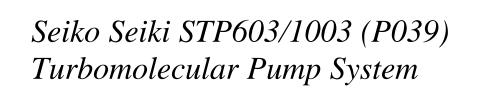
Instruction Manual



(Document number MT-39E-001-D)



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STP-603/1003 Series Turbomolecular Pump INSTRUCTION MANUAL (First Edition- d)

Read through the Safety Precautions and each section of this Manual carefully before using the STP pump.

Keep this Manual in a place where you can quickly access it at any time.

SAFETY PRECAUTIONS

The Safety Precautions in this Manual constitute guidelines to protect operators, the STP pump and its peripheral equipment. To avoid personal injury and prevent product and/or peripheral equipment damage, observe the Safety Precautions as well as the general safety rules (your country's laws, regulations, safety standards and so on). If the equipment is used in a manner not specified by BOC Edwards, the protection provided by the equipment may be impaired.

SYMBOLS

The following symbols are used in this manual:



Death or Serious Personal Injury

Failure to follow the guidelines marked with this symbol may result in death or serious personal injury.

ACAUTION

Minor Personal Injury, Product and/or Peripheral equipment Damage

Failure to follow the guidelines marked with this symbol may result in minor personal injury, product and/or peripheral equipment damage.

Items you must follow during operation and maintenance.

ATTENTION : refer to this manual.

BOC Edwards Japan Limited (hereafter called BOC Edwards) cannot perfectly anticipate circumstances of all of hazards or problems. The <u>scope of anticipation</u> is limited to the precautions included in the



specified in this manual.

WARNING

- The STP pump is provided with a high-speed rotor. Secure the STP pump according to the specified method. Failure to do so may lead to serious personal injury, product and/or peripheral equipment damage if any abnormality/error occurs in the rotor.
- The STP pump operates at high temperatures while the baking heater or the Temperature Management System (TMS) unit is in operation. NEVER touch the STP pump and its peripheral equipment while the baking heater or TMS unit is in operation. Operators can burn hands.

Execute the following to prevent an accident caused by the gas.

- Check the properties of the gas to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier. (explosive • combustible • toxic • corrosive, etc) And, keep MSDS and a safety advice of gas supplier.
- Warn of the danger of the gas with the warning label when the use gas is hazardous chemical materials.
- Always execute gas purge in the pump with the inert gas, and then exhaust residual gases thoroughly from the STP pump when removing the STP pump from the vacuum equipment.
- Secure safety by wearing personal protective equipment when using the gas which might influence damage health. In addition, take appropriate measure for depending upon the properties of the gas to be used.
- Exhaust residual gas thoroughly when disposing of the STP pump. If the STP pump is used for any toxic or reactive gas, always clean the STP pump and dispose of it as industrial waste in accordance with guidelines given by the national and/or local government. Residual gas in the STP pump may cause an accident which, for certain gases, may involve serious injury or death.

- NEVER use any gas that is not specified as usable in this Manual.
 The use of such gas may corrode the STP pump and damage it.
- A hazardous live voltage may exist at connector/terminal that marked

DO NOT touch the terminal. Doing so may result in electric shock. When operating connection/disconnection to connector, always power OFF the STP pump (Switch the breaker "OFF").

- Always check the STP pump has stopped, then turn OFF the primary power (switch the breaker "OFF") before proceeding to any of the following operations. Failure to do so may cause the STP pump to rotate accidentally, which may injure operators seriously or result in electric shock. Moreover, do not remove the connecter while the pump is rotating. The voltage might be output to connector according to the rotational speed, and it causes the electric shock or the failure.
 - Connect or disconnect cables;
 - Perform maintenance such as replacement of fuses;
 - Perform inspections such as deposit and/or the air cooling fan; or
 - Perform investigations into probable causes and action/measures taken in the event of occurrence of a problem.
- O not perform the insulation test (insulation resistance test and withstand voltage test) to the STP control unit and STP pump. When performing the insulation test to your equipment, turn "OFF" the STP control unit. The varistor for the power supply line protection is installed to the STP control unit. DO NOT perform the insulation test with the varistor installed. Doing so may result in product damage.
- When "emergency off" (EMO) circuit is installed in the vacuum equipment, consider the following to stop the STP pump safely when the EMO circuit operates.
 - When the EMO circuit operates, atmosphere might be introduced in the STP pump depending upon the backing pump. Unite the exhaust gas system to prevent atmosphere from being introduced into the STP pump when the EMO circuit operates. (example: shut the valve) When atmosphere is introduced into the STP pump, the touch down bearing may not operate normally.

ACAUTION

- When removing or installing the pump or at maintenance and inspection, follow the precautions below. Failure to do so might hurt your back or cause injuries due to occurrence of an accident such as fall.
 - Use a crane or the like when lifting the heavy product of 18kg or more.
 - When lifting by hands for unavoidable reason, two or more people must always conduct it.
 - When lifting STP control unit with handles, support bottom of STP control unit, do not have only handle.
- Install the STP control unit not only by fitting it with the front panel fitting screws but also by supporting it from the bottom side.
 Fitting the STP control unit with the screws only cannot sustain its weight, and therefore resulting in product damage.
- Always use the STP pump and STP control unit with same model name, which are specified on their own nameplate. If you plan to use the units having different model names, an error massage is indicated and they may not be used. In the latter case, contact Service office. If you plan to use the units having the same model name but different serial numbers, an error message is indicated when they are used without tuning. And, the tuning is necessary when the length of the STP connection cable is changed. They may not function normally when they are used without tuning. Once tuning is completed, re-tuning is not required unless the configuration (the STP pump serial number, the STP control unit serial number, and the STP connection cable length) is changed.
- Use the STP connection cable that BOC Edwards has specified.
 The use of different cables may result in product damage.
- Connect the cables securely. NEVER bend nor place heavy objects on the cable. Doing so may result in electric shock or product damage.
- NEVER remove the splinter shield from the STP pump. Doing so may result in product damage.
- DO NOT put foreign objects into the STP pump. Doing so may result in product damage.
- Always use the power voltage specified on the nameplate for the primary power voltage of the STP control unit. Wire the power cable securely. Incorrect wiring may result in electric shock or product damage.
- The wipes used for clean the flange of the pump might become hazardous waste depending upon the solvent (alcohol). Dispose of the contaminated wipes appropriately according to the regulations of each national and/or local government.

ACAUTION

- NEVER turn OFF the primary power (DO NOT switch the breaker "OFF") while the STP pump is rotating. Doing so may result in product damage.
- Perform investigations into probable causes and remove them before restarting the STP pump in the event of the occurrence of a problem.
 The use of the abnormal STP pump may result in product damage.
- DO NOT move the STP pump and the STP control unit while the STP pump is in operation. Doing so may result in product damage.

INTRODUCTION

Thank you very much for purchasing BOC Edwards' turbomolecular pump. The turbomolecular pump is designed to be installed in the vacuum equipment to exhaust gases from it.

This manual covers all items necessary to ensure safe installation, operation and maintenance of the following series of the STP-603/1003 turbomolecular pump:

Model Name	Specification
• STP-603	High-throughput type
 STP-1003 	High-throughput type

- STP-1003 High-throughput type • STP-603C High-throughput type, chemical specific
- STP-1003C
- High-throughput type, chemical specific *1

For the specifications of other models of the STP-603/1003 pump series, contact BOC Edwards.

In this manual, the above STP-603/1003 pump series is collectively referred to as the "STP pump."

APPLIED STANDARDS

The STP pump conforms to the following directives and standards:

- \diamond Applied Directives
 - EC Machinery Directive
 - EC Electromagnetic Compatibility Directive
 - EC Low Voltage Directive
- \diamond Applied Standards
 - EN1012-2
 - EN61010-1
 - EN61326 (class A)
 - EN61000-6-2
- \diamond Applied Standards (Only a some model)^{*1}
 - UL3101-1, 1993 (Electrical Equipment for Laboratory Use; Part 1: General Requirements)

PRECAUTIONS

- 1) No part of this manual may be reproduced in any form by any means without prior written permission from BOC Edwards.
- 2) BOC Edwards pursues a policy of continuing improvement in design and performance of this product. The right is, therefore, reserved to vary specifications and design without notice. Understand that the product you purchased and its contents including specifications described in this manual may differ.

REQUEST

If you find inaccuracies or errors in this manual, advise distributor or the nearest Service office.

^{*1} : Contact BOC Edwards about recognized model.

LIMITED WARRANTY

This WARRANTY applies to the customer to whom BOC Edwards has delivered this product.

1. WARRANTY PERIOD:

BOC Edwards warrants this product against defects for a period of two (2) years from the date of delivery or during the period specified in the agreement made by and between the customer and BOC Edwards.

2. ITEM WARRANTED:

- 1) This warranty applies only to the product delivered from BOC Edwards to the customer.
- 2) If any defect is found during this period, BOC Edwards will, at its option, repair or recondition the product free of charge. The costs for repair or replacement of the product after the warranty period has passed will be at your own charge.
- 3. DISCLAIMER:

BOC Edwards makes no warranty with respect to any damage occurred due to any of the following during the warranty period:

- 1) Handling, operation or maintenance other than that specified herein;
- 2) Failure to follow any of the warnings or cautions enumerated under



- 3) Installation, operation or maintenance using parts which are not specified by BOC Edwards;
- 4) Maintenance personnel other than those authorized by BOC Edwards or Service office have disassembled, reconditioned, or tampered the product;
- 5) Defect resulting from the not-specified use of the product;
- 6) When the product is used under special conditions without obtaining the written consent of BOC Edwards (Particular gases, strong magnetic field and the radiation are added to the product.);
- 7) Defect resulting from deposit;
- 8) Water cooling system defect resulting from water quality used;
- 9) Defect resulting from the installation of the product (Exclude the installation by authorized personnel.);
- 10) Deterioration in the external because of use (Discoloration, scratches and so forth.);
- 11) Product damage occurred during transport or other factors not attributable to BOC Edwards;

- 12) Product breakage or damage due to natural disasters, fire or other external factors;
- 13) Deterioration in the basic performance due to the use of the product beyond limits of the use;
- 14) Any direct, incidental or consequential damage resulting from the use of the product;
- 15) When continuously operated without overhaul after the WARNING indication ("WARNING" message) on the LCD display;
- 16) Overhaul and replacement of maintenance parts;
- 4. SPARE PARTS:
- Fuse and air cooling fan for control unit
- Touch down bearing
- Heater

SAFETY PRECAUTION

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Installation

1 Precautions for Safe Operation of the STP Pump

1.1 Usable Gases

Chlorine or fluorine system gases can be used in chemical specific pumps (STP-603C/1003C or other models). When you use gases including alkaline metals, but excluding Li, gases including Ga, Hg, In, or Sn, or HBr, contact BOC Edwards.

AWARN I NG

To prevent an accident, confirm the characteristics of gases to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier.

And, keep MSDS and a safety advice of gas supplier.

A CAUTION

- NEVER use corrosive gases (chlorine, fluorine, or other system gases) in the STP-603/STP-1003 pump or other models without anti-corrosion treatment.
- Introduce a dry N₂ gas (purge gas) to protect the inside of the STP pump when using reactive or corrosive. The use of reactive or corrosive gas may result in product damage.
- Cool the STP pump to prevent the STP pump from overheating when pumping gases.

1.2 Maintenance and Inspection Precautions

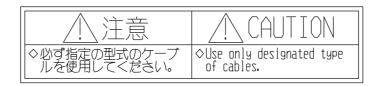
Perform any maintenance or inspection of the STP pump and the STP control unit, following Section 11.6, "Maintenance and Inspection."

1.3 Labels

The following labels are affixed to the STP pump and STP control unit. Read the contents of the labels before operation.

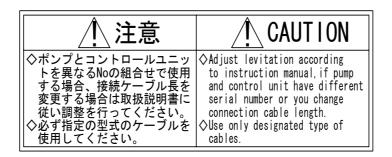
1) STP Pump Caution Label

This label describes precautions for operating the STP pump. Follow these precautions.



2) STP Control Unit Caution Label

This label describes precautions for operating the STP control unit. Follow these precautions.



3) Heavy Product Caution Label

This label is affixed to the product with a weight of 18 kg or more. Follow the precautions of <u>Section 3, "Unpacking"</u> so as not to cause any accident during handling.



4) STP Pump Installation Warning Label

This label describes installation of the STP pump.

Install the STP pump according to the precautions of <u>Section 4</u>, "Installation <u>of the STP Pump.</u>"



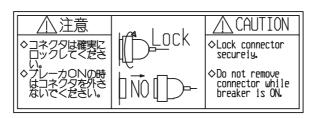
5) STP Control Unit Safety Instruction Label

This label describes instructions before operating the STP control unit.

安全上の指示事項	SAFETY INSTRUCTIONS
使用前に取扱説明書を お読みください。	Read instruction manual before operation.

6) Connector Caution Label

- \diamondsuit This label describes lock of the connector.
- ♦ This label instructs operators to prevent the connectors from being disconnected while the STP pump is in operation.



7) High Voltage Device Caution Label

The STP control unit is equipped with a high voltage device. This label warns operators to pay attention to the high voltage device.



8) Rotational Direction Instruction Label

This label describes the rotational direction of the STP pump. The STP pump rotates in this direction.



9) Voltage Rating Label

This label describes the rated voltage of the STP control unit. Use voltage specified in this label.

AC100-120V/200-240V \sim

10) Hot Surface Warning Label

This label instructs operators so as not to touch the hot surface of the STP pump.

The use of the baking heater (optional accessory) may lead to a considerable rise in temperatures outside the STP pump.

This label warns operators so as not to burn hands.

(only when using the baking heater.)



2 Operation Principle of the STP Pump

The STP series pump is a series of a magnetically-levitated turbomolecular pumps, featuring the following:

- Oil free
- Low vibration
- High reliability

The STP pump is configured so that rotor blade (1) and stator blade (2) are aligned alternately in the axial direction. Gas molecules are pumped from the inlet port to the outlet port by the high speed rotation of the rotor.

Rotor blade (1) is supported by the magnetic bearing without mechanical contact. Therefore, the STP pump requires no lubrication oil unlike conventional turbomolecular pumps using ball bearings.

The magnetic bearing consists of 5 pairs of active magnetic bearings. The rotor is supported in the radial direction by 4 pairs of radial direction active magnetic bearings that consist of radial sensor (3) and radial electromagnet (4). A pair of axial direction active magnetic bearings consists of axial sensor (5) and axial electromagnet (6) to support the rotor in the axial direction. Because the rotor is supported without mechanical contact, it can rotate at low vibration.

There is less heat generated from magnetic bearings because there is no friction. Therefore the STP pump requires no cooling. However, the STP pump requires water or air cooling during baking and gas pumping. Taking into consideration a breakage of magnetic bearings, touch down bearings (7) coated with solid lubrication have been installed. They do not contact with the rotor during the rated operation.

A radial sensor, an axial sensor, a rotation sensor and a temperature sensor always monitor the magnetic bearing as well as the rotor. If an abnormality/error occurs, the rotor will stop.

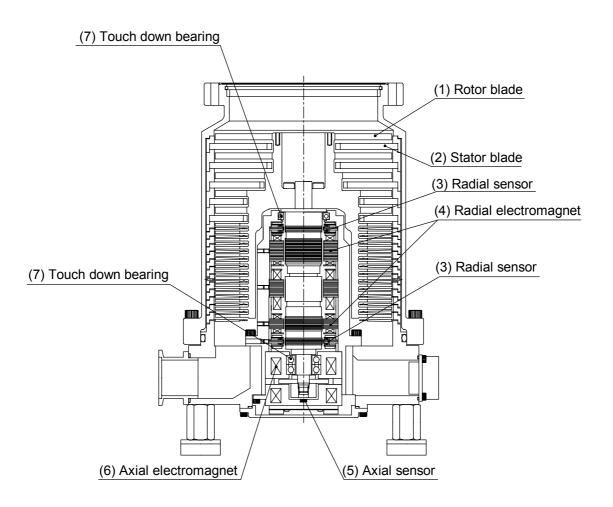


Figure 2.1 Cross Sectional View of the STP Pump

3 Unpacking

3.1 Unpacking the STP Pump and the STP Control Unit

Check the following before unpacking the STP pump and STP control unit.

- Check the package for bruises, breakage, wetness, and other. If there is any abnormality/error or it is judged necessary to return the product, contact BOC Edwards or the selling agency.
- Check the contents of the package.

ACAUTION

The net weight of the STP pump is approx. 31 kg. Use a crane or other appropriate means to lift the STP pump.
 Lift the STP pump with an eyebolt or a similar tool that uses the fitting hole attached to the inlet port flange.
 Lift it with the aid of a suspension tool under the base when installing the STP pump without fitting hole.

- Observe national laws/regulations, safety standards and so on when lifting the STP pump.
- ◇ Use a crane or other appropriate means sufficient enough to withstand the load when lifting the STP pump.
- Always lift the STP pump in stable places free of excessive shock or vibration to prevent it from shaking or dropping.
- \diamond Have at least two people lift the STP pump when doing so by hand.

NOTICE

- Be careful not to scratch the flange of the STP pump.
 Before installing the STP pump, check whether or not there are scratches on the surface.
- It is recommended to keep the packaging materials, such as the corrugated fiberboard container and cushioning material for possible reuse.

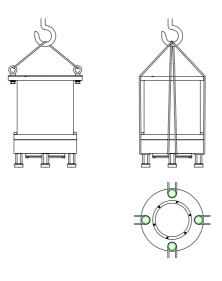


Figure 3.1 Example of Lifting the STP Pump

3.2 Accessories

Table 3.1 Accessories

Item	Q'ty	Remarks
STP control unit	1	
Primary power cable ^{*1}	1	With a single-side connector
STP connection cable ^{*1}	1	With both-side connectors
Inlet port cover	1	
Outlet port cover	1	
STP connector cover	1	
Blank flange for purge port	1	KF10
		(attached only to the chemical specific pumps)
Clamping ring for purge port	1	KF10
		(attached only to the chemical specific pumps)
O-ring washer for purge port	1	KF10
		(attached only to the chemical specific pumps)
Leg	8	4 legs are attached to the STP pump
Rubber foot for leg	4	
Instruction Manual	1	

^{*1 :}The standard cable length is 5 m. Both 10 m and 20 m are available. Contact BOC Edwards on other specifications.

4 Installation of the STP Pump

4.1 Name and Function of Each Part

- (1) Inlet Port Flange (VG^{*1}, ICF^{*2}, ISO, and other)
 - Connected to the vacuum equipment (at the high vacuum side).
- (2) Outlet Port Flange (KF^{*1} 40)
 - Connected to the inlet port side of the backing pump.
- (3) STP Connector (60 pins)
 - Connected to the STP connection cable.
- (4) Purge Port (KF^{*1} 10) [Chemical specific pump]
 - Introduces a purge gas.

This port is attached only to the chemical specific pump. In order to protect the inside of the STP pump when pumping reactive or corrosive gases. The STP pump is delivered with a blank flange attached to this

The STP pump is delivered with a blank flange attached to f port.

- (5) Cooling Water Port (PT^{*3} (Rc^{*1}) 1/4 Female Screw)
 - Connected to the STP pump cooling water pipe.

^{*&}lt;sup>3</sup> : Conform to ISO

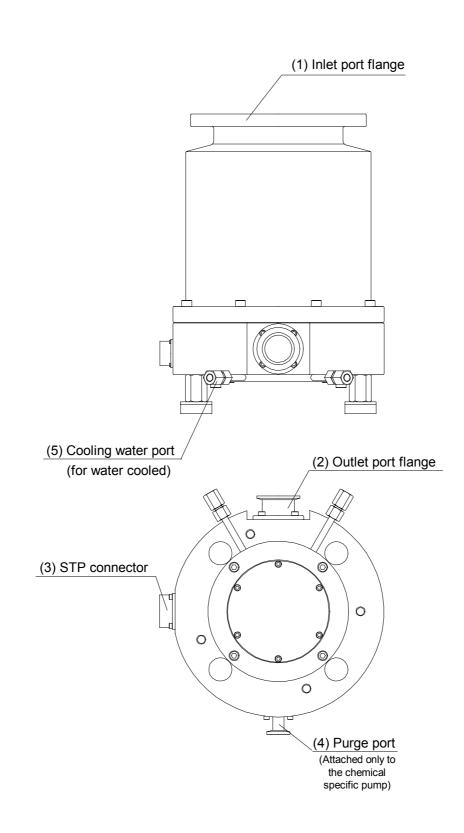


Figure 4.1 Configuration of the STP Pump

- 4.2 Precautions Before Installation
- 4.2.1 Operating Environment

WARN I NG

Check the properties of the gas to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier. And, keep MSDS and a safety advice of gas supplier.
 Take measures according to MSDS to prevent an accident when using toxic, reactive or combustible gases. Dilute the gas to be used with the inert gas controlled if necessary. And, take measures according to MSDS to prevent an accident gas.

ACAUTION

- The STP series models are chemical specific pumps: chlorine or fluorine system gases can be used with these models. When you use gases including alkaline metals, but excluding Li, gases including Ga, Hg, In, or Sn, or HBr, contact BOC Edwards (See Section 1.1, "Usable Gases").
- If the STP pump is used in an area with radiation, contact BOC Edwards.

Install the STP pump in a place meeting the following requirements:

Ambient Temperature	0 to 40 °C
Ambient Relative Humidity	30 to 95 % (no dew condensing)
Environment	 A place free of externally-applied mechanical shock. A place free of a heat source (Keep clear of the heat source or attach a thermal shield plate). A place free of a strong magnetic field (Range: up to 15 mT (150 G) in the axial direction, and up to 3 mT (30 G) in the radial direction with respect to the rotational axis of the STP pump). A place free of a strong electric field. A place free of a strong electric field. No discharge of high voltage (more than 500 V) (If more than 500 V is discharged, contact BOC Edwards).
STP Pump Installation Equipment Conditions	• Install the STP pump securely so that foreign materials will easily fall into the STP pump (Ex.: Si wafers or samples are positioned above the STP pump) (To prevent foreign materials from falling into the STP pump, design a shield plate with large conductance).

4.2.2 Installation Area

Leave enough space for the following in addition to that for the STP pump:

- Space for maintenance and inspection
- Space for connecting cables

 The minimum bending radius of the STP connection cable is 100 mm (See Section 13, "External Appearance of the STP Pump" [bending dimensions of the connection cable]).
 DO NOT excessively bend the cables and beware of any obstacles when installing the STP pump.
 Also, leave enough space to install other cables without bending them excessively.

NOTICE

 The L-type STP connection cable is also offered. Contact BOC Edwards if necessary.

4.2.3 Bench

A bench must be prepared by the customer to secure the STP pump. The shape and size of the bench differ depending upon the type of STP pump. Follow the precautions of the WARNING, CAUTION, or NOTICE (See <u>Section 4.3.3, "How</u> <u>to Secure the STP Pump"</u>).



The STP pump is provided with a high-speed rotor. Any internal abnormality/error may result in a jump in rotational torque leading to personal injury or peripheral equipment damage.
 Design and secure the bench for the STP pump so that it can withstand the maximum torque generated due to the occurrence of an abnormality/error. Refer to Section 4.3.3, "How to Secure the STP Pump" for abnormal torque.

CAUTION

 Secure the customer-prepared bench and the vacuum equipment on the floor or peripheral equipment and other equipment in accordance with the customer application. NEVER move them while the STP pump is in operation.



Confirm the dimensions by the external appearance of the STP pump when designing the bench.
 The bolt may not be able to be inserted from the lower side of the inlet port according to the shape of the inlet port flange.
 When the external appearance of the STP pump is not in the manual, contact BOC Edwards.

4.3 How to Install the STP Pump

Install the STP pump to the vacuum equipment as shown in Figure 4.2.

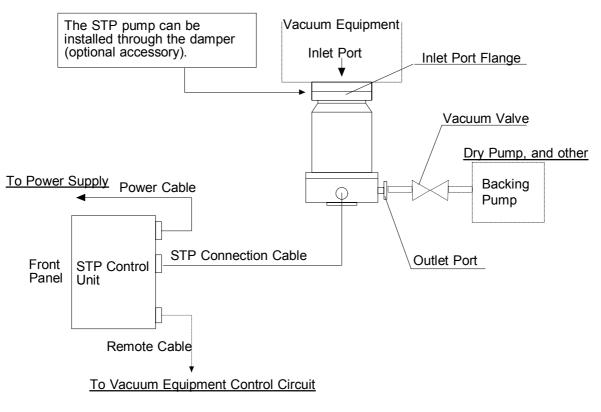


Figure 4.2 Installation of the STP Pump to the Vacuum Equipment

4.3.1 Cleaning the Seal

Inspect the seals of inlet and outlet port flanges for dirt or oil spots before installing the STP pump to the vacuum equipment.

Take the following measures for cleaning the seals:

- Clean off with a pure gas.
- Wipe with proper solvent (such as alcohol).

- A splinter shield is attached to the inlet port flange to prevent foreign materials from falling into the STP pump.
 - Always leave the splinter shield attached during operation.
- The wipes used for clean the flange of the pump might become hazardous waste depending upon the solvent (alcohol). Dispose of the contaminated wipes appropriately according to the regulations of each national and/or local government.

NOTICE

 The splinter shield cannot perfectly prevent foreign materials from falling into the STP pump.

DO NOT install the STP pump in such a manner that foreign materials can easily fall into it (for example, Si wafers or samples are positioned above the STP pump). If installing the STP pump in such a manner, always attach a shield plate with sufficient conductance above the STP pump to prevent foreign materials from falling into it. Foreign materials falling into the STP pump through the splinter shield may result in product damage.

Be careful not to scratch the flange of the STP pump.
 Check whether or not there are scratches on the surface, before installing the STP pump.

4.3.2 STP Pump Installation Positions

The STP pump can be installed vertically, horizontally, upside-down and slanted.

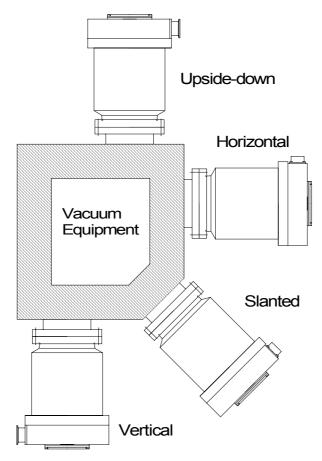
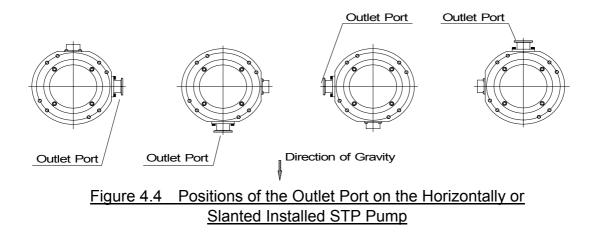


Figure 4.3 STP Pump Installation Positions

When installing the STP pump in a horizontal or slanted position, it is recommended to install it so that the direction of the outlet port is on a vertical or horizontal plane in the direction of the gravity.

This makes it possible to reduce the load on the magnetic bearing and the heat generated by the STP pump.



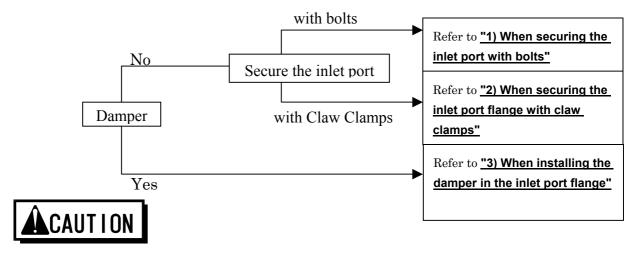
4.3.3 How to Secure the STP Pump

WARNING

The STP pump is provided with a high-speed rotor. The worst-case failure may result in a jump in rotational torque leading to personal injury or peripheral equipment damage.

The method of securing the STP pump will depend on the installation requirements. Secure the STP pump to the vacuum equipment as follows:

 Design and secure the mounting for the STP pump so that it can withstand the maximum rotational torque. Refer to Table 4.2 for torque in pump abnormality.



- In some cases, the damper and the claw clamper securing cannot be used depend on the type of the STP pump.
- ◇ Refer to Table 4.1 for tightening torque of the bolt.

Size of bolt	Tightening torque of bolt (Nm)
M8	12.0
M10	24.1
M12	42.1

Table 4.1 Tightening torque of bo

♦ When making the leg to secure the base, make them shortened more than ones attached to the STP pump.

Use a material that has a tensile strength of 600N/mm² or more.

◇ When securing the base, use stainless steel securing bolts with a tensile strength class is 70 or more.



 When using any securing method other than that specified in this manual, contact BOC Edwards. 1) When securing the inlet port with bolts

Refer to Table 4.2 for torque in pump abnormality and recommended securing bolts.

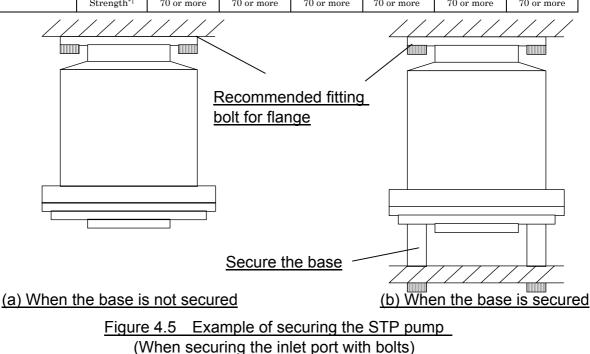
Secure the inlet port flange with all of the boltholes of the size specified in the Inlet Port Flange Standard.

Secure the base with all 8 screw-holes for legs or all 8 attached legs. Follow "CAUTION" on page 4-9 about legs and bolts for securing the base. Make sure that the recommended securing bolt may be different depending on the method of securing the base.

Table 4.2 Maximum Torque predicted and Recommended securing bolt for inlet port flange

Model of 7	STP-603						
Type of flange		VG150		ISO160F/ISO160		ICF203	
Torque in pump abnormality [Nm]		1.5×10^{4}		1.5×10^{4}		1.5×10^{4}	
Base(8 positions)securing		No	Yes	No	Yes	No	Yes
Recommended	Type of bolt	Standard	Standard	Standard	Standard	Standard	Standard
securing bolt for TMP Flange	Type of steel $^{\!\!*1}$	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
for Thir Flange	$Strength^{*1}$	70 or more	70 or more	70 or more	70 or more	70 or more	70 or more

Model of 7	STP-1003						
Type of flange		VG200		ISO200F/ISO250F/ISO200		ICF253	
Torque in pump abnormality [Nm]		1.5×10^{4}		1.5×10^{4}		1.5×10^{4}	
Base(8 positions)securing		No	Yes	No	Yes	No	Yes
Recommended	Type of bolt	Standard	Standard	Standard	Standard	Standard	Standard
securing bolt for TMP Flange	Type of steel $^{\!\!*1}$	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
for TMF Flange	$Strength^{*1}$	70 or more	70 or more	70 or more	70 or more	70 or more	70 or more



⁺¹ Refer to ISO898-1(JISB1051), ISO3506(JISB1054) and AMS6419(Aerospace Material Specification)

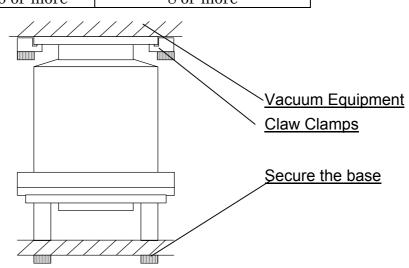
2) <u>When securing the inlet port flange with claw clamps</u> Refer to Table 4.2 for rotational torque.

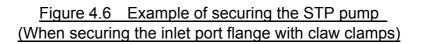
When securing the inlet port flange with only the claw clamp, the vacuum equipment cannot withstand the maximum rotational torque generated by the worst-case failure. To make the vacuum equipment withstand abnormal torque, secure the base with all 8 screw-holes for legs or all 8 attached legs. Follow "CAUTION" on page 4-9 about legs and bolts for securing the base.

For the claw clamp-type, use the required number of claw clamps as specified in Table 4.3. Position the claw clamps evenly on the circumference.

Size of Flange	Number of Claw Clamps	
ISO 160 or less	4 or more	
ISO 200 to 250	6 or more	
ISO 320 or more	8 or more	

Table 4.3	Number of Claw	/ Clamps by	/ Size of Flange





3) When installing the damper in the inlet port flange

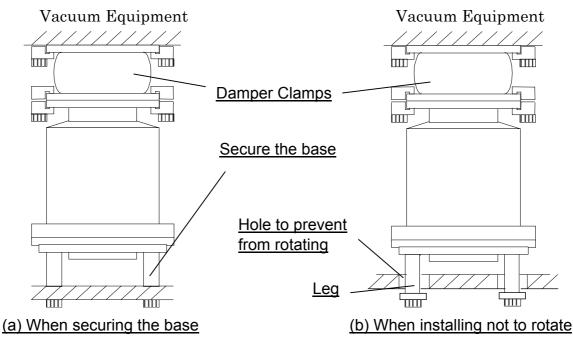
Refer to Table 4.2 for rotational torque.

In case of using a damper, secure the base with all 8 screw-holes for legs or all 8 attached legs. Follow "CAUTION" on page 4-9 about legs and bolts for securing the base.

When the base cannot be secured because of the equipment design, install the pump with a torque restraint like the one shown in Figure 4.7 (b).

Use a damper only at the vertically upright position.

◇ DO NOT remove the bolts and nuts attached to reinforce the damper.



<u>Figure 4.7</u> Example of securing the STP pump (When installing the damper in the inlet port flange)

4.3.4 Vacuum Piping

ACAUTION

- DO NOT open the STP pump through the flange to atmospheric air while the STP pump is running.
 If atmospheric air flows into the STP pump, it may not function normally.
- Depending upon the type of the backing pump used, atmospheric air may reverse flow into the STP pump when the backing pump stops.
 Attach a vacuum valve to the middle of the piping between the STP pump outlet port flange and the backing pump, and close the vacuum valve when the backing pump stops.

In order to let the STP pump bring its performance into full play, follow the precautions below:

- Be careful not to scratch the flange of the STP pump. Before installing the STP pump, check whether or not there are scratches on the surface.
- 2) Use stainless steel or aluminum alloy tubes with a low gas loss to connect the vacuum equipment to the STP pump.
- 3) Take measures for minimizing leakage. It is also necessary to degrease the tubes as regularly as possible to keep the gas loss as low as possible.
- 4) It is recommended to use a backing pump of pumping speed 1300 L/min or more.

However, the pressure at the inlet and outlet ports varies with the flow rate of gas, capacity of the vacuum equipment, length and material of the piping. Select a backing pump in accordance with the capacity and starting method (simultaneous starting, starting after generating roughing vacuum) suitable for the vacuum equipment you use.

5) Connect the STP pump and the backing pump using stainless steel or aluminum alloy tubing, flexible tubing, vacuum rubber or Teflon tubing, and other.

The following measures can be used to avoid the transmission of the vibration of the backing pump to the STP pump and the vacuum equipment.

- DO NOT place the backing pump on the same floor as the vacuum equipment.
- Locate the backing pump on a vibration-proof table. Attain 1/3 or less of the rotational speed of the backing pump, when adjusting the inherent frequency of the backing pump installed on a vibration-proof table.
- Attach a weight to the piping from the backing pump, or secure the piping to a rigid, heavy object free of vibration.
- Use a tube of high flexibility.

- 6) Depending upon the type of the backing pump used, oil vapor may contaminate the inside of the STP pump. Some oil viscosity could cause a malfunction when there is a strong reverse flow of oil.
 Take the following measures to ensure the correct flow of oil:
 - Attach a vacuum valve to the middle of the piping between the STP pump outlet port flange and the backing pump.
 - Attach an absorption trap adjacent to the vacuum valve.

<u>Piping at the Inlet Port Flange</u> Attach the inlet port to the high vacuum side.

> Maximum working pressure: 1.3×10^{-2} Pa $[1 \times 10^{-4}$ Torr] (for natural air) Pressure at the inlet port flange applicable continuously

<u>Piping at the Outlet Port Flange</u> <u>Attach the outlet port to the inlet port flange of the backing pump</u> (primary side pump).

> Allowable backing pressure: 13 Pa [0.1 Torr] (for natural air) Pressure at the outlet port flange applicable continuously



- ◇ Upper pressure is applicable under the following conditions:
 - The N_2 or other similar gas is vacuumed.
 - The backing pump (pumping speed: 240 L/min) is used.
- To attain the ultimate pressure shown in Table 13.1, "Specifications for the STP Pump," set the pressure at the outlet port flange to 1.3 Pa (10⁻² Torr) or less.

4.3.5 Connecting the Purge Port

When pumping reactive or corrosive gases, introduce a dry N_2 gas or other gas into the STP pump in order to protect the inside of the STP pump.

As shown in Figure 4.8, introduce a dry N_2 gas through the electromagnetic vent. valve, needle valve or similar valve (must be prepared by the customer) from the purge port.

For instructions on how to introduce the purge gas, see <u>Section 5.1, "Gas Pumping."</u>



◇ When not introducing the purge gas, close the purge port with the blank flange (attached at delivery).

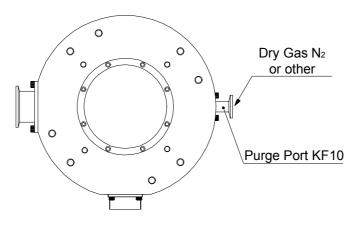


Figure 4.8 Connecting the Purge Port

5 Gas Pumping, Cooling and Baking the STP Pump

5.1 Gas Pumping

WARNING

 When pumping gases, they may remain in the STP pump. Introduce a purge gas and then exhaust all gasses.
 Residual gases in the STP pump may cause an accident when the STP pump is removed.

Confirm the characteristics of gases to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier.

- The STP series models are chemical specific pumps; chlorine or fluorine system gases can be used with these models. When you use gases including alkaline metals, but excluding Li, gases including Ga, Hg, In, or Sn, or HBr, contact BOC Edwards.
- NEVER use corrosive gases (chlorine, fluorine, or other system gases) in the STP-603/STP-1003 pump or other models without anti-corrosion treatment.
- Cool the STP pump to prevent the STP pump from overheating when pumping gases.
- 5.1.1 How to Introduce a Purge Gas

◇ When pumping reactive or corrosive gases, introduce a purge gas to protect the inside of the STP pump. Doing so may result in product damage.

Connect a needle value or a similar part to the purge port and introduce a dry N_2 gas or other gas to perform a gas purge (See <u>Section 4.3.5</u>, "Connecting the Purge <u>Port</u>").

- ♦ The proper amount of the gas purge is approx. 1.7×10^{-2} Pa·m³/sec (10SCCM).
- ◇ The allowable gas pressure ranges from zero [atmospheric pressure] to 4.9×10⁴Pa [gauge pressure] (zero [atmospheric pressure] to 0.5 kgf/cm² [gauge pressure]).
- ♦ High-pressure at the inlet port may result in a noise. This is no abnormality/error.

5.2 Cooling the STP Pump

There are two methods for cooling: Water cooling and Air cooling. When performing baking, always cool the STP pump.

When pumping gases, cool the STP pump.

Select the best one which fits your vacuum equipment.

5.2.1 Water Cooling Method

Connect the cooling water pipe to the cooling water port in accordance with Figure 5.1.

The female screw PT (Rc)1/4 is used in the cooling water port.

Secure the connection hose to prevent water leakage.

Use cooling water under the following conditions:

Amount of water:	2 L/min
Temperature:	$5 ext{ to } 25 \ \ ^{\circ}\! ext{C}$
Water pressure:	$2.9 imes10^5$ Pa (3 kgf/cm ²) or less.

NOTICE

Use clean water as much as possible.
 Cooling water containing foreign materials may corrode or clog the cooling water pipe.

When the cooling system is clogged with foreign materials, clogs may possibly be removed by feeding cooling water reversibly.

- When the STP pump is overheated due to shortage or suspension of water, the protective function detects the overheated condition in the STP pump and stops the STP pump.
 As a further safety procedure, attach a flow switch to the cooling water exit so that the STP pump stops if abnormal cooling water
- flow occurs (A flow switch is available on the market).
 When the STP pump is not to be used for a long period of time or it is to be moved after use, introduce compressed air from one side of the cooling water port so that no water will remain inside.
- The joint for water cooling unit is made of stainless steel. To prevent corrosion, connect the stainless steel joint.

5.2.2 Air Cooling Method

When water cooling is not available, an air cooling unit (optional accessory) can be used.

Attach the air cooling unit using 4 screws at screw holes for cooling unit (4-M8^{*1}, depth 20mm).

(For the positions of screw hole for cooling unit, see <u>Figure 13.1 and 13.2,</u> "External Appearance of the STP Pump.")

ACAUTION

- \bigcirc Check the rated voltage of the air cooling unit before use.
- Purchase protective parts for the air cooling unit, such as an earth leakage breaker or fuses when using the air cooling unit (remote terminal block TB2 incorporates fuses).

5.3 Baking the STP Pump

To attain a less pressure in a shorter time and reduce the exhaust time, bake the vacuum equipment and STP pump.



The surfaces of the STP pump and its peripheral equipment will become extremely hot when performing baking. NEVER touch them with bare hands.

- \diamond When baking the STP pump, always cool it to prevent overheating.
- Start baking after cooling is started.
 Set the temperature of the baking heater to 120 °C or less.
- ♦ DO NOT pump gases during baking to prevent overheating.



◇ To exhaust the gas discharged from the vacuum equipment and the inner wall of the STP pump, run the STP pump during baking.

5.3.1 Attaching a Baking Heater

- 1) Install the backing heater (special accessory) near the inlet port flange in the perimeter of the envelope.
- 2) Affix the hot surface warning label attached on the surface of the pump seen well. (See Figure 5.1, "Attaching Positions of the Cooling Unit and Backing Heater")

- \diamond Check the rated voltage of the baking heater before use. (The range of the available voltage of the backing heater (special accessory) is display voltage ±10%.
- Wind the baking heater around the surface of the STP pump tightly.
 If the baking heater is not wound tightly, the loose parts will overheat.
- Procure protective parts for the baking heater, such as an earth leakage breaker or fuses when using the baking heater.
- \bigcirc DO NOT apply excessive force to the cable for the baking heater.

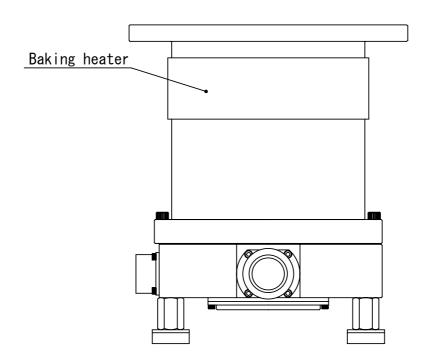


Figure 5.1 Attaching Positions of the Cooling Unit and Baking Heater

6 Installation of the STP Control Unit

6.1 Name and Function of Each Part

6.1.1 Front Panel

- (1) "START" Switch (flat panel switch, green)
 STP pump rotating function (valid in MANUAL operation only).
- (2) "STOP" Switch (flat panel switch, dark gray)
 - STP pump stop operation function (valid in MANUAL operation only).
- (3) "RESET" Switch (flat panel switch, gray)
 - Alarm reset function (valid in MANUAL operation only).
 - Tuning function (valid in both MANUAL or REMOTE operation).
- (4) "MANUAL/REMOTE" Changeover Switch (slide switch, black)Operation mode changeover function.
- (5) "SELECT" Switch (flat panel switch, gray)
 - LCD display (Confirmation mode change) function (valid in both MANUAL and REMOTE operations).
 - Setting mode change function (valid in both MANUAL and REMOTE operations).

Press both of "SELECT" and "UP" switches simultaneously to enter the setting mode.

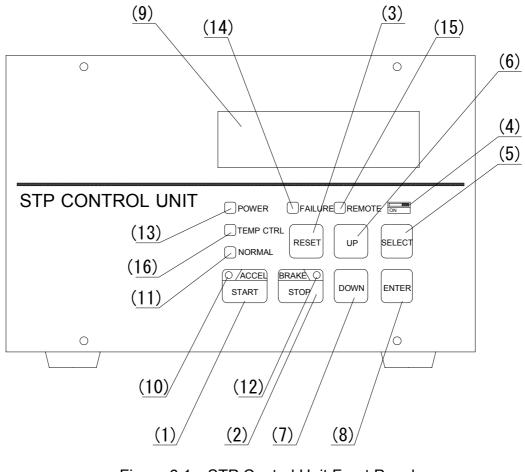
- (6) "UP" Switch (flat panel switch, gray)
- (7) "DOWN" Switch (flat panel switch, gray)
 - Abnormality/error display change function (valid in both MANUAL and REMOTE operations).
 - Setting content confirmation function (valid in both MANUAL and REMOTE operations).
 - Setting content change function (valid in both MANUAL and REMOTE operations).
- (8) "ENTER" Switch (flat panel switch, gray)
 - Setting content determination function (valid in both MANUAL and REMOTE operations).
 - WARNING message display function (valid in both MANUAL and REMOTE operations).

- (9) LCD
 - The LCD displays a pump's operation state, speed, or other messages.
 - The LCD displays an error message when an abnormality/error occurs in the STP pump.
- (10) "ACCEL." Lamp (green LED)
 - Lights during acceleration (ACCELERATION state).
- (11) "NORMAL" Lamp (green LED)
 - Lights during rated speed operation (NORMAL OPERATION state).
- (12) "BRAKE" Lamp (green LED)
 - Lights during deceleration (BRAKE state).
- (13) "POWER" Lamp (green LED)
 - Lights while the power is ON.
 - Goes out while the backup power is being supplied.
- (14) "FAILURE" Lamp (red LED)
 - Lights when any of the abnormalities/errors occurs on the STP pump and the STP control unit. The LCD displays an error message simultaneously.
- (15) "REMOTE" Lamp (green LED)
 - Lights while the operation mode is remote.
- (16) "TEMP CTRL" Lamp (green LED)
 - Lights while the TMS unit (optional accessory) is in operation.



 \diamond The TMS unit is not used with this series of STP pump.

Installation





6.1.2 Rear Panel

- A hazardous live voltage may exist at connector that marked
 - /!\

DO NOT touch the terminal. Doing so may result in electric shock. When operating connection/disconnection to connector, always power OFF the STP pump (Switch the breaker "OFF").

- (17) AC POWER Connector (X2)
 A maximum voltage : Equal to the input voltage of this connector. (MAX 240VAC)
 - For primary power input.
- (18) MAIN POWER Breaker
 - Switches ON/OFF the primary power.
- (19) P.CONNECTOR Connector (X1) A maximum voltage: 79VAC
 - For connection of the STP connection cable.

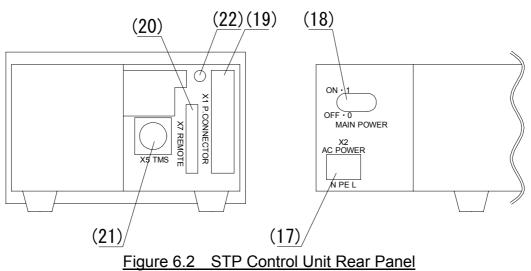
(20) REMOTE Connector (X7)

A maximum voltage: Equal to the input voltage of this connector. (MAX 125VAC)

- For the remote operation.
- (21) TMS Connector (X5)

A maximum voltage: Equal to the input voltage of "AC POWER" connector. (MAX 240VAC)

- For the connection of the TMS unit (optional accessory).
- (22) Ground Terminal
 - For connection of the ground.



6.2 Precautions Before Installation

6.2.1 Operating Environment

Install the STP control unit in a place meeting the following requirements:

Ambient Temperature	0 to 40 °C
Ambient Relative Humidity	30 to 95% (no dew condensing)
Environment	• A place free of exposure to direct sunlight.
	• A place free of high humidity.
	• A place free of dust.
	• A place free of salty air.
	• A place free of dripping water.
	• A place free of explosive or inflammable gas.
	• A place free of corrosive gas.
	• A place free of radiation.
	• A place free of strong magnetic and electric fields.
	• A place free of excessive vibration.
	• A place free of a source of electric noise.
Installation Condition	• Install the STP control unit horizontally
	(within ±10°C).

6.2.2 Insulation Test

Do not perform the insulation test (insulation resistance test and withstand voltage test) to the STP control unit.

When performing the insulation test to your equipment, turn "OFF" the STP control unit so that the test voltage is not applied to the STP control unit.



 The varistor for the power supply line protection is installed to the STP control unit.

DO NOT perform the insulation test with the varistor installed. Doing so may result in product damage.

6.2.3 Installation Area

Leave enough space for the following in addition to that for the STP control unit

- Space for maintenance and inspection
- Space for inlet and outlet of air for cooling
 - Top and side: 5 cm or more
 - Bottom: 1.8 cm or more (height of the rubber feet)
 - Space for connecting the cables
 - Rear: 11.5 cm or more

•

The minimum bending radius of the STP connection cable is
 100 mm (See Figure13.4, "External Appearance of the STP Control Unit" [Cable Space]).

DO NOT excessively bend the cables and beware of any obstacles when installing the STP pump.

Also, leave enough space to install other cables without bending them excessively.

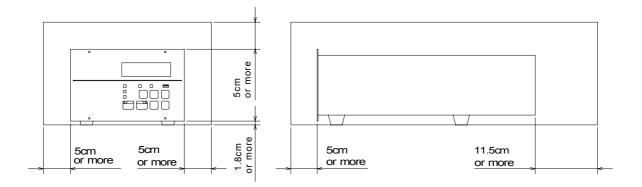


Figure 6.3 Peripheral Space of the STP Control Unit

6.3 Attaching the STP Control Unit to a Rack

The dimensions of the STP control unit front panel conform to EIA standard. Therefore, this panel can be attached to any type of commercially-available racks. Attach the STP control unit to the rack according to the following steps:

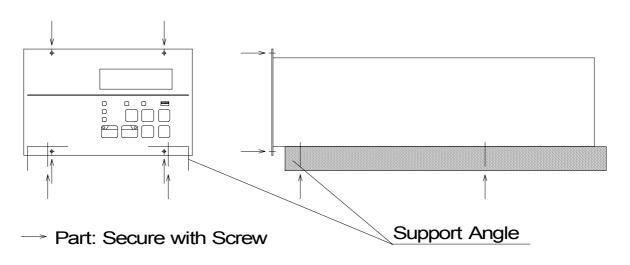
- Attach the front panel to a rack using the screw holes for the front panel.
- Also support the STP control unit from the bottom using a support angle or a similar tool.
- When attaching the STP control unit to a movable rack, to protect the STP control unit during transport, remove the rubber foot from the bottom and attach the STP control unit to the rack using the screw holes for the rubber foot.

ACAUTION

- The STP control unit cannot be supported with only the screws on the front panel (The STP control unit is a heavy product).
 Always support it from the bottom.
- When installing the STP control unit, DO NOT block the ventilation port of the STP control unit by the support angle or other things. It causes the control unit to overheat.



For the dimensions of the front panel and positions of screw holes for the rubber feet, see Figure 13.4, "External Appearance of the STP Control Unit."





6.4 Cable Connection

6.4.1 Name and Dimensions of Each Cable

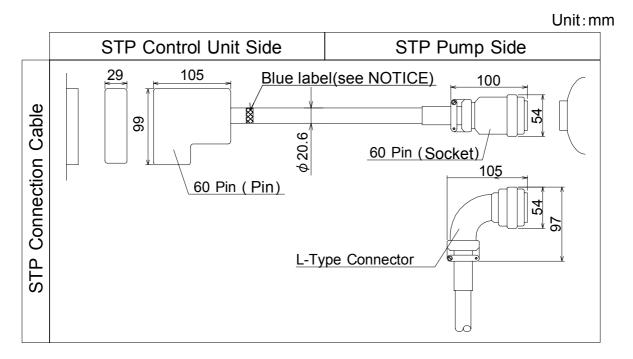
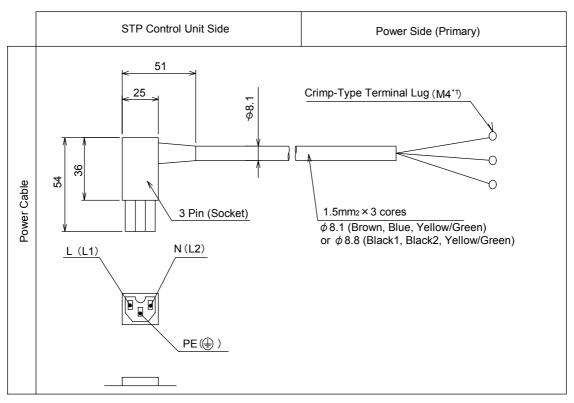


Figure 6.5 External Dimensions of Each Cable

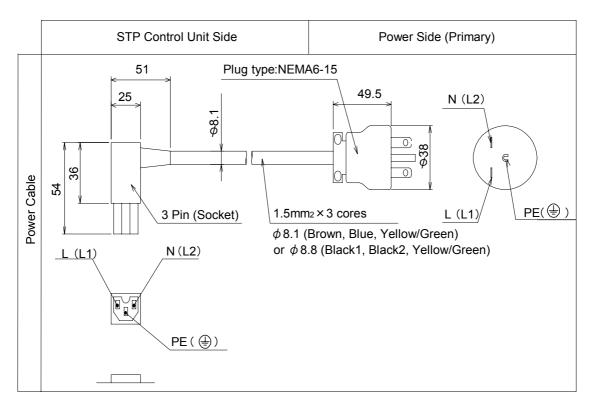


There are two types of STP connection cables. These cables can be distinguished by a blue label.
 This series pump can use either STP connection cable.





a) without power plug



b) with power plug



6.4.2 How to Connect the Cables

- ♦ Use the STP connection cable that BOC Edwards has specified. The use of other cables may result in product damage.
- When connecting/disconnecting cables, always power OFF the STP pump (Switch the breaker "OFF").
 - Failure to do so may result in electric shock or product damage.
- With each connector, align the position of the guide key and insert the pin vertically so as not to bend it.
 If the pin is bent, not only may the connector not function normally,

but may make the pins contact, resulting in a malfunction.

- \diamond Lock and securely tighten each connector and screw.
- DO NOT apply voltage to each pin and DO NOT cause any short-circuiting between pins.
- ♦ Connect each cable securely. DO NOT place heavy objects on the cables nor bend them excessively.

Support each cable so as not to apply direct force to the connectors or terminals.

If any problem occurs in cables, connectors or terminals, the STP pump may not function normally.

(1) Connecting the STP Connection Cable

Connect the receptacle (socket) side of the STP connection cable to the STP connector of the STP pump and connect the plug (pin) side to "<u>P.CONNECTOR</u> <u>X1</u>" of the STP control unit.

(2) Connecting the Power (Primary Side) Cable

Connect the power cable to the "<u>AC POWER X2</u>" on the STP control unit rear panel as shown in Table 6.1.

CON1 Pin No.	Cable Color	Remarks	Rear Panel "AC POWER" Outline of
L(L1)	Brown or Black1	Single phase 200 to 240 V AC ±10% (for 200 V specification)	Connector
N(L2)	Blue or Black2	Single phase 100 to 120 V AC ±10% (for 100 V specification) Both 50/60 Hz	
PE(=)	Yellow/Green	Ground	N PE L

Table 6.1 Connecting the Power Cable

ACAUTION

- \diamond Confirm the power voltage on the name plate.
- ♦ Connect the power cable securely to prevent incorrect wiring.
- O NOT apply surge voltage exceeding 1 kV to the input power line.
- \diamond Always ground the power cable to prevent electric shock.

6.5 Connecting to Semiconductor Equipment

The STP pump is a component system when installing to the semiconductor equipment.

Consider the followings when designing the semiconductor equipment.

6.5.1 Connecting to Power

The STP control unit receives its power from the semiconductor equipment electrical distribution system via a circuit breaker.

Electrical energy isolation (Lockout/Tagout) is achieved by opening the main disconnect device or circuit breaker of the semiconductor equipment, thereby: removing power from the STP pump.

Provide the equipment with the main disconnect or circuit breaker devices rated for at least $10,000 \text{ A}_{\text{rms}}$ symmetrical amperes interrupting capacity (AIC).

6.5.2 Emergency Off Circuit (EMO Circuit)

Activation of EMO circuit of the equipment will interrupt electrical power from the STP control unit.

When the power is shut off, the STP pump performs the same as a power failure. (After backup operation of a power failure, the rotor lands on the touch down bearing)

Consider the followings when establishing the EMO circuit.

CAUTION

- Unite the exhaust gas system to prevent atmosphere from being introduced into the STP pump when the EMO circuit operates.
 (example: shut the valve) When atmosphere is introduced into the STP pump, the touch down bearing may not operate normally.
- The STP pump rotates for a while after the EMO circuit shuts off the power. Perform a recovery operation after the STP pump has stopped completely.
- Before performing the operation check of the EMO circuit with regular maintenance, stop the STP pump to prevent damage to the touch down bearing.

7 How to Start/Stop the STP Pump

- ◇ NEVER connect or disconnect any cables while the power is ON.
- NEVER turn the primary power OFF (Switch the breaker "OFF") while the STP pump is in rotation.
- O NOT release the inlet port flange or outlet port flange into the atmosphere while the STP pump is in rotation.

7.1 Before Starting

After completing installation, piping, leakage test of the STP pump, installation of the STP control unit, and wiring of cables, the STP pump is ready for start. Check the following items before starting:

- 1) Are the STP pump and the STP control unit secured according to the appropriate method?
- 2) Is the power cable connected correctly to the power supply?
- 3) Is the power voltage selected properly?
- 4) Are the STP connection cable, and other cables securely connected? Are each terminal and each connector securely locked?
- 5) Is the serial number of the STP pump the same as that of the STP control unit?

If they are different, perform the tuning according to <u>Section 9.1, "Tuning."</u>

6) Did you change the STP connection cable length? If you did, perform the tuning by reference to <u>Section 9.1, "Tuning."</u>

7.2 Start Procedures

Start the backing pump before or simultaneously with start of the STP pump. Open the vacuum valve located at the outlet port flange side after starting the backing pump.



- DO NOT open the vacuum valve without operating the backing pump.
 Depending upon the type of the backing pump, doing so may cause a reverse flow of oil, which could contaminate the inside of the STP pump.
- When start/stop operations are frequently performed, the STP pump may overheat. Avoid doing so.

7.3 Stop Procedures

Close the vacuum valve located at the outlet port flange side just before or after stopping the STP pump.

After closing the valve, stop the backing pump.

 DO NOT stop the backing pump without closing the vacuum valve.
 Depending upon the type of the backing pump, doing so could cause a reverse flow of atmospheric air into the STP pump, which may result in a malfunction.



DO NOT stop the backing pump without closing the valve.
 Depending upon the type of the backing pump, doing so may cause a reverse flow of oil, which could contaminate the inside of the STP pump.

There are two methods of operating the STP pump: MANUAL and REMOTE.

Select one which fits your vacuum equipment.

7.4 Manual Operation

(See Figure 7.1.)

Slide the "MANUAL/REMOTE" changeover switch on the STP control unit front panel to the position opposite to "ON." At this time, the "REMOTE" lamp is off.

7.4.1 Powering ON

- Switch "ON" the breaker on the rear panel. (To prevent incorrect operation, a metal fitting is attached to the breaker. Loosen the screw, lift the metal fitting, and secure it.) The magnetic bearing functions and the rotor levitates (POWER ON state). The "POWER" lamp lights.
- 2) The STP control unit executes the self test. If no error is found, the LCD displays "LEVITATION."
 In case of the STP pump with the TMS unit (optional accessory), the "TEMP

CTRL" lamp also lights and the TMS unit starts.



> The TMS unit is not used with this series of STP pump.

7.4.2 Starting the STP Pump

1) Press the "START" switch on the front panel to start and accelerate the STP pump. The "ACCEL." lamp lights. The LCD displays the current rotational speed in "ACCEL: ***00rpm" in units of 500 rpm (ACCELERATION state).



- 2) When the STP pump attains the rated speed of rotations, the "ACCEL." lamp goes out, and the "NORMAL" lamp lights. Also, the LCD displays "NORMAL: ***00rpm" (NORMAL OPERATION state).

7.4.3 Stopping the STP Pump

- 1) Press the "STOP" switch on the front panel to stop the STP pump. The "NORMAL" lamp or "ACCEL." lamp goes out, and the "BRAKE" lamp lights (BRAKE state).
- 2) The "BRAKE" lamp goes out when the rotational speed goes below 500 rpm.

7.4.4 Starting the STP Pump after Stopping

Press the "START" switch on the front panel to reaccelerate the STP pump. The STP pump can be reaccelerated even while it is stopping.

7.4.5 Powering OFF

Switch "OFF" the breaker on the rear panel when all three lamps of "ACCEL.", "NORMAL", and "BRAKE" are off.

The magnetic bearing stops, the rotor lands, and the "POWER" lamp goes out (POWER OFF state).

In case of the STP pump with the TMS unit (optional accessory), the "TEMP CTRL" lamp also goes out and the TMS unit stops.

7.4.6 Starting the STP Pump after a Safety Function Operates

A safety function operates when an abnormality/error occurs in the STP pump or peripheral equipment. To restart the STP pump, remove the cause of the abnormality/error after the "BRAKE" lamp goes out, and press the "RESET" switch. The "FAILURE" lamp goes out and the safety function is released (RESET operation). Then, press the "START" switch.

For the safety functions and troubleshooting, see <u>Section 11, "Troubleshooting,</u> <u>Maintenance, and Inspections."</u>

7.5 Remote Operation

(See Figures 7.1.) (Read through <u>Section 8, "Remote Input/Output Signal Connector"</u> before use.)

Slide the "MANUAL/REMOTE" changeover switch on the STP control unit front panel to "ON." The "REMOTE" lamp lights.

7.5.1 Powering ON

- Switch "ON" the breaker on the STP control unit rear panel. (To prevent incorrect operation, a metal fitting is attached to the breaker. Loosen the screw, lift the metal fitting, and secure it.) The magnetic bearing functions and the rotor levitates (POWER ON state). The "POWER" lamp lights.
- 2) The STP control unit executes the self test. If no error is found, the LCD displays "LEVITATION." In case of the STP pump with the TMS unit (optional accessory), the "TEMP CTRL" lamp also lights and the TMS unit starts.

7.5.2 Starting/Stopping the STP Pump

There are two methods of starting/stopping the STP pump. <u>Use one of them</u>.

Table 7.1	Starting/Stopping the STP Pump during Remote Operation
	(REMOTE X7)

Method	Starting the Pump	Stopping the Pump
1	 Short the circuit between (1)-(21). Short the circuit between (3)-(21) for 0.3 seconds or more. However, when inputting this signal simultaneously with switching "ON" the breaker on the rear panel, short the circuit between (3)-(21) for 10 seconds or more. 	Open the circuit between <u>(1)-(21)</u> .
2	Short the circuit between (1) -(3). In this case, (21) is not used.	Open the circuit between <u>(1)-(3)</u> .

7.5.3 Starting the STP Pump after Stopping

Perform the start operation to reaccelerate the STP pump. See <u>Section 7.5.2</u>, <u>"Starting/Stopping the STP Pump</u>."

The STP pump can be reaccelerated even while it is stopping.

7.5.4 Powering OFF

Switch "OFF" the breaker on the rear panel when all three lamps of "ACCEL.", "NORMAL", and "BRAKE" are off.

The magnetic bearing stops, the rotor lands, and the "POWER" lamp goes out (POWER OFF state).

In case of the STP pump with the TMS unit (optional accessory), the "TEMP CTRL" lamp also goes out and the TMS unit stops.

7.5.5 Starting the STP Pump after a Safety Function Operates

A safety function operates when an abnormality/error occurs in the STP pump or peripheral equipment. To restart the STP pump, remove the cause of the abnormality/error after the "BRAKE" lamp goes out, and perform the operation shown in Table 7.2. The "FAILURE" lamp goes out and the safety function is released (RESET operation). Then, restart the STP pump. For the safety functions and troubleshooting, see <u>Section 11</u>, "Troubleshooting, Maintenance, and Inspections."

Table 7.2	Reset Oper	ation during	Remote O	peration ((REMOTE X7)

Method	Reset Operation
1	Short the circuit between (1) - (22) for 0.3 seconds or more.

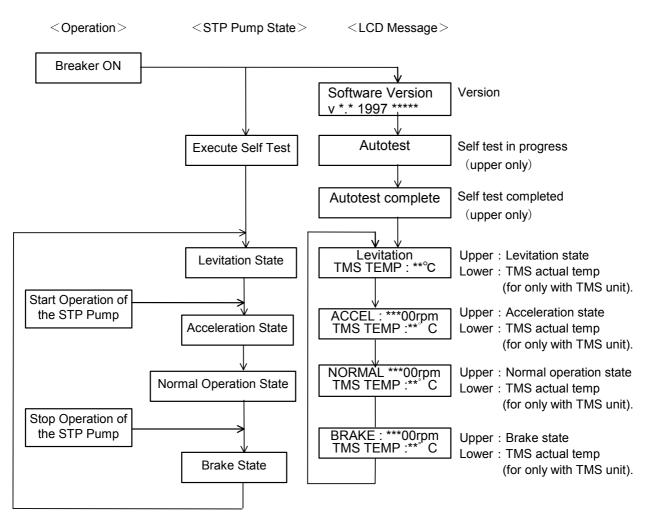
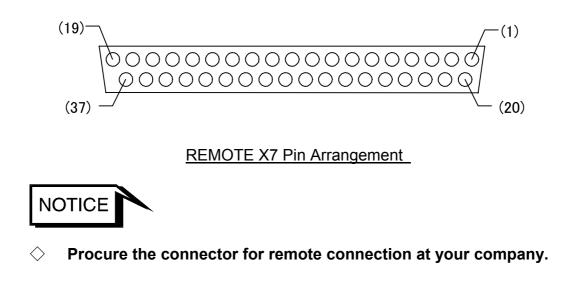


Figure 7.1 STP Pump Operation Procedures

8 **Remote Input/Output Signal Connector**

The remote input/output signal connector (REMOTE X7) is used for input/output remote signals.

This connector is of D-Sub^{*1} type (37-pins, socket type). The screw for connector is M2.6*2.



8.1 Input Signal Pins

Use input signal pins according to Table 8.1 and Figure 8.1. Remote input signals function during REMOTE operation only, except the **ROTATION INHIBIT** signal is input. Two abbreviations are used in Table 8.1:

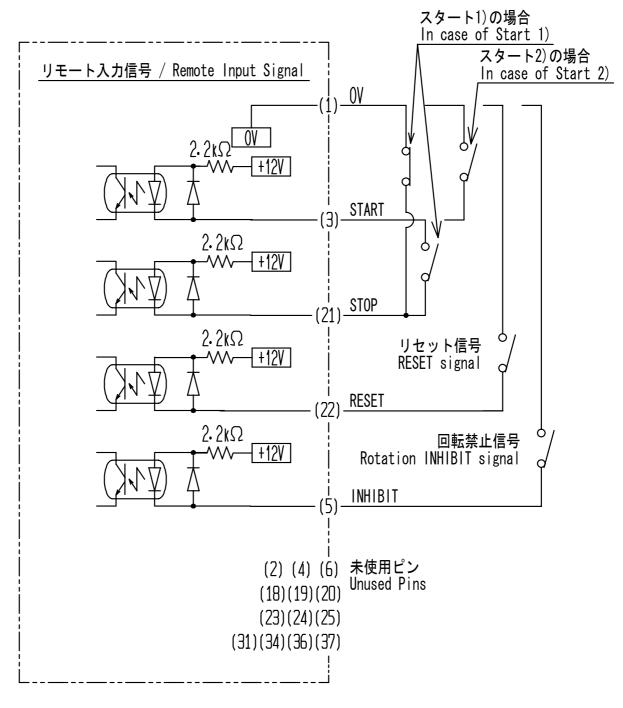
COM: Common IN: Input Pin

^{*1 :} *2 : D-Subminiature connector (Conforms to MIL-C-24308)

Pin		Description
(1)	(3)	Pins for inputting the START signal. The following two methods are available:
СОМ	START IN	 Short the circuits between (1)-(21). Then, short the circuits between (3)-(21) for 0.3 seconds or more. However, when inputting this START signal simultaneously with switching "ON" the breaker on the rear panel, continue to short these pins for 10 seconds or more. Short the circuits between (1)-(3). In this case, (21) is not used.
(1)	(21)	Pins for inputting the STOP signal.
		1) When 1) above is used to start the STP pump, open the circuits between (1)-(21) to stop the STP pump.
СОМ	STOP IN	2) When 2) above is used to start the STP pump, open the circuits between (1)-(3) to stop the pump.
(1) COM	(22) RESET IN	Pins for inputting the abnormality RESET signal. Short the circuits between <u>(1)-(22)</u> for 0.3 seconds or more to turn off the "FAILURE" lamp.
(1)	(5)	Pins for inputting the rotation INHIBIT signal (valid in both MANUAL and REMOTE operations). When pins (1) - (5) are set to open, the STP pump does
СОМ	INHIBIT	not rotate even by performing the start operation. When these pins are set to open when the pump is in rotation, the pump will stop (The pump does not rotate even by manually starting the pump). When not using this function, set the rotation INHIBIT signal function to the "DISABLE" (See <u>Section 9.3, "Setting Mode"</u>).
(2), (4), (6), (18), (19), (20), (23), (24), (31),		These pins are not used.
(34), (36), (3		▲ CAUTION CAUTION CAUTION CAUTION Conversion

Table 8.1 REMOTE X7 Input Signal Pins

Operation







- \diamond 1 pin (0V) is insulated from the frame ground.
- The input current of remote input signal is approx. 5mA. Make sure the minimum applicable load of the relay contact when the remote operation with the relay.

8.2 Output Signal Pins

Use output signal pins according to Table 8.2 and Figure 8.2. Remote output signals function during MANUAL and REMOTE operations. Four abbreviations are used in Table 8.2:

N.O:	Normal Open	N.C:	Normal Close
COM:	Common	OUT:	Output Pin

Table 8.2 REMOTE X7 Output Signal Pins(1)

Pin	Description
(8) REMOTE (27) N.O OUT	Pins for outputting the STP pump REMOTE SELECTION state signal. When the MANUAL/REMOTE changeover switch on the front panel is set to ON (remote side), these pins are closed ("REMOTE" operation).
(9) POWER (28) N.O OUT	Pins for outputting the POWER ON state signal. These pins are closed when the magnetic bearing functions and the rotor levitates. This output is cut OFF at a power failure.
(10)ACCELERATION(29) N.O OUT	Pins for outputting the ACCELERATION state signal. These pins are closed when the STP pump is in acceleration.
(11) NORMAL OUT N.O (12) N.C (30)	Pins for outputting the NORMAL OPERATION state signal. When the STP pump is in rated operation, the pins between (11) - (30) are closed, and the pins between (12) - (30) are opened.
(13) BRAKE (32) N.O OUT	Pins for outputting the BRAKE state signal. These pins are closed when the STP pump is in brake.
(14) ALARM OUT N.O (15) COM N.C (33)	Pins for outputting the ALARM signal. When an abnormality/error is detected under the POWER ON state, the pins between (14) - (33) are closed, and the pins between (15) - (33) are opened.

Operation

Pin	Description	
(16) AT TEMP. OUT N.O (35) COM N.C (17)	 Pins for the TMS unit rated state signal output. When the actual temperature of the TMS unit is within the setting temperature range ±10°C, the pins between (17)-(16) are closed and the pins between (17)-(35) are opened. If the TMS unit function is not valid, the pins do not function. 	
(7) L.VALVE (26) N.O OUT		

Table 8.2 REMOTE X7 Output Signal Pins(2/2)

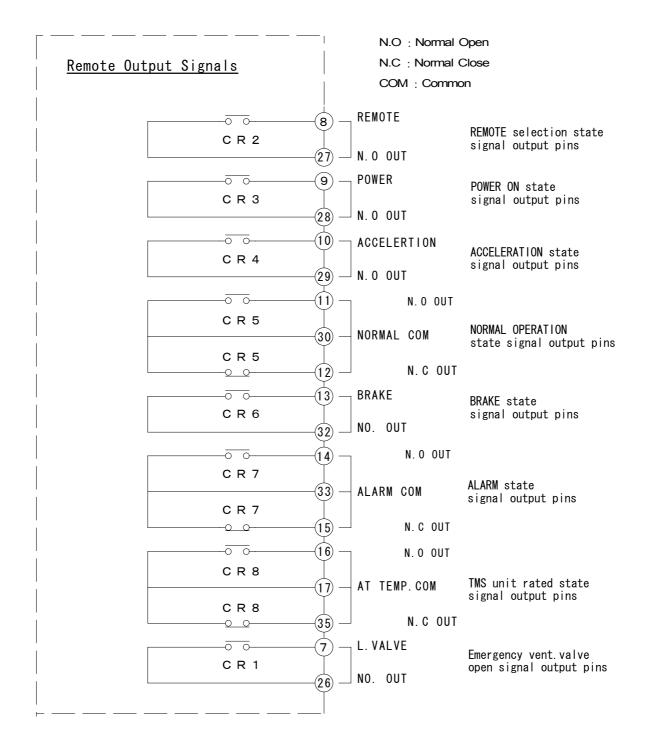


Figure 8.2 REMOTE X7 Output Signal Pins

Table 8.3 shows the rated contacts for relays CR1 to 8 in Figure 8.2.

	Resistance Load $(COS \phi = 1)$
Rated Load	125V AC 0.5A 24V DC 1A
Rated Current	2A
Maximum Contact Point Current	1A
Maximum Open/Close Capacity	AC: 62.5 VA DC: 30W
Minimum Applicable Load	5V DC 1mA

Table 8.3	Rated Contacts for Relays CR1 to CR8
	<u> </u>

9 Adjustment Methods

9.1 Tuning

For the STP pump, tuning is required to align the position of levitation in the axial direction with the center of the rotor's movable range. Tuning can be performed simply by pressing the "RESET" switch on the front panel.

Tuning is completed before delivery, so it is not required before use. However, re-tuning is required in the following cases in which the position of levitation may deviate from the center of the rotor's movable range:

- ◇ When changing the length of the STP connection cable (not when changing the length of the power cable).
- When changing the combination of the STP pump and the STP control unit (The error message "CAUTION: Bad EEPROM content" is displayed upon performing the self test).

9.1.1 Tuning Method

- 1) Connect each cable.
- 2) Switch "ON" the breaker on the rear panel.
- 3) After the STP pump completes the self test and enters the levitation state or the error message "CAUTION: Bad EEPROM content" is displayed, set MANUAL/REMOTE changeover switch to the manual and press the "<u>RESET</u>" switch on the front panel for approx. 5 seconds. Tuning starts with "<u>Tuning!</u>" displayed on the LCD. When the tunable error message such as "CAUTION: Bad EEPROM content"

is displayed, it takes approx. 20 seconds until the display changes "Tuning."
4) Approx. one minute later the LCD displays "<u>Tuning Complete</u>," next it

displays "<u>Levitation.</u>" This completes the tuning. (When changing the MANUAL/REMOTE changeover switch, set to its setting before tuning.)

 DO NOT turn off the primary power (DO NOT switch the breaker "OFF") during tuning. When doing so, perform tuning again.
 "CAUTION : PCB&Pump EEPROM Failure" may be displayed after powering ON again. When tuning is performed with this message, the setting is initialized. Reconfigure the setting if it has been changed by customer.



- Tuning can be performed only while the STP pump is in the LEVITATION state (It cannot be performed while the STP pump is in the ACCELERATION, NORMAL OPERATION, or BRAKE state).
- When performing the tuning during remote operation, use the "RESET" switch on the front panel after switching the "REMOTE" switch to the manual. (The remote signal cannot be used for tuning.)
- Once tuning is completed, re-tuning is not required unless the configuration (the STP pump serial number, the STP control unit serial number, and the STP connection cable length) is changed.
- Although the STP pump sounds during tuning, this is not an indication of abnormality.

9.1.2 Each of data after tuning

The specific information and the user setting are recorded in the STP pump and STP control unit.

When tuning after changing the configuration (the STP pump serial number, the STP control unit serial number), the STP pump data overrides the STP control unit data except control unit serial No. and total hours of running (control unit). Table 9.1 shows the data recorded in the STP control unit.

The user setting may be changed when replacing the STP pump. Confirm the setting after tuning, and reconfigure the setting when the user setting has changed.

Data	Data priority	Reconfiguration
Pump serial No.	Pump	
Control unit serial No.	Control unit	Unnecessary
Total hours of running (Pump)	Pump	(specific
Total hours of running (Control unit)	Control unit	information)
Number of starts	Pump	
Error record	Pump	
Remote operation mode/Detailed	Pump	
Rated speed	Pump	Necessary
Valid/invalid TMS function	Pump	ivecessary
Valid/invalid of inhibit function	Pump	(user setting)
Valid/invalid of Emergency vent.	Pump	
Valid/invalid of Second Damage Limit	Pump	

Table 9.1 Data List

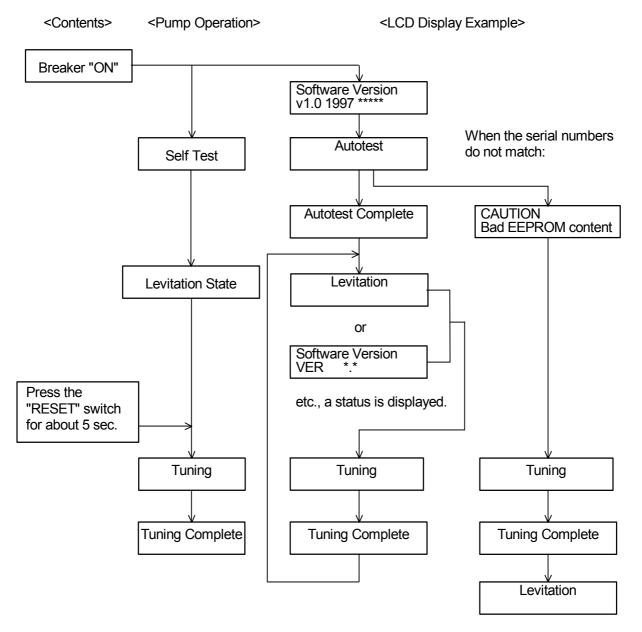


Figure 9.1 Tuning Procedures

9.2 Confirmation Mode

Confirmation Mode is used to check the status of the STP pump and STP control unit. The following items can be checked in Confirmation Mode:

- (1) Version information
- (2) Individual information (serial number, total hours of running, and number of starts)
- (3) Current settings (rated speed, TMS temperature setting, and acutual pump temperature)
- (4) Current function settings (remote mode, TMS function, inhibit command, and emergency vent. valve)
- (5) Error record (lists up to 10 of the most recent errors)

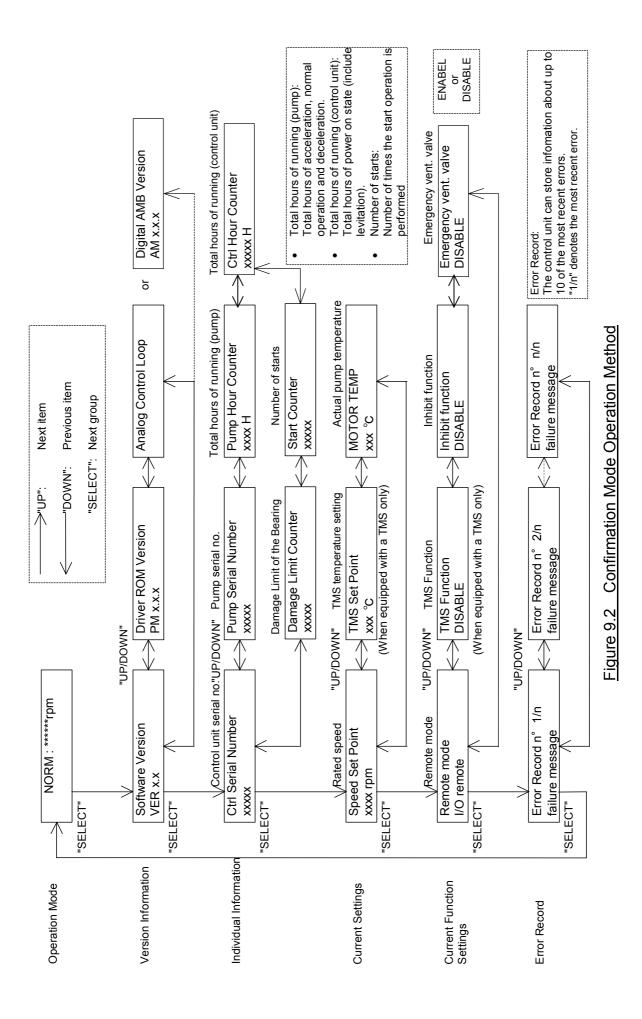


The emergency vent. valve is not used with this series of STP pump. The TMS unit is not used with this series of STP pump.

<Confirmation Method> (See Figure 9.2)

- Press the "SELECT" switch to enter Confirmation Mode. The available menu groups (items (1) through (5) above) are displayed in order.
- 2) Press the "UP" switch to display the next item. Press the "DOWN" switch to display the previous item.
- 3) Press the "SELECT" switch to display the next menu group.
- 4) Press the "UP" and "DOWN" switch to confirm the status of the items of the currently selected menu group.
- 5) Press the "SELECT" switch to return to Operation Mode when viewing the Error Record. Or, if no switch is pressed for approx. 1 minute, the display will automatically revert to Operation Mode.

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9.3 Parameter Set Mode

Parameter Set Mode is used to set the different parameters of the STP pump and STP control unit. The following items can be set in Parameter Set Mode:

- (1) Remote mode
- (2) Rated speed
- (3) TMS function enable/disable
- (4) Rotation Inhibit function enable/disable
- (5) Emergency vent. valve function enable/disable
- (6) Second Damage Limit function enable/disable
- (7) Remote mode configuration





The emergency vent. valve is not used with this series of STP pump. The TMS unit is not used with this series of STP pump. \bigcirc

<Parameter Set Mode> (See Figure 9.3)

1) Push the "SELECT" and "UP" switches at the same time to enter Parameter Set Mode.

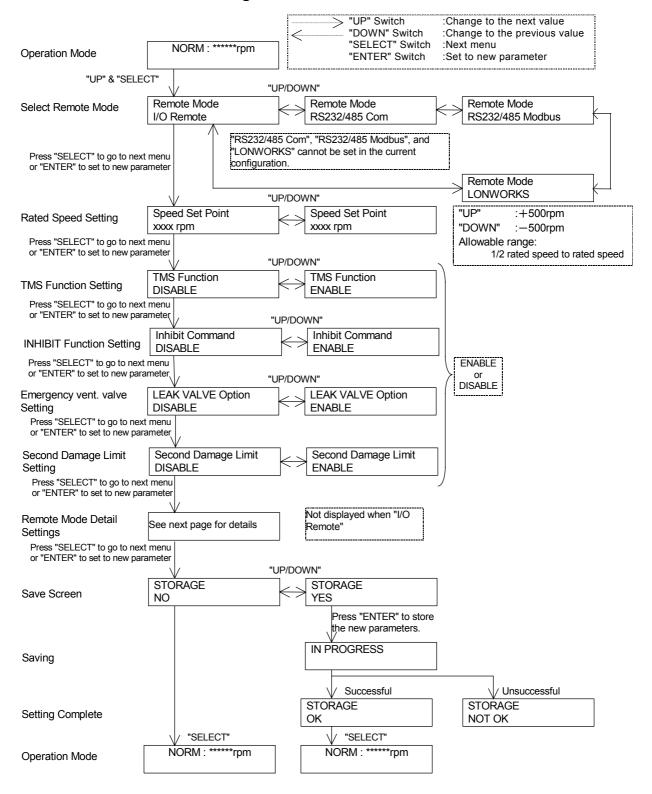
The available menu items (items (1) through (7) above) are displayed in order.

- 2) Press the "UP" switch to display the next parameter and the "DOWN" switch to display the previous one.
- 3) Press the "ENTER" switch to set the parameter to the new setting.
- 4) Press the "SELECT" switch to display the next item.
- 5) Change the parameter by pressing the "UP" and "DOWN" switches, then set it by pressing the "ENTER" switch.
- 6) When the save screen is displayed, select "YES" then press the "ENTER" switch to store the new parameters. "IN PROGRESS" is displayed on the LCD followed by "STORAGE OK", when the new parameters have been stored successfully, or "STORAGE NOT OK", when the new parameters have been stored unsuccessfully.
- 7) Press the "SELECT" switch to return to Operation Mode. Or, do not press any switch for approx. 1 minute and the display will automatically revert to Operation Mode.
- 8) Select "NO" and press the "SELECT" switch to return to Operation Mode without saving the new parameters.

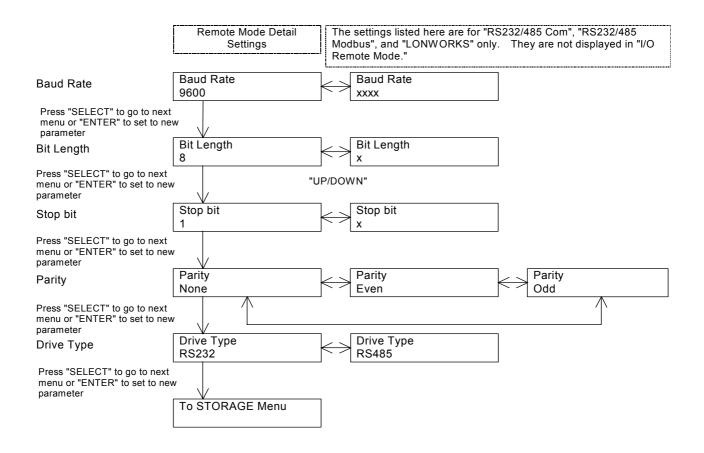
Operation

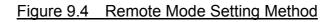


Do not set the "RS232/485 Com", "RS232/485 Modbus", and "LONWORKS" settings of Remote Mode because they cannot be set in the current configuration.









10 Safety Functions

10.1 Power Failure

< I . Operation at a Power Failure>

When the power voltage drops below 80 V due to a power failure or other, the normal operation of the magnetic bearing is maintained using the regenerative energy of the rotating rotor (backup operation during a power failure).

- 1) When the rotational speed is 8,500 rpm or more at a power failure:
 - i. The STP control unit detects any power failure of <u>2 seconds or more</u> and the STP pump decelerates.

At this time, the "POWER" lamp goes out and the "FAILURE" lamp lights. The LCD displays "Mains Failure." Also, an alarm signal is output from REMOTE X7 pins (14)-(33) and (15)-(33). When the rotational speed goes down to <u>approx. 8,500 rpm</u>, the rotor lands on the touch down bearing and stops. The "FAILURE" lamp goes out and the LCD is turned off. Also, the alarm signal output is reset.

- ii. The STP control unit does not detect a power failure of <u>less than approx. 2</u> <u>seconds</u>, continuing rotating the STP pump.
- 2) When the rotational speed is less than approx. 8,500 rpm at a power failure: The STP control unit does not detect the power failure. The rotor lands on the touch down bearing and stops.
- < II. Operation after a Power Recovery>
- 1) MANUAL operation

The magnetic bearing operation and LED lamp and LCD messages are recovered after a power recovery. The "FAILURE" lamp goes out.

- The STP pump continues decelerating even after a power recovery. Press the "START" switch to reaccelerate the STP pump.
- 2) **REMOTE** operation

The magnetic bearing operation and LED lamp and LCD messages are recovered after a power recovery. The "FAILURE" lamp goes out.

- When the START signal is input to the REMOTE input pin after a power recovery, the STP pump reaccelerates.
- When the START signal is not input to the REMOTE input pin after the power recovery, the STP pump continues the BRAKE operation.



8,500 or more

Less than 8,500

Establish a sequence so that the power can be supplied to the STP control unit immediately after a power recovery.

Table 10.1 shows the states of LCD, LED lamps, and REMOTE output signals at a power failure.

Also, Table 10.2 shows the operations of the STP pump after a power recovery.

r	i	i		ł	
Rotational speed	LCD Message	LED	lamps	sig	FE output mals OTE X7)
(rpm)					

POWER

lamp

OFF

OFF

Mains Failure

OFF

FAILURE

lamp

ON

OFF

Power ON

signal

OFF

OFF

ALARM

signal

ON

OFF

Table 10.1 States of Lamps and REMOTE Output Signals at a Power Failure

Table 10 2	Operations of the STP Pump after a Power Recovery

		MANUAL operation	REMC	TE operation
Rotational speed (rpm)	Duration of power failure	STP pump operation after a power recovery	" <u>START"</u> REMOTE signal input after a power recovery	STP pump operation after a power recovery
	Approx. 2 sec. or more	Deceleration/Stop	Yes	Reacceleration
8,500 or more			No	Deceleration/Stop
	Less than approx. 2 sec.	Continues as before.		
Less than		Deceleration/Stop	Yes	Reacceleration
8,500			No	Deceleration/Stop

10.2 Abnormal State of Magnetic Bearing

When the magnetic bearing does not function normally due to a breakage of the STP connection cable, disconnection of connectors or any abnormality/error of the STP control circuit, the rotor falls on the touch down bearing and stops. The "FAILURE" lamp lights and the LCD displays error message "Disturbance*_*".

CAUTION

 When an abnormality/error occurs in the magnetic bearing, check the STP pump as well as the STP control unit. If "FAILURE" cannot be released after reset operation, contact Service office.

10.3 Excessive Vibration

When serious vibration or mechanical shock causes the rotor to touch the touch down bearing (due to external vibration/impact, intrusion of atmosphere or foreign materials into the STP pump or rotor imbalance), the STP pump decelerates and stops.

The "FAILURE" lamp lights and the LCD displays error message "Disturbance*_*".

10.4 Motor Driver Overload

When the STP pump does not attain the rated speed within approx. 30 minutes after starting or when the ACCELERATION state remains unchanged during operation for approx. 30 minutes, the STP pump decelerates and stops. The "FAILURE" lamp lights and the LCD displays error message "DRIVER Overload".

10.5 Overheating Inside the STP Pump

When the temperature of the motor inside the STP pump overheats due to an abnormal baking temperature or overload operation, the STP pump decelerates and stops.

The "FAILURE" lamp lights and the LCD displays error message "MOTOR Overheat".

10.6 Overheating Inside the STP Control Unit

When the temperature inside the STP control unit overheats due to a failure in the air cooling fan, external heat source, and other, the WARNING message "CAUTION: CNT heat*" is displayed. In this case, the STP pump does not stop. If the STP control unit overheats further, the STP pump decelerates and stops. The "FAILURE" lamp lights and the LCD displays error message "CNT Overheat".

10.7 Overspeed

When the rotational speed of the STP pump exceeds the specified rotational value due to a failure in the motor driver, the breaker in the STP control unit switches "OFF." The STP pump has no power supplied and stops. The "FAILURE" lamp lights and the LCD displays error message "OVERSPEED*".

		-		
Reset by RESET switch	Impossible	Possible	Possible	Possible
Probable causes of an abnormality/error	Power failure. Power cable breakage. Power cable disconnection.	STP connection cable breakage. STP connection cable disconnection. Abnormal control circuit.	External vibration and impact. Intrusion of atmospheric air. Intrusion of foreign materials.	Leakage from the vacuum equipment or piping. Insufficient pressure at inlet and outlet port sides. Failure of starting of the backing pump.
State of the STP pump	The magnetic bearing continues to operate using regenerative energy. The STP pump decelerates and stops. The rotor lands on the touch down bearing.	The STP pump stops.	The STP pump decelerates and stops.	The STP pump decelerates and stops.
REMOTE output signal	"ALARM" "POWER ON" output cut-off	"ALARM"	"ALARM"	"ALARM"
LCD	"Main Failure"	"Disturbance *_*"	"Disturbance *_*"	"DRIVER Overload"
Lamp indication	"FAILURE" lights. "POWER" goes out.	"FAILURE"	"FAILURE"	"FAILURE"
Operation state of safety functions	Power failure time: 2 seconds or more	Rotor descends onto the touch down bearing.	Rotor vibrates excessively to come into contact with the touch down bearing.	The STP pump does not attain the rated speed 30 minutes or more after it starts.
Abnormality /Error	Power failure	Abnormal magnetic bearing	Excessive vibration	Overload of motor driver

Table 10.3 Safety Functions (1/2)

I				
	Reset by RESET switch	Possible	Possible	Impossible
	Probable causes of an abnormality/error	Abnormal baking temperature. Insufficient cooling. Leakage of vacuum equipment or piping. Continuous repetition of startup/stop. Extraordinarily-high temperature.	Failure in the cooling fan. Shielding of cooling air inlet and ventilation port. Extraordinarily-high temperature.	Failure in the motor driver.
	State of the STP pump	The STP pump decelerates and stops.	The STP pump does not stop. The STP pump decelerates and stops.	Breaker OFF. Power failure state is entered and the STP pump stops.
	REMOTE output signal	"MARAT"	"ALARM"	"ALARM" "POWER ON" output cut-off
	LCD	"MOTOR Overheat"	"CAUTION: Overheat*" "CNT Overheat*"	"OVERSPEED*"
	Lamp indication	"FAILURE"	"FAILURE"	"FAILURE"
	Operation state of safety functions	Temperature of the STP pump motor rises.	Temperature inside the STP control unit rises.	Rotational speed of the STP pump over the specified speed.
	Abnormality /Error	Overheating inside the STP pump	Overheating inside the STP control unit	Overspeed

Table 10.3 Safety Functions (2/2)

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Abnormality /Error	Operation state of safety functions	Lamp indication	LCD	REMOTE output signal	State of the STP pump	Probable causes of an abnormality/error	Reset by RESET switch
Failure of TMS unit	Abnormal temperature Setting temperature +10°C or more -10°C or less	"FAILURE"	"TMS Higher Temp." or "TMS Lower Temp."	"ALARM"	The STP pump decelerates and stops. Output of heater and cooling water valve is OFF.	Abnormal cooling water. Heater disconnect.	Possible
	TMS heater overheats	"FAILURE"	"TMS Overheat"	"ALARM"	The STP pump decelerates and stops. Output of heater and cooling water valve is OFF.	Error/abnormality detection above does not function.	Impossible
Failure of TMS connection cable	Failure of TMS TMS connection connection cable or its cable connector is disconnected.	"FAILURE"	"T.Cable Disconnect"	"ALARM"	The STP pump decelerates and stops. Output of heater and cooling water valve is OFF.	TMS connection cable breakage. TMS connection cable disconnection.	Impossible

Table 10.4 Safety Functions (When the TMS Unit is Used)



 \diamondsuit The TMS unit is not used with this series of STP pump.

11 Troubleshooting, Maintenance, and Inspection

The STP pump is provided with safety functions for various abnormality/errors.

When an abnormality/errors occurs in the pump or control unit, the safety function operates with the "FAILURE" lamp lit, and an alarm signal is output from the remote output pins. An error message showing the number of the error in the form "Error n° **/**" and the contents of the error are displayed alternately on the lower line of the LCD.

If an abnormality/error is found when using the STP pump, check it and take measures in accordance with the following procedures. If you cannot trace it or if the STP pump does not function normally after the troubleshooting, fill in the necessary information in the "<u>Malfunction</u> information" and fax it to Service office.

11.1 Troubleshooting Immediately after an Abnormality/Error Occurs

11.1.1 Troubleshooting Power Failure

Establish a sequence so that the power can be supplied to the STP control unit immediately after a power recovery.

11.1.2 Troubleshooting Other Abnormality/Error

Refer to <u>Section 7.4.6 and 7.5.5</u>, "Starting the STP Pump after a Safety Function <u>Operates</u>."

- After confirming the "BRAKE" lamp goes out and the STP pump stops, remove the probable cause of the abnormality.
 When the LCD displays an error message, take the necessary action according to <u>Section 11.2</u>, "When Error Message is <u>Displayed on LCD</u>."
- ii. Perform the RESET operation according to turn off the "FAILURE" lamp.
- iii. Perform the START operation. Check if the STP pump operates correctly.

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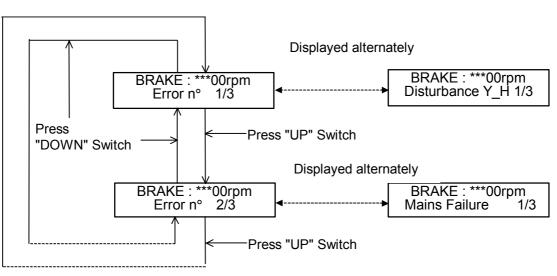
- When disconnecting cables from the STP pump and/or the STP control unit to perform troubleshooting and take the necessary action, confirm that the STP pump stops, turn OFF the primary power (Switch the breaker "OFF"), then disconnect the cables.
- If the RESET operation does not turn off the "FAILURE" lamp, confirm that the STP pump stops, turn OFF the primary power (Switch the breaker "OFF"), then turn ON the primary power again (Switch the breaker "ON").

11.2 When Error Message is Displayed on LCD

11.2.1 Error Messages

When error is detected, "Error n°**/**" and the error message are displayed on the lower line of the LCD alternately. The first number of "**/**" is the order of detected errors that have occured. Thus, a "1/3"would denote the fastest error of 3 errors. Press the "UP"or "DOWN" switch to scroll display the contents of the next or previous error message. (The "UP" or "DOWN" switch can also be input in Remote Mode.)

Example)





- The upper message on the LCD shows the current STP pump operation state.
- When the message on the LCD is in Conformation mode or Parameter Set mode, press the "SELECT" switch several times to change it to the status display mode.

LCD Messages	Probable Causes	Countermeasures	Referred Section
CAUTION Bad PCB EEPROM	1) Turning on the power after "Tuning Error" is detected.	1) Perform tuning.	9.1
	 Abnormal data in STP control unit. 	2) Perform tuning.	9.1
	3) Failure of the STP control unit.	3) Contact Service office.	Malfunction information
CAUTION	Use of different series of the	Use the same series of the	—
Bad Pump Identifier	STP pump and the STP control unit.	STP pump and the STP control unit.	
CAUTION Bad EEPROM content	Use of different serial No. of the STP pump and the STP control unit.	Perform tuning.	9.1
CAUTION Bad Pump EEPROM	1) Abnormal data in STP pump unit.	1) Perform tuning.	9.1
	 2) Failure of the STP pump. 	2) Contact Service office.	Malfunction information
CAUTION	Failure of the STP pump.	Contact Service office.	Malfunction
Different Pump_ID			information
CAUTION :PCB& Pump EEPROM Failure	1) Power is turned off during turning	1) Perform turning again. Reconfigure the	9.1
	2) Use of different version of the software.	initialized settings. 2) Perform tuning.	9.1
	 Failure of the STP pump or the STP control unit. 	3) Contact Service office.	Malfunction information
CAUTION : CNT heat 2	Overheat inside the STP control unit (the STP pump does not stop):		
	1) High ambient temperatures	1) Set the ambient temperature to 40 °C or less.	6.2.1 6.2.2
	2) Insufficient cooling of the STP control unit.	2) Remove obstacle from the ventilation port.	6.2.2
	3) Failure of the air cooling fan in the control unit	3) Repair is needed. Contact Service office.	Malfunction information
CAUTION	Failures of the STP pump and	Contact Service office.	Malfunction
	the STP control unit.		information
CNT Overheat 1	Overheat inside the STP		
CNT Overheat 2	control unit:		
	1) High ambient temperature	1) Set the ambient temperature to 40 °C or less.	6.2.1
	2) Insufficient cooling of the STP control unit	 Remove obstacle from the ventilation port. 	6.2.1
	3) Failure of the air cooling fan in the control unit	3) Repair is needed. Contact Service office.	Malfunction information

Table 11.1	Error Messages	(1/5)

LCD Messages	Probable Causes	Countermeasures	Referred Section
DRIVER Overload	The motor driver overload.		
	(when the rated operation		
	does not start approx. 30 min.		
	after start operation is		
	executed:		
	ACCELERATION state		
	continues for approx. 30		
	minutes:		
	1) High pressure at the	1) Use the maximum	4.3.4
	inlet port	working pressure or less.	13.1
	2) High pressure at the	2) Use the allowable	4.3.4
	outlet port	backing pressure or less.	13.1
	3) Leakage of the piping	3) Check the vacuum	4.3.4
	system	piping system for	13.1
	4) Failure of the backing	leakage.4) Check the backing	4.3.4
	_	pump for its capacity	4.3.4 13.1
	pump	and START state	10.1
		(use a pump with the	
		recommended capacity or more)	
DRIVER Overvoltage	Failure of the STP control	Contact Service office.	Malfunction
Ditt v Elt Over voltage	unit.	Contact Bervice onnee.	information
DRIVER Sensor Lost	Failure of the STP control	Contact Service office.	Malfunction
DIGI V EIG SEHSOF LOST	unit.	Contact Service onice.	information
DRIVER com. Failure	Failure of the STP control	Contact Service office.	Malfunction
	unit.		information
DSP->PCB com fail	Failure of the STP control	Contact Service office.	Malfunction
	unit.		information
Disturbance X B	Abnormal magnetic bearing:		
Disturbance X H	1) Change of the cable	1) When changing the	9.1
Disturbance Y_B	length	cable length, perform	0.1
Disturbance Y_H	longui	tuning.	
Disturbance Z	2) Disconnection of the	2) Contact Service office.	Malfunction
	STP connection cable or	2) Contact Bervice onice.	information
	control circuit error		mormation
	Excessive vibration applied		
	externally to the STP pump:		
	1) External	1) Remove external	4.3.4
		vibration so as not to	4.3.4
	vibration/impact.	transmit it to the STP	
	(\mathbf{r})	pump.	4.9.4
	2) Atmospheric air flows	2) Check the vacuum	4.3.4
	the STP pump	piping.	101
	3) Foreign materials fall	3) Install the STP pump	4.2.1
	into the STP pump	in a way that no foreign	
		materials fall into the	
		STP pump.	
EPROM Error	Failure of the STP control	Contact Service office.	Malfunction
	unit.		information
Error Message n°**/**	If an error occurs	Refer to the respective error	11.2
Error Message n°**/**	If an error occurs (**/** shows the number of errors occurred).	Refer to the respective error message.	11.2

LCD Messages	Probable Causes	Countermeasures	Referred Section
First Damage Limit	First damage phenomenon	Overhaul is needed. Contact	Malfunction
	appeared on the touch down	Service office.	information
	bearing (the STP pump does		
	not stop).		
E.Valve Disconnect	Disconnection of the	Connect the cable correctly.	\land
	emergency vent valve cable	If the cable connector is not	
	(not used in this	locked, lock it securely.	
	specification model).		
	Failure of the emergency	Contact Service office.	\searrow
	vent valve cable (not used in		\mid \times
	this specification model).		
	Incorrect setting of the	When the emergency vent	9.3
	emergency vent valve (not	valve function is set to	
	used in this specification	"ENABLE," set it to	
	model).	"DISABLE".	
MOTOR Overheat	Overheating inside the STP		
	pump:		
	1) Overheating during	1) Set the temperature of	5.3
	baking	the baking heater to	
		120°C or less.	
	2) Insufficient cooling	2) At the time of baking or	5.2
		gas pumping, always	
		cool the STP pump.	
	3) Leakage of the	3) Check the piping	4.3.4
	vacuum piping system	system for leakage.	7 0
	4) Repetitious start/stop	4) Repetitious start/stop	7.3
	operations	operations may cause	
		the STP pump to	
M TEMP CENCOD		overheat. Contact Service office.	Malfunction
M_TEMP SENSOR LOST	Failure of the STP pump.	Contact Service office.	information
Mains Failure			information
mains ranure	Insufficient power supply: 1) Power failure	1) Check whether or not a	10.1
	1) rower lanure	power failure has	6.4.2
		occurred.	0.4.2
	2) Incorrect connection of	2) Connect the power	Malfunction
	the power cable.	cable correctly.	information
	3) Failure of the power	3) Replace the power	6.4.2
	cable	cable.	0.4.2
	4) Failure of the power	4) Set the voltage to the	13.2
	voltage	rated voltage $\pm 10\%$.	10.2
No Levitation	The rotor does not levitate.	Refer to the respective error	11.2
		message.	
OVERSPEED 1	Overspeed of the STP pump.		Malfunction
OVERSPEED 2	pump.		information
OVERSPEED 3			
P.Cable Disconnected	Incorrect connection of the	Connect the cable correctly.	6.4.2
	STP connection cable.	If the cable connector is not	0.1.4
		locked, lock it securely.	
	Failure of the STP	Contact Service office.	Malfunction
	connection cable.		information
PCB->DSP com fail	Failure of the STP control	Contact Service office.	Malfunction
	unit.		information
		Contact Service office.	Malfunction
Power Supply Failure	Failure of the STP control	ICONTACT Service office	Manunction

Table 11.1 Error Messages (3/5)

LODM			
LCD Messages	Probable Causes	Countermeasures	Referred Section
RAM Error	Failure of the STP control	Contact Service office.	Malfunction
	unit.		information
START NOT ALLOWED		Overhaul is needed. Contact	
	damage on the touch down	Service office.	information
	bearing exceeds the second		
	damage limit and the start		
	is not allowed.		
Second Damage Limit	When the extent of the	Overhaul is needed. Contact	
	damage on the touch down	Service office.	information
	bearing exceeds the second		
	damage limit and the start		
	is not allowed.		
Speed Pulse Lost	Failure of the STP pump.	Contact Service office.	Malfunction
			information
	Failure of the STP control	Contact Service office.	Malfunction
	unit.		information
T.Cable Disconnected	Disconnection of the TMS	Connect the cable correctly.	6.4.2
	connection cable.	If the cable is not locked, lock	
		it securely.	
	Failure of the TMS	Contact Service office.	Malfunction
	connection cable.		information
	Disconnection of the TMS	Contact Service office.	Malfunction
	sensor.		information
	Incorrect setting of the TMS	When the TMS function is in	9.3
	function.	no use, set the TMS function	
		to "DISABLE".	
TMS Breaker Trip	The TMS unit earth leakage		
	breaker (optional) is "OFF"		
	1) Incorrect setting of the	1) Always remain the	Instruction
	TMS unit earth	TMS unit earth leakage	Manual of TMS
	leakage breaker.	breaker "ON."	Unit
	2) Failure of the TMS	2) Contact Service office.	Malfunction
	heater or the valve		information
TMS Higher Temp.	TMS temperature control		
	error (when the TMS unit		
	detection temperature		
	becomes +10°C or more):		
	1) Insufficient cooling of	1) Connect the cooling	Instruction
	the TMS unit	water electromagnetic	Manual of TMS
		valve correctly. Check	Unit
		the amount and the	
		temperature of cooling	
		water.	
	2) Failure of the TMS	2) Contact Service office.	Malfunction
	unit		information

Table 11. 1 Error Messages (4/5)

TMS Lower Temp.	TMS temperature control error (when the detection temperature of the TMS unit becomes -10°C or less: such error cannot be detected within 1 hour after startup): 1) Failure of the TMS heater 2) Failure of the TMS	 Contact Service office. Contact Service office. 	Malfunction information
	2) Failure of the TMS unit	2) Contact Service office.	Malfunction information

LCD Messages	Probable Causes	Countermeasures	Referred Section
TMS overheat	Overheat of the TMS heater:		
	1) Failure of the TMS		
	heater	1) Contact Service office.	Malfunction
	2) Failure of the TMS		information
	unit	2) Contact Service office.	Malfunction
			information
Tuning Error 1	Tuning errors	"No LEVITATION" is	9.1
Tuning Error 2		displayed.	
Tuning Error 3		Perform tuning again after	
Tuning Error 4		turning on the power.	
Tuning Error 5			
w	When any warning message	Refer to the respective	11.4
(appears on the upper	appears on the LCD display.	warning message.	
right LCD display)			

Table 11 1	Error Messages (5/5)

11.3 Other Abnormalities

11.3.1 Abnormalities When Powering ON

(When the "FAILURE" lamp lights and the LCD displays an error message, see <u>Section 11.2, "When Error Message is Displayed on LCD."</u>)

No.	Symptom	Probable cause	Countermeasures	Referred Section
1	The "POWER" lamp does not light when powering ON.	Incorrect connection of power cable	Connect the power cable correctly.	6.4.2
		Abnormal power voltage	Set the voltage to rated voltage $\pm 10\%$.	$6.4.2 \\ 13.2$
		Power failure	Check whether or not a power failure has occurred.	10.1

Table 11.2 Troubleshooting after Powering ON

11.3.2 Abnormalities When Performing the STP Pump Start Operation

(When the "FAILURE" lamp lights and the LCD displays an error message, see <u>Section 11.2, "When Error Message is Displayed on LCD</u>.")

No.	Symptom	Probable cause	Countermeasures	Referred Section
1	The "ACCEL." lamp does not light.	The "MANUAL/ Slide the "MANUAL/ REMOTE" changeover witch is not at the switch to the correct position.		
		ROTATION INHIBIT signal input pins (REMOTE X7 (1)-(5)) are opened.	When not using this function, short the circuits between (1)-(5), or set "Inhibit Command" to "DISABLE". If these pins are opened, the STP pump will not rotate after performing start operation.	8.1 9.3

Table 11.3 Troubleshooting When Performing the STP Pump Start Operation

11.3.3 Other Abnormalities

(When the "FAILURE" lamp lights and the LCD displays an error message, see <u>Section 11.2</u>, "When Error Message is Displayed on LCD.")

No.	Symptom	Probable causes	Countermeasures	Referred Section
1	Insufficient ultimate pressure	Failure of the backing pump	Check the capacity and starting state (use a backing pump having more capacity that we specified).	4.3.4 13.1
		Leakage of the piping system	Check the piping system for leakage.	4.3.4
		Residual molecules	If the main composition is H ₂ or H ₂ O, perform baking; if it is other gases, clean the inside of the vacuum equipment (If gases remain inside the STP pump, contact Service office when it is needed to be cleaned).	5.3 11.6.3
2	The STP pump stops.	ROTATION INHIBIT signal input pins (REMOTE X7 (1)-(5)) are opened.	When not using this function, short the circuit between (1)-(5), or set "Inhibit Command" to "DISABLE". If these pins are opened, the STP pump will not rotate after performing start operation.	8.1 9.3
3	The TMS unit does not function	Incorrect settings of TMS function	When using the TMS unit, set "TMS Function" to "ENABLE".	9.3
4	ROTATION INHIBIT signal does not function correctly.	Incorrect settings of Inhibit function	When using the ROTATION INHIBIT signal, set "Inhibit Command" to "ENABLE".	9.3
5	The E. V. valve does not function (The E.V. valve is not used with this series of the STP pump).	Incorrect settings of the E. V. valve function	When using the E. V. valve, set "LEAK VALVE Option" to "ENABLE".	

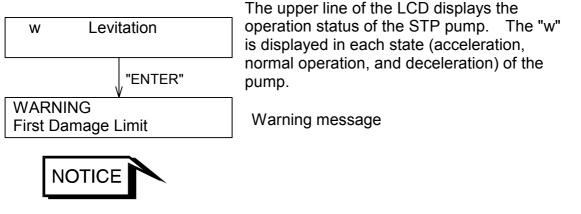
Table 11.4 Troubleshooting While the STP Pump Is Rotating

11.4 "WARNING" Message Display Function

The STP control unit is provided with a "WARNING" message to display when an overhaul is needed following a self test.

When a "w" appears in the upper left hand corner of the LCD, press and hold the "ENTER" switch to display the warning message. The warning message indicates that an overhaul is necessary. Please contact Service office for an overhaul. (The "ENTER" switch can also be used in Remote Mode.)

Example:



- The "WARNING" message cannot be reset by the "RESET" switch. Service office is in charge of resetting the "WARNING" message.
- The STP pump can operate even when the "WARNING" message is displayed.

It is recommended to have the STP pump overhauled as soon as possible.

 The STP pump can operate even when the "WARNING" message is displayed except when "Second Damage Limit" is displayed.
 Overhaul the STP pump when "Warning" message is displayed.

11.4.1 First Damage Limit

The touch down bearing inside the STP pump will be worn out caused by impact or air in rush from outside. Also, touch down at the power failure causes wear. The STP control unit adds the damage point at each "Disturbance" and "Mains Failure" error. "First Damage Limit" is displayed when the accumulation point attains the prime setting value. "First Damage Limit" cannot be reset. It is recommended to have the STP pump overhauled as soon as possible.

11.4.2 Second Damage Limit

"Second Damage Limit" is displayed when continuing to operate the STP pump after "First Damage Limit" is displayed, and the accumulation of the damage point attains the second setting value by generating second "Disturbance" or "Mains Failure". Overhaul the STP pump because the STP pump cannot perform the rotational operation when "Second Damage Limit" is displayed.

11.5 "ERROR RECORD" Message Display Function

The STP control unit can display the contents of up to the last 10 errors on the LCD.

To view the error record, push the "SELECT" switch follow the instructions for entering Confirmation Mode in Section 9.2. The error number of up to the last 10 errors is displayed on the upper line of the LCD in the form "Error Record n° */*", and the contents of the error is displayed on the lower line. The first number of "**/**" shows the number of the error (the most recent error is number 1) and the second number shows the number of errors that have occurred up to 10. Thus, a "1/3" would denote the most recent error of 3 errors. Press the "UP" or "DOWN" switch to scroll display the contents of the next or previous error in the error record. (the "UP" and "DOWN" switch can also be input in Remote Mode. See Section 9.2 for a more detailed explanation of Confirmation Mode.

11.6 Maintenance and Inspection

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 When performing maintenance and inspections of the STP pump, exhaust gases inside the STP pump thoroughly.

Residual gases may cause an accident when removing the STP pump.

Confirm the characteristics of gas to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier. Wear personal protective equipment if necessary.

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 Stop the STP pump, and turn OFF the primary power (Switch the breaker "OFF"), before performing maintenance and inspections of the STP pump and STP control unit.
 Failure to do so may result in the inadvertent rotation of the STP

pump, which may result in an accident.

- Do not touch any place other those specified when performing maintenance or inspecting the pump and NEVER open any panel because it could cause shock, malfunction, or short circuit.
- Power OFF the baking heater and other peripheral equipment before performing maintenance and inspections.
- The wipes used for clean and decontamination might become hazardous waste depending upon the solvent (alcohol). Dispose of the contaminated wipes appropriately according to the regulations of each national and/or local government.

11.6.1 Cleaning and Decontamination

The method of cleaning and decontamination of the STP pump and STP control unit is shown below.

Area	cea Cleaning and Decontamination	
STP Pump	Exterior	Wipe with proper solvent (such as alcohol). Clean off with a pure gas when dust has accumulated in the connector. When the label of the STP pump has been damaged, contact Service office.
-		The decontamination (overhaul) in the STP pump is executed in Service office. When overhaul is needed, contact Service office.
STP Control unit	Exterior	 Wipe with proper solvent (such as alcohol). When dust has accumulated in the ventilation port, wipe off or vacuum it with the cleaner. In this case, dust must not enter in the STP control unit. Clean off with a pure gas when dust has accumulated in the connector. When the label of the STP control unit has been damaged, contact Service office.
	Interior	The cleaning (overhaul) in the STP control unit is executed in Service office. When overhaul is needed, contact Service office.

Table 11.5 Cleaning and Decontamination

11.6.2 Inspecting the Deposit

Leaving the STP pump without removing the deposit may cause the STP pump to be corroded beyond repair.

Deposit may have accumulated inside the STP pump depending upon the type of the vacuum equipment installed in the STP pump. An increase in the amount of deposit may lead to a malfunction of the STP pump.

Therefore, perform regular maintenance (once every three to six months as a target).

Inspect the inside of the outlet port flange for adhesion of deposit while watching the outlet port flange. If deposit has accumulated to some extent, an overhaul (cleaning) is required. Contact Service office.

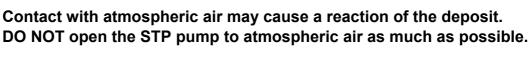
Note that the costs of troubleshooting problems resulting from deposit will be at your own charge even during the warranty period.

If a problem resulting from deposit occurs inside the STP pump, hermetically seal inlet port, outlet port, purge port, and leak port flanges, and immediately return them to Service office.

For the transport method, see Section 11.6.3, "Transport for Repair or Overhaul."



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11.6.3 Overhaul

The recommended maintenance intervals for different process applications are tabulated below:

	Process	Period	Remarks	
	Metal Etch	1 year	Ensure that TMS (Temperature Management	
			System) is fitted and operational to prevent	
ഷ്			accumulation of by-product deposition in the pump.	
hir	Other Etch	2 years		
Image: Second state Other Etch Image: Second state Processes				
μ Ξ ι	It is recommended to	change the pu	np rotor after 5 years due to accumulated wear of the	
	protective plating material			
		2 years	Processes resulting in accumulation of deposits in	
proc	ess		the pump will require more frequent service.	
Clea	an applications	5 years		
(Only vacuum pumping)				
Oth	er use	(2 years)	Dependent on application, contact BOC Edwards.	



The touch down bearing inside the STP pump will be worn out after a number of full speed touch downs. When the STP control unit displays "w," it is essential to have the touch down bearings replaced.

The costs of replacing parts that need to be replaced because of deterioration or abrasion will be at your own charge.

When overhaul of the STP pump or the STP control unit is needed, contact Service office.

^{*1} "Etching" includes semiconductor etching and LCD etching.

11.6.4 Transporting for Repair or Overhaul

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- When returning the STP pump which has used any kind of gases to Service office, fill the type of gas and handling precautions in the "Malfunction Information " and fax it to Service office.
 Confirm the characteristics of gas to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier.
- Follow the instruction of "Return Procedure" to prevent an accident during the transportation, repair or overhaul.

 When returning the STP pump to Service office, be sure to pack it well to prevent external damage.
 If "Return Procedure" has not been satisfied, BOC Edwards will not be responsible for any troubles.

<u>i) Always contact Service office before returning the STP pump for repairs,</u> <u>overhaul, or other purposes.</u> To avoid any accident by gases or corrosion inside the STP pump, particularly when corrosive, reactive or flammable gases have been used, <u>ii) Vacuum and hermetically seal the STP pump</u> before transport. <u>iii) Specify the type of gases used and handling precautions in the "Malfunction</u> <u>Information"</u> and return the STP pump to Service office.

When returning the STP pump to Service office, be sure to pack it well to prevent external damage. Use similar or superior packaging material as originally supplied.

"Return Procedure" and the "Malfunction Information" are in the end of the Instruction Manual. When additional sheet is needed, contact Service office.



- The costs of cleaning and overhaul of the STP pump will be at your own charge.
- When returning the STP pump to Service office, fill in the necessary items in the "Malfunction Information " and fax it to Service office.

12 Storage and Disposal

12.1 Storage of the STP Pump

When the STP pump is left unused over a long period (more than a few months), follow the precautions below:

- 1) Close the inlet port of the STP pump and vacuum it using a backing pump.
- 2) Introduce dry N_2 gas or dry air from the outlet port or the purge port.
- 3) Close the outlet port and purge port.
- 4) If the STP pump is water cooled, introduce compressed air from one side of the cooling water port so that no water remains in the STP pump.
- 5) Store the STP pump in a vertical position.
- 6) DO NOT store the STP pump in the following places:
 - Place of high humidity. (If it must be stored in a place of high humidity, insulate it from the outside and use a dehumidifying agent.)
 - Place of high temperatures (<u>more than + 55 °C</u>) and low temperatures (<u>less than -25 °C</u>).
 - Place where there are corrosive gases.
 - Place subjected to dripping water.
 - Place with a lot of dust.
 - Place with insufficient ventilation.
 - Place subjected to strong magnetic or electric fields.
 - Place subjected to radiation.

12.2 Storage of the STP Control Unit

If the STP control unit (including cables) is not used for a long period (more than a few months), follow the precautions below:

- 1) Store the STP control unit in a horizontal position.
- 2) DO NOT store the STP control unit in the following places:
 - Place of high humidity. (If it must be stored in a place of high humidity, insulate it from the outside and use a dehumidifying agent.)
 - Place of high temperature (<u>more than + 55 °C</u>) and low temperature (<u>less</u> <u>than 25 °C</u>) (excluding the battery).
 - Place subjected to direct sunlight.
 - Place where there are corrosive gases.
 - Place subjected to dripping water.
 - Place with a lot of dust.
 - Place of insufficient ventilation.
 - Place subjected to strong magnetic or electric field.
 - Place subjected to radiation.
 - Place subjected to mist.
 - Place with electric noise.
 - Place with vibration.

12.3 Disposal

Dispose of the STP pump and the STP control unit as **industrial waste** according to the guidelines given by each national and/or local government.



♦ When disposing of the STP pump, exhaust gases inside the STP pump thoroughly.

Residual gases may result in an accident when disposing of the STP pump.

If the STP pump has been used with reactive or corrosive gasses, always clean thoroughly before disposing of it to avoid any injury. Confirm the characteristics of gas to be used, referring to the Material Safety Data Sheet (MSDS) you obtain from the gas supplier.

ACAUTION

 BOC Edwards is not responsible for problems during or after disposal.

Specifications 13

Specifications for the STP Pump 13.1

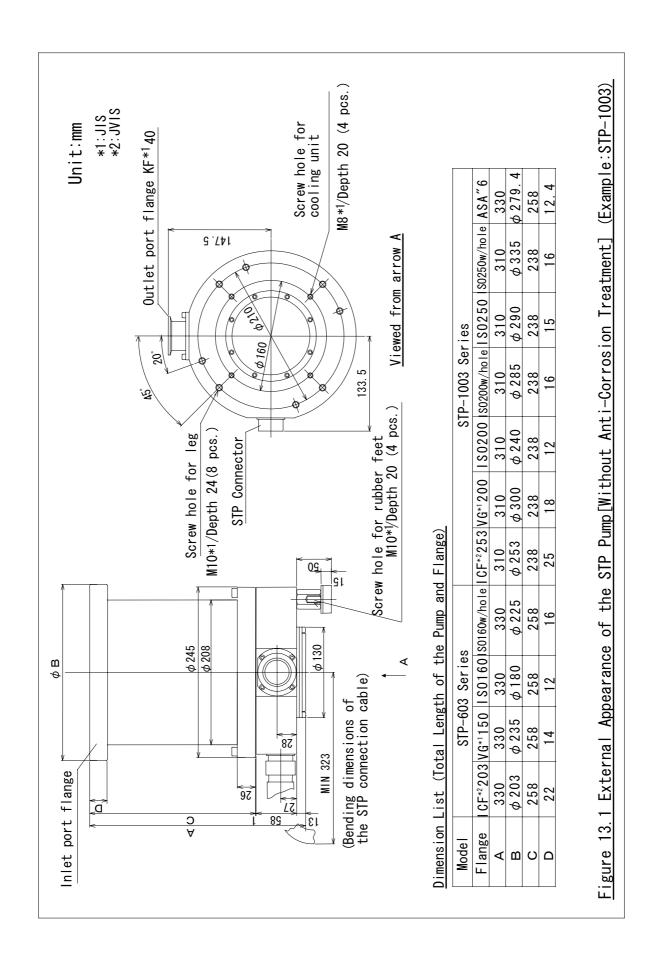
Item			STP-603 Series	STP-1003 Series
Flange size		ICF203/VG150/ISO160	ICF253/VG200/ISO200	
Flange size	Outlet p	ort flange	KF40	KF40
Duranian a succed	N_2	L/sec	650	1000
Pumping speed	H_2	L/sec	550	800
Compression ratio	N_2		>1	.08
Compression ratio	H_2		1	0^{5}
Ultimate pressure Pa (Torr)	Without anti-corr		10 ⁻⁸ (10 ⁻¹⁰) order:ICF flange 10 ⁻⁷ (10 ⁻⁹) order:VG/ISO flange	
	treatmen			
	Chemica type	l specific		er∶ICF flange
			e less:VG/ISO flange	
Maximum working p		Pa (Torr)	$1.3 \times 10^{-2} (1 \times 10^{-4})$	
Allowable backing pressure ^{*1} Pa (Torr)		13 (0.1)		
Rated speed rpm		35,	000	
Starting time		min	(3
Stopping time		min	(3
Noise		dB	<50 (at 35,000 rpm)	
Baking temperature		°C	<1	20
Lubricating oil			Not ne	cessary
Installation position			Free	
			Natural air cooling	
Cooling method			(Water cooling, Air cooling: At baking and gas pumping)	
Standard auxiliary p	ump	L/min	1,3	300
Mass ^{*2} kg		3	1	
Dimensions		mm	$\Phi245 imes$ H330	$\Phi245 imes$ H310
Ambient temperature	e range	°C	0 to 40	
Storage temperature	range	°C	- 25 te	0 + 55

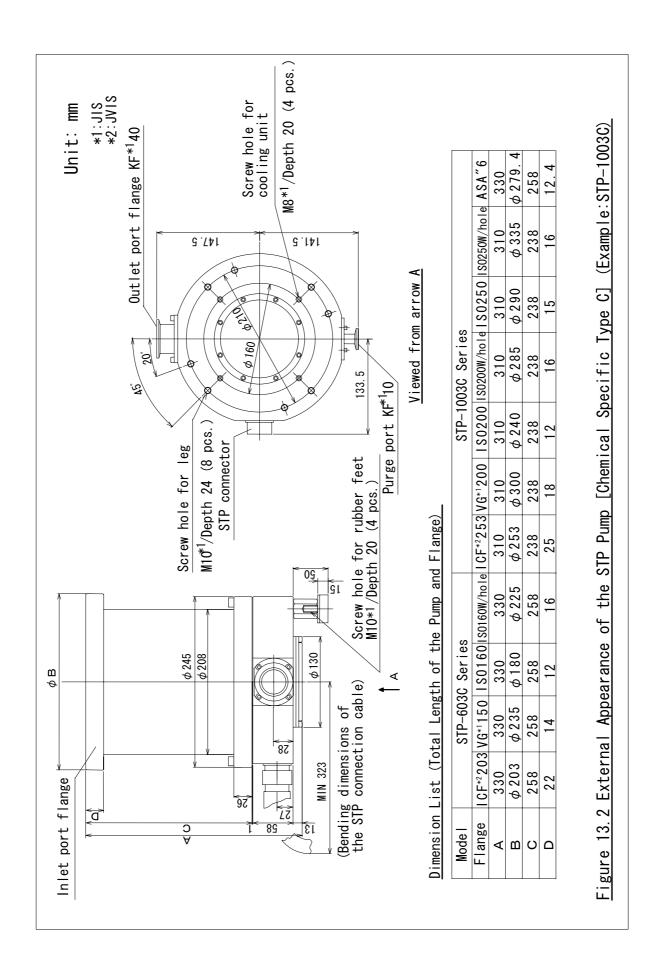
Table 13.1 Specifications for the STP Pump

The values shown in the table are typical.; They are not guaranteed.

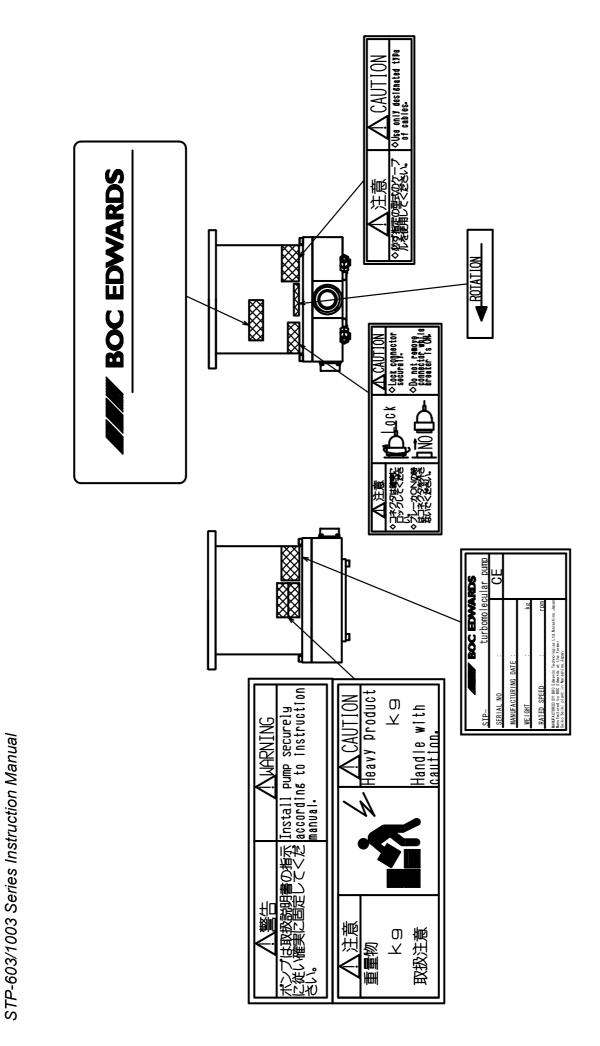
 ^{*1 :} The pressure is applicable under conditions that N₂ or other similar gas is vacuumed and the backing pump (pumping speed: 240 L/min) is used.
 *2 : Mass is a value of state that the only standard accessory was installed (except the optional accessory).

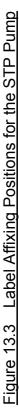






Specification





13.2 Specifications for the STP Control Unit

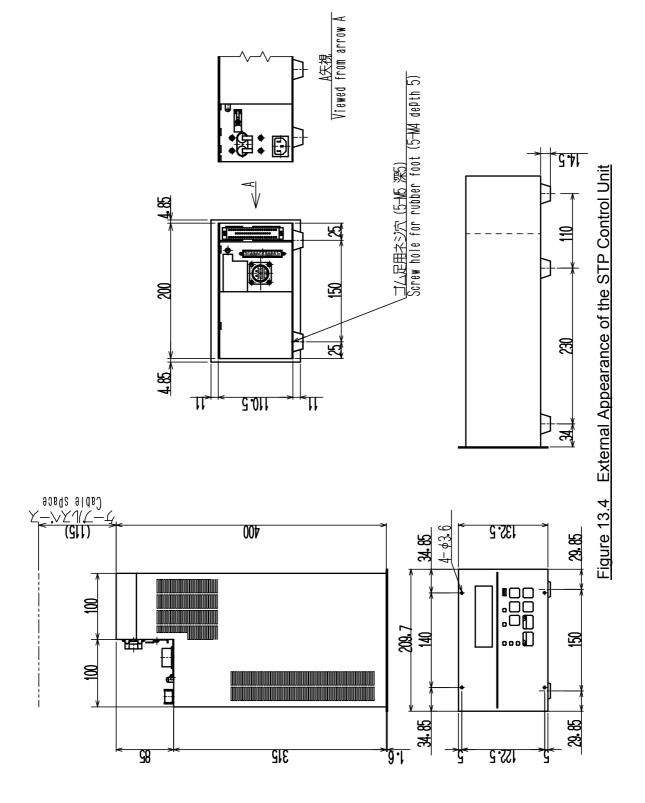
		Item		Specificat	tions
		$200 \text{ to } 240 \pm 10\% (200 \text{V specification})$			
Input voltage		V AC	$100 \text{ to } 120 \pm 10\% (100 \text{V specification})$		
Input power	Wit	Without the TMS unit: VA		Max. 800	
mput power	Wit	h the TMS unit:	VA	Max. 1,200	
Input frequency	у		Hz	50/60±	2
Leakage currer	nt val	ue	mA	Max. 3.5	
Input phase				Single phase	
	Rated current			15A	
Main breaker s	spec.	AIC: Ampere Interr Capacity	rupting	1000A(AC240V, 50/60Hz)	
Motor drive sys	stem			3-phase DC brushle	ss motor driver
Output voltage	under	rated operation	VAC	80	
Output frequer	ncy ur	der rated operation	Hz	583	
Ambient tempe	eratur	e range	°C	0 to 4	0
Storage temper	rature	e range	°C	- 25 to + 55	
Mass^{*1}			kg	9	
Dimensions			mm	W210 $ imes$ H132.5 $ imes$ D401.6	
TMS control un	nit			Internal	
Operation switches			• START switch (flat panel switch, green)		
				 STOP switch (flat panel switch, dark gray) RESET switch 	
				(flat panel switch, gray)SELECT switch (flat panel switch, gray)	
				• UP switch (flat panel switch, gray)	
				• DOWN switch (flat panel switch, gray)	
				• ENTER switch (flat panel switch, gra	y)
			• MANUAL/REMOTE changeover switch (slide switch, black)		
Panel indication lamps			 ACCEL. lamp NORMAL lamp BRAKE lamp TEMP CTRL lamp POWER lamp FAILURE lamp REMOTE lamp 	(green LED) (green LED) (green LED) (green LED) (green LED) (red LED) (green LED)	
Panel display	Panel display			• LCD panel (20 × 2 characters)	
				•	

Table 13.2 Specifications for the STP Control Unit (1/2)

^{*1} Mass is a value of state that the only standard accessory was installed (except the optional accessory).

Item	Specifications		
Input/output terminals	 AC POWER X2 (3 pins) P.CONNECTOR X1 (60 pins) TMS X5 (26 pins) REMOTE X7 (37 pins) 		
Input/output cables	 Power (primary) cable STP connection cable TMS connection cable (optional accessory) 		
Safety functions	 Magnetic bearing abnormality/error detection STP pump overheat detection Driver overload detection Power failure detection STP pump overspeed detection STP control unit overheat detection TMS unit failure detection Other TMS unit failure detection 		

Table 13.2 Specifications for the STP Control Unit (2/2)



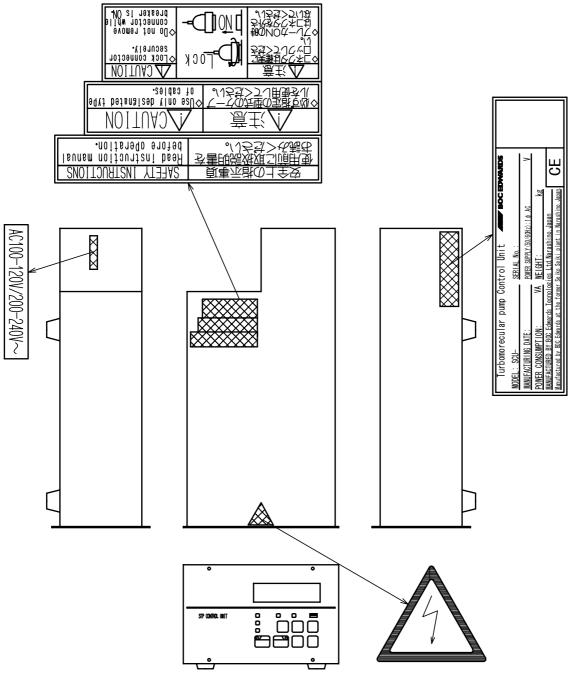


Figure 13.5 Label Affixing Positions for the STP Control Unit

UNIT CONVERSION TABLE

Length

m	cm	mm	inch
1	100	1.00x10 ³	39.4
0.01	1	10.0	0.394
1x10 ⁻³	0.10	1	39.4x10 ⁻³
25.4x10 ⁻³	2.54	25.4	1

Weight

g	kg	lb.
1	1.00x10 ⁻³	2.20x10 ⁻³
1x10 ⁻³	1	2.20
454	0.454	1

Pressure

Ра	Torr	kgf/cm ²
1	7.50x10 ⁻³	1.02x10 ⁻⁵
133	1	1.36x10 ⁻³
9.81 x 10 ⁴	736	1

For more information, contact to the nearest Service Office.

Manufacture: BOC Edwards Japan Limited

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	International	+81-3-5470-6530			
Facsimile:	Domestic	03-5470-6521			
	International	+81-3-5470-6521			



Return of BOC Edwards Equipment - Procedure

INTRODUCTION

Before returning your equipment, you must warn BOC Edwards if substances you used (and produced) in the equipment can be hazardous. This information is fundamental to the safety of our Service Centre employees and will determine the procedures employed to service your equipment.

Complete the Declaration (HS2) and send it to BOC Edwards before you dispatch the equipment. It is important to note that this declaration is for BOC Edwards internal use only, and has no relationship to local, national or international transportation safety or environmental requirements. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable laws.

GUIDELINES

- Equipment is '**uncontaminated**' if it has not been used, or if it has only been used with substances that are not hazardous. Your equipment is '**contaminated**' if it has been used with any substances classified as hazardous under EU Directive 67/548/EEC (as amended) or OSHA Occupational Safety (29 CFR 1910).
- If your equipment has been used with radioactive substances, biological or infectious agents, mercury, polychlorinated biphenyls (PCB's), dioxins or sodium azide, you must decontaminate it before you return it to BOC Edwards. You must send independent proof of decontamination (for example a certificate of analysis) to BOC Edwards with the Declaration (HS2). Phone BOC Edwards for advice.
- If your equipment is contaminated, you must either:
 - Remove all traces of contamination (to the satisfaction of laws governing the transportation of dangerous/hazardous substances).
 - Or, properly classify the hazard, mark, manifest and ship the equipment in accordance with applicable laws governing the shipment of hazardous materials.

Note: Some contaminated equipment may not be suitable for airfreight.

PROCEDURE

- 1. Contact BOC Edwards and obtain a Return Authorisation Number for your equipment.
- 2. Complete the Return of BOC Edwards Equipment Declaration (HS2).
- 3. If the equipment is contaminated, you must contact your transporter to ensure that you properly classify the hazard, mark, manifest and ship the equipment, in accordance with applicable laws governing the shipment of contaminated/hazardous materials. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable law. **Note: Equipment contaminated with some hazardous materials, such as semiconductor by-products, may not be suitable for airfreight contact your transporter for advice.**
- 4. Remove all traces of hazardous gases: pass an inert gas through the equipment and any accessories that will be returned to BOC Edwards. Where possible, drain all fluids and lubricants from the equipment and its accessories.
- 5. Seal up all of the equipment's inlets and outlets (including those where accessories were attached) with blanking flanges or, for uncontaminated product, with heavy gauge tape.
- 6. Seal equipment in a thick polythene/polyethylene bag or sheet.
- 7. If the equipment is large, strap the equipment and its accessories to a wooden pallet. If the equipment is too small to be strapped to a pallet, pack it in a suitable strong box.
- 8. Fax or post a copy of the Declaration (HS2) to BOC Edwards. The Declaration must arrive before the equipment.
- 9. Give a copy of the Declaration (HS2) to the transporter. You must tell your transporter if the equipment is contaminated.
- 10. Seal the original Declaration in a suitable envelope: attach the envelope securely to the outside of the equipment package, in a clear weatherproof bag.

WRITE YOUR RETURN AUTHORISATION NUMBER CLEARLY ON THE OUTSIDE OF THE ENVELOPE OR ON THE OUTSIDE OF THE EQUIPMENT PACKAGE.

BOC EDWARDS

You must:

Form HS2

P900-71-000 Issue K

Return Authorisation Number:

Return of BOC Edwards Equipment - Declaration

•	Know about all of the substances which have been used and proc	duced in the equipment before you complete this Declaration

- ٠ Read the Return of BOC Edwards Equipment - Procedure (HS1) before you complete this Declaration
- ٠ Contact BOC Edwards to obtain a Return Authorisation Number and to obtain advice if you have any questions
- Send this form to BOC Edwards before you return your equipment •

SECTION 1: EQUIPMENT					
Equipment/System Name			IF APPLICABLE:		
Part Number		Tool Reference Number			
Serial Number			Process		
Has the equipment been used, teste	d or operated ?		Failure Date		
YES 🗋 Go to Section 2 NO 🗋	Go to Section	4	Serial Number of Replacement Equipment		
SECTION 2: S	UBSTANCE		NTACT WITH THE	EQUIPMENT	
 Are any substances used or produced in the equipment: Radioactive, biological or infectious agents, mercury, poly chlorinated biphenyls (PCBs), dioxins or sodium azide? (if YES, see Note 1) YES _ NO _ Hazardous to human 			 Note 1 : BOC Edwards will not accept delivery of any equipment that is contaminated with radioactive substances, biological/infectious agents, mercury, PCB's, dioxins or sodium azide, unless you: Decontaminate the equipment Provide proof of decontamination 		
health and safety?	YES 🗋 N	0	YOU MUST CONTACT BOC EDWARDS FOR ADVICE BEFORE YOU RETURN SUCH EQUIPMENT		
SECTION 3: LIST (OF SUBSTAI	NCES II	N CONTACT WITH	THE EQUIPMENT	
Substance name	Chemical Symbol		ions required (for example, protective gloves, etc.)	Action required after a spill, leak or exposure	
	SECTION 4	RETU	RN INFORMATION		
Reason for return and symptoms o	of malfunction				
If you have a warranty claim: • who did you buy the equipment from ? • give the supplier's invoice number					
	SECTI	ON 5: D	ECLARATION		
Print your name:Print your job title:					
Print your organisation:					
Print your address:					
Telephone number: Date of equipment delivery:					
I have made reasonable enquiry and I have supplied accurate information in this Declaration. I have not withheld any information, and I have followed the Return of BOC Edwards Equipment - Procedure (HS1). Note: Please print out this form, sign it and return the signed form as hard copy.					
Signed:		_Date			

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