

**Reagent Dispenser
RD-5
Instruction Manual**

NIC-TD-0000007-02



Nippon Instruments Corporation

Table of Contents

1.	Introduction	1
1.1.	Safety precautions.....	1
1.1.1.	Meanings and descriptions of symbols	1
1.1.2.	Cautions concerning installation.....	1
1.1.3.	Cautions concerning handling	1
2.	Outline of instrument	2
2.1.	External appearance of instrument	2
2.1.1.	Front.....	2
2.1.2.	Right side	3
2.1.3.	Rear	3
2.1.4.	Upper face	4
2.1.5.	Reagent bottles and reagent bottle stand (Standard: 5mL).....	5
2.1.6.	Reagent bottles and reagent bottle stand (Option: Large).....	6
3.	Installation and connection	7
3.1.	Installation of instrument	7
3.2.	Reagent tubes connection & replacement.....	7
3.2.1.	Reagent tubes connection.....	7
3.2.2.	Replacement of standard ↔ large capacity reagent tubes.....	9
4.	Startup and shutdown.....	10
5.	Maintenance	11
5.1.	Daily inspection	11
5.2.	Time-change components.....	11
5.3.	Yearly inspection	12
6.	Detailed specification.....	13
6.1.	Performance	13
6.2.	Specification of external connection	13
6.3.	Dimensions and weight	13
6.4.	Power supply.....	13
6.5.	Standard accessories.....	13
6.6.	Options	13
7.	Installation requirements.....	14
7.1.	Atmosphere	14
7.2.	Measures against electric noise.....	14
8.	Warranty	15

8.1.	Warranty period and relevant item	15
8.2.	Warranty terms	15
9.	Precautions concerning disposal of instrument.....	15
10.	Contact address.....	16



1. Introduction

1.1. Safety precautions

To use this product safely, observe the following precautions.

Nippon Instruments Corporation will not take any responsibility for accidents caused by a user's carelessness.

1.1.1. Meanings and descriptions of symbols

 Danger	In the case of mishandling, a user may be killed or suffer a serious injury immediately.
 Warning	In the case of mishandling, a user may be killed or suffer a serious injury.
 Caution	In the case of mishandling, a user may suffer an injury or material damage is expected.

* Using this product involves no risk corresponding to "Danger".

1.1.2. Cautions concerning installation

 Caution	➤ Observe the installation requirements and methods, or a failure may occur. ➤ Install the instrument on a horizontal working table with sufficient strength, or a slight injury or a failure caused by a fall or a drop may result.
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1.1.3. Cautions concerning handling

 Warning	➤ Before using a reagent, procure and administer the safety data sheet (SDS). ➤ When using a reagent, wear protective equipment and carry out ventilation sufficiently. Reagents to be used for the instrument include acute toxic and corrosive substances.
 Caution	➤ Do not disassemble or modify the instrument without permission, or a failure may result. ➤ Read this document carefully before using the instrument, or a failure caused by an operational mistake may result. ➤ Observe the range of the specification, or a failure may result. ➤ Do not operate the instrument with a wet hand. ➤ Cut off the power supply before carrying out maintenance work, or a failure caused by a short circuit may result. ➤ Dispose of effluent appropriately after using the instrument.

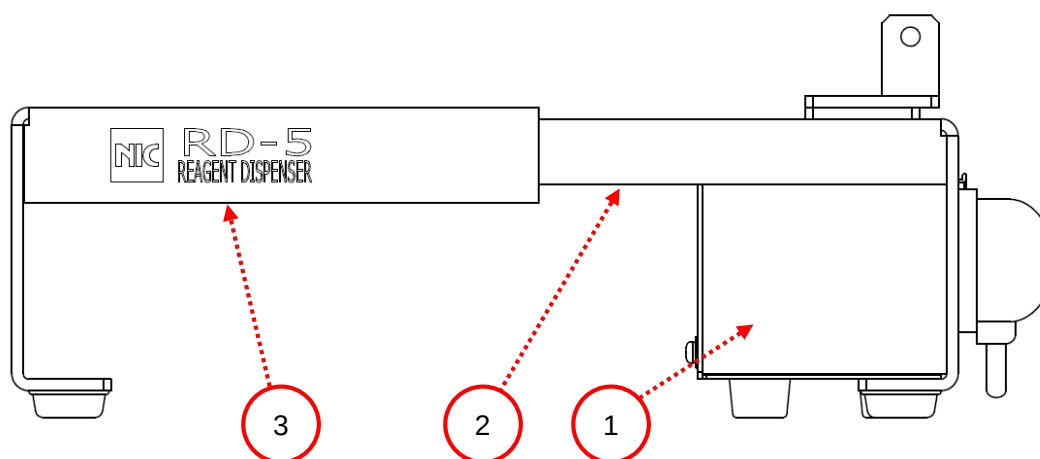
2. Outline of instrument

The reagent dispenser RD-5 is an optional instrument for the reducing vaporization mercury analyzer RA-5 or fully automatic heat vaporization mercury analyzer MA-3000.

This instrument enables the automatic dispensing of reagents according to instructions received from the main detector (RA-5 or MA-3000) in order to ease the user's burden and support analyses with good reproducibility.

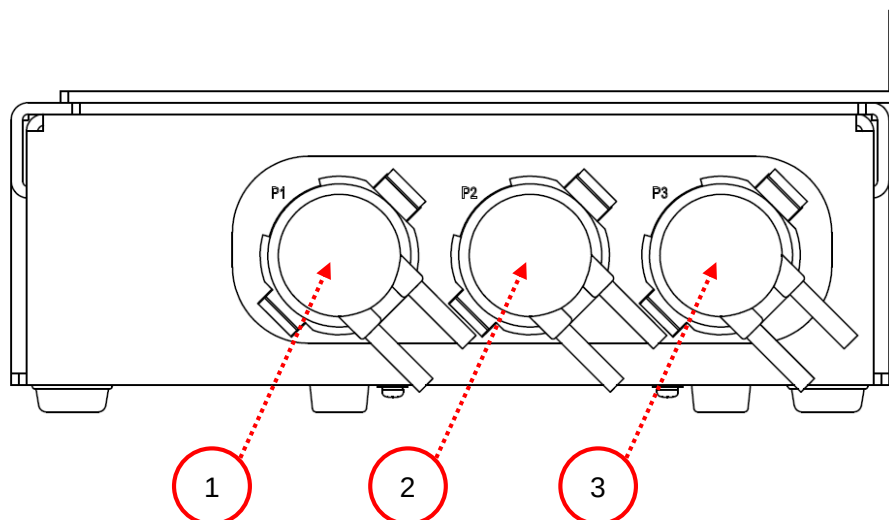
2.1. External appearance of instrument

2.1.1. Front



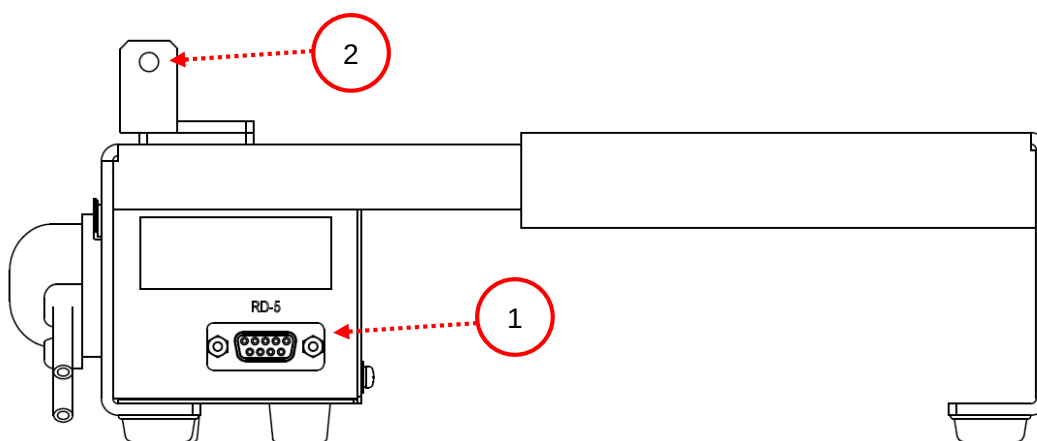
No.	Name	Description
1	Reagent dispenser main unit	Houses tube pumps for reagent dispensing.
2	Stand (fixed portion)	Fixes the reagent dispenser.
3	Stand (movable portion)	Can be slid to mount the RA-5 or SC-5.

2.1.2. Right side



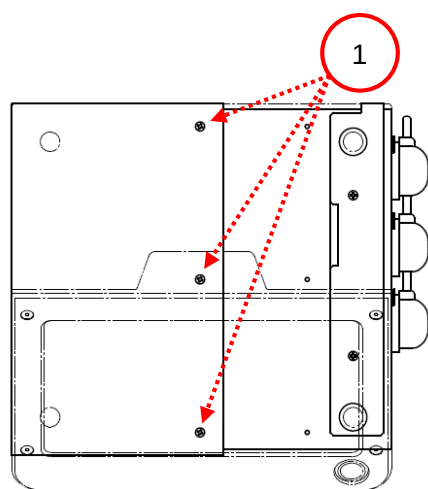
No.	Name	Description
1	Reagent pump (P1)	Used mainly for the reagent sulfuric acid (1+1).
2	Reagent pump (P2)	Used mainly for the reagent 10% stannous chloride (II) solution.
3	Reagent pump (P3)	Reserved

2.1.3. Rear

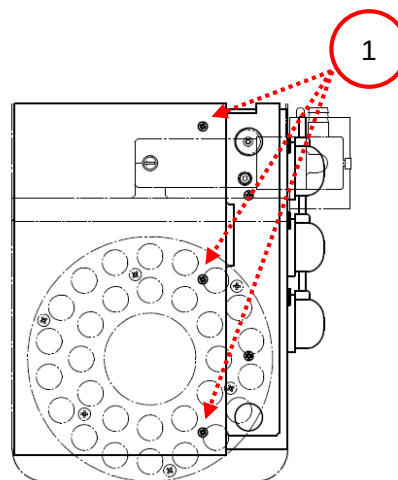


No.	Name	Description
1	RD-5 connector	This is a connector for connection to the main detector (RA-5/MA-3000).
2	RA-5/SC-5 fixing hole	This is a hole to fix the RA-5 or SC-5 to the stand using the supplied knurled screw.

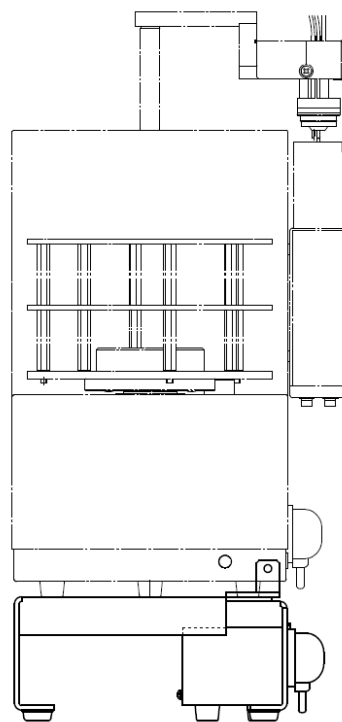
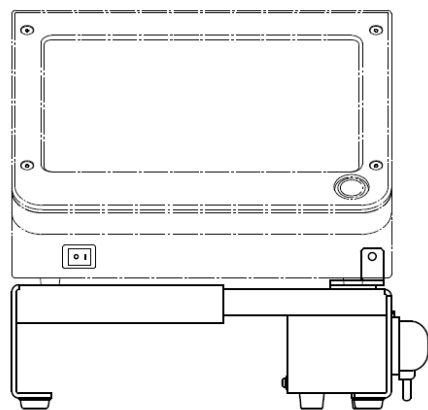
2.1.4. Upper face



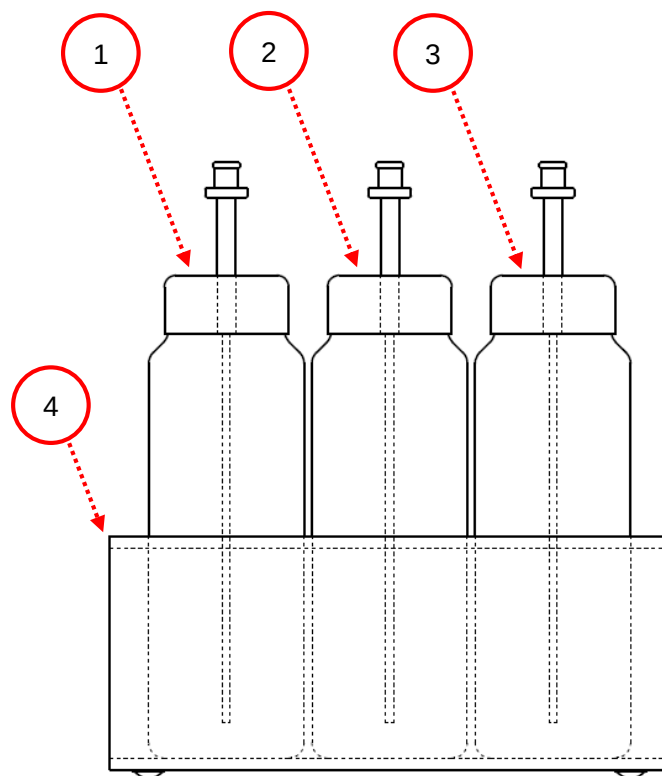
Positions of fixing screws when RA-5 is installed



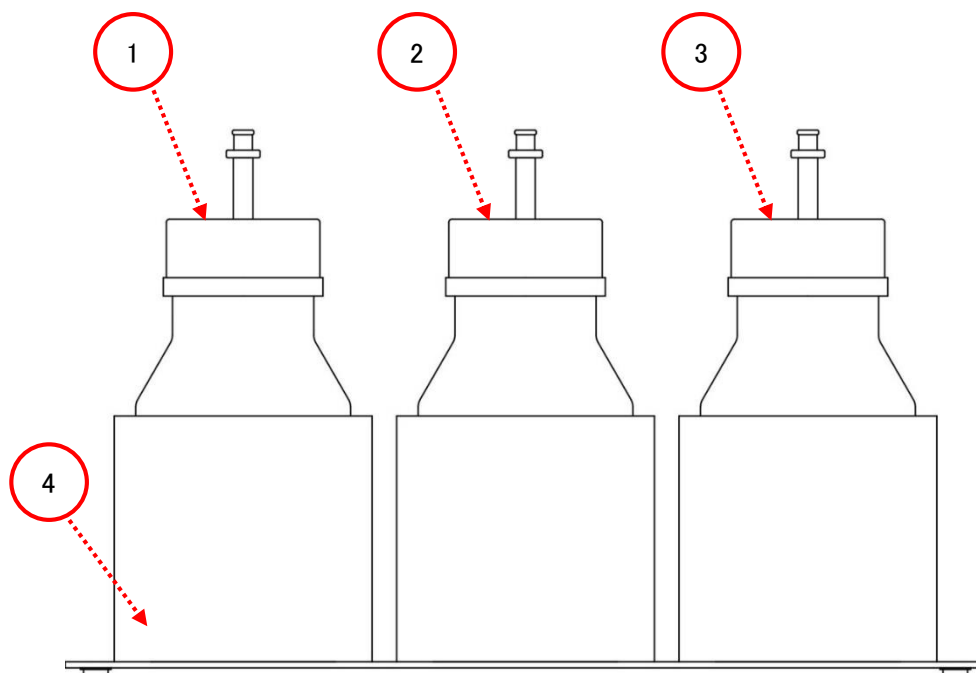
Positions of fixing screws when SC-5 is installed



No.	Name	Description
1	Fixing screws	Fix the movable portion of the stand to the fixed portion. (3 places)

2.1.5. Reagent bottles and reagent bottle stand (Standard: 5mL)

No.	Name	Description
1	Reagent Bottle 1	This is the reagent container for the reagent pump P1.
2	Reagent Bottle 2	This is the reagent container for the reagent pump P2.
3	Reagent Bottle 3	This is the reagent container for the reagent pump P3.
4	Reagent stand	Three kinds of reagent bottles are set.

2.1.6. Reagent bottles and reagent bottle stand (Option: Large)

No.	Name	Description
1	Reagent Bottle 1	This is the reagent container for the reagent pump P1.
2	Reagent Bottle 2	This is the reagent container for the reagent pump P2.
3	Reagent Bottle 3	This is the reagent container for the reagent pump P3.
4	Reagent stand	Three kinds of reagent bottles are set.

3. Installation and connection

3.1. Installation of instrument



Caution

- Observe the installation requirements, or a failure may occur.
- Install the instrument on a horizontal working table with sufficient strength, or a slight injury or a failure caused by a fall or a drop may result.

- 1) Adjust the width of the stand of the RD-5 for the RA-5 or SC-5.
- 2) Install the RA-5 or SC-5 on the stand of the RD-5, and then attach the supplied knurled screw to the fixing hole in the rear to fix the RA-5 or SC-5 to the stand of the RD-5.
- 3) Connect the instrument to the upper instrument (RA-5 or MA-3000) using the supplied RDIF cable.
- 4) Pour the necessary quantities of reagents into the reagent bottles, and set them in the reagent bottle stand.

3.2. Reagent tubes connection & replacement



Caution

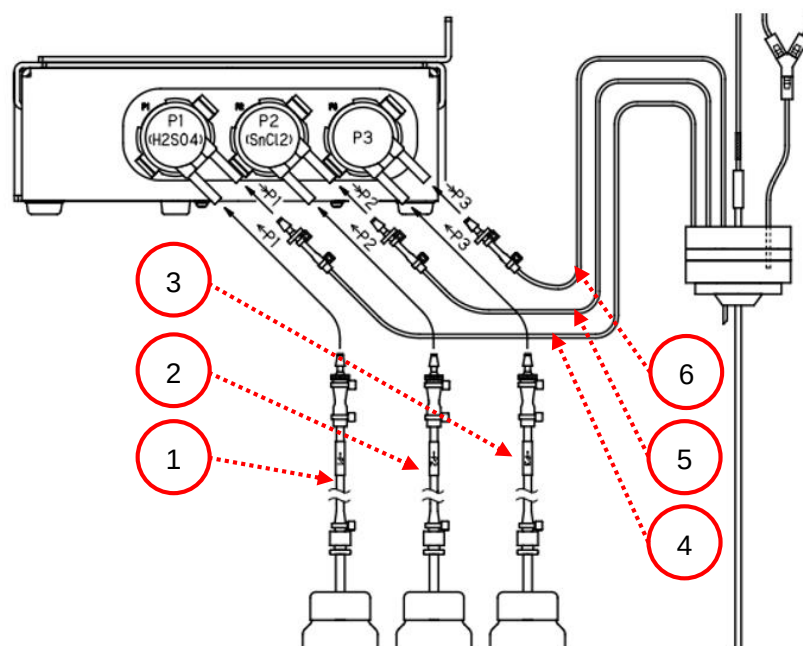
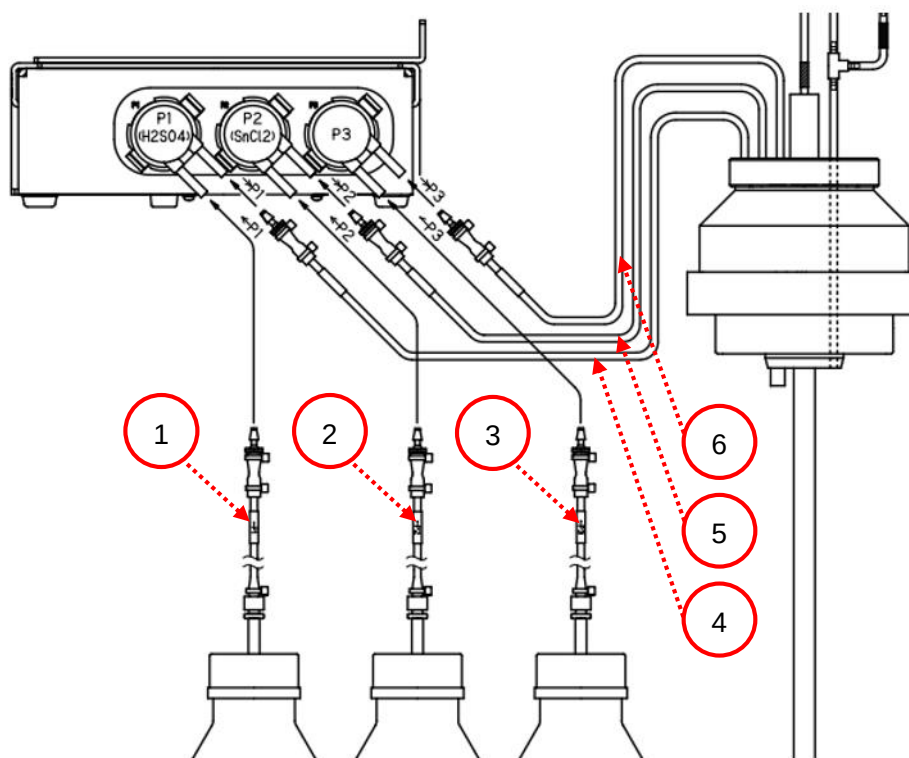
- Check that each tube is not wet or dirty.
- Do not operate the instrument before the connection of each tube is completed.
- Make cable tie surely in order to prevent piping disconnection. It may cause leakage or disconnection.
- Be careful not to damage fittings.

3.2.1. Reagent tubes connection

- 1) Connect the following reagent tubes.

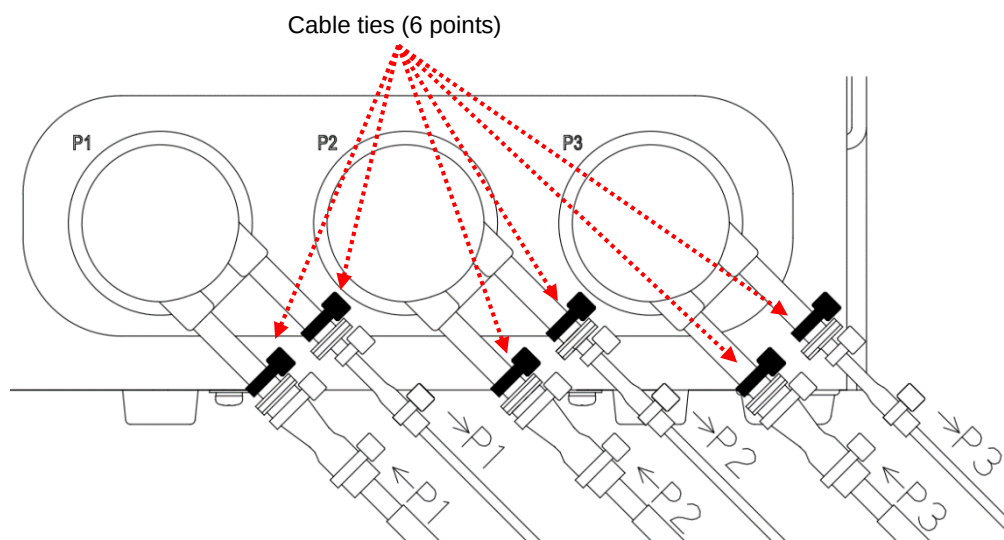
No.	Name	Connection destination
1	RD-5: Reagent tube P1in (<-P1)	Reagent Bottle 1
2	RD-5: Reagent tube P2in (<-P2)	Reagent Bottle 2
3	RD-5: Reagent tube P3in (<-P3)	Reagent Bottle 3
4	Reagent tube P1 (->P1)	Cap unit (P1)
5	Reagent tube P2 (->P2)	Cap unit (P2)
6	Reagent tube P3 (->P3)	Cap unit (P3)

* See the next page for connection diagram.

Standard: 5mLOption: Large

* The above figure shows an example in the case of the SC-5 caps. Connect tubes similarly also in the case of other caps.

- 2) After connecting, securely tighten the pump tube of RD-5 and the fitting part (total of 6 points) with cable ties. When pliers etc. are used, please be careful of the breakage of the fitting.



3.2.2. Replacement of standard ↔ large capacity reagent tubes

When the reagent tubes for standard or large capacity are replaced to use multiple sample volumes, please refer to “Removal and attachment of pump cassette” of “5.2 Time-change components” and change the all reagent tubes including the pump cassettes.

4. Startup and shutdown

The reagent dispenser RD-5 is operated by driving signals from the main detector. For the procedures for the startup and shutdown, see the instruction manual of the main detector (RA-5/MA-3000).

5. Maintenance

5.1. Daily inspection

Item	Inspection standard
Communication cable	1) Should be connected to the main detector and RD-5. 2) Should be fixed to the connectors using the screws of the communication cable.
Reagent tubes	1) Any connection should not be disconnected. 2) Any tube should not be bent or clogged. 3) The tubes should be filled with reagents.
Reagent bottles	1) Should contain the necessary quantities of reagents. 2) Any tube should not be bent or clogged.

5.2. Time-change components

We recommend that the following components be replaced periodically to use the product stably, though their lifetimes vary depending on the usage condition:

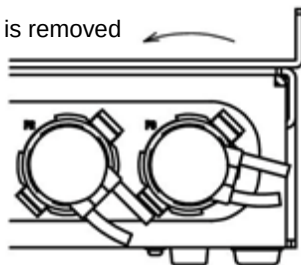
Item	Exchange period and replacement procedure
Reagent pump tube	Replace a tube approximately one year or 2,000 hours after the start of use. If any abnormality in a tube such as a crack is found, replace it even before the above period expires. <u>Replacement procedure</u> 1) Carry out the reagent ejection and remove the reagent tube. 2) Turn the cassette counterclockwise and pull it toward you to remove it. 3) Insert the new pump cassette with it aligned with the pump center axis, and turn it clockwise until it is locked. 4) Insert the new tube as before.
Reagent pump	Replace a reagent pump approximately three years or 3,000 hours after the start of use. If there is an abnormality such as an abnormal sound during rotation, replace the reagent pump even before the above period expires. <u>Replacement procedure</u> 1) Carry out the reagent ejection and remove the reagent tube. 2) Catch the hook with your finger, pull it out toward you and remove the connector. 3) Connect the connector of the new pump to that of the main unit, catch the hook in the notch in the main unit, and push it in. 4) Insert the tube as before.

* The recommended exchange period is not the guaranteed lifetime.

* Apply silicone grease on a pump tube.

- **Removal and attachment of pump cassette**

When pump cassette is removed



When pump cassette is attached

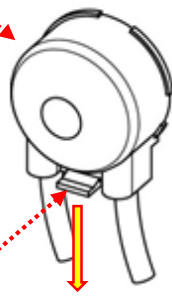


- **Removal and attachment of pump tube**

Pump cassette

Tube holder
hook

Pull.



Range for application of grease



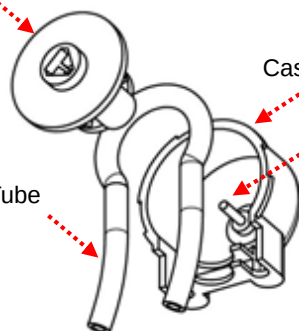
Tube

Rotor

Cassette

Shaft

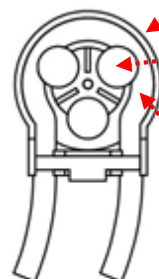
Tube



Cassette

Roller

The tube should be caught in the gap between the rollers and the cassette.



5.3. Yearly inspection

To use the product stably for a long period of time, we recommend that the instrument be sent back for annual maintenance.

In the sending back maintenance, the replacement of time-change components, repair, adjustment and performance check are carried out.

6. Detailed specification

6.1. Performance

Number of reagent pumps	3
Type of reagent pump	Tube pump
Diameters of pump tube	Standard : 1 mm (ID) × 3 mm (OD) Large : 3 mm (ID) × 5 mm (OD)
Maximum flow rate	Standard : 16 mL/min. (0.04 mL per revolution) Large : 120 mL/min. (0.28 mL per revolution)
Dispensing quantity	Variable control by upper instrument
Driving power source	Supplied as driving signals from upper instrument

6.2. Specification of external connection

Connector	D-sub 9-pin plug
Connection cable	D-sub 9-pin socket, straight connection

6.3. Dimensions and weight

Dimensions	When RA-5 is installed: 250 (W) × 230 (D) × 80 (H) (excluding protrusions) When SC-5 is installed: 180 (W) × 230 (D) × 80 (H) (excluding protrusions)
Weight	Approximately 2 kg

6.4. Power supply

Power supply other than the driving signal is unnecessary.

6.5. Standard accessories

Item	Description	Qty
Knurled screw	For fixing RA-5/SC-5 (M3×8)	1
Reagent bottle	110 mL screwed bottle with tube	3
Reagent bottle stand	Stand for 3 reagent bottles	1
Set of tubes	For in/out connection of reagent pumps	1
Pump tube	Spare part for pump tube	3
Communication cable	Dedicated communication cable for connection to upper instrument	1

6.6. Options

Item	Description	Qty
Reagent bottle (large)	250 mL screwed bottle with tube	3
Reagent bottle stand (large)	Stand for 3 reagent bottles (large)	1

7. Installation requirements

7.1. Atmosphere

Temperature	10-35°C * The instrument shall be used in an air-conditioned room in which there is no abrupt temperature change.
Humidity	10-80% r.h. There shall be no condensation.
Other atmospheric requirements	➤ The instrument shall not be used in dusty environment. ➤ The instrument shall not be exposed to the wind of an air-conditioner or direct sunlight. ➤ No corrosive gas or volatile organic solvent shall be detected.
Vibration	Shall not be sensed by a human body.
Installation location	Shall be horizontal and have sufficient strength.

7.2. Measures against electric noise

The RD-5 has been designed such that it complies with the standard concerning the electromagnetic compatibility (EMC).

However, if the instrument is exposed to conductive or emissive noise beyond the standard, the instrument may receive a bad influence. Do not install the RD-5 within a 10 m radius from an instrument that generates the above-mentioned noise, such as a high output electric power instrument, high frequency instrument, SCR controlled machine, emission spectrophotometer or electric welder.

Also be fully careful of static electricity.

8. Warranty

8.1. Warranty period and relevant item

The warranty period of the following shall be one year after acceptance:

- Reagent dispenser RD-5 main unit (excluding accessories and consumables)

8.2. Warranty terms

A failure caused by any of the following shall not be covered by this warranty. In that case, we will separately consult with the customer about measures.

- Abnormal condition such as a natural disaster
- Use of the instrument for a purpose other than the original one or beyond the specification
- Installation condition considerably different from the installation requirements
- Remodeling of the instrument without prior consultation with us
- Serious fault (including an operational mistake) or intentional act
- Consumable that has been consumed or component the life of which has expired

9. Precautions concerning disposal of instrument



Caution

If the instrument is discarded inadequately, environmental pollution or personal damage may result.

When discarding this instrument, do so appropriately according to the regulations, laws, etc. of each area.

Some parts of this instrument have hazardous substances.

Recycle metal components etc. if possible.

Request to reuse components for shipment of instrument

To use limited resources effectively, we request the following:

Packing materials and special tools for shipment that were used at the time of the shipment of this instrument become necessary in the case of relocation or the like.

We request you to retain them if possible and reuse them when they are needed.

10. Contact address



Nippon Instruments Corporation

URL <http://www.hg-nic.com>

Service Department

14-8, Akaoji-cho, Takatsuki-shi, Osaka 569-1146, Japan

Phone : +81 (0)72-693-6820

Fax : +81 (0)72-694-0663