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# Instruction Manual (B)

## STP Series Turbomolecular Pumps
## STP-A2503/A3003 Series
## Pump Specific Information

| *Model name* | *Voltage* |
|---|---|
| *STP-A2503/A3003 series* | *200 - 240 Va.c.* |




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VIEW OUR INVENTORY

STP pump consists of the three-volumed Instruction Manuals.

| | |
|---|---|
| Instruction Manual (A): | STP pump generic Instruction Manual |
| **Instruction Manual (B): (This Instruction Manual)** | **STP pump specific information** |
| Instruction Manual (C): | STP control unit Instruction Manual |

EDWARDS

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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.

# Declaration of Conformity

We,

| | |
|---|---|
| Manufacture: | Edwards Japan Limited<br>1078-1, Yoshihashi, Yachiyo-shi, Chiba, 276-8523, Japan |
| EU Representative: | Edwards Limited<br>Manor Royal, Crawley, West Sussex, RH10 9LW, UK |

declare under our sole responsibility, as manufacturer and person within the EU authorised to assemble the technical file, that the product(s)

| | |
|---|---|
| Product Name: | Turbomolecular pump |
| Model Number: | STP-A2503/A3003 series |
| Accessories Covered: | TMS Unit, Lon Communication Unit |

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

| | |
|---|---|
| EN1012-2:1996, A1:2009 | Compressors and vacuum pumps - Safety requirements - Part 2: Vacuum pumps |
| EN61010-1:2001 | Safety requirements for electrical equipment for measurement, control and laboratory Use. General requirements |
| EN61326-1:2006 | Electrical equipment for measurement, control & laboratory Use. EMC requirements. General requirements (Immunity: Industrial locations, Emission: Class A) |
| EN61000-6-2:2005 | Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments |
| EN61000-6-4:2007 | Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments |
| EN55011:2007, A2:2007 | Industrial, scientific and medical (ISM) radio-frequency equipment. Electromagnetic disturbance characteristics (Group1, Class A) |

and fulfils all the relevant provisions of

| | |
|---|---|
| 2006/42/EC | Machinery Directive |
| 2006/95/EC | Low Voltage Directive |
| 2004/108/EC | Electromagnetic Compatibility (EMC) Directive |
| 2002/95/EC* | Restriction of Certain Hazardous Substances (RoHS) Directive |

** i.e. The product(s) contain less than - 0.1wt% for hexavalent chromium, lead, mercury, PBB and PBDE; 0.01wt% for cadmium - in homogeneous materials (subject to the exemptions allowed by the Directive). This information relates only to products sold on or after the date of this certificate. Edwards has taken all reasonable steps to confirm this statement, which is based mainly on information from our suppliers. Whilst the RoHS Directive does not legally apply to this vacuum equipment, we recognize that component compliance is relevant to many of our customers.*

*Manufacture:* Yuji Kato — *25th Dec. 2009, Yachiyo*

*Yuji Kato, TMP Technical Senior Manager, Edwards Japan Limited* — *Date and Place*

*EU representative:* — *30th Dec. 2009, Burgess Hill*

*Barrie D Brewster, Technical Manager, Edwards Limited* — *Date and Place*

*This product has been manufactured under a quality system registered to ISO9001*

*VI-DOC-43-006*

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# 1 TECHNICAL DATA

## 1.1 Applicable pump specifications

| Model Name | Specification | Applicable Control unit[*1] |
|---|---|---|
| STP-A2503/A3003 series | High-throughput type | SCU-1400/SCU-1500/SCU-1600 |

[*1] Applicable control unit: There are different performance specifications between SCU-1400, SCU-1500, and SCU-1600. Refer to Section 1.1.1, "STP pump specifications" for the differences.

Naming convention:

- "C" following a pump model name indicates a corrosion resistant[*2] type (e.g. STP-A2503C).
- "CV" indicates an enhanced corrosion resistant type with TMS[*3] (e.g. STP-A3003CV).

[*2] Corrosion resistant: STP pump with anti-corrosive treatment.

[*3] 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.

### 1.1.1 STP pump specifications

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

| Item | | | A2503 series | A3003 series |
|---|---|---|---|---|
| Flange size | Inlet port flange | | VG250/ISO250F/ ICF305 | VG300/VG350/ ISO320F |
| | Outlet port flange | | KF40 | KF40 |
| Pumping speed | $N_2$ | L/s | 2500 | 3000 |
| | $H_2$ | L/s | 1600 | 1800 |
| Compression ratio | $N_2$ | | $>10^8$ | |
| | $H_2$ | | $6\times10^3$ | |
| Ultimate pressure | | Pa (Torr) | $10^{-6}$ ($10^{-8}$) order [after baking] | |
| Maximum gas flow-rate[*1] | $N_2$ | Pa·m$^3$/s (SCCM) | 3.0 (1800): Water cooling<br>1.5 (900): TMS unit is used (60 °C) | |
| | Ar | Pa·m$^3$/s (SCCM) | 1.5 (900): Water cooling<br>1.0 (600): TMS unit is used (60 °C) | |
| Allowable backing pressure[*1] | | Pa (Torr) | 333 (2.5) : Water cooling/TMS unit used | |
| Flow rate of purge gas <$N_2$> | | Pa·m$^3$/s (SCCM) | $3.4\times10^{-2}$ (20) | |
| Rated speed | | rpm | 27,000 | |
| Backup rotational speed[*2] | | rpm | Approximately 6,000 | |
| Starting time[*3] | | min | 9: with SCU-1500/SCU-1600<br>10: with SCU-1400 | |
| Stopping time[*3] | | min | 9: with SCU-1500/SCU-1600<br>11: with SCU-1400 | |
| Noise | | dB | <50 (at 27,000 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[*4] | | kg | 72 | |
| Ambient temperature range | | °C | 0 to 40 | |
| Storage temperature range | | °C | -25 to 55 | |
| Applicable Control unit | | | SCU-1400/SCU-1500/SCU-1600 | |

*1 The pressure is applicable under conditions that $N_2$ 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.

*2 A backup rotational speed is the lowest rotational speed to which the magnetic bearing can be backed up at a power failure.

*3 Time varies depending on the control unit used.

*4 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) *1 |
| Flow rate L/min | 2 |
| Water temperature °C | 5 to 25 |
| Water pressure MPa (kgf/cm$^2$) | 0.3 (3) |

*1 Standard type

## 1.2 External appearance of the STP pump

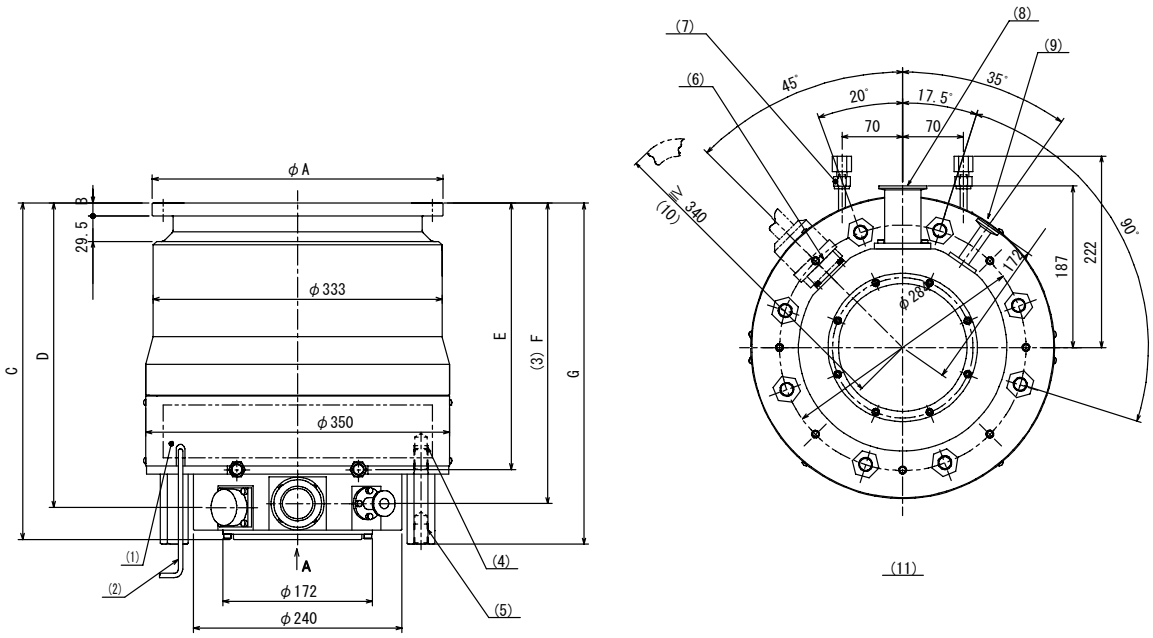



Figure 1 - STP-A2503 series: VG250/ISO250F

| No. | Item | Description |
|---|---|---|
| 1 | TMS heater | Built-in |
| 2 | TMS heater cable | |
| 3 | Height of the purge port | |
| 4 | Screw hole for legs | 8-M16 depth 24 |
| 5 | Screw hole of legs | 8-M16 depth 24 |
| 6 | STP cable connector | |
| 7 | Cooling water port | Rc[*1]1/4 |
| 8 | Outlet port flange | KF40 |
| 9 | Purge port | KF10 |
| 10 | Bending dimension of the STP connection cable | |
| 11 | Viewed from arrow A | |

| Inlet port flange | VG250 | ISO250F |
|---|---|---|
| ϕA | 350 | 335 |
| B | 15 | 15 |
| C | 389.5 | 389.5 |
| D | 352.5 | 352.5 |
| E | 308 | 308 |
| F | 348 | 348 |
| G | 395 | 395 |

[*1] ISO

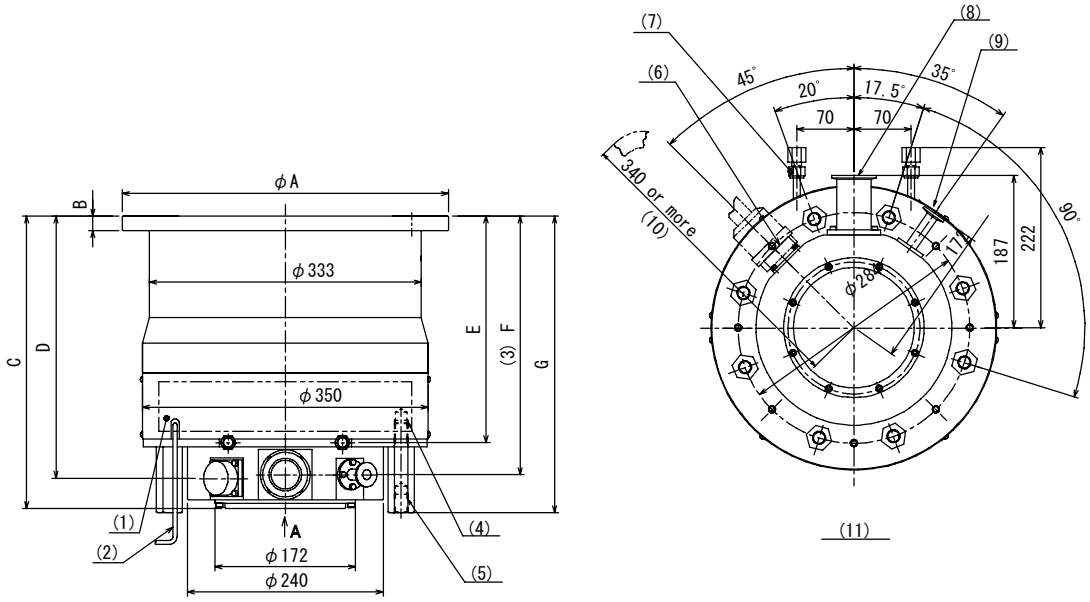



Figure 2 - STP-A3003 series: VG350/VG300/ISO320F

| No. | Item | Description |
|---|---|---|
| 1 | TMS heater | Built-in |
| 2 | TMS heater cable | |
| 3 | Height of the purge port | |
| 4 | Screw hole for legs | 8-M16 depth 24 |
| 5 | Screw hole of legs | 8-M16 depth 24 |
| 6 | STP cable connector | |
| 7 | Cooling water port | Rc[*1]1/4 |
| 8 | Outlet port flange | KF40 |
| 9 | Purge port | KF10 |
| 10 | Bending dimension of the STP connection cable | |
| 11 | Viewed from arrow A | |

| Inlet port flange | VG350 | VG300 | ICF320F |
|---|---|---|---|
| ϕA | 450 | 400 | 425 |
| B | 20 | 18 | 20 |
| C | 359.5 | 359.5 | 364.5 |
| D | 322.5 | 322.5 | 327.5 |
| E | 278 | 278 | 283 |
| F | 318 | 318 | 323 |
| G | 365 | 365 | 370 |

[*1] ISO

### 1.3 Label affixing positions

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

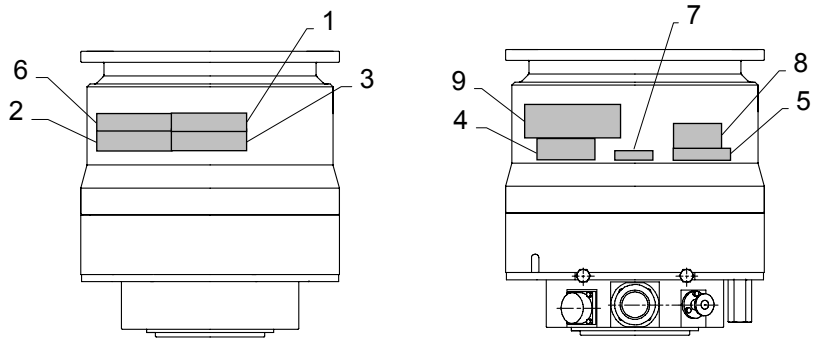



Figure 3 - Label affixing positions for the STP pump

| | |
|---|---|
| 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 |
| 6 | TMS heater caution label |
| 7 | Rotational direction instruction label |
| 8 | Name plate |
| 9 | Company logo |

## 1.4 Accessories

| Item | Q'ty | Remarks |
|---|---|---|
| Inlet port cover | 1 | |
| Outlet port cover | 1 | |
| STP connector cover | 1 | |
| Blank flange for purge port | 1 | KF10 |
| Clamping ring for purge port | 1 | KF10 |
| O-ring washer for purge port | 1 | KF10 |
| Leg | 8 | |
| Instruction Manual (B) | 1 | This manual |

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# 2 HOW TO SECURE THE STP PUMP

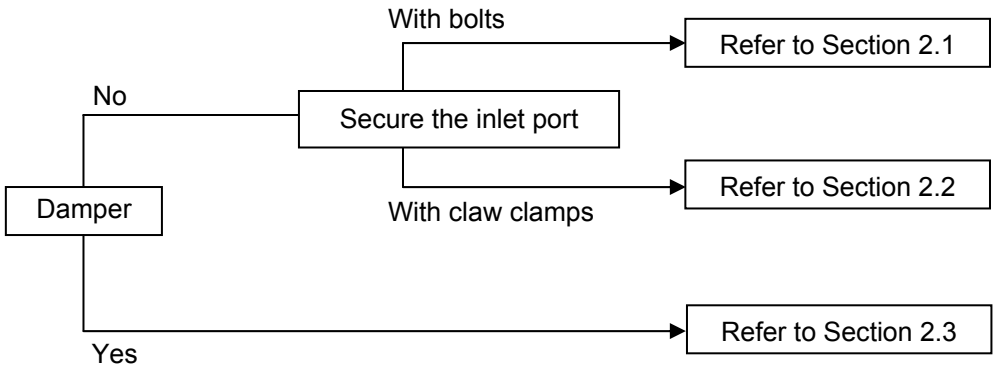
**WARNING**

**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 clamper 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$^2$ 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.*

### 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.

Reduced diameter shank bolts (R.D.S.B.) listed on Table 2 are more reinforced bolts over standard bolts by smoothing the portion to attach flange securing bolts to the respective face at the equipment side. Refer to Figure 5 for Shape of R.D.S.B.

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.

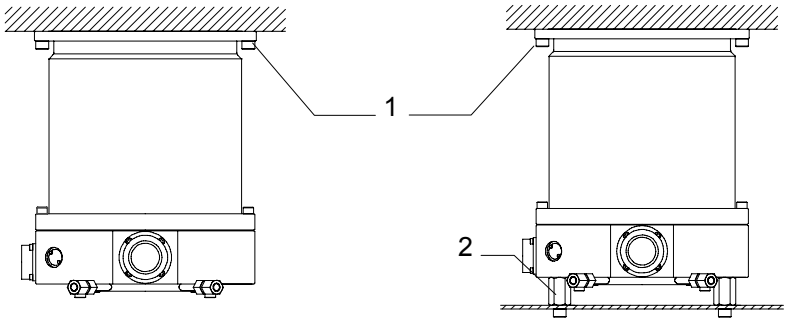
| **Pump model** | | **STP-A2503 series** | | | | | |
|---|---|---|---|---|---|---|---|
| Flange type | | VG250 | | ISO250F | | ICF305 | |
| Torque in pump abnormality [Nm] | | $7.4\times10^4$ | | $5.9\times10^4$ | | $7.4\times10^4$ | |
| Base (8 positions) securing | | No | Yes | No | Yes | No | Yes |
| Recommended securing bolt for flange | Shape | Standard | Standard | R.D.S.B.[*2] | Standard | Standard | Standard |
| | Size | M12 | M12 | M10 | M10 | M8 | M8 |
| | Q'ty | 12 | 12 | 12 | 12 | 32 | 32 |
| | Material[*1] | Carbon steel Alloyed steel | Stainless steel | Carbon steel Alloyed steel | Stainless steel | Carbon steel Alloyed steel | Stainless steel |
| | Strength[*1] | 12.9 or more | 70 or more | 12.9 or more | 70 or more | 12.9 or more | 70 or more |

| **Pump model** | | **STP-A3003 series** | | | | | |
|---|---|---|---|---|---|---|---|
| Flange type | | VG300 | | ISO320F | | VG350 | |
| Torque in pump abnormality [Nm] | | $7.4\times10^4$ | | $7.4\times10^4$ | | $7.4\times10^4$ | |
| Base (8 positions) securing | | No | Yes | No | Yes | No | Yes |
| Recommended securing bolt for flange | Shape | Standard | Standard | Standard | Standard | Standard | Standard |
| | Size | M12 | M12 | M12 | M12 | M12 | M12 |
| | Q'ty | 12 | 12 | 12 | 12 | 12 | 12 |
| | Material[*1] | Carbon steel Alloyed steel | Stainless steel | Carbon steel Alloyed steel | Stainless steel | Carbon steel Alloyed steel | Stainless steel |
| | Strength[*1] | 12.9 or more | 70 or more | 12.9 or more | 70 or more | 12.9 or more | 70 or more |

[*1] Refer to ISO898-1 (JISB 1051), ISO3506 (JISB 1054) and AMS6419 (Aerospace Material Specification).

[*2] Refer to Figure 5 Shape of Reduced Diameter Shank Bolts (R.D.S.B.)

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

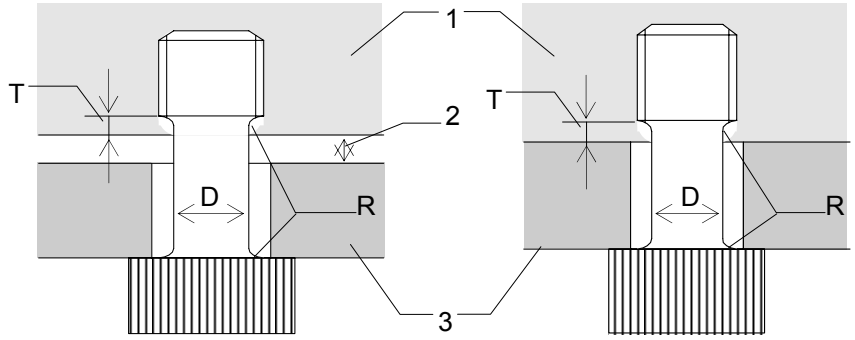



(A) When the base is not secured (B) When the base is secured

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)

Refer to Figure 5 for the shape of Reduced Diameter Shank Bolts (R.D.S.B.)




1. Vacuum equipment
2. Clearance made by cantering
3. Pump flange

Figure 5 - Shape of reduced diameter shank bolts

Use Table 3 in conjunction with Figure 5. Ensure that the surface of the levelled and smoothed area (expressed by "D" in Figure 5) is free of crack, depression, and other damages. Also, when you want to use commercially-available screws, be sure to thoroughly grind them so as not to leave spiral seams on their bottom.

| Bolt size | Type of flange | T | D | R |
|---|---|---|---|---|
| M8 | ISO_F flange | 2.5 mm or more | 5.9 mm or more | 0.8 mm or more |
| | ICF flange | 1 mm or more | | |
| M10 | ISO_F flange | 3 mm or more | 7.5 mm or more | |
| | VG flange | 1.5 mm or more | | |
| M12 | ISO_F flange | 3.5 mm or more | 9.1 mm or more | |
| | VG flange | 2 mm or more | | |

Table 3 - Shape of reduced diameter shank bolts

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

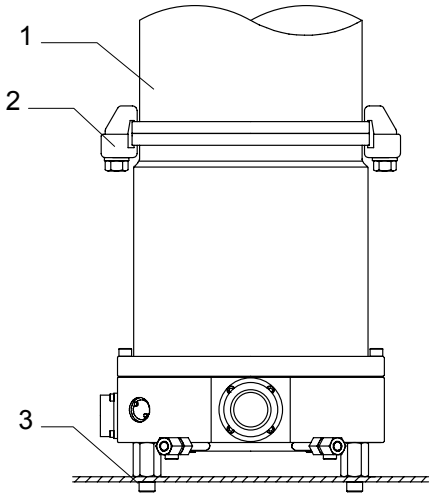
Refer to Table 2 for rotational torque.

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 4. 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 4 - Number of claw clamps for flange size




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

Figure 6 - Example of securing the STP pump
(when securing the inlet port flange with claw clamps)

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

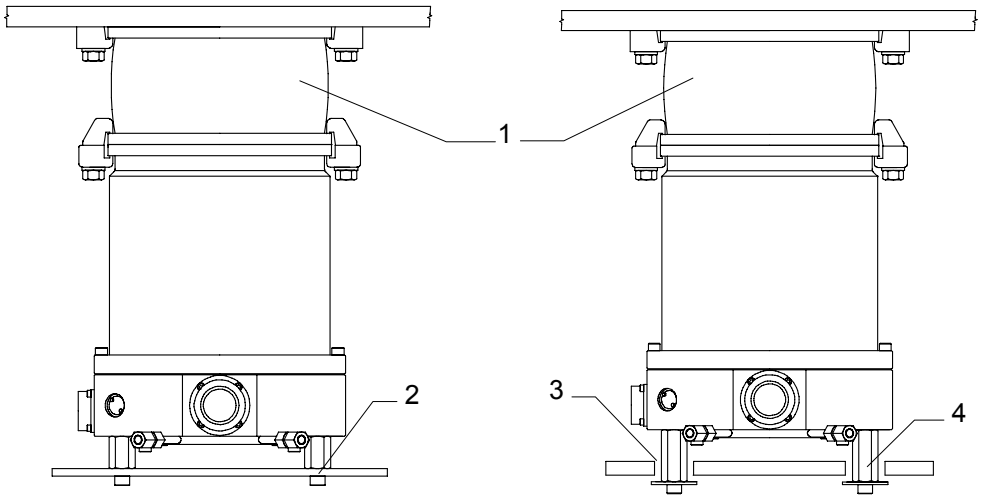
| CAUTION |
| --- |
| Use a damper only at the vertically upright position. |

| 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 screw-holes 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 7 (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 7 - Example of securing the STP pump (when installing the damper in the inlet port flange)

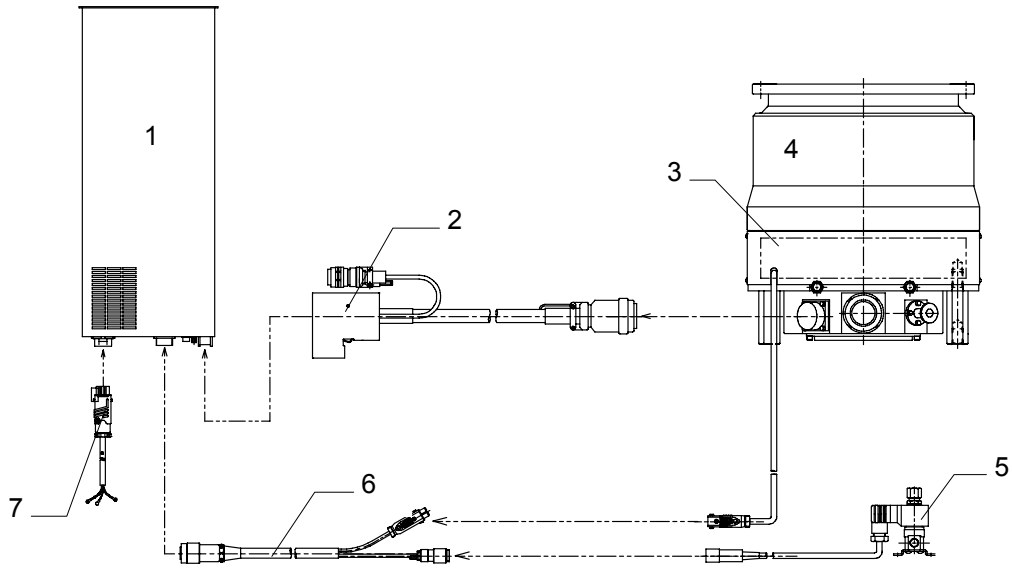
# 3 TEMPERATURE MANAGEMENT SYSTEM (TMS)

**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
2. STP connection cable
3. TMS heater
4. STP pump
5. TMS valve
6. TMS connection cable
7. Power cable

Figure 8 - Configuration of the STP pump with the TMS

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

### 3.2 TMS connection cable

The components of the TMS connection cables are as follows: (see Figure 9)

| 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 |

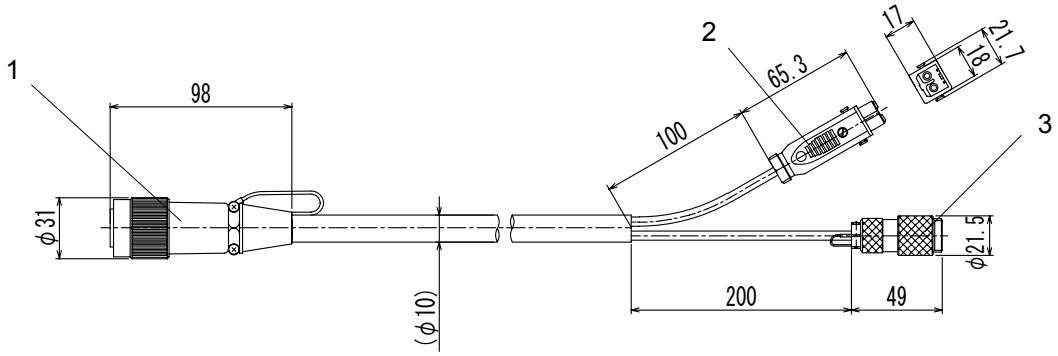



Figure 9 - External view of TMS connection cable

*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-A2503CV/A3003CV series at the factory.

### 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 TMS sensor cable is not required for STP-A2503CV/A3003CV 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 8, "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.

The TMS heater is fitted with the STP-A2503CV/A3003CV at the factory.

Use cooling water under the conditions in Section 3.7, “Condition for the TMS unit”.

*Note: Procure and connect the cooling water pipe and affix the electromagnetic cooling water valve at your site. The diameter of the valve is Rc1/4 (ISO standard).*

### 3.6.3 Connecting TMS connection cable to STP pump

Refer to Figure 8, "Configuration of the STP pump with the TMS".
Connect the TMS connection cable to the STP pump as follows:

1. Connect the cable for the TMS heater to the "CON1 HEATER OUT" connector 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.

### 3.7 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 flow | L/min | 2 |
| Alarm output | | Alarm outputs from the STP control unit |

### 3.8 Accessories

| Item | Q'ty | Condition |
|---|---|---|
| TMS heater | 1 | Built-in |
| TMS connection cable | 1 | With connector on one side |
| TMS valve | 1 | Coupling for water cooling port, cable with connector on one side |

For more information, contact the nearest Service Office.

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