CONTENTS

INSTRUCTIONS

BS-04***SSR Series

ROTARY SENSOR

IBS-04***SSR-2a
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JEOL

CONTENTS

BS-04***SSR Series

ROTARY SENSOR

Please be sure to read this instruction manual carefully, and fully understand its contents prior to the operation or maintenance for the proper use of the instrument.

JEOL

CONTENTS

NOTICE

- The following actions must be avoided without prior written permission from JEOL Ltd. or its subsidiary company responsible for the subject (hereinafter referred to as "JEOL"): modifying the instrument; attaching products other than those supplied by JEOL; repairing the instrument, components and parts that have failed, such as replacing pipes in the cooling water system, without consulting your JEOL service office; and adjusting the specified parts that only field service technicians employed or authorized by JEOL are allowed to adjust, such as bolts or regulators which need to be tightened with appropriate torque. Doing any of the above might result in instrument failure and/or a serious accident. If any such modification, attachment, replacement or adjustment is made, all the stipulated warranties and preventative maintenances and/or services contracted by JEOL or its affiliated company or authorized representative will be void.
- Replacement parts for maintenance of the instrument functionality and performance are retained and available for seven years from the date of installation. Thereafter, some of those parts may be available for a certain period of time, and in this case, an extra service charge may be applied for servicing with those parts. Please contact your JEOL service office for details before the period of retention has passed.
- In order to ensure safety in the use of this instrument, the customer is advised to attend to daily maintenance and inspection. In addition, JEOL strongly recommends that the customer have the instrument thoroughly checked up by field service technicians employed or authorized by JEOL, on the occasion of replacement of expendable parts, or at the proper time and interval for preventative maintenance of the instrument. Please note that JEOL will not be held responsible for any instrument failure and/or serious accident occurred with the instrument inappropriately controlled or managed for the maintenance.
- After installation or delivery of the instrument, if the instrument is required for the relocation whether it is within the facility, transportation, resale whether it is involved with the relocation, or disposition, please be sure to contact your JEOL service office. If the instrument is disassembled, moved or transported without the supervision of the personnel authorized by JEOL, JEOL will not be held responsible for any loss, damage, accident or problem with the instrument. Operating the improperly installed instrument might cause accidents such as water leakage, fire, and electric shock.
- The information described in this manual, and the specifications and contents of the software described in this manual are subject to change without prior notice due to the ongoing improvements made in the instrument.
- Every effort has been made to ensure that the contents of this instruction manual provide all necessary information on the basic operation of the instrument and are correct. However, if you find any missing information or errors on the information described in this manual, please advise it to your JEOL service office.
- In no event shall JEOL be liable for any direct, indirect, special, incidental or consequential damages, or any other damages of any kind, including but not limited to loss of use, loss of profits, or loss of data arising out of or in any way connected with the use of the information contained in this manual or the software described in this manual. Some countries do not allow the exclusion or limitation of incidental or consequential damages, so the above may not apply to you.
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- When this manual or the software described in this manual is furnished under a license agreement, it may only be used or copied in accordance with the terms of such license agreement.

- In some cases, this instrument, the software, and the instruction manual are controlled under the “Foreign Exchange and Foreign Trade Control Law” of Japan in compliance with international security export control. If you intend to export any of these items, please consult JEOL. Procedures are required to obtain the export license from Japan’s government.

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- Windows is a trademark of Microsoft Corporation.
- All other company and product names are trademarks or registered trademarks of their respective companies.

MANUFACTURER

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Telephone: 81-42-543-1111 Facsimile: 81-42-546-3353 URL: http://www.jeol.co.jp/

Note: For servicing and inquiries, please contact your JEOL service office.

WARRANTY INFORMATION

1 Limited Warranty

Products manufactured by JEOL Ltd. (hereafter “JEOL products”) that fail under normal use by the customer during the warranty period will be repaired or replaced, at JEOL’s discretion, without charge.
The components, modules and devices that are provided as replacements will be new parts or refurbished parts that provide the same performance as new parts. All components, modules and devices removed under this warranty become the property of JEOL.

1.1 Applicable Products

- This warranty applies only to hardware and software products manufactured by JEOL Ltd.
- For components that are not JEOL products, such as the computer, HDD, memory device, and the like, the warranty provisions of the respective manufacturers shall apply.

1.2 Warranty Period

- In the case of products for which the warranty period is recorded in the contract documentation, the recorded warranty period shall take precedence.
- If not specifically stated elsewhere, the warranty period is 12 months or a separately specified period from the date on which the acceptance test is completed after delivery to the customer.
- For components that are not JEOL products, like the computer, HDD, memory device, and the like, the warranty start date shall be the date on which the acceptance test is completed after delivery to the customer and the warranty periods established by the respective makers shall apply.
- In the event that parts are replaced or repaired free of charge during the warranty period, there is no change to the warranty start date or the warranty period for the product.

1.3 Scope of the Warranty

Failure diagnosis

If a problem occurs, contact your JEOL service office and describe the conditions and content of the problem. JEOL will assess the problem based on the situation and content of the problem.

Repair method

If it is determined that the problem is caused by a fault or defect of a JEOL product, repair or replacement will be performed free of charge. The choice of whether to repair or replace a component is entirely at the discretion of JEOL.

Warranty exclusions

This limited warranty does not extend to products for which any of the following situations apply. Even within the warranty period, in the situations listed below, a fee will be charged to repair the product.

- Product is operated or stored in an environment or under conditions that do not satisfy the specified installation requirements.
- The installation environment has changed (temperature, humidity, magnetic fields, etc.) since the time of installation.
- There is significantly accelerated deterioration of components and/or corrosion of electrical circuitry as a result of exposure to extreme temperature, humidity, or an environment containing highly-corrosive gases or excessive dust.
- The quality of the utilities (including electricity, water, gas, air quality) has worsened.
- The customer has relocated an installed instrument.

- Even in the case of a portable or movable instrument designed to be transported to a remote location or moved around for use by the user, damage or failures caused during the instrument relocation by the customer.
- Product has not been properly maintained.
- Consumable items or parts with the specified replacement period have not been replaced as specified.
- Corrupted operating system or application software, or damaged computer used with the instrument, caused by shutting down the main power to the computer without performing the proper shutdown sequence.
- Products that have been disassembled, modified or repaired by the customer in ways other than those specified in the instruction manuals provided with the instrument.
- Products with damage or failure caused by using them in combination with hardware, software, peripheral devices, and accessories that have not been provided or approved by JEOL.
- Damage or failure resulting from a situation caused by the customer, such as failing to properly manage the instrument, for which JEOL cannot be held responsible.
- Corruption of the operating system or application software, or damage to a computer used with the instrument, caused by fluctuations in the electricity or power failure.
- Product damaged as a result of fire, earthquake, flooding, lightning or other natural disaster, or due to local conflict or war.
- Damage or malfunction of operating system, application software, or the instrument itself as a result of infection by a computer virus.
- Instruments that have been restored after being disposed of or re-sold without prior written notice to and agreement from JEOL.

1.4 Items Not Covered by Warranty

- Regardless of whether a product is still within the warranty period, this warranty does not cover losses or damage to devices made by any other manufacturer at the customer site even if they are damaged by a malfunction of the JEOL product.
- JEOL is not responsible for any loss or damage to data recorded onto storage media, or to storage units. The customer is responsible for making back-up copies of their own data.
- Replacement parts for maintenance of the instrument functionality and performance are retained and available for seven years from the date of installation. Thereafter, some of those parts may be available for a certain period of time. Please contact your JEOL service office for details before the period of retention has passed.
- For items that are frequently updated, remodeled, or disappear from the market, like the computers used with the JEOL products, it may not be possible to obtain an exact replacement.

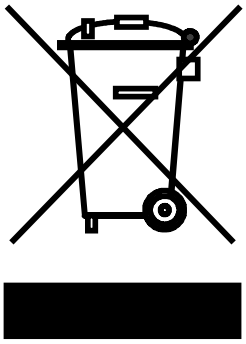
2 Repairs for a Fee

Repairs of JEOL products are available with charges after the end of the warranty period, or at anytime a customer requests. The components, modules and devices that are provided as replacements during the paid repair work will be new parts or refurbished parts that provide the same performance as new parts. All components, modules and devices removed during such repairs will become the property of JEOL.

- The warranty period for parts replaced and the service during paid repair work is a period of 3 months after the completion of the repairs; or, in the case of parts that must be periodically replaced, the warranty period is the length of the specified replacement period.
- In the event that repairs are performed again during the warranty period, there is no change to the warranty start date or the warranty period.

Notes on Disposal for Business Users

Attention:
Your product is marked with this symbol. It means that used electrical and electronic products should not be mixed with general household waste. There is a separate collection system for these products.



■ In the European Union

This symbol means that electrical and electronic equipment, at the end of its life, should be disposed of correctly.

In the European Union there is a separate collection system for used electrical and electronic products. Please help us to conserve the environment we live in!

Electrical and electronic appliances and machines often contain materials which, if handled or disposed of incorrectly, are potentially hazardous to human health and to the environment. They are, however, essential for the correct functioning of your appliance or machine. Therefore, please do not dispose of your old machine or appliance together with your household waste.

Your JEOL product is designed and manufactured with high-quality materials and components which can be recycled and reused. If the product is used for business purposes and you want to discard it, please contact your JEOL dealer, who will advise you about the end-of-life disposal arrangements.

■ Outside the European Union

If you wish to discard this product, please contact your local authorities and ask for the correct method of disposal.

NOTATIONAL CONVENTIONS AND GLOSSARY

■ Examples for general notations

– CAUTION –:	Important precautions for use, which, if not followed, may result in damage to or problems with the device itself.
IMPORTANT NOTICES :	Important notices for operating the instrument.
✍:	Additional points to remember regarding the operation.
☞:	A reference to another section, chapter or manual.
1, 2, 3 :	Numbers indicate a series of operations that achieve a task.
◆ :	A diamond indicates a single operation that achieves a task.
File:	The names of menus, commands, or parameters displayed on the screen are denoted with **bold** letters.
File–Exit :	Selecting a menu item from a pulldown menu is denoted by linking the menu and the item with a dash (–). For example, **File–Exit** means selecting **Exit** from the **File** menu.
Ctrl :	Keys on the keyboard are denoted by enclosing their names in a box.

This Rotary Sensor is of the crystal type and incorporates six crystal oscillators.
It functions as a sensor for deposition-rate control and monitoring.
When this sensor is installed in the IC/5 Thickness Controller, it automatically moves one crystal when a crystal failure takes place, thus enabling an evaporation or sputtering process to extend over a long period of time for continuous film formation.
When the optional ST-RSCONT is installed on the ST-XTC/2 Thickness Controller, automatic rotation of crystal oscillators following a crystal failure is possible.
The detection hole is in a fixed position, so there is no need to change the value of the factor each time the crystal oscillator is moved

CONTENTS

CONTENTS

SAFETY PRECAUTIONS

1. Before use

- Before using this product, read this manual carefully and understand the correct method of use.
- Fully understand safety precautions before operation. Also exercise utmost caution never to perform erroneous operation. In the worst case, personal injury or death can result.
- After going through this manual and the leaflets attached to component units, keep them at hand for immediate reference.

2. Cautions

The following are general precautions to be followed in using this product. Always comply with them. This product has been carefully checked for normal operation before shipment from the factory, but in the initial stage, abnormal actions can happen due to a fault, in aging or for other causes. To prevent possible accidents, the operator is requested to take multiple safety measures against accidents by considering possible malfunctions of this product and their aftereffects, and incorporate multiple safety features in the system or product.

Safety notations are classified into “WARNING” and “CAUTION”.

⚠ **WARNING :** Failure to comply with WARNING can be very dangerous and can lead a serious accident, such as loss of life or serious personal injury.

⚠ **CAUTION :** Failure to comply with CAUTION can be dangerous and can damage the product or cause personal injury. It can also lead to a serious accident depending on the situation. Always comply with CAUTION.

Labels using the following graphic symbols are affixed to dangerous locations of the instrument. Follow these cautions.

Examples:

⚠ WARNINGS

■ Wiring arrangement

Always ground the grounding terminal of JEOL instruments to Class A ground (ground resistance less than 10Ω) at one point. Otherwise, electric shock or fire can result.

■ Operation

High voltage is present in this instrument. Never touch the terminal part nor touch an internal component with a tool when it is energized with power. You may get electric shock. Also keep your hand off a rotating part. You may get injured on contact with it.

■ Maintenance

High voltage is present in this instrument. Never touch the internal part of the power supply when it is energized with power. You may get electric shock. Before access to components in the power supply, turn off the main power to the instrument.

⚠ CAUTIONS

■ Receiving check

Upon receipt of an instrument or part, make sure that it is the correct one you ordered.

■ Installation location

Never use the instrument in a place where temperature and/or humidity is high, the instrument may be splashed with water, in an atmosphere of corrosive or combustible gas or in the vicinity of inflammable gas nor in a place where dust or metal particles are present. Failure of the instrument, electric shock, fire or explosion can result.

■ Wiring

Arrange all cables correctly and connect them securely.

■ Operation

- In the initial stage of test run, do not run the instrument under full load to avoid unforeseen accidents.

- If the instrument is used as a component of a system, provide an interlock and emergency stop switch to eliminate the risk of danger. Otherwise, you may get injured.
- If an alarm is given, eliminate its cause and reset the instrument after checking for safety before restarting operation. Otherwise, you may get injured.

■ Inspection and Maintenance

Do not change the wiring to this instrument and to the user's equipment energized with power. You may get electric shock or injured or the instrument may be damaged.

● Cautions in installing the instrument

■ Operate the instrument at an ambient temperature of 5°C to 40°C and an ambient humidity of 90% or less.

- Do not install the instrument in a place where conductive powder like dust particles or metal powder, oil mist, cutting fluid, water content, salt, organic solvent, etc. are present.
- Do not install the instrument in a place bathed with direct sunlight or radiation heat.
- Do not install the instrument in a place where high intensity electric field or high intensity magnetic field is generated or a place where the instrument may be subject to electromagnetic interference, electrostatic discharge or radio frequency interference.
- Do not install the instrument in a place where vibration or impact is transmitted to the instrument.
- Provide the following space around the instrument for ventilation, heat exhaust and maintenance.
  1 m on the front, 1 m on the back, 1 m on the side, 0.3 m above the instrument
  * Secure space for maintenance.
- The floor should be rigid enough to withstand the instrument weight and be free from vibration from outside.

● Cautions in incorporating the instrument into user's system

- When installing a part of this instrument in a system, make sure that the temperature in the instrument does not exceed 5°C to 40°C by cooling components in the system, and others.
- If there is a source of vibration near the instrument, install a shock absorber or other to hold the vibration transmitted to this instrument below the specified level of 0.5 G.

● Cautions in Wiring Arrangement

■ **In wiring arrangement, see to it that the diameter of wiring, type of wiring and maximum wiring length do not exceed the specified values.**

■ **Take the following actions against noise.**

- Install a noise filter as close to the controller as possible.
- Install surge absorbing circuits for relays, electromagnetic contactors, solenoids, and other coils.
- In making wiring arrangement, lay power lines (AC power line, motor line, etc.) and signal lines more than 30 cm away from each other. Do not pass them in the same duct nor bind them together.

  Keep high voltage cables and other wiring more than 50 cm away from each other (except when accommodating them in a shielded wiring duct.) Do not accommodate them in the same duct or bind them together.
- If the instrument is operated on the same power as that for an electric welding machine, electric discharge machine or other or if there is a high-frequency noise generating source nearby, though the same power is not used, install noise filters in the power supply and input circuit, .
- When a load (electron beam gun for deposition) is connected to the instrument, arc discharge may be produced depending on the operating conditions on the load side and may generate high-frequency spike noise. This may cause malfunction of and damage to components of the user's system. Check the entire system for earth wiring and wiring arrangement to make the instrument immune from them. Also install a surge absorbing circuit and an insulation amplifier on parts that may be affected by such noise.

■ **See to it that cables are free from bend or tension.**

Safety Instructions for Using JEOL Products

- **Products using materials hazardous for operators or equipment**
  When measuring, indicating, or detecting harmful or corrosive substances, or voltages or other electrical quantities that may cause electric shock, read the instruction manual carefully to assure proper operation. Ensure that all operators of the instrument receive training on the operation method.
  If there is a problem in the product, take appropriate measures in accordance with the instruction manual and contact a JEOL service office immediately.

- **Products having accessible parts that reach high temperatures**
  If an accessible part of the product reaches a high temperature while it functions, notify all the operators to exercise cautions whenever they will be near any such parts.
  It is recommended to take measures to restrict the access to the instrument by enclosing with rope or chain.

- **Using JEOL product for an integrated system with other manufacturer's product**
  Consult your JEOL office. We assume no responsibility for any damages resulting from using the product in combination with other manufacturer's product without consultation.

- **Using product in an environment that does not satisfy the installation requirements**
  Consult your JEOL office. We assume no responsibility for any damages resulting from using the product in an environment other than one specified by JEOL without consultation.

- **Attachment used for JEOL product**
  For safety reasons, only use the accessories or attachments that are supplied or designated by JEOL. We assume no responsibility for any damages resulting from using any accessory or attachment other than those specified by JEOL.
  Do not replace detachable main power supply cords with inadequately rated cords.

CONTENTS

1. Specifications

1-1. Sensor tube

Sensor outer dia.	ϕ 50
Mounting hole diameter	2 inches
Sensor dimensions	Table 1
Drive method	Air-driven, 0.4MPa (max 0.7MPa)
Connection port diameter	6mm (air)
Cooling system	Water-cooled jacket, 2L/min (0.2MPa)
Connection port diameter	6mm (cooling water)
Crystal temperature	100℃ max
Cooling water temperature	30℃ max
Sensor position detecting check connector wiring	Fig.1

Table1 : Sensor dimensions

	Name	Sensor dimensions
BS-04010SSR	ROTARY SENSOR (200mm)	200 mm
BS-04020SSR	ROTARY SENSOR (300mm)	300 mm
BS-04030SSR	ROTARY SENSOR (350mm)	350 mm
BS-04040SSR	ROTARY SENSOR (400mm)	400 mm
BS-04050SSR	ROTARY SENSOR (450mm)	450 mm
BS-04060SSR	ROTARY SENSOR (480mm)	480 mm
BS-04070SSR	ROTARY SENSOR (500mm)	500 mm
BS-04080SSR	ROTARY SENSOR (540mm)	540 mm
BS-04090SSR	ROTARY SENSOR (545mm)	545 mm
BS-04100SSR	ROTARY SENSOR (580mm)	580 mm
BS-04110SSR	ROTARY SENSOR (650mm)	650 mm

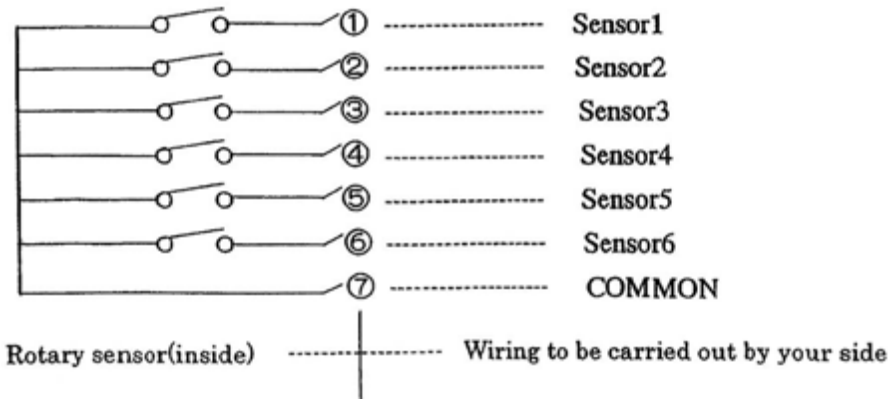


Fig.1

1-2. Rotary sensor head specifications

Crystal six crystal oscillators installed (6MHz AT-CUT)

Rotary sensor head Table 2

Table 2 : Rotary sensor head

	Name	head angle
BS-04120SSH	ROTARY SENSOR HEAD (180DEGREE)	180 degree
BS-04130SSH	ROTARY SENSOR HEAD (45DEGREE)	45 degree

1-3. Cu cap specifications (optional)

When the crystal holder temperature is estimated to exceed 100℃ due to the ambient temperature conditions, fit a Cu cap.

Cu cap Table 3

Table 3 : Cu cap

	Name	Reference
BS-04140CAP	ROTARY SENSOR CAP (FLAT)	for BS-04120SSH
BS-04150CAP	ROTARY SENSOR CAP (45DEGREE)	for BS-04130SSH

1-4. Solenoid valve kit specifications (optional)

Solenoid valve kit Table 4

Table 4 : Solenoid valve kit

	Name	voltage
BS-04160KIT	ELECTROMAGNET VALVE KIT (5V)	5V
BS-04170KIT	ELECTROMAGNET VALVE KIT (24V)	24V

2. Fitting Procedure

a) Fit the sensor to the chamber.
b) Carry out the inlet/outlet piping for cooling water.
c) Carry out air piping.
d) Connect between the BNC connector and the 6MHz OSC of the quartz-type film thickness controller or of the film thickness monitor.
e) When you use a solenoid valve kit, connect the drive circuit to the solenoid valve. (Fig. 2)

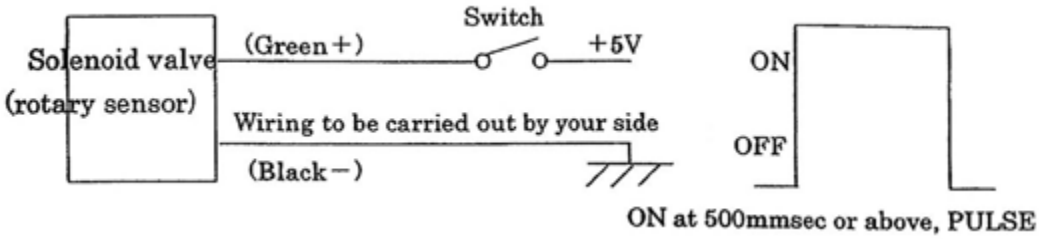


Fig. 2

3. Function Check

3-1. IC/5

Supply cooling water and air.
Set the power switch of the film thickness controller (IC/5) to ON.
The rotary sensor rotates to check quartz crystals automatically.
It returns to 1 after checking No.1 to 6.

3-2. XTC/2

Supply cooling water and air.
When you use ST-RSCONT, refer to Paragraph 6.

3-3. JTC-820

Supply cooling water and air.
Disconnect the BNC of the rotary sensor.
Make sure that the quartz crystals move automatically one by one.
Connect the BNC when the positional indication of the upper sensor becomes 1.

3-4.Others

Supply cooling water and air.
Make sure that the quartz crystals are moved one by one by setting the external switch to ON.

4. Replacement

4-1. BS-04120SSH　(Rotary sensor head 180degree type)

Refer to Fig. 6.

a) Remove the cover (RS110).

b) Loosen the bolt (RS111) at the sensor holder center to remove the whole holder.

c) Remove the M3 bolt on the retainer (RS107).

d) Remove the quartz crystal from the sensor holder (RS109) and replace it with a new one.

e) After completion of replacement, fit a new quartz crystal by reversing the steps form a) to d).

4-2. BS-04130SSH　(Rotary sensor head 45degree type)

Refer to Fig. 7.

a) Remove the cover (RH208).

b) Loosen the bolt (RH205) at the sensor holder center to remove the whole holder.

c) Remove the M3 bolt on the retainer (RH203).

d) Remove the quartz crystal from the sensor holder (RH103A) and replace it with a new one.

e) After completion of replacement, fit a new quartz crystal by reversing the steps form a) to d).

5. Temperature Conditions

The rotary sensor's temperature data are as shown in Fig. 5.
The temperature data varies largely with the installation position of the sensor.
Just use the following data for your reference.

The quartz crystal is best in the 30－50℃ temperature range of the sensor holder.
When the sensor holder temperature is estimated to exceed 100℃ due to the ambient temperature conditions.

(1) Fit an adiabatic cover around the sensor.
(it is best if the sensor is water cooled)

(2) Or, fit a Cu cover (BS-04140CAP, BS-04150CAP).

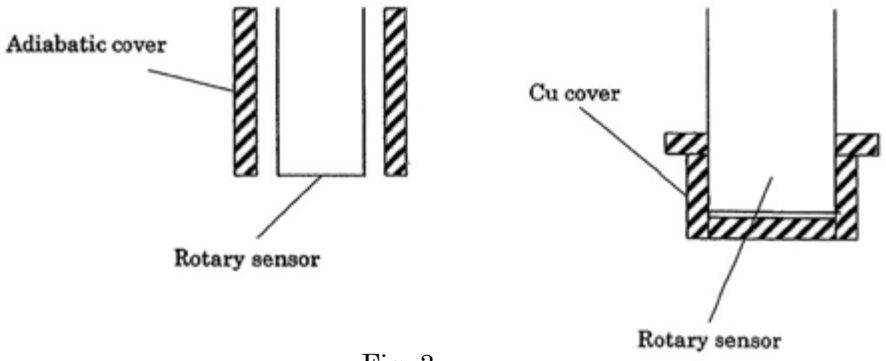


Fig. 3

6. ST-RSCONT

When you use the rotary sensor for the XTC/2 film thickness controller, fitting this unit allows automatic rotation of the rotary sensor at XtalFail, to enable detection with the next quartz crystal.

6-1. Wiring

a) Wire the grounding cable and an AC100 socket.
b) Carry out the wiring between the 10-pin connector (for XTC/2) and SYSTEM I/O (for XTC/2). (Use the attached cable)
c) Carry out the wiring for two systems; one is from Sensor 1 connector-5 pin to the rotary sensor valve and the other from it to the OSC cable.
(Use the attached cable).
d) Connect the OSC cable (Short) from Sensor 1 to the BNC connector of the rotary sensor, and connect to it the OSC from the film thickness controller.

6-2. Film thickness controller program

Set 6(14) of Switch 2 (the back configuration switch on XTC/2) to ON.
With two rotary sensors, set 6.7(14,15) of switch 2 to ON.

6-3. Function Check

a) When the piping is completed, supply cooling water and air.
b) Carry out the wiring in accordance with 6-1.
Then set the power switch to ON, and make sure that the power indicator lamp lights up.
c) Set the power switch of the film thickness controller (XTC/2) to ON.
The rotary sensor rotates to check Xtals automatically.
It returns to 1 after checking No.1 to 6.

6-4. Positional detection signal and Xtal No.indication of film thickness controller

With XTC/2, the film thickness controller's position at power ON does not necessarily agree with the positional detection signal because the position is indicated as Xtal No.1.

Cope with XtalFail taking place before the start of control, by Xtal switch ON.
(It is not coped with automatically)

7. Outer View

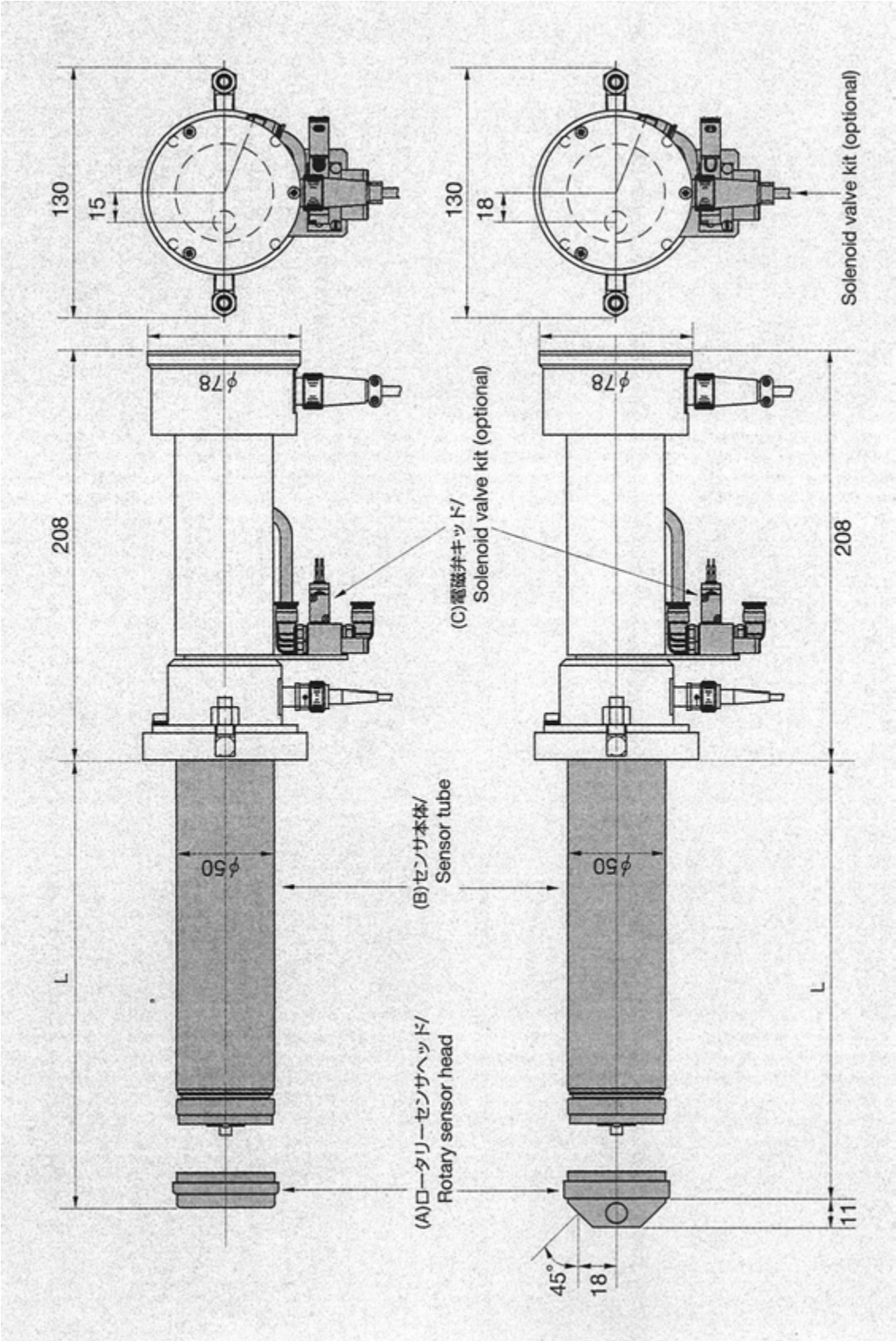
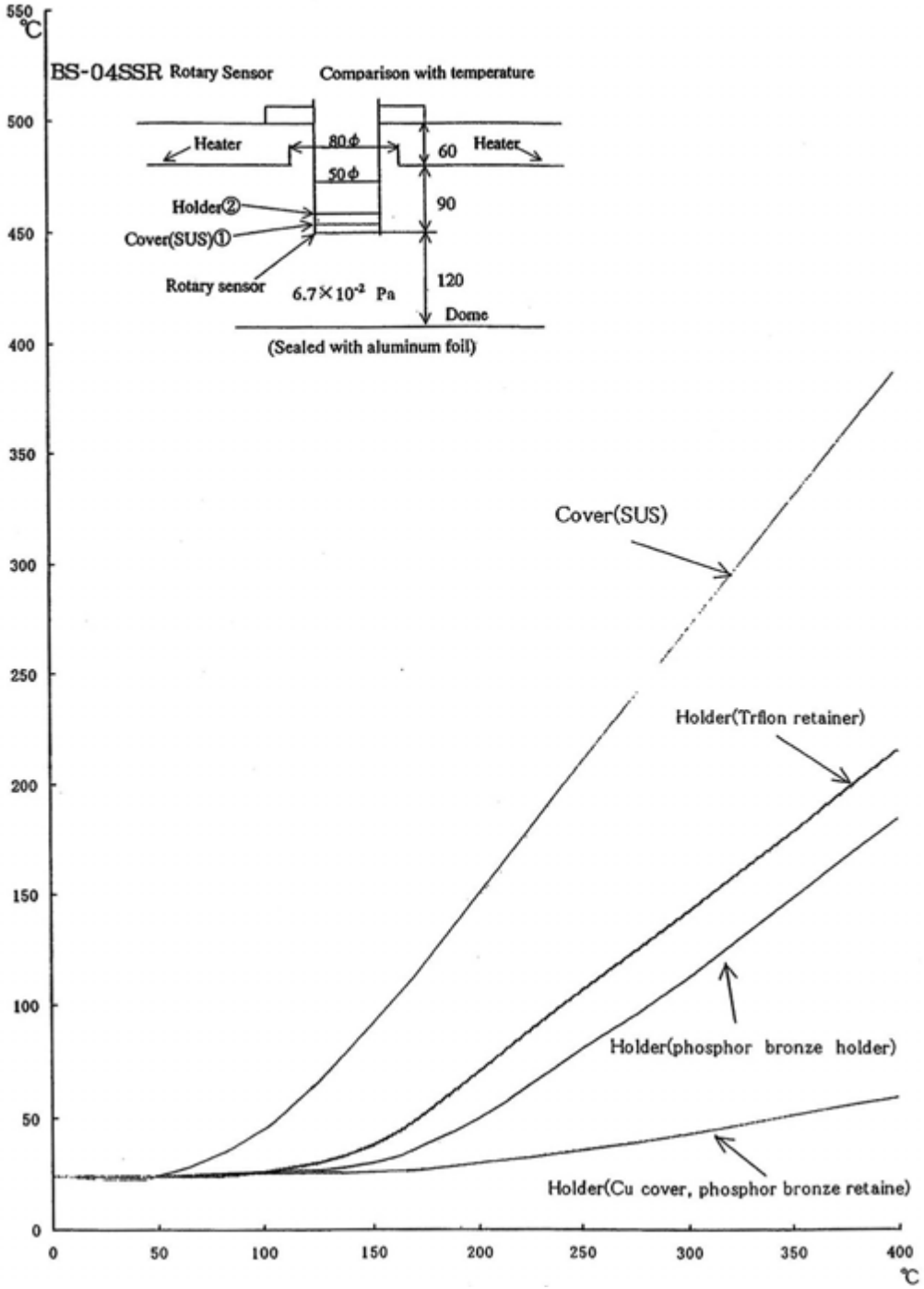
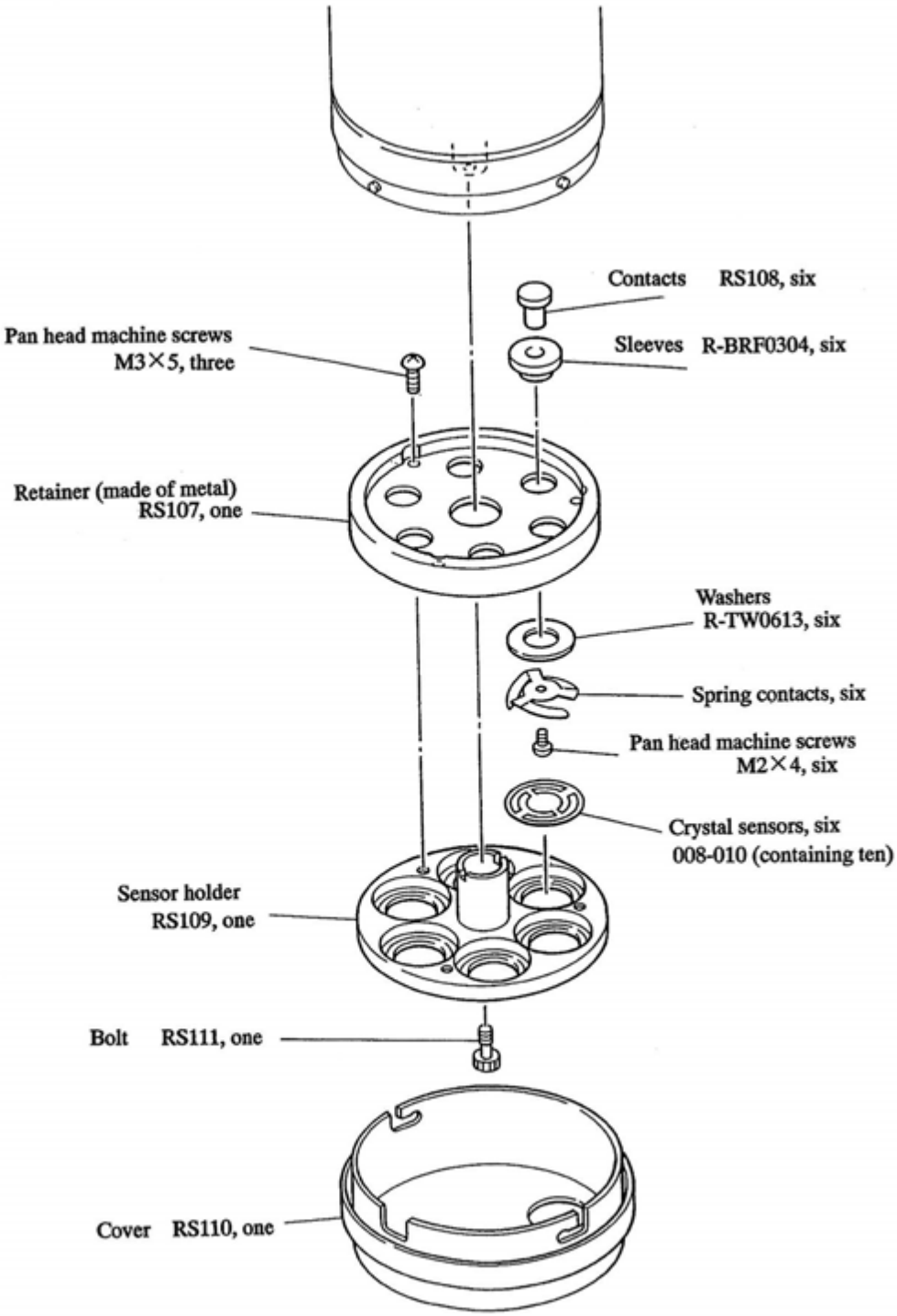


Fig. 4



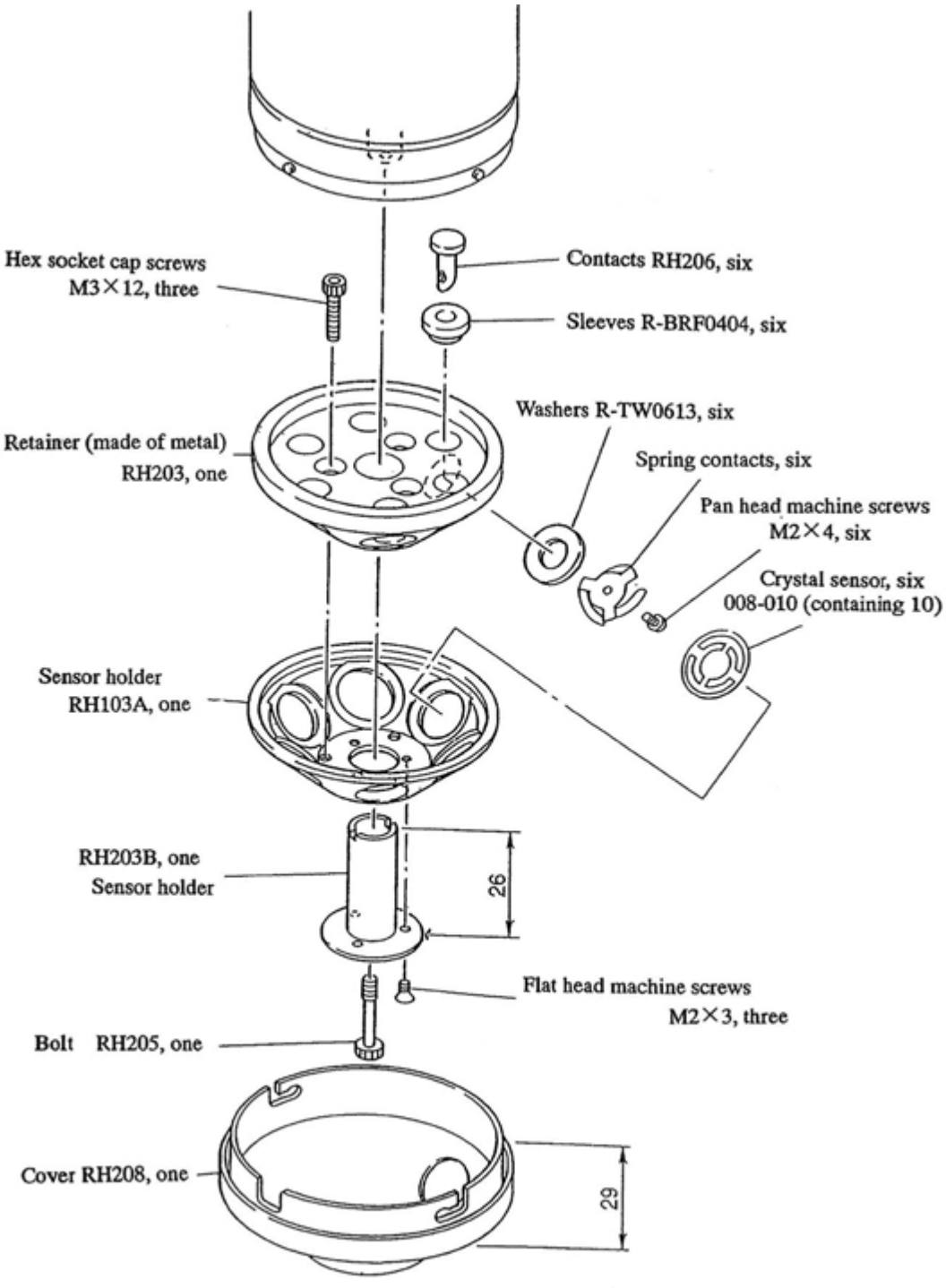
Dome temperature

Fig. 5



Rotary Sensor Head (Flat Type)

Fig. 6



Rotary Sensor Head (45° -Tilt Type)

Fig. 7