Instruction Manual (B)

STP Series Turbomolecular Pumps
STP-A2203 Series
Pump Specific Information

Model name	*Voltage*
STP-A2203 series	*200 - 240 Va.c.*

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

Declaration of Conformity

We,

Manufacture:	Edwards Japan Limited 1078-1, Yoshihashi, Yachiyo-shi, Chiba, 276-8523, Japan
EU Representative:	Edwards Innovation Drive, Burgess Hill, West Sussex, RH15 9TW, 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-A2203 series
Accessories Covered:	TMS Unit, Communication Interface (LonWorks, EtherCAT)

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. Vacuum Pumps
EN61010-1:2010	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use. General Requirements
EN61326-1:2013	Electrical equipment for measurement, control and 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
EN55011:2009, A1:2010	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics (Group1, Class A)
EN50581:2012	Technical Documentation for the Assessment of Electrical and Electronic Products with respect to the Restriction of Hazardous Substances

and fulfils all the relevant provisions of

2006/42/EC	Machinery Directive
2014/35/EU	Low Voltage Directive
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU*	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). The RoHS Directive does not legally apply to industrial vacuum equipment until July 2019 (July 2017 for instruments).*

Note: This declaration covers all product serial numbers from the date this Declaration was signed onwards.

Manufacture: Yuji Kato
Yuji Kato, TMP Technical Senior Manager, Edwards Japan Limited

5th June. 2016, Yachiyo
Date and Place

EU representative:
Ian Stones, Vice President, Technology, Edwards

6th June. 2016, Burgess Hill
Date and Place

This product has been manufactured under a quality management system certified to ISO 9001:2008

VI-DOC-41-009

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
- Maintenance
- Storage, transportation and disposal
- Service, spares, and accessories

Keep the manuals in an easily accessible location.

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ILLUSTRATIONS

TABLES

1 TECHNICAL DATA

1.1 Applicable pump specifications

Model Name	Specification	Applicable Control unit
STP-A2203 series	High-throughput type	SCU-1600

Naming convention:

- "C" following a pump model name indicates a corrosion resistant[*1] type (e.g. STP-A2203C).
- "CV" indicates an enhanced corrosion resistant type with TMS[*2] (e.g. STP-A2203CV).

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

[*2] 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			A2203 series
Flange size	Inlet port flange		VG250/ISO250F/ICF305
	Outlet port flange		KF40
Pumping speed	N_2	L/s	2200
	H_2	L/s	1700
Compression ratio	N_2		$>10^8$
	H_2		2.5×10^4
Ultimate pressure		Pa (Torr)	10^{-6} (10^{-8}) order [after baking]
Maximum gas flow-rate[*1]	N_2	Pa·m³/s (SCCM)	2.5 (1500): Water cooling 2.0 (1200): TMS unit used (60 °C)
	Ar	Pa·m³/s (SCCM)	1.5 (900): Water cooling 1.0 (600): TMS unit used (60 °C)
Allowable backing pressure[*1]		Pa (Torr)	400 (3): Water cooling/TMS unit used
Flow rate of purge gas <N_2>		Pa·m³/s (SCCM)	3.4×10^{-2} (20)
Rated speed		rpm	27,000
Backup rotational speed[*2]		rpm	Approximately 6,000
Starting time		min	7
Stopping time		min	8
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[*3]		kg	61
Ambient temperature range		°C	0 to 40
Storage temperature range		°C	-25 to 55
Applicable Control unit			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 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

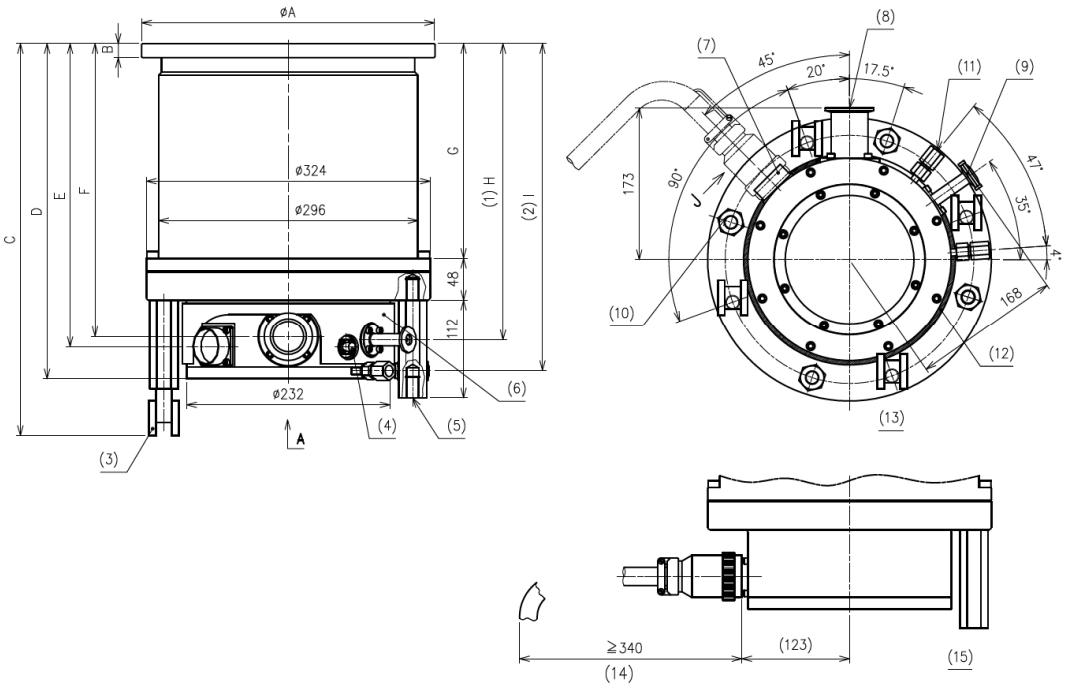


Figure 1 - STP-A2203 series: VG250/ISO250F/ICF305

No.	Item	Description
1	Height of purge port	
2	Height of cooling water port	
3	Caster	4
4	TMS sensor connector	Optional accessory
5	Screw hole for casters	Rc*1 1/4
6	TMS heater	Optional accessory
7	STP cable connector	
8	Outlet port flange	KF*2 40
9	Purge port	KF*2 10
10	Screw hole for legs	8-M16 depth 24
11	Cooling water port	2-Rc*1 1/4
12	TMS heater	Optional accessory
13	Viewed from arrow A	
14	Bending dimension of the STP connection cable	
15	Viewed from arrow J	

Inlet port flange	VG250	ISO250F	ICF305
ϕA	350	335	305
B	18	16	28
C	438	448	478
D	373.5	383.5	413.5
E	337	347	377
F	325	335	365
G	235	245	275
H	329	339	369
I	364	374	404

*1 ISO

*2 JIS

1.3 Label affixing positions

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

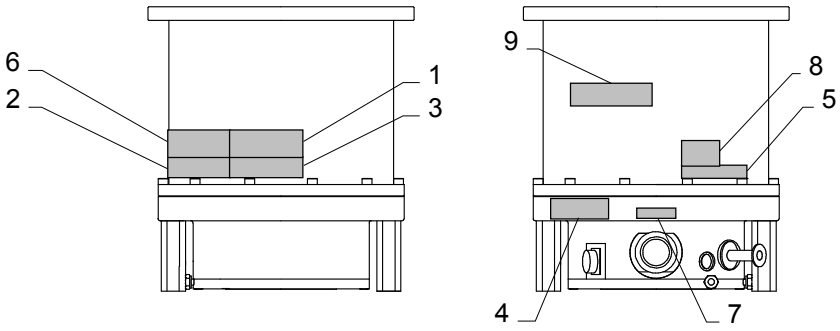


Figure 2 - Label affixing positions for the STP pump

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	4	
Leg with a caster	4	adjustable
Instruction Manual (B)	1	This manual

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.

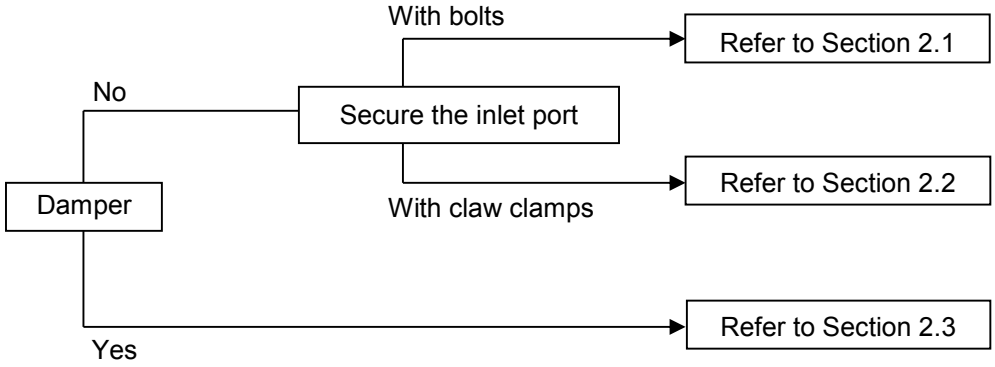
The STP pump is provided with a high-speed rotor. The worst-case failure may result in a jump in rotational torque leading to personal injury or peripheral equipment damage.

The method of securing the STP pump will depend on the STP pump model and its installation requirements. Secure the STP pump to the vacuum equipment according to the method specified in this manual.

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

- Confirm that electric resistance value between the STP pump and vacuum equipment is set to 0.1 Ω or less after securing the STP pump to the vacuum equipment.

The generated torque during a pump failure is called "Destructive torque". 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

Pump model		**STP-A2203 series**							
Flange type		VG250		ISO250F [*3]				ICF305	
Torque reduction mechanism		Not Equipped (standard)		Equipped (optional)		Not Equipped (standard)		Not Equipped (standard)	
Torque in pump abnormality [Nm]		6.7×10^4		3.4×10^4		5.2×10^4		6.7×10^4	
Base (8 positions) securing		No	Yes	No	Yes	No	Yes	No	Yes
Recommended securing bolt for flange	Shape	Standard	Standard	Standard	Standard	R.D.S.B.[*2]	Standard	Standard	Standard
	Size	M12	M12	M10	M10	M10	M10	M8	M8
	Q'ty	12	12	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	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	12.9 or more	70 or more
	Special washer	Not necessary	Not necessary	Figure 3	Figure 3	Not necessary	Not necessary	Not necessary	Not necessary

[*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.)

[*3] 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

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.

The generated destructive torque depends on the presence of a torque reduction mechanism that can be built into the flange, according to the pump model and flange type. This mechanism, shown in Figure 3, is designed to absorb energy and also buffer the destructive torque.

There are two installation methods for the pump, as shown in Figure 4. Make sure to secure the inlet port flange of the pump with the recommended bolts, as described in Figure 4, according to the installation method used.

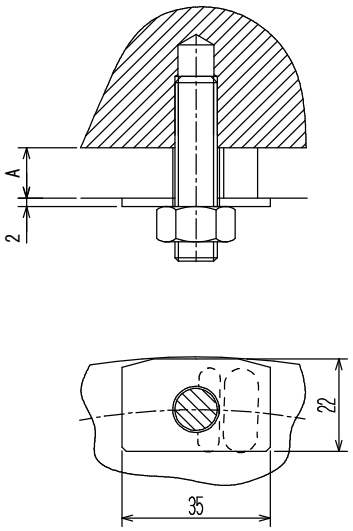
Note that special washers will be required if the pump includes the inlet torque reduction mechanism. The washer shape is shown in Figure 3.

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 7. Make sure that the recommended securing bolt is the correct one depending on the method of securing the base.

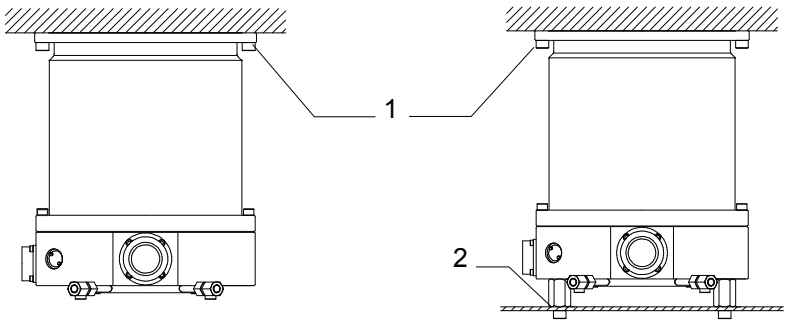
CAUTION
Install the flange securing bolts in the proper position with the special square washer shown in Figure 3. Failure to do so may cause abnormal operation of the torque reduction mechanism and damage the pump.

CAUTION
When any internal abnormality/error results in high rotational torque, causing the torque reduction mechanism to operate, the pump may rotate a maximum of 5 degrees around the rotor rotation at axis.



1. Vacuum equipment
2. Inlet port flange
3. Washer
4. Torque reduction mechanism
5. Bolt insert position

Figure 3 - Shape of reduced diameter shank bolts

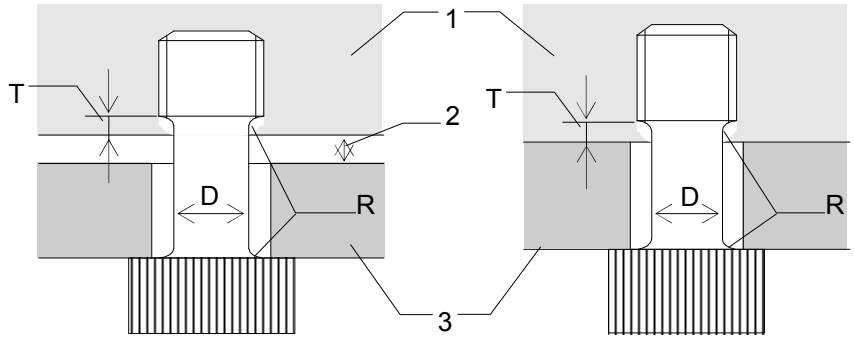


(A) When the base is not secured (B) When the base is secured

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 4 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

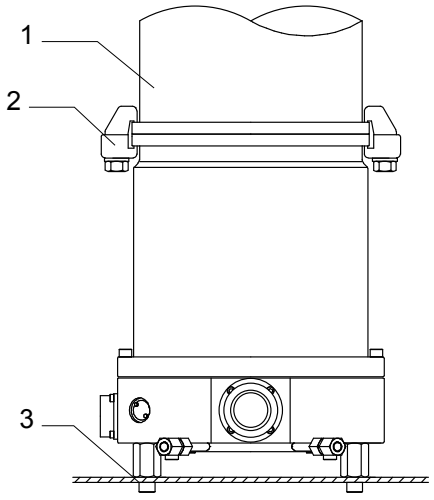
Refer to Table 2 for destructive torque.

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 7.

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

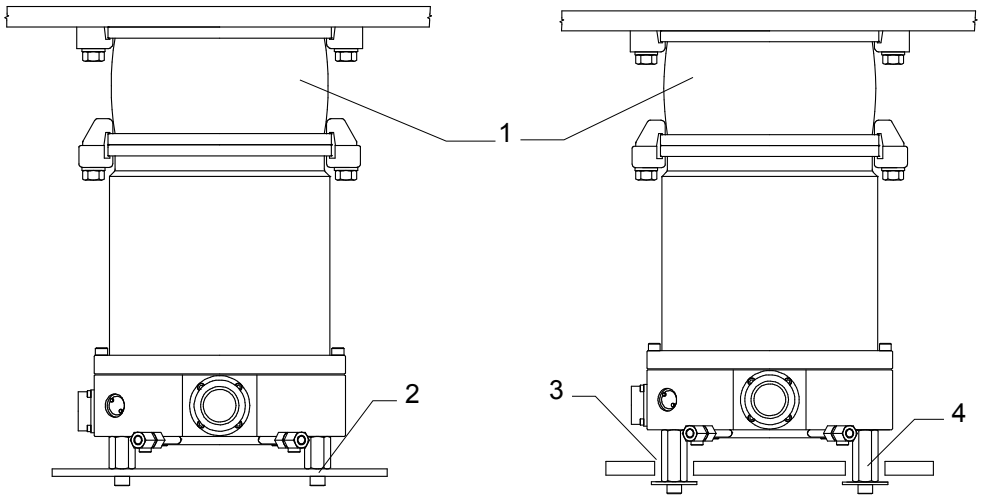
CAUTION
Use a damper only at the vertically upright position.

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 7.

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)

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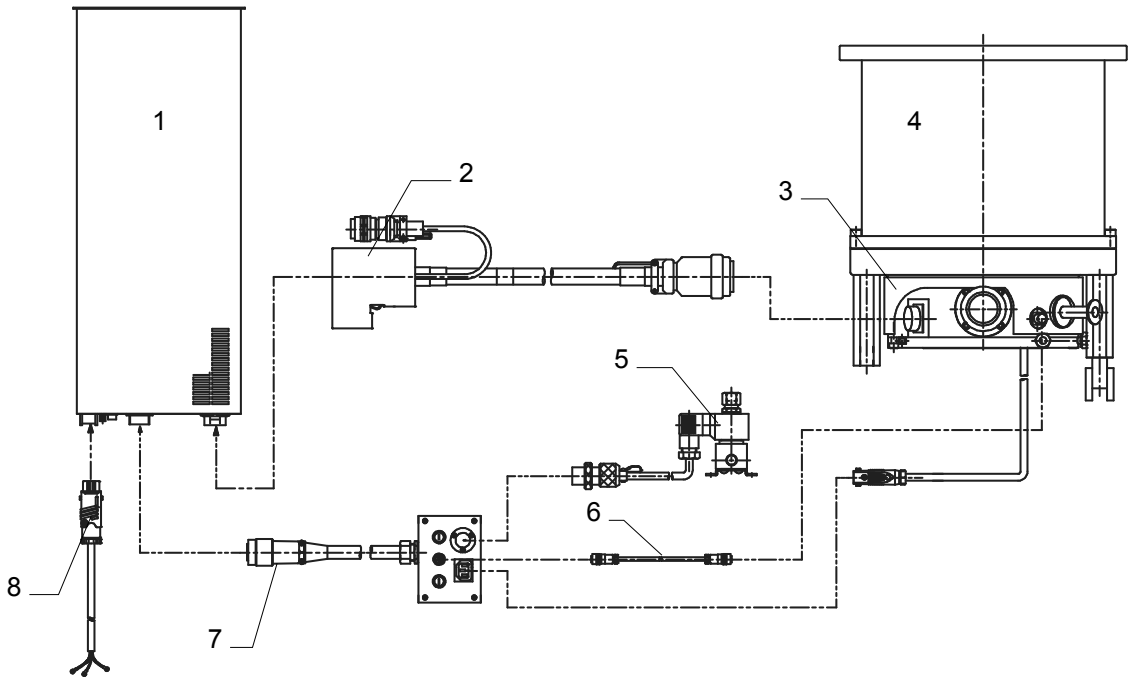
3 TEMPERATURE MANAGEMENT SYSTEM (TMS)

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 sensor cable
7. TMS connection cable
8. 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 types of pumps.

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	TC IN connector	For the TMS sensor cable
3	Fuse (F2)	For protection of the TMS valve (1.0 A)
4	CON2 COOLING VALVE OUT connector	For the TMS valve
5	Metal fitting	Secures CON1 and CON2 connectors
6	CON1 HEATER OUT connector	For the TMS heater
7	Fuse (F1)	For protection of the TMS heater (3.0 A)

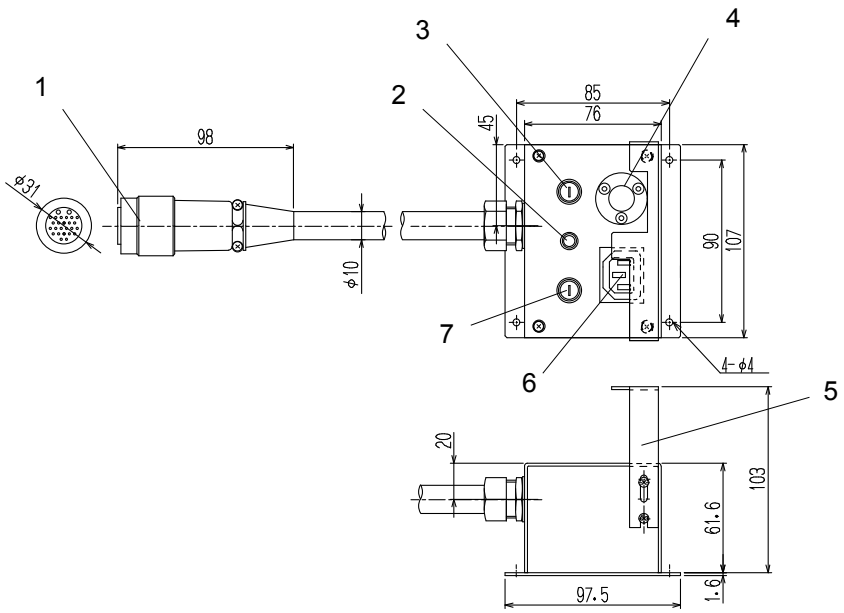


Figure 9 - External view of TMS connection cable

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

3.3 TMS heater

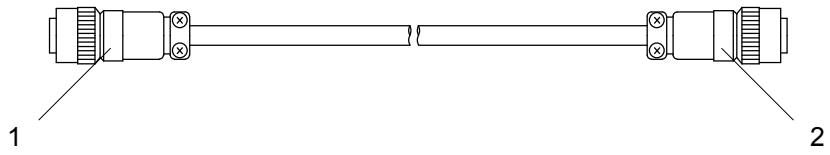
The TMS heater heats the base of the STP pump. It's fitted with the STP-A2203CV series at the factory.

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 for reading the TMS sensor signal from the base of the STP pump.



1. TMS connection cable side (5 pin, pin type)
2. STP Pump side (5 pin, socket type)

Figure 10 - TMS sensor cable

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.

CAUTION
Install the STP pump in the enclosure of the end equipment so as not to touch it directly.

3.6.1 Connecting the TMS connection cable to the STP control unit

1. When installing the distribution box, place and secure it near the STP pump (see Figure 8 for the dimension of the TMS connection cable).
2. 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 sensor cable, TMS valve

Refer to Figure 8, "Configuration of the STP pump with the TMS" to connect the pump and TMS sensor cable, TMS valve proceed as follows:

1. Connect the TMS sensor cable to the connector of the temperature sensor in the base of the pump.
2. 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. 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. Loosen the screws on the metal fitting securing the connectors to the distribution box, and remove the hooks.
2. Connect the cable for the TMS heater to the "CON1 HEATER OUT" connector of the distribution box.
3. Connect the cable for the TMS valve to the "CON2 COOLING VALVE OUT" connector of the distribution box.
4. Connect the TMS sensor cable to the "TC IN" connector of the distribution box.
5. Connect the CON1 and CON2 connectors securely to prevent the removal of these connectors.

3.7 Replacing the fuses in the TMS connection cable

Remove the probable causes of the blown fuse (e.g. a problem with the remote input signal, etc.) before replacing the fuse.
Always check the label on the distribution box, and use specified fuses.
If fuses are blown frequently even after they are replaced, contact Service Office.
Fuses are attached for replacement (see Table 5).

Item	Specification	Recommended model
F1	3.0 A, 250 V, Ø5.2×20 mm, Slow blow type (for overcurrent protection of the TMS heater)	SD6-3AN1 (SOC)
F2	1.0 A, 250 V, Ø5.2×20 mm, Normal acting type (for overcurrent protection of the TMS valve)	MQ4-1AN1 (SOC)

Table 5 - Service parts specification

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 flow	L/min	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	Attached to the STP pump
TMS connection cable	1	With connector on one side, a distribution box
TMS valve	1	Coupling for water cooling port, cable with connector on one side
TMS sensor cable	1	With connector at each end
Spare fuse F1 (3.0 A)	1	For TMS heater
Spare fuse F2 (1.0 A)	1	For TMS valve

For more information, contact the nearest Service Office.

Manufacturer:

Edwards Japan Limited

1078-1, Yoshihashi, Yachiyo-shi, Chiba 276-8523 JAPAN

Telephone:	Domestic	047-458-8853
	International	+81-47-458-8853
Facsimile:	Domestic	047-458-8048
	International	+81-47-458-8048