 0.13 mm, length 160 mm
Wetting part materials	SUS316L, quartz, PFA, PEEK
Cell pressure tolerance	12 MPa
Cell temperature adjustment	○

Semi-micro cell 228-64725-42

Item	Features
Optical path length	5 mm
Capacity	2.5 µL
Inlet tube	4.3 µL:I.D. 0.1 mm, length 550 mm (The length out of the cell is 315～340 mm.)
Outlet tube	2.1 µL:I.D. 0.13 mm, length 160 mm
Wetting part materials	SUS316L, quartz, PFA, PEEK
Cell pressure tolerance	12 MPa
Cell temperature adjustment	○

■ Optional Parts CBM-40 CL

Option Name	Part No.	Features
Optical Cable 0.6 m	228-77025-06	It is an optical cable for communication between the system controller and each module.
Optical Cable 0.8 m	228-77025-08	
Optical Cable 1 m	228-77025-10	
Optical Cable 2 m	070-92025-52	
Optical Cable 3 m	070-92025-53	
Optical Cable 5 m	070-92025-54	

Option Name	Part No.	Features
Remote Cable	228-28253-91	It is used for input or output of error / start / stop signals from other equipment. Reference CBM-40 CL Instruction Manual "4.1 External Input/Output Terminal"

■ Optional Parts SIL-40 XR /X3 CL

Optional parts that can be added to this instrument are listed in the table. For optional parts not listed in the table or details on optional parts, contact your Shimadzu representative.

Option Name	Part Number	Features
Identification label for 96 well microplate (100 sheets set)	228-71840-41	Putting one on a sample plate enables the autosampler to automatically identify the type of the plate. Each label comes in a set of 100.
Identification label for 96 well deep well plate (100 pieces set)	228-71840-42	
Identification label for 384 well microplate (100 sheets set)	228-71840-43	
Identification label for 384 well deep well plate (set of 100 sheets)	228-71840-44	
SAMPLE LOOP 100 µL	228-63132-45	This sample loop intended for total-volume injection allows injection of up to 100 µL.
SAMPLE LOOP 500 µL	228-45405-45	This sample loop intended for total-volume injection allows injection of up to 500 µL. This is connected to the 100 µL sample loop (228-63132-45).
SAMPLE LOOP 2000 µL	228-45405-46	This sample loop intended for total-volume injection allows injection of up to 2000 µL. This is connected to the 100 µL sample loop (228-63132-45).
SUS Piping, 0.1 × 600	228-53184-91	This stainless (SUS316L) outlet tubing has an inner diameter of 0.1 mm and a length of 600 mm. This connects the outlet of the high pressure valve and the inlet of the column. Volume: approximately 4.7 µL
SUS Piping, 0.17 × 600	228-53184-48	This stainless (SUS316L) outlet tubing has an inner diameter of 0.17 mm and a length of 600 mm. This connects the outlet of the high pressure valve and the inlet of the column. Volume: approximately 13.6 µL
SUS Piping, 0.3 × 600	228-53184-49	This stainless (SUS316L) outlet tubing has an inner diameter of 0.3 mm and a length of 600 mm. This connects the outlet of the high pressure valve and the inlet of the column. Volume: approximately 42.4 µL
UHPLC FITTING	228-56867-41	This fitting which withstands a pressure of 130 MPa can be used repeatedly.
MALE NUT FITTING	228-45717-01	This finger tight fitting which withstands a pressure of 35 MPa can be used repeatedly and comes in a set of two.

Option Name	Part Number	Features
INJ-HPV pipe, ID0.17 × 170 mm	228-64106-46	The stainless (SUS316L) tubing has an inner diameter of 0.17 mm and a length of 170 mm. This connects the injection port and the high pressure valve. Volume: 3.9 µL
INJ-HPV pipe, ID0.3 × 170 mm	228-64106-42	The stainless (SUS316L) tubing has an inner diameter of 0.3 mm and a length of 170 mm. This connects the injection port and the high pressure valve. Volume: 12.0 µL
MULTI RINSE OPTION (For needle inner surface rinse and injection port rinse	228-71767-45	This allows you to rinse the inner surface of the needle and the injection port with three different rinse solutions. Use of the multi-rinse kit requires the flow rinse kit (228-71767-45) to be installed with it. SIL-40C X3 CL is equipped with this part as standard. Reference SIL-40 CL Series Instruction Manual "3.2.3 Needle Inner Surface Rinse and Injection Port Rinse"
Rinse Coupling	228-36573	When the multi-rinse kit is installed, connecting rinse solution tubing not being used to the suction filter assembly with this rinse coupling makes the in-between degassing unit unnecessary. Note: Purge the rinse solution flow line if there is a rinse solution not to be used. If a rinse solution flow line is not filled with a solution, air enters the measuring flow line and causes variation in sample draw volume.
Plunger Seal	228-21975-91	Use of hexane as rinse solution requires the plunger seal of the measuring pump to be replaced with a seal made of polyethylene. Note: Not replacing it may shorten the seal lifetime and cause an earlier leakage.
PTFE solenoid valve	228-67723-42	When using THF as rinse solution, change the solenoid valves of both the HPV drain and the flow rinse line to ones made of PTFE. Note: Not replacing it may shorten the lifetime and cause an earlier leakage. 228-67723-42 consists of one solenoid valve.
Hand Tool Kit	228-57647-43	This kit is a set of tools necessary for preparation, inspection, and maintenance.

·Sample Plates and Sample Vials

The table lists the sample plates and sample vials available for this instrument.

Different sample plates have different available sample vials. The needle stroke is a setting value that sets the needle to be inserted so that the end is positioned 2 mm above the bottom of each sample vial. The table also shows a volume of the sample that remains in the bottom of the vial after the sample is drawn with this needle stroke.

⚠CAUTION

Be sure to put a cap on a vial when using a sample containing volatile acids. Be sure to put a sealing mat or sheet on a microplate.

Failure to follow the above instruction may cause vaporized acids to corrode the metal parts in the instrument and results in failure.

Sample plate (for 1-mL sample vials)

Name	P/N	Number of Samples	Material	Remarks
1-mL sample vial plate	228-71762-42	84	Polypropylene	1 piece

·Compatible sample vial

Name	P/N	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
1-mL sample vial 	228-39699-91	1 mL	Vial: Borosilicate glass Cap: Polyethylene	47 mm (Approx. 65 µL)	Includes 250 vials (With caps)

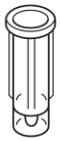
Sample plate (for 1.5-mL sample vials)

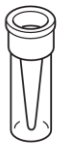
Name	P/N	Number of Samples	Material	Remarks
1.5-mL sample vial plate	228-71762-46	54	Polypropylene	1 piece

・Attachment for small outer diameter vials

Name	P/N	Number of Samples	Material	Remarks
Attachment for small outer diameter vials	228-74331-41	-	-	Installing this attachment to 1.5-mL sample vial plate enables use of thin vials with an outer diameter of 10 to 10.9 mm. Use this attachment when using TORAST™-H Bio Vials from Shimadzu GLC and 0.2-mL sample vial (V-shaped bottom)(P/N:228-35217-91).

・Compatible sample vial

Name	P/N	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
1.5-mL sample vial 	228-15652-92	1.5 mL	Borosilicate glass (clear)	47 mm (Approx. 150 µL)	Includes 100 vials (With caps and silicone rubber septa)
	228-15652-95		Borosilicate glass (Brown)		
1-mL sample vial (U-shaped bottom) 	228-31600-91	1 mL	Vial: Polypropylene Cap: Polyethylene	45 mm (Approx. 25 µL)	Includes 200 vials (With caps)

Name	P/N	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
0.2-mL sample vial (V-shaped bottom) 	228-35217-91	200 µL	Vial: Polypropylene Cap: Polyethylene	45 mm (Approx. 5 µL)	Includes 100 vials (With caps) The small volume sample vial mode may be effective in improving the area value reproducibility of the analysis. SIL-40 CL Series Instruction Manual 5.4 [SYSTEM] Settings Group/Using small volume sample vial mode《SMALL VIAL MODE》
Silicone rubber septum 	221-26718-93	-	Silicone rubber coated with PTFE	-	Includes 100 pieces • For 1.5-mL sample vial • For 1.1-mL sample vial
PTFE septum 	228-15655-91	-	PTFE	-	

・Recommended sample vial

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
LabTotal Vial 1.5 mL (For LC and LCMS)	227-34001-01 (Shimadzu GLC)	1.5 mL	Glass (Clear)	47 mm (Approx. 150 µL)	Includes 100 pieces Caps with a septum Comes with a certificate
TORAST™-H Glass Vial	370-04300-01/03 (Shimadzu GLC)	1.5 mL	Glass (01: Clear, 03: Brown)	47 mm (Approx.150 µL)	Includes 100 pieces Caps with a septum Comes with a certificate

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
TORAST™-H Glass Vial	370-04301-01/03 (Shimadzu GLC)	150 µL	Glass (01: Clear, 03: Brown)	33 mm (Approx. 10 µL)	Includes 100 pieces Caps with a septum Comes with a certificate
TORAST™-H Bio Vial	370-04350-00 (Shimadzu GLC)	300 µL	Vial: Polypropylene / Cap: Polyethylene	45 mm (Approx. 5 µL)	Includes 100 pieces (With caps) Use the attachment for small outer diameter vials. ・Sample Plates and Sample Vials (P.213)

Note	Caps with more than 13.0 mm outer diameter cannot be used because they will interfere with each one next to them.

Sample plate (for 4-mL sample vials)

Name	P/N	Number of Samples	Material	Remarks
4-mL sample vial plate	228-71762-43	28	Polypropylene	1 piece

・Compatible sample vial

Name	P/N	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
4-mL sample vial 	228-21287-91	4 mL	Borosilicate glass	47 mm (Approx. 400 µL)	Includes 100 vials (With caps and silicone rubber septa)
	228-31537-91	4 mL	Polypropylene	47 mm (Approx. 400 µL)	Includes 100 vials (With caps and silicone rubber septa)
Silicone rubber septum 	228-21290-91	-	Silicone rubber coated with PTFE	-	Includes 100 pieces 4-mL sample vial
PTFE septum 	228-23469-91	-	PTFE	-	

Sample plate (for 10-mL sample vials)

Name	P/N	Number of Samples	Material	Remarks
10-mL sample vial plate	228-71762-44	12	Polypropylene	1 piece

・Compatible sample vial

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke	Remarks
10-mL sample vial	18 09 1306-1 (Shimadzu GLC)	10 mL	Glass	47 mm	Includes 100 vials (vial only)
Cap with septum	18 03 1414-1 (Shimadzu GLC)	-	Silicone rubber coated with PTFE	-	Includes 100 pieces for 10-mL sample vial

Sample plate (for micro tubes)

Name	P/N	Number of Samples	Material	Remarks
Micro tube plate	228-71762-45	24	Polypropylene	1 piece Can be fixed with the cap open.

・Recommended sample vial

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke	Remarks
Eppendorf Safe-Lock Tubes (V-shaped)	No. 0030120086 (Eppendorf)	1.5 mL	Polypropylene	47 mm	Includes 1000 pieces Eppendorf Quality™, clear

Note	• Analysis with the micro tube lids closed leads to abnormal operation of the needle or needle driving part and causes failure of the instrument and incorrect analysis results. The micro tubes must be set in the instrument with the lids open. Solvent samples containing volatile acids cannot be used because they corrode the internal metal parts of the instrument. • This micro tube plate cannot be used with the optional Plate Changer CL.

Sample vial materials

Note	Sample vials are made of glass or plastic (polypropylene). Incorrect use or choice of sample vials may cause problems with analysis. When using them, pay attention to the following.

- Glass sample vial
  Ionic substances such as acids and bases may adhere to the glass surface. Analysis in this situation leads to a lower accuracy and precision, reducing the reliability of analysis. Prevent the adherence of these substances by carefully choosing and preparing a sample solvent. The following are suitable for a sample solvent.
  - Solution of 10 mM to 100 mM perchloric acid or a mixed solution of it and organic solvent (Use acetonitrile, methanol, or ethanol for organic solvent.)
  - Organic solvent solution of 10 mM trifluoroacetic acid (TFA)
  - (Use acetonitrile, methanol, or ethanol for organic solvent. Note that absorbance detection in the range between 200 nm and 220 nm detects trifluoroacetic acid.)

If these sample solvents cannot be used, use plastic sample vials.
Note that alkali and hydrogen fluoride corrode glass material.

- Plastic sample vial
  For plastic sample vials, hydrophobicity of substances causes the adherence to the surface. This lowers the accuracy and precision of analysis. A higher sample solvent polarity has a greater impact. Use of a sample solvent with a low polarity reduces the adherence of hydrophobic substances but too low a polarity may cause additives in plastic to dissolve from the surface of the sample vial. The following are suitable for a sample solvent.
  - Mixed solution of water or a buffer solution and an organic solvent
    (Organic solvent composition ratio: 20 % to 50 % [V/V]. Use acetonitrile, methanol, or ethanol for organic solvent.)

If these sample solvents cannot be used, use glass sample vials.
Note that an organic solvent can denature plastic.

Microplates and deep well plates (96 wells)

・Recommended plates (1)

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke	Remarks
96-well plate Shallow TORAST 96well 500 RU	370-04010-01 (Shimadzu GLC)	350 µL	Polypropylene	48 mm	A set of 10 Round hole, shallow, U-shaped bottom (round bottom), 500-µL well volume, unsterilized
TORAST™-H 96well 500 RU	370-04100-01 (Shimadzu GLC)	350 µL	Polypropylene	48 mm	A set of 10 U-shaped bottom (round bottom), 500-µL well volume.

Compatible Mat and Sheet	Model Number by Manufacturer (Manufacturer Name)	Material	Remarks
Well cap mat TORAST 96well Silicone Mat	370-04020-01 (Shimadzu GLC)	Silicone	A set of 50 Round hole
Adhesive sheet TORAST 96well Seal F Type	370-04000-01 (Shimadzu GLC)	Silicone and PET	There is no adhesive for the well part. With slits Self-sealing 80 mm × 122 mm

・Recommended plates (2)

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke	Remarks
Microplate	267245 (Thermo Fisher Scientific)	0.5 mL	Polypropylene	48 mm	Round bottom
Deep well plate	278752 (Thermo Fisher Scientific)	2 mL	Polypropylene	48 mm	Round bottom
	P-DW-20-C (AXYGEN)	2 mL	Polypropylene	48 mm	Round bottom

Compatible Mat and Sheet	Model Number by Manufacturer (Manufacturer Name)	Material	Remarks
Well cap mat	AM-2ML-RD (AXYGEN)	Silicone	With slits
	276011 (Thermo Fisher Scientific)	Silicone	With slits
	276002 (Thermo Fisher Scientific)	Thermoplastic elastomer	
Adhesive sheet	NAL-96 Sealing Film 2923-5000 (USA SCIENTIFIC)	Top layer: Polyethylene Bottom layer: Polypropylene	Adhesive-free over the wells

・Recommended plates (3)

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke	Remarks
Microplate	SIL-0078 (4titude)	0.3 mL	Polypropylene	48 mm	Round bottom
Deep well plate	4Ti-0120 (4titude)	1.15 mL	Polypropylene	48 mm	Round bottom
	4Ti-0130 (4titude)	1.85 mL	Polypropylene	48 mm	Round bottom

Compatible Mat and Sheet	Model Number by Manufacturer (Manufacturer Name)	Material	Remarks
Heat sealing sheet	Easy Peel AB-0745 (ABgene)	Aluminum	
	Peel-Seal 4Ti-0521 (4titude)	Foil	
	Pierce-Seal 4Ti-0531 (4titude)	Foil	
	298-37851 (FUJIFILM Wako Pure Chemical Corporation)	Permanent Sheet PP	

Microplates and deep well plates (384 wells)

・Recommended plates (1)

Name	Model Number by Manufacturer (Manufacturer Name)	Volume	Material	Needle Stroke (Remaining Volume)	Remarks
Microplate	60180-P203 (Thermo Fisher Scientific)	58 µL	Polypropylene	48 mm	Round bottom
Deep well plate	60180-P204 (Thermo Fisher Scientific)	300 µL	Polypropylene	48 mm (Approx. 15 µL)	V-shaped bottom

Compatible Mat and Sheet	Model Number by Manufacturer (Manufacturer Name)	Material	Remarks
Well cap mat	M150 (Thermo Fisher Scientific)	Silicone	With slits
Adhesive sheet			Adhesive-free over the wells

Note	Take sufficient care in using mats with the following characteristics ❶ and ❷ because they may clog the flow lines including the needle and needle seal.

❶ Mats with adhesive applied to the entire back side (that comes in contact with the plate)

Regardless of the type of sample solvent, this type of mat tends to cause the adhesive to adhere to the outer surface of the needle and the inside of the flow line hole over time, preventing the sample from being drawn and resulting in incorrect peak areas or clogging the flow lines.

❷ Mats made of polyethylene terephthalate (PET)

Some sample solvents such as acetonitrile-based solvent and DMSO-based solvent tend to swell and wrinkle mats where they are attached, which reduces airtightness. Other sample solvents such as water-based and methanol-based ones hardly cause any practical problems.

■ Optional Parts PLATE CHANGER CL

The optional parts that can be added to the plate changer are listed in the table below. For information on optional parts that are not listed below or details of optional parts, contact your Shimadzu representative.

Option	Part No.	Features
Plate changer expansion kit (for second plate changer)	228-71766-41	This kit is a collection of parts necessary for adding a second plate changer on the left side of the plate changer.
Plate changer expansion kit (for third plate changer)	228-71766-42	This kit is a collection of parts necessary for adding a third plate changer on the left side of the second plate changer.
ID label for MTP96 (100 pcs set)	228-71840-41	Attach this optional part to the plate for automatic plate type identification. This comes in a set of 100 sheets. For compatible microplates and deep well plates, see PLATE CHANGER CL Instruction Manual “Microplates and Deep Well Plates”
ID label for DWP96 (100 pcs set)	228-71840-42	
ID label for MTP384 (100 pcs set)	228-71840-43	
ID label for DWP384 (100 pcs set)	228-71840-44	

Sample Bottle Plates

The following sample bottle plates can be loaded. For more information on sample bottles that can be loaded in each sample plate.

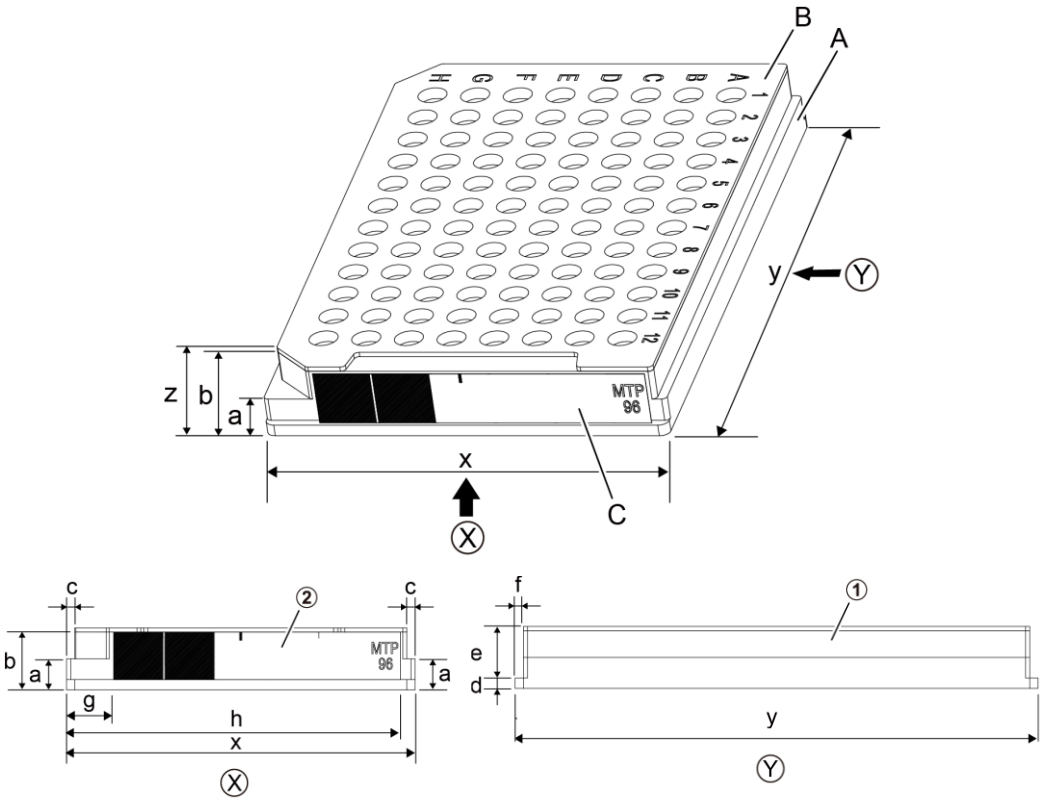
Part Name	Part No.	Remarks
1 mL vial plate (1 pc)	228-71762-42	Up to 84 1-mL sample bottles (228-39699-91) can be loaded.
1.5 mL vial plate (1 pc)	228-71762-46	Up to 54 1.5-mL sample bottles (228-15652-92) can be loaded.
4 mL vial plate (1 pc)	228-71762-43	Up to 28 4-mL sample bottles (228-21287-91) can be loaded.
10 mL vial plate (1 pc)	228-71762-44	Up to 12 recommended 10-mL sample bottles can be loaded.

Microplates and deep well plates come in different sizes, and some cannot be used with the plate changer. For compatible microplate and deep well plate sizes and weights, see the following Compatible plates (P.223) for recommended products.

Compatible plates

Symbol	Description
A	Plate
B	Mat
C	Plate identification label (optional)

Symbol	Size	Location	Remarks
x	84.5 to 86.2 mm	Shorter side of the plate	• If the plate is too small, its position may shift on the sample rack. • If the plate is too large, it cannot be properly conveyed.
y	126.5 to 128.3 mm	Longer side of the plate	
z	MTP: 17 mm or less DWP: 45 mm or less	Plate height (including mat)	
a	7.5 mm or less	Flange height	The arm holds the plate surface ① during conveyance. The plate cannot be held at level when there is a height difference on surface ①.
b	13 mm or more	Plate height (excluding mat)	
c	2 mm or less	Flange height difference	
d	2 to 4 mm	Flange height	The optional plate identification label is affixed to surface ②. (If plate identification label is not used, this restriction does not apply.)
e	11 mm or more	Height over the flange	
f	3 mm or less	Flange height difference	
g	10 mm or less	Width of the flat area of the label affixing surface	
h	80 mm or more		



CAUTION

Do NOT use any plate that does not conform to the sizes listed in Compatible plates (P.223)

Non-conformity with the size restrictions can prevent proper plate conveyance and result in analysis failure or equipment malfunction.

Always use a mat or sheet that is smaller than the width of the plate.

A mat or sheet larger than the width of the plate may prevent proper plate conveyance.

The weight of the plate, including the sample, must not exceed 350 g.

Using a plate over 350 g prevents the arm from holding the plate properly, which may result in the plate falling or equipment failure.

Note	Up to 14 microplates with a height of 17 mm or less can be loaded simultaneously. Plates of other sizes can be loaded, but only up to a maximum of 7 plates.

Reference PLATE CHANGER CL Instruction Manual “3.2.3 Installing the Stack Plates”

Item	Type	Plate Height (including mat)
Sample plates usable with all stacks (stack plate usable)	96-well microplates 384-well microplates	17 mm or less
Sample plates usable with odd-numbered stacks (stack plate not usable)	96-well deep well plates 384-well deep well plates	45 mm or less
	1-mL sample bottle plates 1.5-mL sample bottle plates 4-mL sample bottle plates 10-mL sample bottle plates	

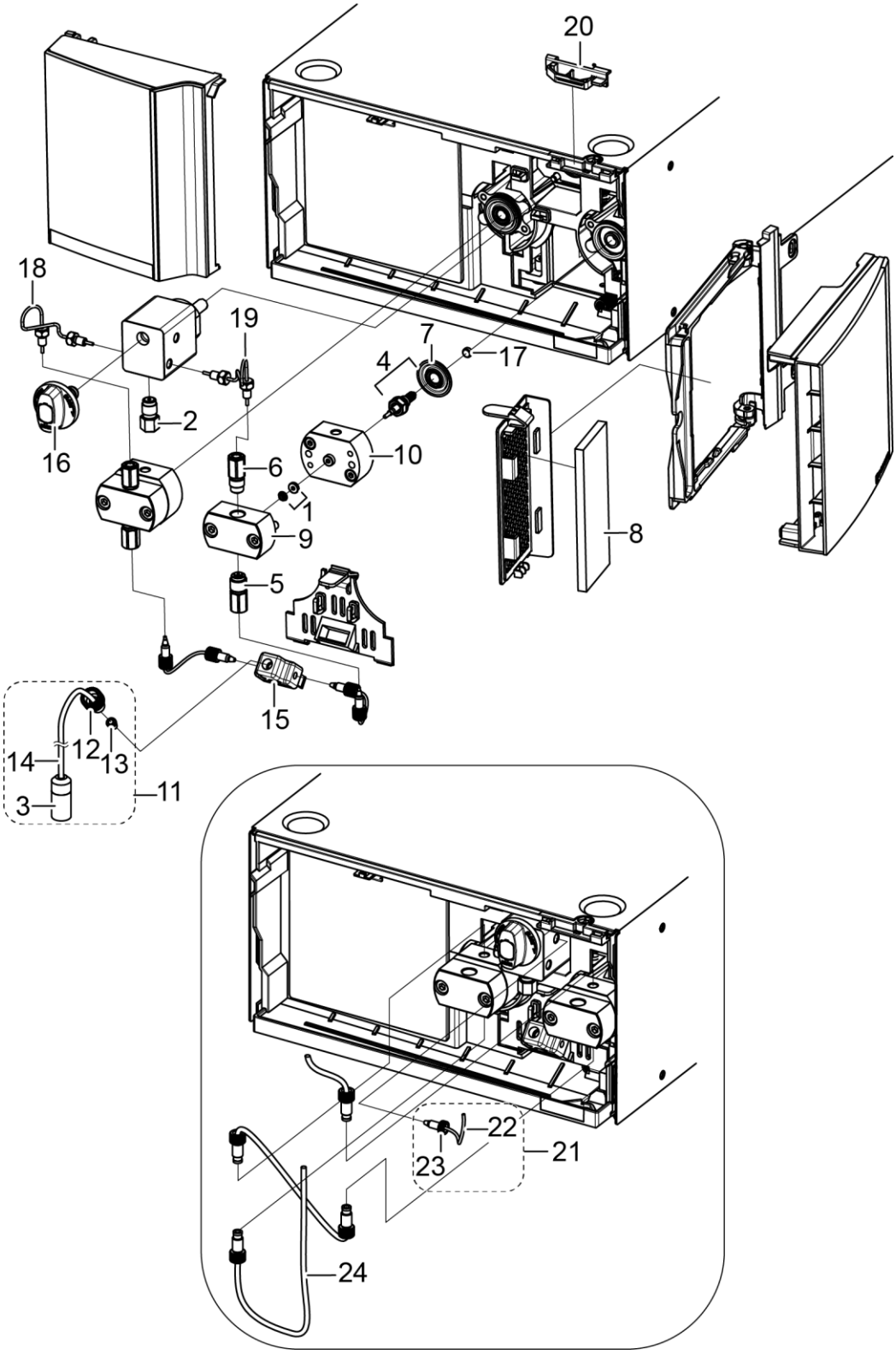
■ Optional Parts FCV-S CL

Flow channel selection valve

Option	Part No.	Flow Line Type	Pressure Resistance	Remarks
FCV-0206H	228-65607-58	Two-position six-port	80 MPa	For high speed analysis
FCV-0206H3	228-65624-58	Two-position six-port	130 MPa	For ultra high speed analysis
FCV-0607H	228-65608-58	Six-position seven-port	80 MPa	For high speed analysis
FCV-0607H3	228-65625-58	Six-position seven-port	130 MPa	For ultra high speed analysis

10.3 Maintenance Parts

■ Maintenance Parts LC-40D X3 CL ／ LC-40D XR CL



Consumable Parts

No.	Part Name	Part No.	Remarks
1	PLUNGER SEAL	228-52711-93	Seal for pump head, with backup ring
	Plunger Seal GFP	228-52711-94	Optional parts
2	Line Filter ASSY, SUS	228-57501-92	LC-40D X3 CL
		228-35871-96	LC-40D XR CL
3	Suction filter	228-45707-91	Filter body only (cleaned)
4	Plunger Holder ASSY	228-52069-44	with diaphragm
5	Inlet Check Valve ASSY	228-52964-42	LC-40D X3 CL
		228-48249-96	LC-40D XR CL
	Inlet Check Valve ASSY, 2 pieces	228-48249-97	LC-40D XR CL
6	Outlet Check Valve ASSY	228-53334-96	LC-40D X3 CL
		228-45705-43	LC-40D XR CL
7	DIAPHRAGM 2PCS	228-55272-41	
8	AIR FILTER FOR RIGHT PANEL	228-53924-06	Filter only

Replacement Parts

No.	Part Name	Part No.	Remarks
9	PUMP HEAD	228-55230-45	
10	HEAD HOLDER,2030	228-38022-01	
11	Suction Filter ASSY	228-45708-91	
12	PEEK Bush Fitting 3	228-39084	For suction filter
13	FERRULE,3.0F-T	228-12493	For suction filter
14	FEP TUBE 3.0 (O.D.)×1.5(I.D.)	670-10321-05	For suction filter
15	INLET BLOCK PEEK	228-47518	Pump inlet
16	DRAIN VALVE ASSY,TP	228-51229-93	
17	THRUST	228-34469	
18	SUS PIPE L	228-70472-01	For the left pump head of LC-40D X3 CL
		228-70026-01	For the left pump head of LC-40D XR CL
19	SUS PIPE R	228-70472-02	For the right pump head of LC-40D X3 CL
		228-70026-02	For the right pump head of LC-40D XR CL
20	TUBE HOLDER	228-70044	
21	DRAIN TUBE ASSY	228-25495-93	
22	ETFE TUBE 1.6(O.D.)X0.8(I.D.)	228-18495-01	For use between the inlet block and the check valve
23	MALE NUT 1.6 PEEK	228-35403	For plumbing between the inlet block and the check valve

Maintenance Kit

A set of consumable parts is provided as Maintenance Kit

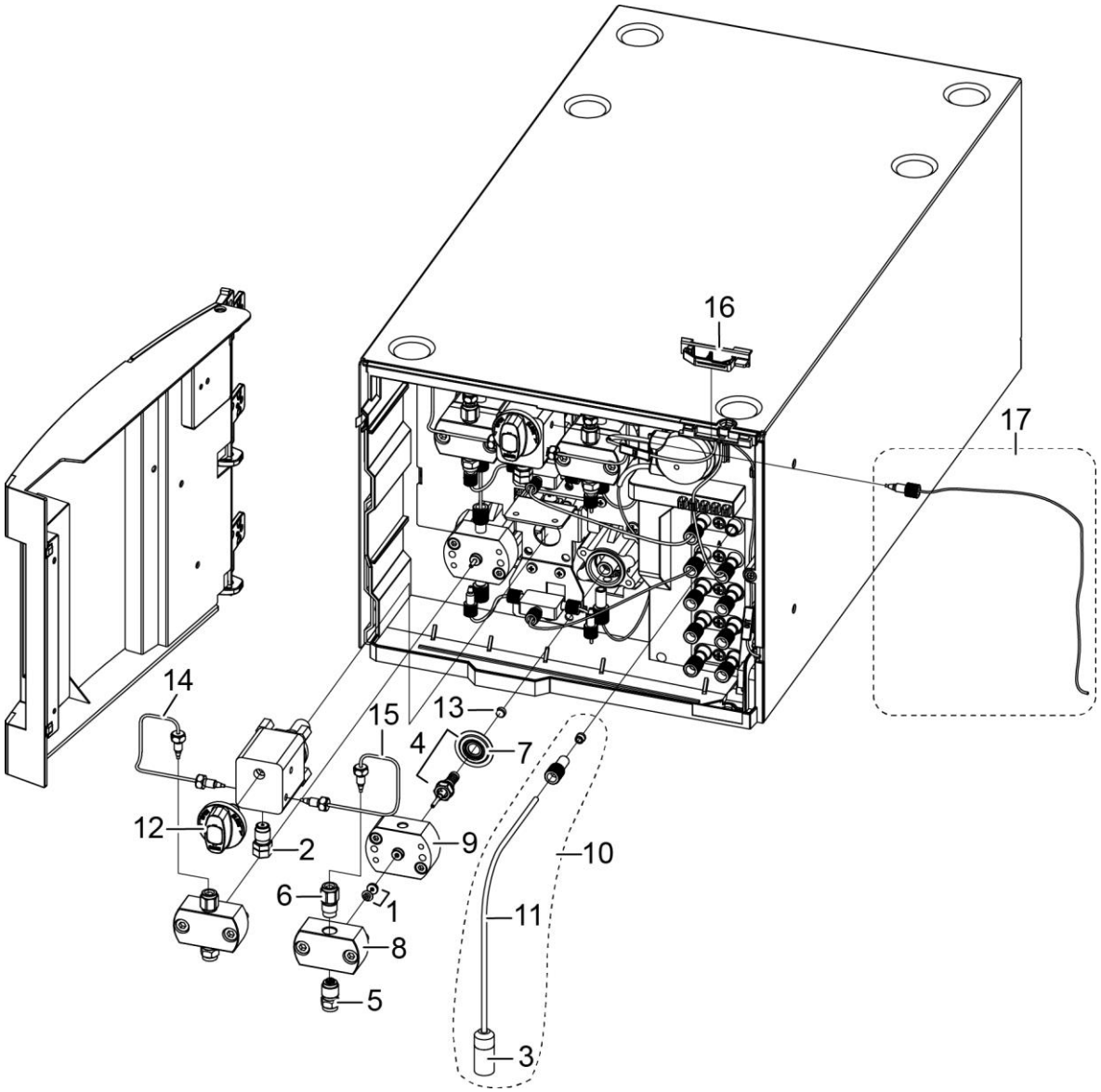
Maintenance Kit for LC-40D X3 CL (Parts No. 228-53265-45)

Part Name	Part No.	Quantity	Remarks
PLUNGER SEAL,BACKUP RING UHP	228-52711-93	2	With backup ring
Line Filter ASSY, SUS	228-57501-92	1	
Suction Filter ASSY	228-45708-91	1	
Plunger Holder ASSY	228-52069-44	2	With diaphragm
Inlet Check Valve ASSY	228-52964-42	2	
Outlet Check Valve ASSY	228-53334-96	2	
Air Filter for Right Panel	228-53924-06	1	

Maintenance Kit for LC-40D XR CL (Parts No. 228-45593-49)

Part Name	Part No.	Quantity	Remarks
PLUNGER SEAL,BACKUP RING UHP	228-52711-93	2	With backup ring
Line Filter ASSY, SUS	228-35871-96	1	
Suction Filter ASSY	228-45708-91	1	
Plunger ASSY	228-52069-44	2	With diaphragm
FERRULE 1.6F 316L	228-16000-10	2	
MALE NUT 1.6MN	228-16001	2	
SUS316LTP 0.3	228-50579-91	1	0.3 mm (I.D.) x 2 m. With ferrules and male nuts (2 pieces).
Inlet Check Valve ASSY	228-48249-96	2	
Outlet Check Valve ASSY	228-45705-43	2	

■ Maintenance Parts LC-40B X3 CL



Consumable Parts

No.	Part Name	Part No.	Remarks
1	PLUNGER SEAL,BACKUP RING UHP	228-52711-93	Seal for the pump head, with backup ring
	Plunger Seal GFP	228-52711-94	Optional parts
2	Line Filter ASSY, SUS	228-57501-92	
3	SUS Filter Element, w/PTFE Fitting	228-45707-91	Filter body only (cleaned)
4	Plunger ASSY	228-52069-44	With diaphragm
5	Inlet Check Valve ASSY	228-52964-42	
6	Outlet Check Valve ASSY, XR	228-53334-96	
7	DIAPHRAGM 2PCS	228-55272-41	

Replacement Parts

No.	Part Name	Part No.	Remarks
8	PUMP HEAD	228-55230-45	
9	HEAD HOLDER,2030	228-38022-01	
10	Suction Filter ASSY, for LC-20, LC	228-56200-48	
11	FEP TUBE 3.0(O.D.)×1.5(I.D.)	670-10321-05	For the suction filter
12	DRAIN VALVE ASSY,TP	228-51229-93	
13	THRUST	228-34469	
14	SUS PIPE L,40-L	228-70026-01	For the left pump head
15	SUS PIPE R,40-R	228-70026-02	For the right pump head
16	TUBE HOLDER	228-70044	
17	DRAIN TUBE ASSY	228-25495-93	

Maintenance Kit

A set of consumable parts is provided as Maintenance Kit.

Maintenance Kit for LC-40B X3　CL(Parts No. 228-53265-46)

This kit includes the parts for two pump ASSYs (one unit of LC-40B X3 CL).

Part Name	Part No.	Quantity	Remarks
PLUNGER SEAL,BACKUP RING UHP	228-52711-93	4	With backup ring
Line Filter ASSY, SUS	228-57501-92	2	
Suction Filter ASSY	228-56200-48	2	
Plunger ASSY	228-52069-44	4	With diaphragm
Inlet Check Valve ASSY	228-52964-42	4	
Outlet Check Valve ASSY	228-53334-96	4	

■ Maintenance Parts SPD-40 CL

Consumable Parts

No.	Part Name	Part No.	Remarks
1	D2 lamp, L15050	228-73407	Light source

Maintenance Parts

No.	Part Name	Part No.	Remarks
1	Gasket, ID2.0, 2PC	228-35097-95	Cell gasket (2 pcs)*1
2	Lens	228-73281-41	Cell lens*1

*1　For maintenance parts information for the optional cell, contact your Shimadzu representative.

■ Maintenance Parts CTO-40C CL

Consumable Parts

Part Name	Part No.	Remarks
Air filter	228-72570-01	Filter only

Replacement Parts

Part Name	Part No.	Remarks
Filter holder	228-72234	
Tube cap	228-72351	The tube hole cap
Guide	228-72350	For tube cap
Insulator for pipe	228-23848-01	Heat insulation material for the tubing hole

■ Maintenance Parts SIL-40C XR CL/SIL-40C X3 CL

Consumables

Part Name	Part Number	Remarks
Rotor, 2 position 6 port	228-71780-42	
Stator, 2 position 6 port	228-48858-46	
Needle	228-64909-98	
NEEDLE SEAL ASSY	228-64364-42	
SAMPLE LOOP 50uL	228-63132-44	For injection of 0.1 µL to 50 µL
SAMPLE LOOP 100uL	228-63132-45	For injection of 0.1 µL to 100 µL
SUS Filter Element	228-45707-91	
Rinsing port cap 10 pieces (without hole)	228-67725-41	Rinse port caps (228-64277-01), 10 pcs. included
Rinsing port cap 10 pieces (with hole)	228-67725-42	Rinse port caps (228-64277-02), 10 pcs. included

・Repair Parts

Flow line parts

Part Name	Part Number	Remarks
Rrotor for low pressure valve	228-71780-43	
Stator for low pressure valve	228-71782-41	
Plunger Assy	228-35010-92	
Plunger Seal GFP ID3	228-35145	
Packing for low pressure valve	228-51923	
UHPLC FITTING 2 S	228-56867-41	
FERRULE 1.6F 316L	228-16000-10	
SUS Male Nut Fitting, 1.6MN	228-16001	
SUS Male Nut Fitting, 1.6MN, W6	228-16001-03	
Plunger Seal	228-21975-91	• Optional parts • Use of hexane as rinse solution requires the plunger seal of the measuring pump to be replaced with a seal made of polyethylene.

Base parts

Part Name	Part Number	Remarks
Front panel (top)	228-71043-42	
Front panel (bottom)	228-71045-42	
Sample rack grip	228-64130-42	

Other parts

Part Name	Part Number	Remarks
Rinsing port cover	228-67725-43	

Tools

Part Name		Part Number
Hand Tool Kit		228-57647-43
	SPANNER,HEX 3	086-03804
	SPANNER,HEX 4	086-03805
	ALLEN WRENCH 3 LONG	670-18928-04
	SPANNER,DOUBLE OPEN END 6X8-R	086-03047-01
	SPANNER,DOUBLE OPEN END 8X10-R	086-03047-06
	Tube Cutter TC-P	228-77045-01
	DRIVER WITH HANDLE ASSY	228-28767-41
	SEAL REMOVER,10AD	228-62458-42
	JIG,DIAPHRGM	228-54852
	SEAL REMOVER 10A ROHS	228-25142-01
	TOOL FOR NEEDLE SEAL XR	228-50570
	JIG,ROTOR	228-48899-91
	SYRINGE,SS-20ESZ	228-66048
	NEEDLE ASSY,FOR SYRINGE	228-18216-91
	SYRINGE,H4020-LL_16913	046-00017-01
	ADAPTOR,SYRINGE	228-15672-91
	UHPLC FITTING TOOL	228-56866

■ Maintenance Parts PLATE CHANGER CL

Consumable Parts

Part Name	Part No.	Remarks
Air filter	228-53924-06	

Replacement Parts

Part Name	Part No.	Remarks
Plate chuck pad (3 pcs set)	228-71841-41	
Packing, Front panel	228-67720-41	
Safety guide	228-97195	
Stack plate	228-66752-42	
Drain tube (L=2000)	228-25162-04	
L-shaped joint	035-61561-11	
Y-shaped joint	035-61561-03	
Straight joint	228-28163	

■ Maintenance Parts FCV-S CL

・Consumable Parts

Check the instruction manual for the flow channel selection valve for information on its consumable parts.

・Replacement Parts

Part Name	Part No.	Remarks
COMMUNICATION CABLE	228-71807-41	

10.4 Specifications

■ Specifications LC-40D X3 CL

Item		Specification
Pump Type		Micro-volume double plunger pump (approx. 10 µL/stroke)
Pumping Methods		Constant flow pumping and constant pressure pumping
Allowable Maximum Pressure		130 MPa
Constant Flow Pumping	Flow Rate Setting Range	0.0001 to 10.0000 mL/min
	Maximum Delivery Pressure	130 MPa (0.0001 to 3.0000 mL/min) 80 MPa (5.0000 mL/min) 22 MPa (10.0000 mL/min)
	Flow Rate Accuracy	±1 % (1 mL/min when water is pumped at 80 MPa, with water and room temperature constant between 20 to 30 °C)
	Flow Rate Precision	Larger value of either 0.06 % RSD or 0.02 min SD
Pressure Display Accuracy		Larger value of either ±2 % or ±2.4 MPa
Suction Filter		10 µm
Line Filter		5 µm
Time Program		Commands for flow rate, pressure, [LOOP] (for program repetition), 320 steps (total of 10 program files)

■ Specifications LC-40D XR CL

Item		Specification
Pump Type		Micro-volume double plunger pump (approx. 10 µL/stroke)
Pumping Methods		Constant flow pumping and constant pressure pumping
Allowable Maximum Pressure		70 MPa
Constant Flow Pumping	Flow Rate Setting Range	0.0001 to 10.0000 mL/min
	Maximum Delivery Pressure	70 MPa (0.0001 to 3.0000 mL/min) 44 MPa (3.0001 to 5.0000 mL/min) 22MPa (5.0001 to 10.0000 mL/min)
	Flow Rate Accuracy	Larger value of either ±1 % or ±2 µL/min (0.01 mL/min to 3 mL/min) Larger value of either ±2 % or ±2 µL/min (0.01 mL/min to 3 mL/min)
	Flow Rate Precision	No more than the large value calculated with either 0.06 % RSD or 0.02 min SD

Item		Specification
Constant Pressure Pumping	Pressure Setting Range	1.0 to 60 MPa (in steps of 0.1 MPa)
	Pressure Accuracy	Larger value of either ±10 % or 1.5 MPa
Pressure Display Accuracy		Larger value of either ±2 % or ±1.0 MPa
Suction Filter		10 µm
Line Filter		5 µm
Time Program		Commands for flow rate, pressure, [EVENT], [LOOP] (for program repetition), 320 steps (total of 10 program files)

・High-Pressure Gradient System

Item	Specification	
	LC-40D X3 CL	LC-40D XR CL
Number of Solvents Mixed	2 or 3	
Gradient Profile	Step, linear and exponential functions (Only when controlled by LC workstation) possible at multiple levels	
Maximum Program Steps	400 steps (total of 20 program files)	
Program Duration	0.01 to 9999.90 minutes (in steps of 0.01 minutes)	
Range of Set Concentrations	0 % to 100 % (in steps of 0.1 %)	
Concentration Accuracy*1	±0.5 % (1 mL/min, 80 MPa)	±0.5 % (0.05 to 3 mL/min, 1 to 40 MPa)
Flow Rate Possible	0.0001 mL/min to 10 mL/min	

*1 For binary gradient with water/caffeine solution

・Low-Pressure Gradient System

Item	Specification
Number of Solvents Mixed	Max. 4
Gradient Profile	Step, linear and exponential functions (Only when controlled by LC workstation) possible at multiple levels
Maximum Program Steps	400 steps (total of 20 program files)
Program Duration	0.01 to 9999.90 minutes (in steps of 0.01 minutes)
Range of Set Concentrations	0 % to 100 % (in steps of 0.1 %)
Concentration Accuracy	±0.5 %(1 mL/min, 10 MPa) (for binary gradient with water/caffeine solution)
Flow Rate Possible	0.0001 mL/min to 10 mL/min

Other Specifications

Item	Specification
Liquid-Contacting Part Materials	SUS316L, PEEK, ruby, sapphire, HastelloyC, polyethylene
Operating Temperature Range	4 °C to 35 °C
Humidity Range	20 % to 85 %
Available pH Range	1 to 14
Dimensions	W260 mm × H140 mm × D500 mm (Excluding protruding parts)
Mass	10 kg

Item		Specification
Power Supply	Power Supply Voltage (indicated on the instrument)	100 V AC to 240 V AC * Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
	Power Consumption	150 VA
	Frequency	50/60 Hz
	Rated Breaking Capacity	50 A * Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.
Installation Environment (IEC)		Installation Category Ⅱ, Pollution Degree 2, Altitude 2000 m max. Install indoors.
Plunger Rinsing Line		Automatic rinsing kit as standard equipment
Pressure Limiter Operations		Upper/lower limits can be set
Error Display		Exist (Error display and stop at the time of malfunction)

Low Pressure Gradient Kit

Item	Specification
Flow Line Switching Method	Flow Line Switching with the five-way solenoid valve
Number of Flow Lines	1 (with four built-in two way solenoid valve)
Solenoid Valve Operating Pressure	0 kPa to 50 kPa
Materials for Parts Exposed to Liquid	PTFE, PEEK, fluororubber
Operating Temperature	4 °C to 35 °C
Available Flow Rate	0.0001 mL/min to 10 mL/min
Available pH	1 to 14

■ Specifications LC-40B X3 CL

Item		Specification
Pump Type		Micro-volume double plunger pump (approx. 10 µL/stroke)
Pumping Methods		Constant flow pumping
Allowable Maximum Pressure		130 MPa
Constant Flow Pumping	Flow Rate Setting Range	0.0001 to 10.0000 mL/min
	Maximum Delivery Pressure	130 MPa (0.0001 to 3.0000 mL/min) 80 MPa (5.0000 mL/min) 22 MPa (10.0000 mL/min)
	Flow Rate Accuracy	±1 % (1 mL/min when water is pumped at 80 MPa, with water and room temperature constant between 20 to 30 °C)
	Flow Rate Precision	No more than the large value calculated with either 0.06 % RSD or 0.02 min SD
Pressure Display Accuracy		Larger value of either ±2 % or ±2.4 MPa

Item	Specification
Suction Filter	10 µm
Line Filter	5 µm
Time Program	Commands for flow rate, pressure, [EVENT], [LOOP] (for program repetition), 320 steps (total of 10 program files)

*1 When water is pumped at 10 to 40 MPa, with water and room temperature constant between 20 to 30 °C.

*2 When water is pumped at 40 to 60 MPa, with water and room temperature constant between 20 to 30 °C.

High-Pressure Gradient System

Item	Specification
Number of Solvents Mixed	2 or 3
Gradient Profile	Step, linear and exponential functions (Only when controlled by LC workstation) possible at multiple levels
Maximum Program Steps	400 steps (total of 20 program files)
Program Duration	0.01 to 9999.90 minutes (in steps of 0.01 minutes)
Range of Set Concentrations	0 % to 100 % (in steps of 0.1 %)
Concentration Accuracy*1	±0.5 % (1 mL/min, 80 MPa)
Flow Rate Possible	0.0001 mL/min to 10 mL/min

*1 For binary gradient with water/caffeine solution

Other Specifications

Item		Specification
Liquid-Contacting Part Materials		SUS316L, PEEK, ruby, sapphire, HastelloyC, polyethylene
Operating Temperature Range		4 °C to 35 °C
Humidity Range		20 % to 85 %
Available pH Range		1 to 14
Dimensions		W260 mm × H210 mm × D500 mm (Excluding protruding parts)
Mass		21 kg
Power Supply	Power Supply Voltage (indicated on the instrument)	100 V AC to 240 V AC * Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
	Power Consumption	180 VA
	Frequency	50/60 Hz
	Rated Breaking Capacity	50 A * Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.
Installation Environment (IEC)		Installation Category Ⅱ, Pollution Degree 2, Altitude 2000 m max. Install indoors.
Plunger Rinsing Line		Automatic rinsing kit as standard equipment
Pressure Limiter Operations		Upper/lower limits can be set

Item	Specification
Error Display	Exist (Error display and stop at the time of malfunction)

■ Specifications DGU-405 CL

Item	Specifications
Number of Channels	5 channels
Degassing Performance	When a UV absorption detector with wavelength of 210 nm and sensitivity of 0.5 AU is used and methanol saturated with dissolved oxygen (HPLC grade at 25 °C) is flowed at a rate of 1 mL/min, UV absorption difference with or without the degassing unit is 300 mAU or more
Maximum Operating Flow Rate	10 mL/min per channel *1 Assuming that the degassing capacity of He degassing of methanol as 100 %, the capacity at the flow rate of 1 mL/min and 10 mL/min will be 89 % and 25 % respectively. If more degassing capacity than the above is required, ultrasonic vacuum degassing of the mobile phase etc. shall be carried out beforehand.
Internal Capacity	400 µL/1 channel
Pressure Resistance	± 0.1 MPa (only for suction with the solvent delivery module. It is not possible to pressurize the degassing unit.)
Self Purge	A mechanism is provided that operates stably by capturing outside air during vacuum pump operation

Note	If the maximum operating flow rate is exceeded, bubbles may appear or the degassing chamber may be overloaded and damaged.

・Other Specifications

Item	Specifications
Materials Contacting Liquid	Fluororesin, PEEK, FEP
Operating Temperature	4 °C to 35 °C
Operating Humidity	20 % to 85 % (non condensing environment)
Operating pH	1 to 14
Piping Used	PTFE tube having external diameter of 3 mm × internal diameter of 1.5 mm
Dimensions	W 260 mm × H 72 mm × D 500 mm (not including protruding parts)
Mass	4 kg
External Output	• Ratings of contacts: 5 V, 10 mV • Vacuum pressure monitor: Voltage: 2 V / Vacuum Pressure Output: 0 kPa (atmospheric pressure) Voltage: 0.18 V / Vacuum Pressure Output: -90.6 kPa Voltage: 0.1 V / Vacuum Pressure Output: -94.6 kPa
Power Supply	24 V DC, SELV (Power is supplied by connecting a cable to the solvent delivery module)
Installation Environment (IEC)	Installation category Ⅱ, Pollution degree 2, Altitude up to 2000 m, Installed indoor.

■ Specifications SPD-40 CL

Item	SPD-40 CL
Light source	D2 lamp
Wavelength range	190 to 700 nm Cut-off filter to eliminate second-order diffraction is automatically activated for the 371 to 700 nm range.
Spectral bandwidth	8 nm
Wavelength accuracy	±1 nm
Wavelength reproducibility	±0.1 nm*1
Noise Level	Single wavelength mode: 4.0×10^{-6} AU Max. (230 nm pumping water 1 mL/min, response 2 sec) Dual wavelength mode*2: 10.0×10^{-6} AU Max. (250 nm pumping methanol 1 mL/min, response 2 sec)
Drift	0.1×10^{-3} AU/hour Max. (250 nm, room temperature constant, pumping methanol 1 mL/min)
Linearity	2.5 AU (Caffeine, 273 nm)
Temperature coefficient	0.1×10^{-3} AU/℃ Max. (250 nm, pumping methanol 1 mL/min)
Sampling time Connected to CBM-40 CL	Single wavelength mode: 10、20、50、100、200、500、1000、2000 ms Dual wavelength mode*3: 100、200、500、1000、2000 ms
Response	The value is automatically set according to the sampling time. For manual setting, the user can choose from the following. No filtering, 0.05, 0.1, 0.5, 1.0, 1.5, 2.0, 3.0, 6.0, 8.0, 10.0 seconds

*1 Reproducibility when the wavelength is changed in single wavelength mode.
*2 The setting values of wavelength for dual-wavelength mode are “250 nm” and “280 nm”.
*3 The 100 and 200 ms of dual-wavelength mode are generated by interpolation.

Standard Flow Cell

Item	SPD-40 CL
Cell length	10 mm
Cell volume	12 µL
Cell pressure resistance	12 MPa
Cell connection materials	SUS316L, PFA (fluorine resin), Quartz, PEEK
pH range	1 to 13 (Using some mobile phases with pH 10 or above for long periods may damage the flow cell quartz and change its transmission property.)
Inlet tube	14 µL：I.D. 0.13mm, length 1040 mm (The length out of the cell is 315～340 mm.)
Outlet tube	8 µL：I.D. 0.25 mm, length 160 mm
Cell temperature input range	0 (OFF), 9 to 50 °C, 1 °C step

Detector Unit

Item		SPD-40 CL
Dual wavelength monitor*1	Measurement wavelength	Selectable, two wavelengths in 190 to 370 nm or 371 to 700 nm range
	Sampling frequency	0.5 sec
Range		Can be set between 0.0001 and 2.56 AUFS in 0.0001 AUFS steps
Zero adjustment		Auto zero function, baseline shift function
Polarity switching		Possible
Time Program		Available in detector or by system controller or software
	Set items	Wavelength (including dual wavelengths), auto zero, response, polarity, lamp ON/OFF, loop, cell temperature, stop
	Number of steps (detector program)	Maximum 32 steps
Lamp hour-meter		Records up to 9999 hours
Dimensions		260 (W) × 140 (H) × 500 (D) mm
Mass		11 kg (main unit only)
Operating temperature range		4 °C to 35 °C
Installation Environment (IEC)		Installation Category II Pollution Degree 2 Altitude 2000 m or lower Install inside the room.

*1 Noise level in dual wavelength mode varies depending on the wavelength. For example, use sensitivity 0.005 AUFS max. at 250 nm. Generally, for wavelengths with small optical outputs, noise level increases accordingly.

Power Supply

Item	Specification			
SPD-40 CL	Power Supply Voltage*1 (indicated on the instrument)	Power Consump-tion	Frequency	Rated Breaking Capacity*5\2
	100-240 V AC (100-240 V)	150 VA	50/60 HZ	50 A

*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.

*2 Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.

■ Specifications CBM-40 CL

Item	Specification
Operating Environment Temperature	4-35 ℃
Available Humidity Range	20-85% (No condensation)
External Dimensions	W 260 × H 72 × D 500 mm (Excluding protruding parts)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Mass</td><td>5 kg</td></tr>
<tr><td>Power Supply</td><td>
<table>
<tr><th>Power Supply Voltage*1 (Display on main unit nameplate)</th><th>Power Consumption</th><th>Frequency</th><th>Rated Breaking Capacity*2</th></tr>
<tr><td>AC100-240 V (100-240V～)</td><td>50 VA</td><td>50/60 Hz</td><td>50 A</td></tr>
</table>
*1 The voltage fluctuation of the power supply should not exceed 10% of the nominal voltage of the power supply.
*2 Please connect the power supply of this unit to an outlet with a circuit breaker that shuts off with current below this current capacity.
</td></tr>
<tr><td>External Connecting Terminal</td><td>Ethernet x 1
Optical link connector x 8
Event In x 1*1
Event Out x 2
External Start Terminal (Man.Inj) x 1*1
Option Connector x 1*2
AC Remote Connector x 1*1</td></tr>
<tr><td>Installation Environment (IEC)</td><td>Installation category Ⅱ, pollution degree 2, altitude 2000 m or less
Install indoors.</td></tr>
<tr><td colspan="2">*1 :Not used in CL model.
*2 : Not used.</td></tr>
</table>

Connectable Device

The controllable devices are shown below.

Unit	Nexera Series		Maximum Number of Connectable Units
	Nexera X3 (130MPa)	Nexera XR (70MPa)	
Pump	LC-40D X3 CL LC-40B X3 CL	LC-40D XR CL	4
Autosampler	SIL-40C X3 CL	SIL-40C XR CL	1
Column Oven	CTO-40C CL		4
Detector	SPD-40 CL		2

■ Specifications SIL-40C XR CL/SIL-40C X3 CL

Analysis Performance

Item	Specifications
Injection method	Total-volume injection, variable volume injection method (zero sample loss by injection)
Injection volume setting range	0.1 µL to 50 µL 0.1 µL to 2000 µL (optional) Step: 0.01 µL (0.01 µL to 9.99 µL), 0.1 µL (10 µL or more)

Item	Specifications
Number of processed samples	252 (for 1-mL sample vial plate, 84 vials × 3 plates) 162 (for 1.5-mL sample vial plate, 54 vials × 3 plates) 84 (for 4-mL sample vial plate, 28 vials × 3 plates) 36 (for 10-mL sample vial plate, 12 vials × 3 plates) 72 (for micro tube plate, 24 tubes × 3 plates) 288 (for microplate, 96 wells × 3 plates) 1152 (for microplate, 384 wells × 3 plates)
Sample vials	0.2 mL, 1 mL, 4 mL: plastic 1 mL, 1.5 mL, 4 mL, 10 mL: glass Micro tube 96 wells, 384 wells: microplate 96 wells, 384 wells: deep well plate
Injection volume reproducibility	RSD ≤ 1.0 % (for injection of 0.5 µL to 0.9 µL) RSD ≤ 0.5 % (for injection of 1.0 µL to 1.9 µL) RSD ≤ 0.25 % (for injection of 2.0 µL to 4.9 µL) RSD ≤ 0.15 % (For injection of 5.0 µL to 50 µL) (Optional: 5.0 µL to 2000 µL)
Carryover	0.0015 % max. (without rinse), 0.0003 % max. (with rinse, typically) *Under specified conditions
Injection volume accuracy	± 1 % (injection of 5 µL, n=20)
Linearity	0.9999 min.
Maximum allowable pressure	80 MPa: SIL-40C XR CL 130 MPa: SIL-40C X3 CL
Rinse function	Needle outer surface rinse (two types of solution: immersion rinse/flow rinse)
	Needle inner surface rinse (three types of solution) *1 Available as standard on SIL-40C X3 CL
Analysis cycle time	6.7 sec. max. (not including W/S communication operation) *Under specified conditions

Temperature Control Performance

Item	Specifications
Method	Air temperature control
Temperature setting range	4 °C to 45 °C (Cooling down to 4 °C requires the ambient temperature to be 30 °C max. and the humidity to be 70 % max.)
Temperature accuracy	± 0.5 °C (the temperature at the detector of the displayed temperature), ± 2 °C (the temperature of the liquid in the 1.5-mL glass sample vial)
Temperature stability	± 0.5 °C/15 min. (the temperature of the liquid in the 1.5-mL glass sample vial)

Other

Item	Specifications
Liquid contact part material	Mobile phase flow line: stainless (SUS316L), DLC, PEEK
	Other flow lines: stainless (SUS316L), PEEK, ceramic, PTFE, ETFE, FEP, GFP, sapphire, PPS, FFKM
Operating temperature	4 °C to 35 °C

<table>
<tr><th>Item</th><th colspan="2">Specifications</th></tr>
<tr><td>Operating humidity range</td><td>20 % to 85 %</td><td>Cooling down to 4 °C requires the ambient temperature to be 30 °C max. and the humidity to be 70 % max.</td></tr>
<tr><td>Operating pH range</td><td colspan="2">1 to 14</td></tr>
<tr><td>Dimensions</td><td colspan="2">W260 mm × H280 mm × D500 mm (The protrusion of models with the temperature control function is 140 mm deep.)</td></tr>
<tr><td>Mass</td><td colspan="2">24 kg</td></tr>
<tr><td>Power supply</td><td colspan="2">
<table>
<tr><th>Power Supply Voltage *1 (On Main Unit Nameplate)</th><th>Power Con-sump-tion</th><th>Frequency</th><th>Rated Breaking Capacity *2</th></tr>
<tr><td>100 V AC to 240 V AC (100-240V～)</td><td>400 VA</td><td>50/60 Hz</td><td>63 A</td></tr>
</table>
*1 Make sure that the voltage fluctuation of the power supply does not exceed 10 % of its nominal voltage.
*2 Connect the power supply of this instrument to an outlet equipped with a circuit breaker whose breaking capacity is equal to or less then this breaking capacity.
</td></tr>
<tr><td>Installation environment (IEC)</td><td colspan="2">Installation category: II, pollution degree: 2, altitude: 2000 m max.
Indoor use only.</td></tr>
<tr><td>Error display</td><td colspan="2">Available (When malfunctioning, the instrument displays an error and stops.)</td></tr>
</table>

■ Specifications PLATE CHANGER CL

Specifications

Item	Specification
Processable number of samples (including the two plates of the autosampler)	1536 (When microplates are used: 96 wells × 16 plates) 864 (When deep well plates are used: 96 wells × 9 plates) 6144 (When microplates are used: 384 wells × 16 plates) 3456 (When deep well plates are used: 384 wells × 9 plates) 756 (When 1-mL sample bottle plates are used: 84 bottles × 9 plates) 486 (When 1.5-mL sample bottle plates are used; 54 bottles × 9 plates) 252 (When 4-mL sample bottle plates are used: 28 bottles × 9 plates) 108 (When 10-mL sample bottle plates are used: 12 bottles × 9 plates)
Processable number of samples (including the two plates of the autosampler; when three plate changers are connected (optional))	4224 (When microplates are used: 96 wells × 44 plates) 2208 (When deep well plates are used: 96 wells × 23 plates) 16896 (When microplates are used: 384 wells × 44 plates) 8832 (When deep well plates are used: 384 wells × 23 plates) 1932 (When 1-mL sample bottle plates are used: 84 bottles × 23 plates) 1242 (When 1.5-mL sample bottle plates are used; 54 bottles × 23 plates) 644 (When 4-mL sample bottle plates are used: 28 bottles × 23 plates) 276 (When 10-mL sample bottle plates are used: 12 bottles × 23 plates)

<table>
<tr><th colspan="2">Item</th><th>Specification</th></tr>
<tr><td rowspan="4">Sample cooler (only when the autosampler is equipped with a temperature control function)</td><td>System</td><td>Air temperature control system</td></tr>
<tr><td>Temperature setting range</td><td>4 to 45 °C
To cool to 4 °C, the room temperature must be 30 °C or lower with the humidity being 70 % or lower
To heat to 45 °C, the room temperature must be 15 °C or higher
(When three plate changers are connected:
To cool to 4 °C, the room temperature must be 27 °C or lower with the humidity being 70 % or lower
To heat to 45 °C, the room temperature must be 15 °C or higher)</td></tr>
<tr><td>Temperature accuracy</td><td>±0.5 °C (Display area temperature),
±2 °C (Liquid temperature inside 1.5-mL glass sample bottle)</td></tr>
<tr><td>Temperature stability</td><td>±0.5 °C/15 min. (Liquid temperature inside 1.5-mL glass sample bottle)</td></tr>
<tr><td colspan="2">Operating temperature range</td><td>4 to 35 °C</td></tr>
<tr><td colspan="2">Operating humidity range</td><td>20 to 85 %</td></tr>
<tr><td colspan="2">Dimensions</td><td>170 (W) × 560 (H) × 500 (D) mm (excluding rear-side protrusion of 140 mm)</td></tr>
<tr><td colspan="2">Mass</td><td>26 kg</td></tr>
<tr><td colspan="2">Power Supply</td><td>
<table>
<tr><th>Power Supply Voltage*1 (indicated on the instrument)</th><th>Power Consumption</th><th>Frequency</th><th>Rated Breaking Capacity*2</th></tr>
<tr><td>AC100-240V (100-240 V~)</td><td>400 VA</td><td>50/60 Hz</td><td>63 A</td></tr>
</table>
*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
*2 Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.
</td></tr>
<tr><td colspan="2">Installation Environment (IEC)</td><td>Installation category II, Pollution degree: 2, Altitude: Up to 2000 m, Indoor</td></tr>
<tr><td colspan="2">Error indication</td><td>Provided
(In case of error, the error is displayed on the display panel of the autosampler upon stopping)</td></tr>
</table>

■ Specifications FCV-S CL

Specifications

Item	Specification
Supported valve types	• Two-position valve six-port • Six-position valve seven-port
Max. number of valves mountable	1
Flow line switching time	Approx. 0.1 second/60°
Operating temperature range	Room temperature 4 to 35 °C, Valve tip 4 to 85 °C

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Operating humidity range</td><td>20 to 85 %</td></tr>
<tr><td>Dimensions</td><td>65 mm (W) × 123 mm (H) × 325 mm (D) (excluding protrusions)</td></tr>
<tr><td>Mass</td><td>2.7 kg (Excluding the mass of the flow channel selection valve)</td></tr>
<tr><td>Power Supply</td><td>
<table>
<tr><th>Power Supply Voltage*1 (indicated on the instrument)</th><th>Power Consumption</th><th>Frequency</th><th>Rated Breaking Capacity*2</th></tr>
<tr><td>AC100-240 V (100-240 V～)</td><td>50 VA</td><td>50/60 Hz</td><td>5 A</td></tr>
</table>
*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
*2 Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.
</td></tr>
<tr><td>Installation Environment (IEC)</td><td>Installation Category II, Pollution Degree 2, Altitude 2000 m or lower
Install inside a room.</td></tr>
</table>

Index

A

Automatic Rinsing Kit 206
Available pH Range 234, 236

C

CMD 208
Consumable Parts 226, 228

D

D2 LAMP USED TIME 107
Degassing Performance 237

H

High-Pressure Gradient System 234, 236

I

Internal Capacity 237

L

Specifications LC-40D XR CL 233
Liquid-Contacting Part Materials 234, 236
Low-Pressure Gradient System 234

M

Maintenance Kit 227, 229
Mass 237
Maximum Operating Flow Rate 237

O

Operating Humidity 237