

# Instruction Manual (B)

## STP Series Turbomolecular Pumps STP-A1603 Series Pump Specific Information

<i>Model name</i>	<i>Voltage</i>
<i>STP-1603 series</i>	<i>200 - 240 Va.c.</i>



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## VIEW OUR INVENTORY

STP pump consists of the three-volumed Instruction Manuals.

Instruction Manual (A):	STP pump generic Instruction Manual Supplied with STP pump
➔ <b>Instruction Manual (B): (This Instruction Manual)</b>	<b>STP pump specific information Supplied with STP pump</b>
Instruction Manual (C):	STP control unit Instruction Manual Supplied with STP control unit



The description of this product consists of the three-volumed Instruction Manuals. Read through each Instruction Manual before operation.

The separate volume contents of each description are as follows:

### **Instruction Manual (A)**

STP pump generic Instruction Manual:

- Introduction
- Installation of the STP pump
- Installation of the STP control unit
- Operation
- Safety functions
- Maintenance and inspection
- Storage and disposal
- Service, Spares and accessories

### **Instruction Manual (B)**

STP Pump specific information:

- Technical data
- How to Secure the STP pump
- Temperature Management System (TMS)

### **Instruction Manual (C)**

STP control unit Instruction Manual:

- Introduction
- Technical data
- Installation
- Operation
- Serial communication protocol
- STP-Link (except for SCU-750)
- Maintenance
- Storage, transportation and disposal
- Service, spares, and accessories

Keep the manuals in an easily accessible location.



## EC DECLARATION OF CONFORMITY

Manufacture: Edwards Japan Limited  
1078-1, Yoshihashi, Yachiyo-shi, Chiba 276-8523, Japan  
EU Representative: Edwards Limited  
York Road, Burgess Hill, West Sussex RH15 9TT, UK

declare under our sole responsibility that the product

Product Name: Turbomolecular pump  
Model Number: STP-A1603 series  
Accessories Covered: TMS Unit, Lon Communication Unit

to which this declaration relates is in conformity with the following standards:

EN 1012-2: 1996

EN 61010-1: 1993 +A2: 1995

EN 61326: 1997/A1: 1998, Class A, EN 61000-6-2: 1999

and with the following provisions of EC directive

Machinery Directive (98/37/EC)

Low Voltage Directive (2006/95/EC)

EMC Directive (2004/108/EC)

MD and LVD test report is certified by

Certificate number: SC20208

Certification Body: ETL SEMKO SHANGHAI LIMITED

Manufacture:

Yachiyo 10<sup>th</sup> Aug. '07  
Place and date

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Director, Technology  
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EU representative:

Crawley, 17<sup>th</sup> August 2007

Place and date

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Technical Director  
Edwards Limited

VI-DOC-46-005

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## STP-A1603 Series Turbomolecular Pump

# 1 TECHNICAL DATA

## 1.1 Applicable pump specifications

Model Name	Specification	Applicable Control unit
STP-A1603 series	Advanced high-throughput type	SCU-750/SCU-800

Naming convention:

- "C" following a pump model name indicates a corrosion resistant<sup>\*1</sup> type (e.g. STP-A1603C).
- "CV" indicates an enhanced corrosion resistant type with TMS<sup>\*2</sup> (e.g. STP-A1603CV).

<sup>\*1</sup> Corrosion resistant: STP pump with anti-corrosive treatment.

<sup>\*2</sup> Temperature Management System: TMS unit (optional accessory) maintains the temperature at the base of the turbomolecular pump by monitoring the temperature with the temperature sensor in the base of the turbomolecular pump, and performing the TMS valve and base heater ON/OFF control.

### STP-A1603 Series Turbomolecular Pump

#### 1.1.1 STP pump specifications

The values shown below are typical. They are not guaranteed.

Item		A1603 series
Flange size	Inlet port flange	ISO200F/VG200/ICF253
	Outlet port flange	KF40
Pumping speed	N <sub>2</sub> L/s	1600
	H <sub>2</sub> L/s	1200
Compression ratio	N <sub>2</sub>	>10 <sup>8</sup>
	H <sub>2</sub>	7×10 <sup>3</sup>
Ultimate pressure	Pa (Torr)	10 <sup>-7</sup> (10 <sup>-9</sup> ) order [after baking]
Maximum gas flow rate <sup>*1</sup>	N <sub>2</sub> Pa·m <sup>3</sup> /s (SCCM)	4.2 (2500): Water Cooling 1.7 (1000): TMS unit used (60 °C)
	Ar Pa·m <sup>3</sup> /s (SCCM)	1.7 (1000): Water Cooling 0.8 (500): TMS unit used (60 °C)
Allowable backing pressure <sup>*1</sup>	Pa (Torr)	266 (2): Water cooling/TMS unit used
Flow rate of purge gas <N <sub>2</sub> >	Pa·m <sup>3</sup> /s (SCCM)	3.4×10 <sup>-2</sup> to 8.4×10 <sup>-2</sup> (20 to 50)
Rated speed	rpm	36,500
Backup rotational speed <sup>*2</sup>	rpm	Approximately 8,000
Starting time	min	7
Stopping time	min	9
Noise	dB	<50 (at 36,500 rpm)
Temperature Management System (TMS)		Available
Baking temperature	°C	<120
Lubricating oil		Not necessary
Installation position		Free
Cooling method		Water cooling
Recommended backing-pump	L/min	>1,300
Mass <sup>*3</sup>	kg	35
Ambient temperature range	°C	0 to 40
Storage temperature range	°C	-25 to 55
Applicable Control unit		SCU-750/SCU-800

### STP-A1603 Series Turbomolecular Pump

- <sup>\*1</sup> The pressure is applicable under conditions that N<sub>2</sub> or other similar gas is vacuumed and the backing-pump (pumping speed: 1,300 L/min) is used. When the gas is exhausted intermittently, the gas more than the maximum gas flow rate can be exhausted. Consult Edwards about conditions.
- <sup>\*2</sup> A backup rotational speed is the lowest rotational speed to which the magnetic bearing can be backed up at a power failure.
- <sup>\*3</sup> Mass is a value of state that the only standard accessory was installed (except the optional accessory).

#### 1.1.2 Condition for the water-cooling unit

Item	Specification
Port type	Rc 1/4 (Female) <sup>*1</sup>
Flow rate L/min	2
Water temperature °C	5 to 25
Water pressure MPa (kgf/cm <sup>2</sup> )	0.3 (3)

<sup>\*1</sup> Standard type

#### 1.2 External appearance of the STP pump

See the next page.



STP-A1603 Series Turbomolecular Pump

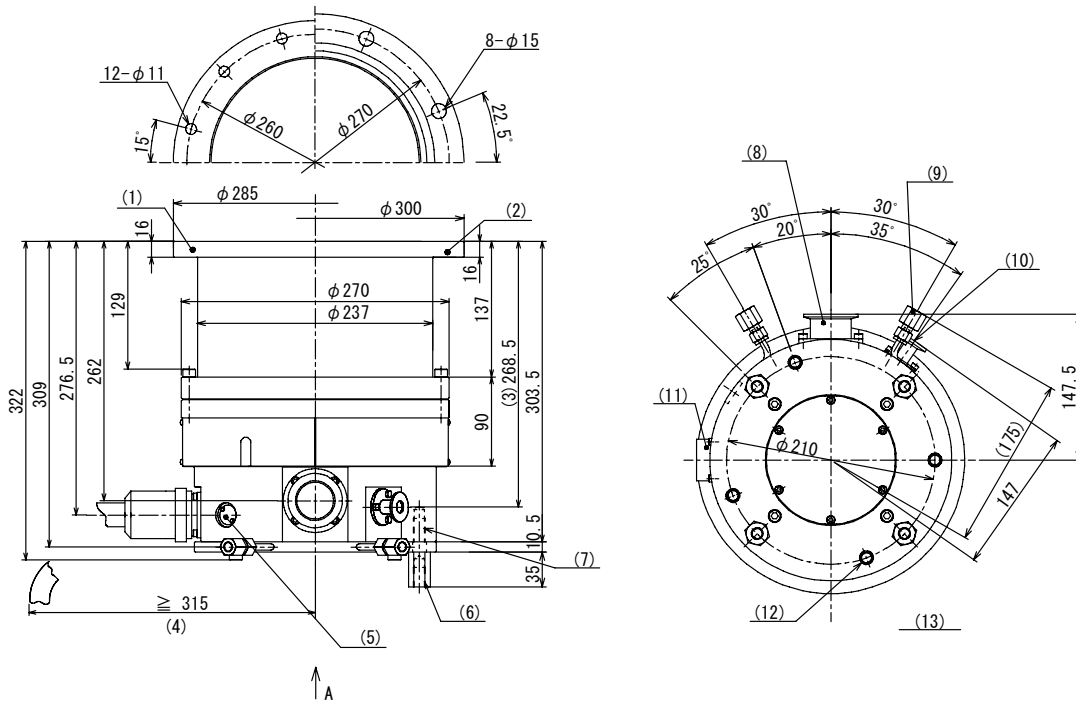


Figure 1 - STP-A1603 series: ISO200F/VG200

No.	Item	Description
1	Inlet port flange	ISO <sup>*2</sup> 200F
2	Inlet port flange	VG <sup>*1</sup> 200
3	Height of the purge port	
4	Bending dimension of the STP connection cable	
5	Temperature sensor connector	Optional accessory
6	Screw hole of legs	M12 <sup>*1</sup> depth 20
7	Screw hole for legs	M12 <sup>*1</sup> depth 24
8	Outlet port flange	KF <sup>*1</sup> 40
9	Cooling water port	2-Rc <sup>*2</sup> 1/4
10	Purge port	KF <sup>*1</sup> 10
11	STP connector	
12	Screw hole for legs	8-M12 <sup>*1</sup> depth 24
13	Viewed from arrow A	

<sup>\*1</sup> JIS

<sup>\*2</sup> ISO

STP-A1603 Series Turbomolecular Pump

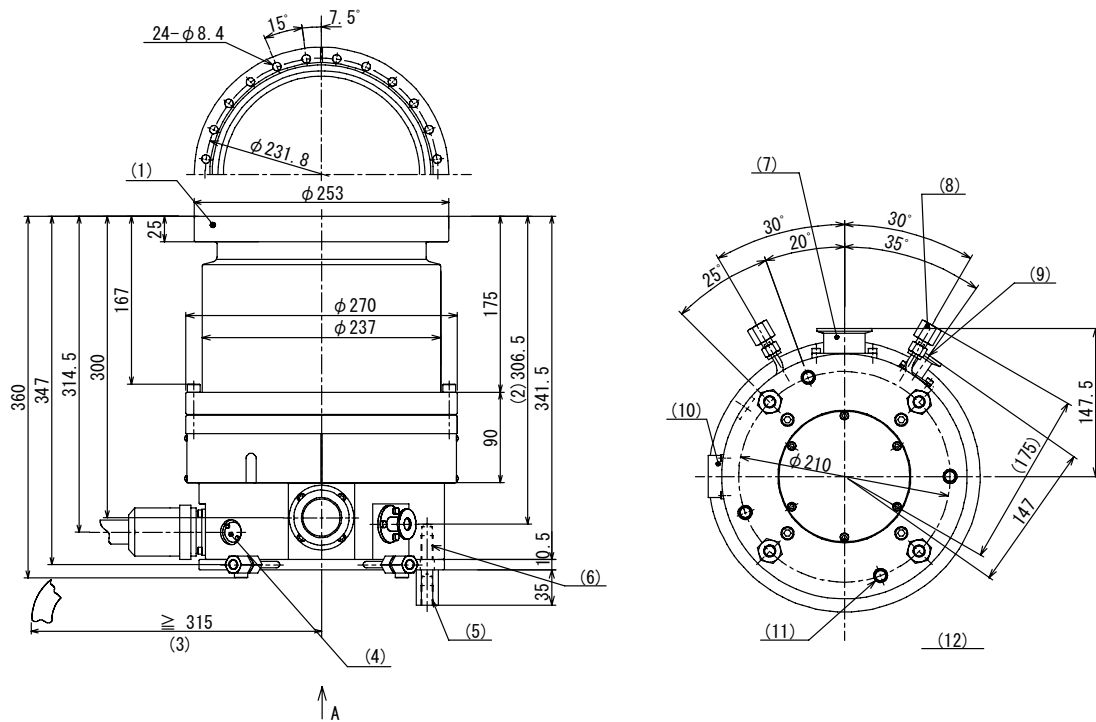


Figure 2 - STP-A1603 series: ICF253

No.	Item	Description
1	Inlet port flange	ICF <sup>*1</sup> 253
2	Height of the purge port	
3	Bending dimension of the STP connection cable	
4	Temperature sensor connector	Optional accessory
5	Screw hole of legs	M12 <sup>*2</sup> depth 20
6	Screw hole for legs	M12 <sup>*2</sup> depth 24
7	Outlet port flange	KF <sup>*2</sup> 40
8	Cooling water port	2-Rc <sup>*3</sup> 1/4
9	Purge port	KF <sup>*2</sup> 10
10	STP connector	
11	Screw hole for legs	8-M12 <sup>*2</sup> depth 24
12	Viewed from arrow A	

<sup>\*1</sup> JVIS

<sup>\*2</sup> JIS

<sup>\*3</sup> ISO

**STP-A1603 Series Turbomolecular Pump**

**1.3 Label affixing positions**

Refer to the Instruction Manual (A) for the details of the labels 1 to 7.

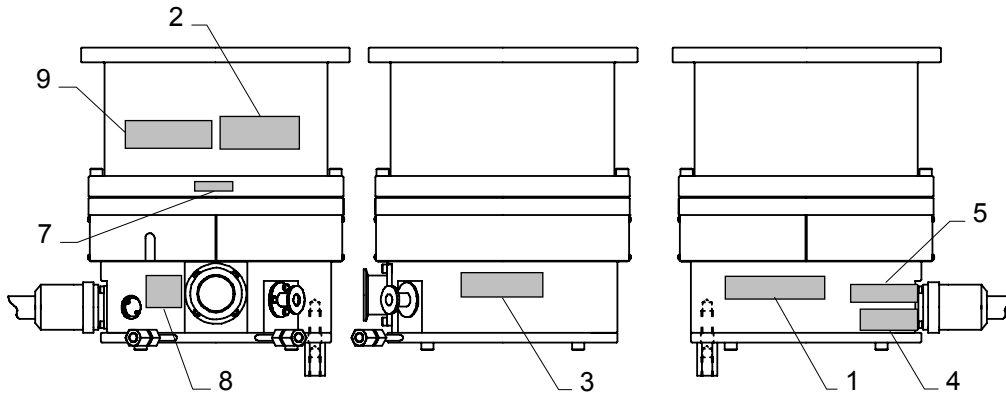


Figure 3 - Label affixing positions for the STP pump

- 1 STP pump installation warning label
- 2 Hot surface warning label
- 3 Heavy product caution label
- 4 Connector caution label
- 5 STP pump/control unit caution label
- 7 Rotational direction instruction label
- 8 Name plate
- 9 Company logo



**STP-A1603 Series Turbomolecular Pump**

**1.4 Accessories**

<b>Item</b>	<b>Q'ty</b>	<b>Remarks</b>
Inlet port cover	1	
Outlet port cover	1	
STP connector cover	1	
Blank flange for purge port	1	KF10 or KF16
Clamping ring for purge port	1	KF10 or KF16
O-ring washer for purge port	1	KF10 or KF16
Leg	8	4 legs are attached to the STP pump
Rubber foot for leg	4	
Instruction Manual (B)	1	This manual






*STP-A1603 Series Turbomolecular Pump*

1

TECHNICAL DATA

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## 2 HOW TO SECURE THE STP PUMP



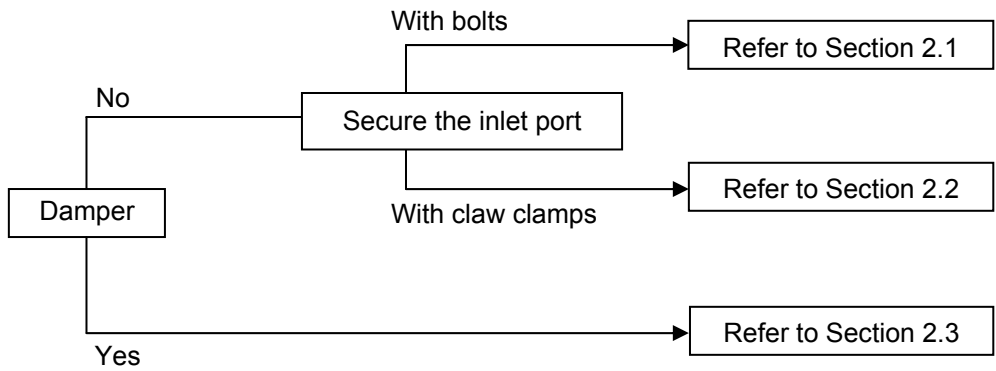
**WARNING**

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.

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 2 for torque in pump abnormality.



In some cases, the damper and the claw clamping securing cannot be used.

This will depend on the type of STP pump. Refer to Table 1 for torque tightening the bolts used.

Bolt size	Tightening torque (Nm)
M8	12
M10	24
M12	42

Table 1 - Tightening torque of bolt

When making the legs to secure the base, make them shorter than the ones attached to the STP pump. Use a material that has a tensile strength of 600N/mm<sup>2</sup> or more.

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

*Note:* When using any securing method other than that specified in this manual, contact Edwards.

**STP-A1603 Series Turbomolecular Pump**

**2.1 When securing the inlet port with bolts**

Refer to Table 2 for maximum predicted torque in any pump abnormality and for the recommended type of securing bolt for inlet port flange.

Secure the inlet port flange with the correct size bolts as specified in the Inlet Port Flange Standard.

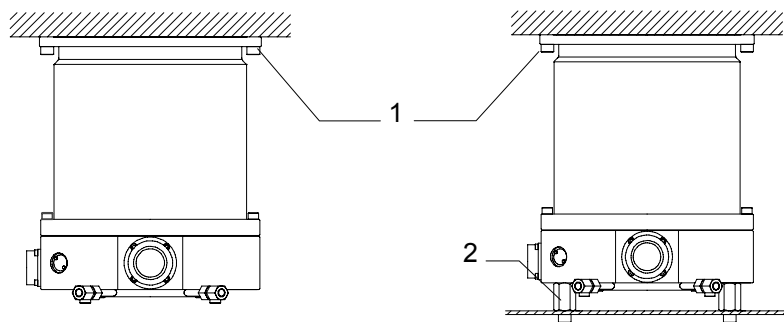
Secure the base with either the 8 screws for legs or the 8 attached legs. Ensure instructions with regard to legs and bolts for securing the base are adhered to page 9. Make sure that the recommended securing bolt is the correct one depending on the method of securing the base.

Pump mode		STP-A1603 series					
Flange type		ISO200F <sup>*2</sup>		VG200		ICF253	
Torque in pump abnormality [Nm]		4.0×10 <sup>4</sup>		4.0×10 <sup>4</sup>		4.0×10 <sup>4</sup>	
Base (8 positions) securing		No	Yes	No	Yes	No	Yes
Recommended securing bolt for flange	Shape	Standard	Standard	Standard	Standard	Standard	Standard
	Material <sup>*1</sup>	Carbon steel Alloyed steel	Stainless steel	Carbon steel Alloyed steel	Stainless steel	Carbon steel Alloyed steel	Stainless steel
	Strength <sup>*1</sup>	12.9 or more	70 or more	12.9 or more	70 or more	12.9 or more	70 or more

<sup>\*1</sup> Refer to ISO898-1 (JISB 1051), ISO3506 (JISB 1054) and AMS6419 (Aerospace Material Specification).

<sup>\*2</sup> Maximum predicted torque of ISO flange type pump is the same as that of ISO\_F flange type pump.

Table 2 - Maximum torque predicted and recommended securing bolt for inlet port flange



(A) When the base is not secured

(B) When the base is secured

1. Recommended fitting bolt for flange
2. Secure the base

Figure 4 - Example of securing the STP pump (when securing the inlet port with bolts)

**STP-A1603 Series Turbomolecular Pump**

**2.2 When securing the inlet port flange with claw clamps**

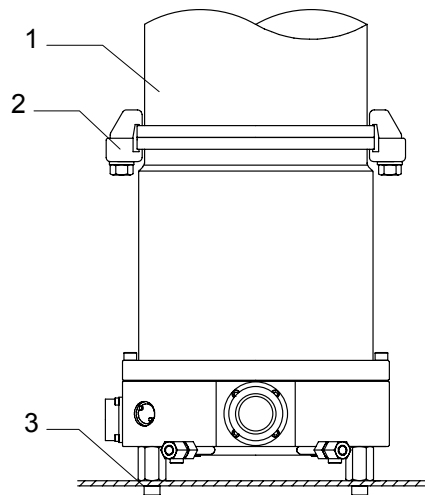
Refer to Table 2 for rotational torque.

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 either the 8 screws for legs or the 8 attached legs. Ensure instructions with regard to legs and bolts for securing the base are adhered to page 9.

For the claw clamp-type, use the required number of claw clamps as specified in Table 3. Position the claw clamps evenly on the circumference.

Flange size	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 3 - Number of claw clamps for flange size



1. Vacuum equipment
2. Claw clamps
3. Secure the base

Figure 5 - Example of securing the STP pump  
(when securing the inlet port flange with claw clamps)



**STP-A1603 Series Turbomolecular Pump**

**2.3 When installing the damper in the inlet port flange**

**CAUTION**

Use a damper only at the vertically upright position.

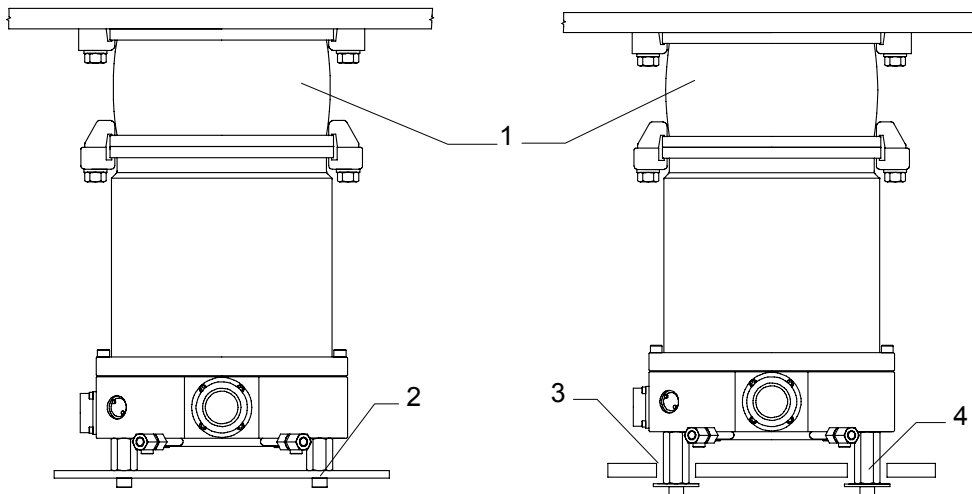
**CAUTION**

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

Refer to Table 2 for rotational torque.

When using a damper, secure the base with either the 8 screws for legs or the 8 attached legs. Ensure instructions with regard to legs and bolts for securing the base are adhered to page 9.

When the base cannot be secured because of the equipment design, install the pump with a torque restraint like the one shown in Figure 6 (B).



(A) When securing the base

(B) When installing not to rotate

- 1. Damper
- 2. Secure the base
- 3. Hole to prevent from rotating
- 4. Leg

Figure 6 - Example of securing the STP pump (when installing the damper in the inlet port flange)

### 3 TEMPERATURE MANAGEMENT SYSTEM (TMS)

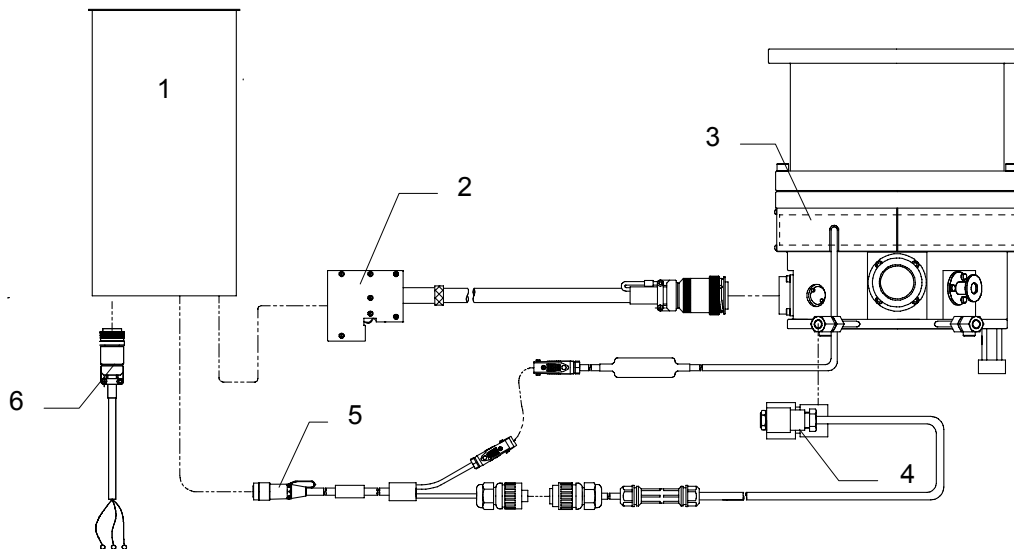


**WARNING**

The STP pump operates at high temperatures while the Temperature Management System (TMS) unit is in operation. NEVER touch the STP pump and its peripheral equipment while TMS unit are in operation. Operators can burn hands.

The Temperature Management System (TMS) maintains the temperature of the turbomolecular pump by monitoring the temperature with temperature sensor in the base of the turbomolecular pump, and performing the TMS valve and TMS heater ON/OFF control.

#### 3.1 Configuration of the STP pump with the TMS



- |                          |                         |
|--------------------------|-------------------------|
| 1. STP control unit      | 4. TMS valve            |
| 2. STP connection cable  | 5. TMS connection cable |
| 3. TMS heater (Built-in) | 6. Power cable          |

Figure 7 - Configuration of the STP pump with the TMS

*Note: The shape of each part is an example. It varies according to specifications.*

### STP-A1603 Series Turbomolecular Pump

#### 3.2 TMS connection cable

The components of the TMS connection cables are as follows: (see Figure 8)

Item	Description	Function
1	Connector X5A	For the STP control unit
2	CON1 HEATER OUT connector	For the TMS heater
3	CON2 COOLING VALVE OUT connector	For the TMS valve

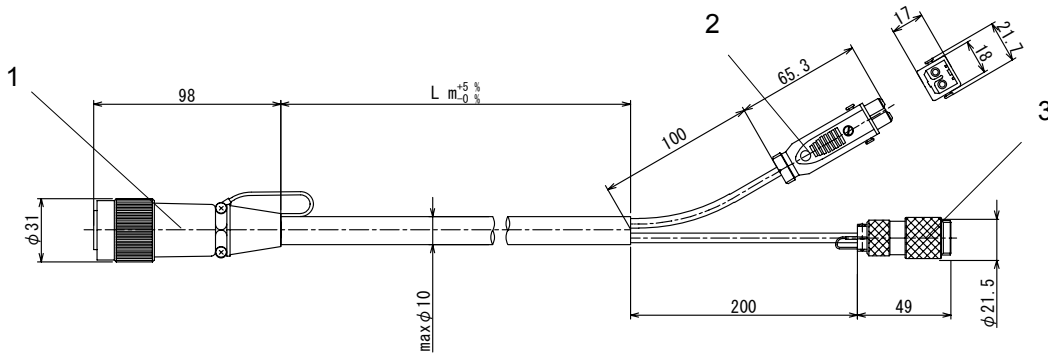


Figure 8 - External view of TMS connection cable

*Note: The shape of the TMS connection cable is an example. It varies according to specifications.*

#### 3.3 TMS heater

The TMS heater heats the base of the STP pump. It's fitted with the STP-A1603CV series at the factory. A fuse is set in the TMS heater cable of the STP-A1603CV series

#### 3.4 TMS valve

The TMS valve controls the cooling water in order to maintain a constant temperature inside the STP pump. The shape of the TMS valve varies according to specifications.

#### 3.5 TMS sensor cable

The sensor cable is not required for STP-A1603CV series.

### 3.6 Installation of the TMS unit

**CAUTION**

DO NOT install the TMS unit in places with high temperature, humidity, noise, vibration, or other unstable environment.

**CAUTION**

DO NOT apply force to the TMS unit and cables during installation and DO NOT bend the cables excessively.

#### 3.6.1 Connecting the TMS connection cable to the STP control unit

Insert the connector X5A of the TMS connection cable into the connector X5 of the STP control unit. (see the "STP control unit Instruction Manual (C)" for the position of the connector X5.)

#### 3.6.2 Connecting the pump and TMS valve

Refer to Figure 7, "Configuration of the STP pump with the TMS".

Connect the cooling water pipe to the TMS valve. Pay special attention to the port label on the cooling water valve to connect proper port. Connect the NC side (or OUT side) of the TMS valve to the STP pump, and COM side (or IN side) of the TMS valve to the equipment.

Use cooling water under the conditions in Section 3.8, "Condition for the TMS unit".

*Note: Procure and connect the cooling water pipe and affix the electromagnetic cooling water valve at your site.*

#### 3.6.3 Connecting TMS connection cable to STP pumps

Refer to Figure 7, "Configuration of the TMS unit".

Connect the TMS connection cable to the STP pump as follows:

1. Connect the cable for the TMS heater to the "CON1 HEATER OUT" of the TMS connection cable.
2. Connect the cable for the TMS valve to the "CON2 COOLING VALVE OUT" connector of the TMS connection cable.

**STP-A1603 Series Turbomolecular Pump**

**3.7 Replacing the fuses in the TMS connection cable**

Fuses for the TMS valve and the TMS heater of STP-A1603CV series are set inside the TMS connection cable. Contact the Service office, when replacement is required.

**3.8 Condition for the TMS unit**

Item	Condition
Ambient temperature range °C	0 to 40
Storage temperature range °C	-20 to 55
Input voltage	Same voltage as the STP control unit 200 to 240 Vac
Temperature control method	Control ON/OFF of the TMS heater and cooling water
Setting temperature °C	Standard type: 60
Cooling water temperature °C	5 to 25
Quantity of cooling water L/min flow	2
Alarm output	Alarm outputs from the STP control unit
Electric leakage protection (Only with ELB type)	Protected by Earth Leakage Breaker on the TMS heater primary side (Sensed current: 15 mA, operating time: within 0.1 second)

**3.9 Accessories**

Item	Q'ty	Condition
TMS heater	1	Built-in
TMS connection cable	1	With connector at each end
TMS valve	1	Cable with connector on one side

For more information, contact the nearest Service Office.

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## Return of Edwards Equipment - Procedure

### INTRODUCTION

Before returning your equipment, you must warn 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 Edwards before you dispatch the equipment.** It is important to note that this declaration is for 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 Edwards. You must send independent proof of decontamination (for example a certificate of analysis) to Edwards with the Declaration (HS2). Phone 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 Edwards and obtain a Return Authorisation Number for your equipment.
2. Complete the Return of 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 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. E-mail via scan, fax or post a copy of the original with signature of the Declaration (HS2) to 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.**

# Return of Edwards Equipment - Declaration

Return Authorisation Number: \_\_\_\_\_

You must:

- Know about all of the substances which have been used and produced in the equipment before you complete this Declaration
- Read the Return of Edwards Equipment - Procedure (HS1) before you complete this Declaration
- Contact Edwards to obtain a Return Authorisation Number and to obtain advice if you have any questions
- Send this form to Edwards before you return your equipment as per the procedure in HS1

## SECTION 1: EQUIPMENT

Manufacturer's Product Name \_\_\_\_\_

Manufacturer's Part Number \_\_\_\_\_

Manufacturer's Serial Number \_\_\_\_\_

Has the equipment been used, tested or operated?

YES  Go to Section 2      NO  Go to Section 4

**IF APPLICABLE:**

Tool Reference Number \_\_\_\_\_

Process \_\_\_\_\_

Failure Date \_\_\_\_\_

Serial Number of Replacement Equipment \_\_\_\_\_

## SECTION 2: SUBSTANCES IN CONTACT 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 health and safety?      YES  NO

**Note 1:** 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

**YOU MUST CONTACT EDWARDS FOR ADVICE BEFORE YOU RETURN SUCH EQUIPMENT**

## SECTION 3: LIST OF SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Substance name	Chemical Symbol	Precautions required (for example, use protective gloves, etc.)	Action required after a spill, leak or exposure

## SECTION 4: RETURN INFORMATION

Reason for return and symptoms of malfunction: \_\_\_\_\_

If you have a warranty claim:      • who did you buy the equipment from? \_\_\_\_\_

• give the supplier's invoice number \_\_\_\_\_

## SECTION 5: DECLARATION

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 Edwards Equipment - Procedure (HS1).

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

**Note: Please print out this form, sign it and return the signed form as hard copy.**