

Instruction Manual

STP Series Turbomolecular Pumps
TMS Unit for STP-301CVB3
(Second Edition - c)

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.

Read this Manual thoroughly and keep it with the Turbomolecular Pump Instruction Manual.



Jan. 2008

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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 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.



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.

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



and



specified in this manual.

WARNING

- ◇ The STP pump operates at high temperatures while the baking heater is in operation. NEVER touch the STP pump and its peripheral equipment while the baking heater 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 chemicals 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.

CAUTION

- ◇ 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.
- ◇ TMS unit does not stop automatically when an abnormality/error is detected. Establish a sequence so that equipments can stop when an abnormality/error occurs.
- ◇ Always check the STP pump has stopped, then turn OFF the primary power (disconnect the power cable) and isolate the electrical energy source (Lockout/Tagout) on the vacuum equipment 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.
 - Connect or disconnect cables;
 - Perform maintenance and inspections such as replacement of; or
 - Perform investigations into probable causes and action/measures taken in the event of occurrence of a problem.
- ◇ Connect the cables securely. NEVER bend nor place heavy objects on the cable. Doing so may result in electric shock or 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.
- ◇ 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.

INTRODUCTION

Thank you very much for purchasing Edwards' Temperature Management System (TMS) unit.

The Temperature Management System (TMS) maintains the temperature of the turbomolecular pump by monitoring the temperature with thermistor in the base of the turbomolecular pump, and performing the TMS valve and TMS heater ON/OFF control. This manual covers all items necessary to ensure safe installation, operation and maintenance of the TMS unit for STP-301CVB3:

Model name:	Pump type
STP-301CVB3:	Chemical specific* ¹

The pump with a TMS unit has some specifications which are different from the STP-301 series. Refer to Section 7 in this manual for details.

For the "Safety Precautions", installation, operation and maintenance, read the "STP-301/451 Series Instruction Manual".

In this manual, the above Temperature Management System unit series is collectively referred to as the "TMS unit".

PRECAUTIONS

- 1) No part of this manual may be reproduced in any form by any means without prior written permission from Edwards.
- 2) 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 Chemical specific: STP pump with anti-corrosive treatment (responding to chlorine, fluorine or other system gases)

LIMITED WARRANTY

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

1. **WARRANTY PERIOD:**

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 Edwards.

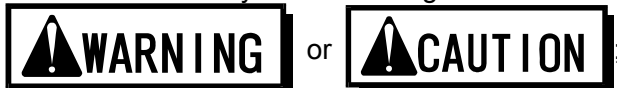
2. **ITEM WARRANTED:**

- 1) This warranty applies only to the product delivered from Edwards to the customer.
- 2) If any defect is found during this period, 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 the customer's own charge.

3. **DISCLAIMER:**

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 Edwards;
- 4) Maintenance personnel other than those authorized by 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 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 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

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1 Configuration

- 1) TMS control unit
 - It controls the TMS heater and the TMS valve.
- 2) TMS heater (for base)
 - It heats the base of the STP pump.
 - Controlling the heater stabilizes the STP pump's temperature.
 - A cable with connector is a standard accessory.
- 3) TMS valve (3 port)
 - It controls the cooling water flow quantity, and stabilizes the STP pump's temperature.
 - A cable with connector is a standard accessory.
- 4) TMS power cable
 - It supplies the power supply to the TMS heater and TMS valve.
- 5) TMS sensor cable
 - For connections of the TMS control unit and TMS sensor.
 - The built-in sensor in the base of the STP pump detects the temperature through this cable.

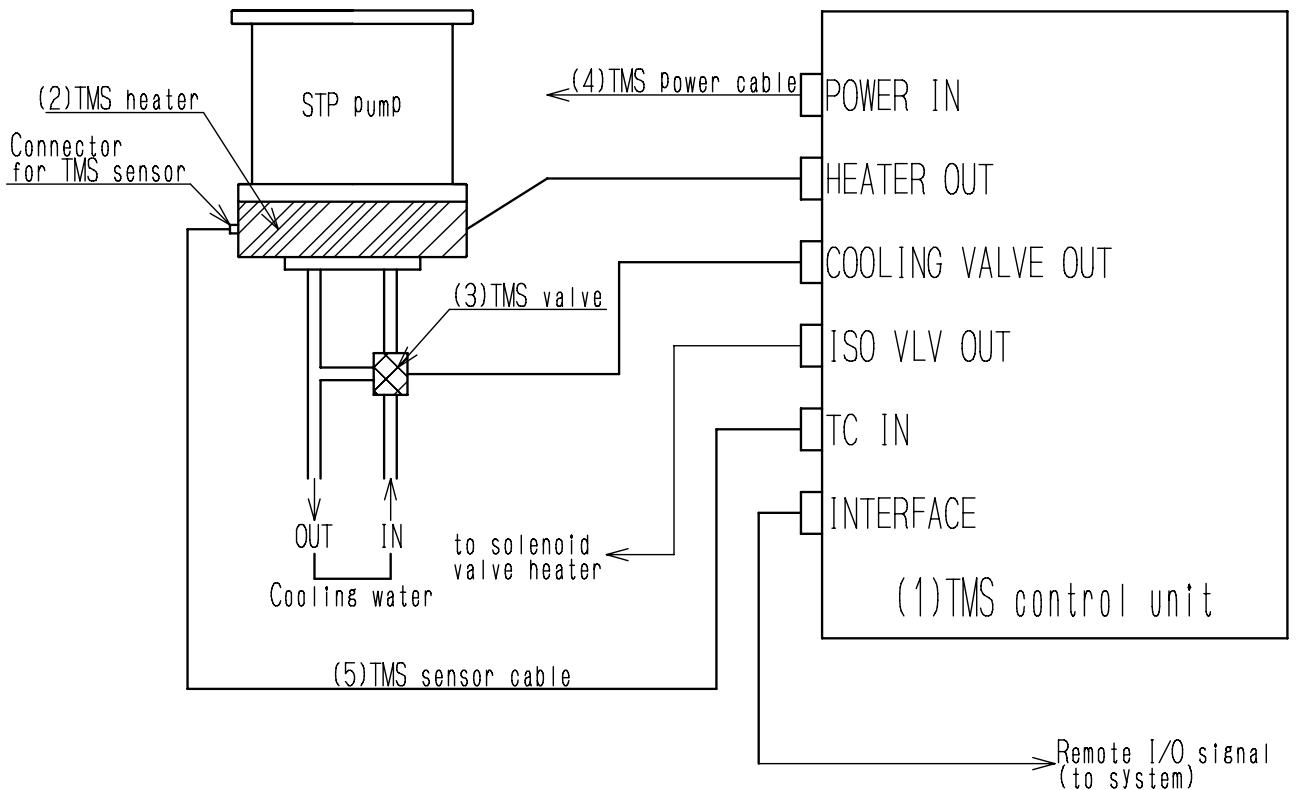


Figure 1.1 TMS Unit Block Diagram

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2 Name and Function of Each Part

2.1 TMS Control Unit

- (1) "POWER IN" connector (J1)
 - For input power source. (primary side, for TMS heater and TMS valve)
- (2) "HEATER OUT" connector (J2)
 - For TMS heater output.
- (3) "COOLING VALVE OUT" connector (J3)
 - For TMS valve output.
- (4) "ISO VLV OUT" connector (J4)
 - For solenoid valve heater output.
This output voltage is supplied by "POWER IN" connector directory.



◇ Procure the heater for solenoid valve at your site.

- (5) "TC IN" connector
 - For TMS sensor input.
- (6) "INTERFACE" connector
 - Control power input connector
 - POWER ON and ALARM signal output connector
- (7) "POWER ON" LED (Green LED)
 - Illuminates during operation.
- (8) "ALARM" LED (Red LED)
 - Illuminates when any of the malfunction occur. (See Section 4.4, "Operation when malfunction occur")
- (9) "F1" fuse (0.5A)
 - For control power.
- (10) "F2" fuse (2A)
 - For TMS heater.
- (11) "F3" fuse (0.5A)
 - For TMS valve.
- (12) "F4" fuse (1.5A)
 - For Solenoid valve heater.

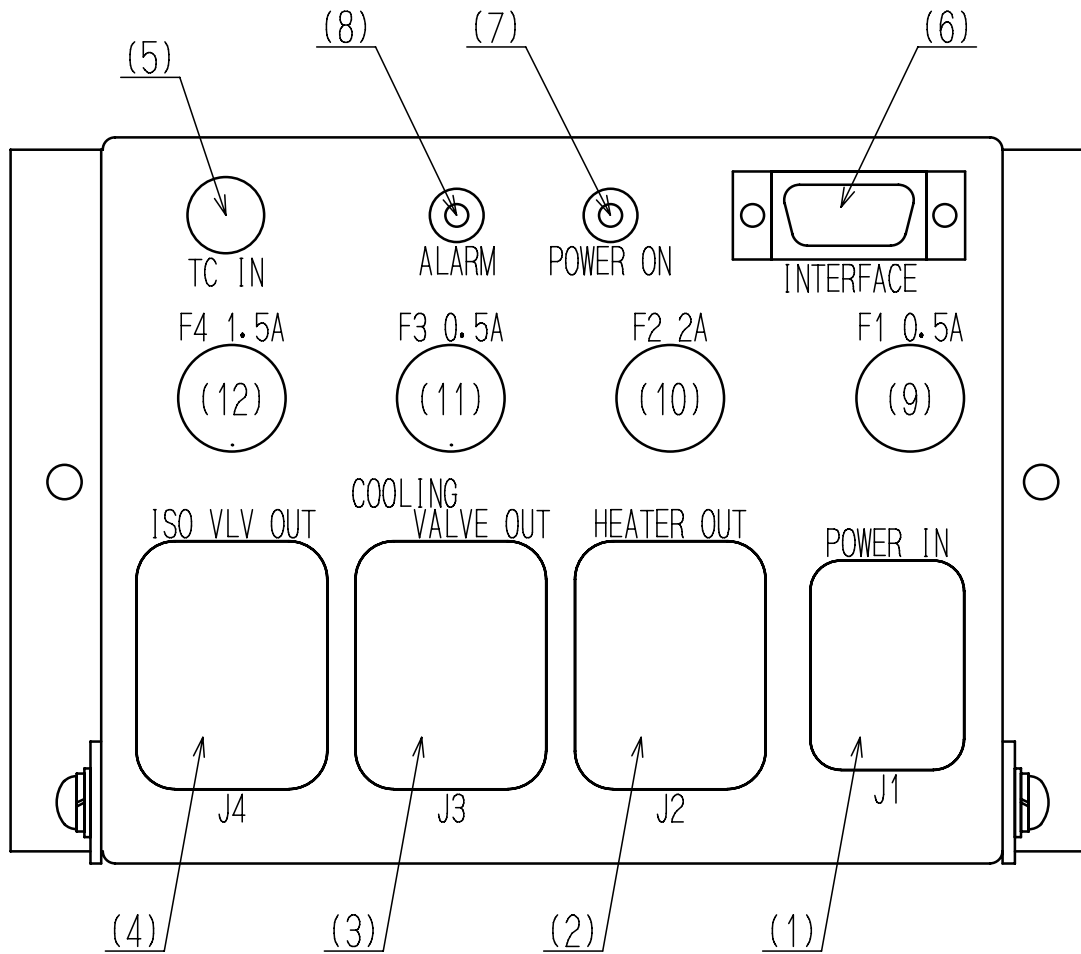


Figure 2.1 TMS Control Unit

2.1.1 Remote Input/Output Signal Connector ("INTERFACE" Connector)

Use it in accordance with Table 2.1 and Figure 2.3.

This connector is of D-Sub*1 type (9-pins, pin type).

The screw for connector is No.4-40UNC-2B.

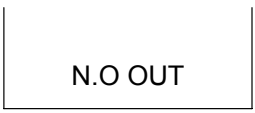
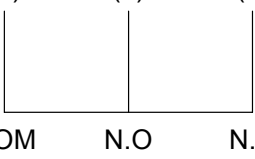
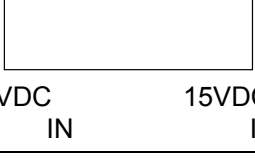
Five abbreviations are used in the following table:

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



◇ Procure the connector for remote connection at your site.

Table 2.1 Remote Input/Output Signal Connector

Pins	Method of use
(1) POWER ON (2)  N.O OUT	Pins for outputting the POWER ON state signal. These pins are closed during POWER ON.
ALARM OUT (3) (4) (5)  COM N.O N.C	Pins for outputting the ALARM state signal. When an abnormality/error is detected under the POWER ON state, the pins between (3)-(4) are closed, and the pins between (3)-(5) are opened. (See Section 4.4, "Operation when malfunction occur") If malfunction is detected, using this signal to stop the pump.
(6) START IN (9)  0VDC IN 15VDC IN	Pins for inputting the control power. Input 15 VDC between (6) pin and (9) pin, TMS control unite is start. The 0 VDC side is (6) pin, the 15VDC side is (9) pin.
(7), (8)	Unused pins. DO NOT use.

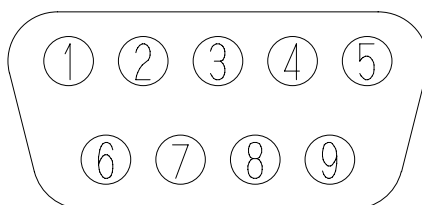


Figure 2.2 Pin Arrangement

*1: D-Subminiature connector (Conforms to MIL-C-24308)

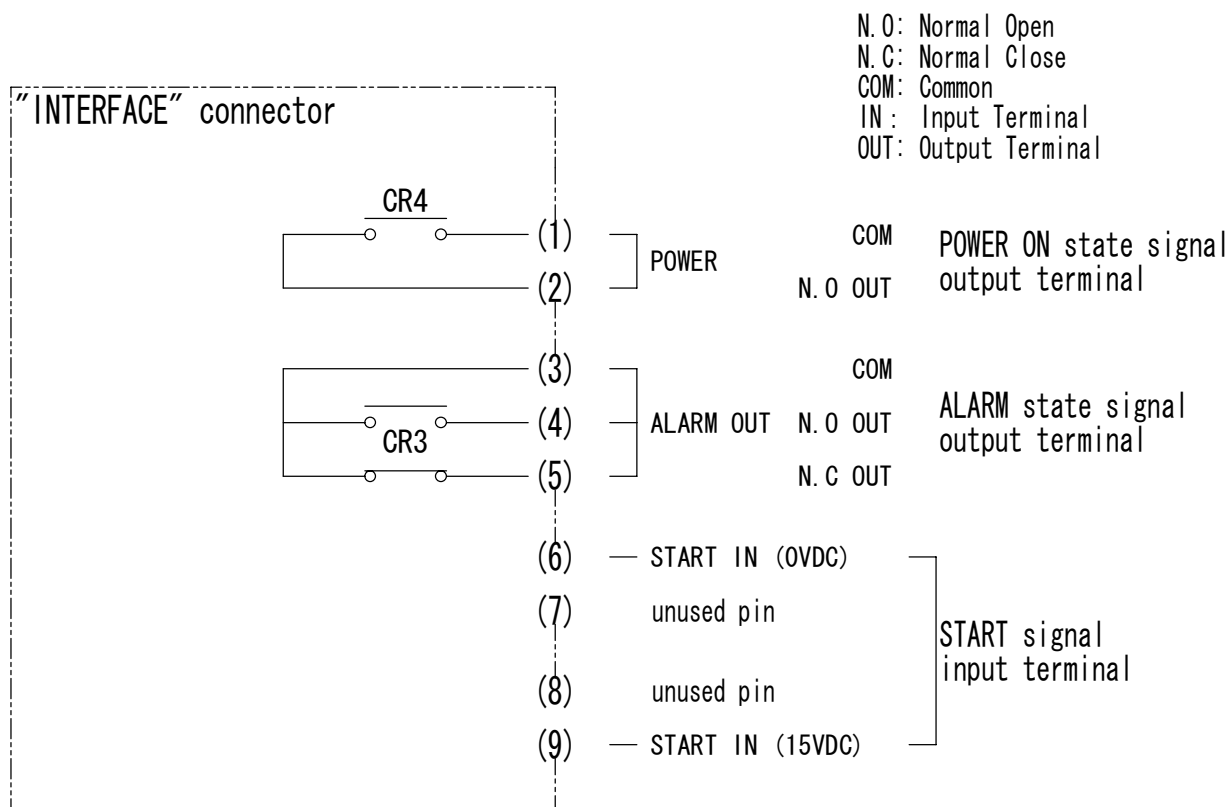


Figure 2.3 "INTERFACE" Connector

Table 2.2 shows rated contacts for relays CR3 and 4. (see Figure 2.3)

Table 2.2 Rated Contacts for Relays CR3 and 4

	Resistance Load (COS $\phi = 1$)	Induction Load (COS $\phi = 0.4$) (L/R = 7 ms)
Rated Load	AC120 V 0.4 A DC 30 V 2 A	AC125 V 0.2 A DC 30 V 1 A
Rated Current	3 A	
Maximum Contact Point Voltage	AC250 V DC220 V	
Maximum Contact Point Current	3 A	
Maximum Open/Close Capacity	AC50 VA DC60 W	AC25 VA DC30 W
Minimum Applicable Load	DC10 mV, 10 μ A	

3 Installation

Read the "STP pump Instruction Manual" for the installation of the STP pump and STP control unit.

3.1 Operating Environment

Install the TMS unit in a place meeting the following requirements:

Ambient temperature	0 to 40 °C
Ambient relative humidity	30 to 95 % (no dew condensing)
Other	Install a place meeting required environment for the STP pump and STP control unit.

3.2 Preparation for STP Pump

3.2.1 Installation for the Water Cooling Unit

- 1) Unpack the supplied water cooling unit. (See Figure 3.1)
- 2) Attach the water cooling unit using 4 screws at screw holes for legs. (8-M8, depth 16 mm)

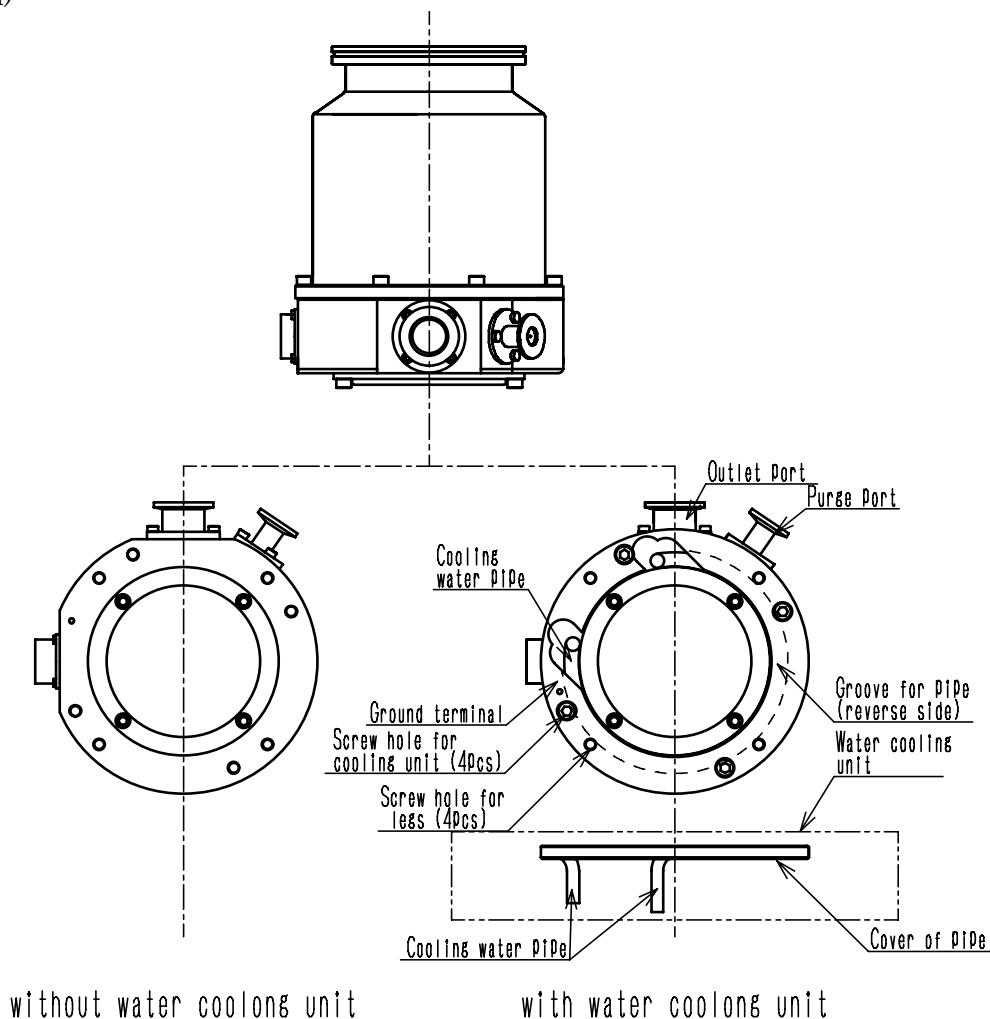


Figure 3.1 Installation for the Water Cooling Unit

TMS Unit INSTRUCTION MANUAL for STP-301CVB3

3.2.2 Installation for the TMS Heater

Wind the base part of the pump with the TMS heater. (See Figure 3.2)



- ◇ Wind the TMS heater around the surface of the STP pump tightly. If the TMS heater is not wound tightly, the loose parts will overheat.
- ◇ DO NOT apply excessive force to the cable for TMS heater.

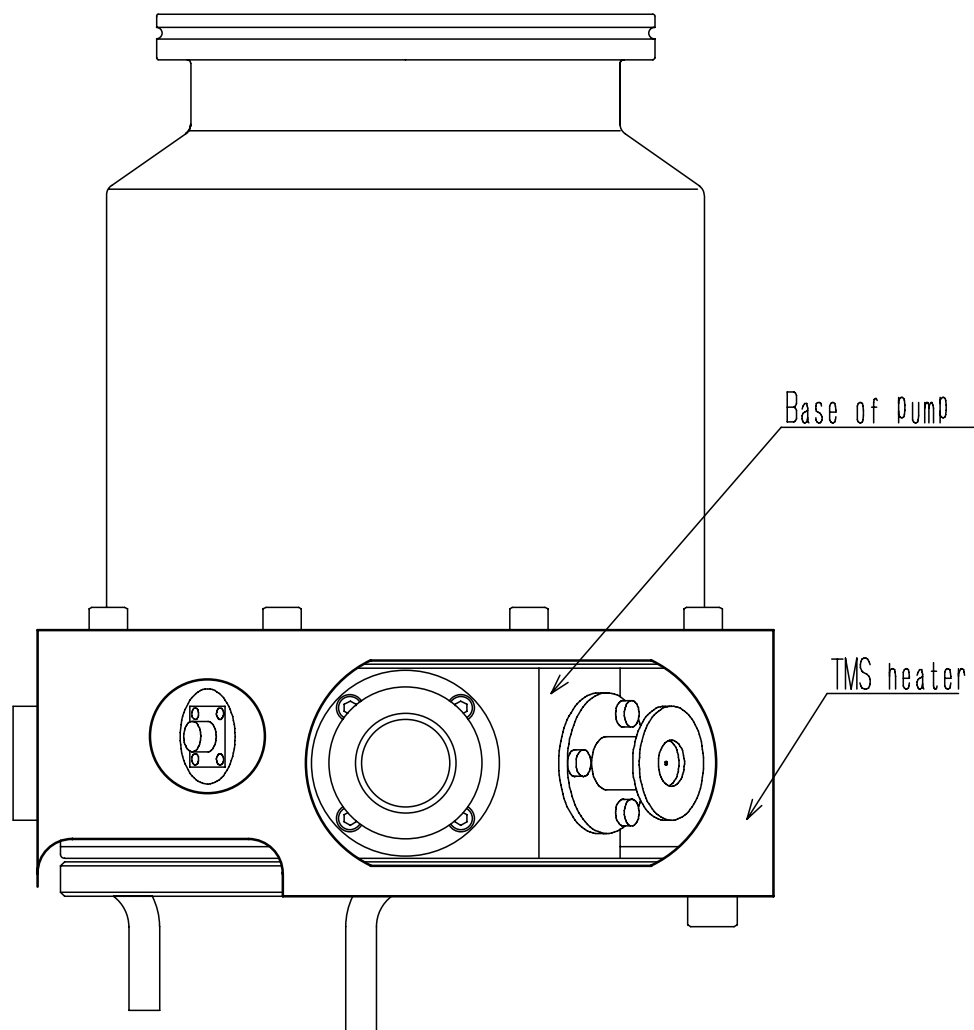


Figure 3.2 Installation for the TMS Heater

3.2.3 Installation for the TMS Valve



- ◇ DO NOT apply excessive force to the cable for TMS valve.
- ◇ Pay special attention to the port label (IN, NO, NC) on the TMS valve. Cooling water does not flow normally when the TMS valve is not connected to the appropriate port.
- ◇ Secure cooling water pipe to prevent water leakage.



- ◇ Procure and connect the cooling water pipe and connect the TMS valve at your site.
- ◇ 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 inlet/outlet port so that no water will remain inside.

Connect the TMS valve to the cooling water pipe according to Figure 3.3.

- Outside diameter of the cooling water ports are 1/4 inch.
- Use cooling water under the following conditions:
Amount of water: 1.5 L/min or more
Temperature: 10 to 20 °C
Water pressure: 2.9×10^5 Pa (3 kgf/cm²) or lower

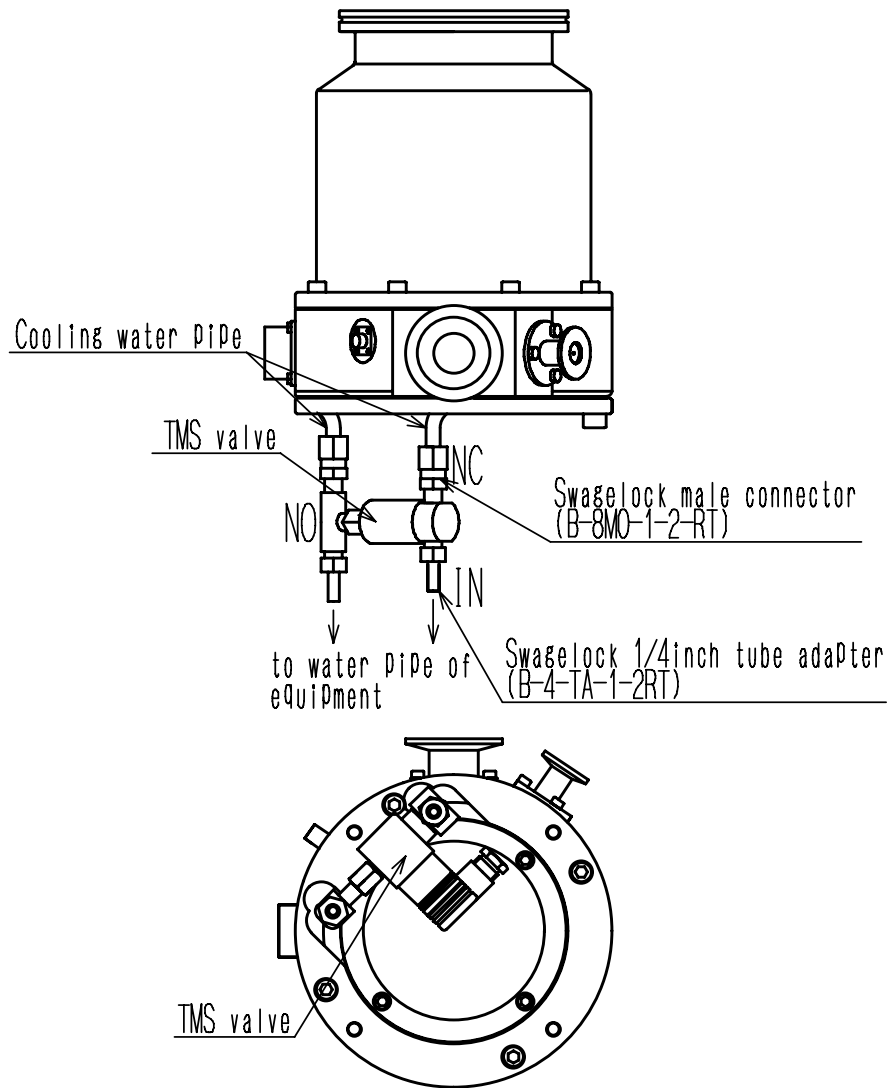


Figure 3.3 Installation for the TMS Valve

3.3 Installation for the TMS Control Unit

TMS control unit can be install with two screws.

Refer to Figure 6.1, "External Appearance of the TMS Control Unit" for the dimensions of installing hole.



- ◇ Tighten all installing screw. Doing so may result in product damage.
- ◇ NEVER bend nor place heavy objects on the cable. Connect the cables securely. Doing so may result in electric shock or product damage.

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3.4 Cable Connection

3.4.1 Name and Dimensions of Each Cable

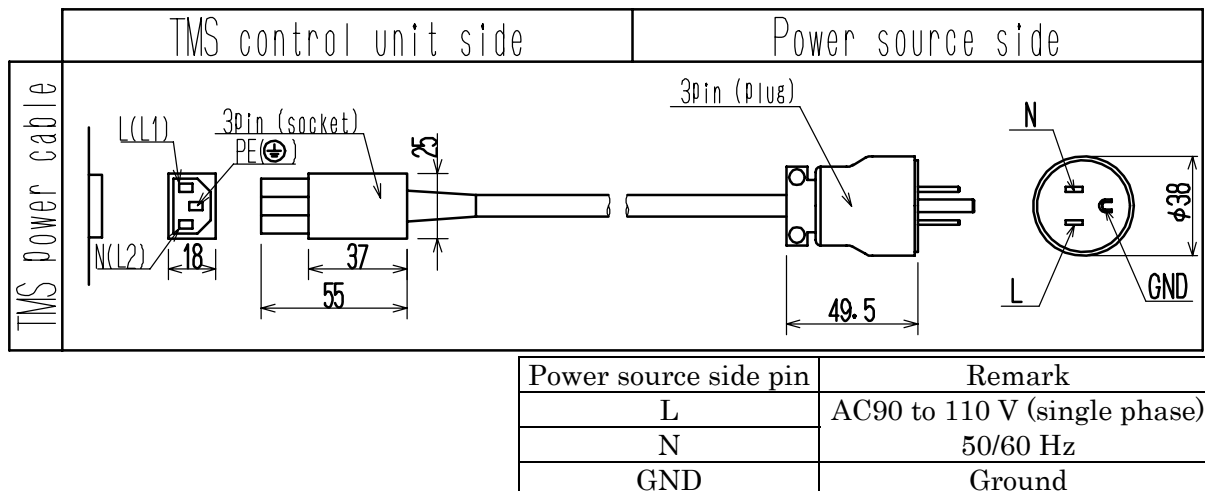


Figure 3.4 External Dimensions of TMS Power Cable

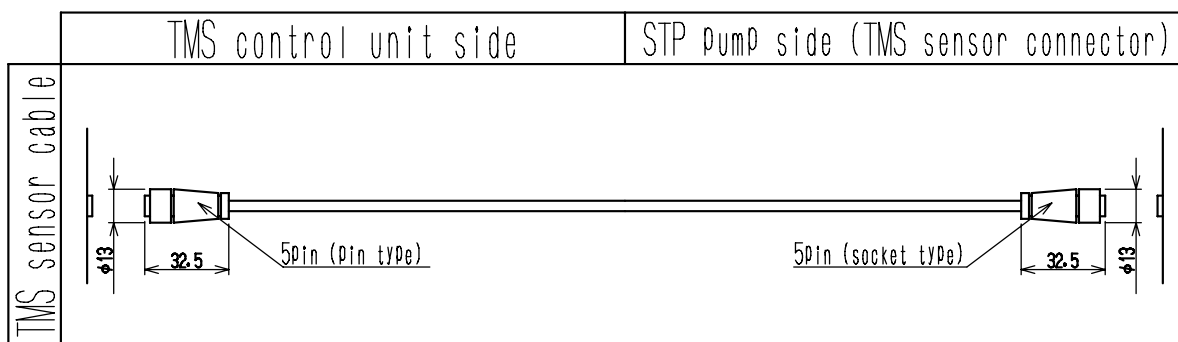


Figure 3.5 External Dimensions of TMS Sensor Cable

3.4.2 STP Pump and TMS Control Unit Connection

See Figure 1.1, "TMS Unit Block Diagram", connect the pump and TMS control unit as described below:

- 1) Connect the TMS sensor cable between the "TMS sensor connector" of the STP pump and "TC IN" connector of the TMS control unit.
- 2) Connect the cable of TMS valve to "COOLING VALVE OUT" connector (J3) of the TMS control unit.
- 3) Connect the cable of TMS heater to "HEATER OUT" connector (J2) of the TMS control unit.
- 4) Connect the TMS power cable to "POWER IN" connector (J1) of the TMS heater cable.

4 Operation

4.1 Operation Start

Input control power (15 VDC) to the "INTERFACE" connector of the TMS control unit.
(6 pin: 0 VDC, 9 pin: 15 VDC)
TMS control unit starts operation.

4.2 Temperature Control Operation

TMS valve and TMS heater is controlled by detected temperature of TMS sensor inside the base of pump.

- 1) When the pump temperature is less than "Setting value", the pump heats up through the TMS heater. In this case, the TMS valve is open on "NO" side and no water flows into the pump.
- 2) When the pump temperature is "Setting value" or higher, the TMS valve is open on "NC" side and water flows into the pump. In the case, there is no current on the TMS heater.



- ◇ The message "PUMP TEMP: **°C" displayed on the LCD of the STP control unit is the motor part temperature. It is not the TMS detection temperature.

4.3 Operation Stop

Shut off the control power (15 VDC). TMS control unit starts operation.

4.4 Operation when malfunction occur



- ◇ TMS unit does not stop automatically when an abnormality/error is detected.
It is recommended to establish a procedure so that equipments can stop when an abnormality/error occurs.
- 1) High-temperature error
It is detected that the temperature is +10°C or higher than the setting value due to a failure of the TMS valve.
The "ALARM" LED illuminates and "ALARM" signal is output from remote input/output terminal block.
- 2) Low-temperature error
It is detected that the temperature is -10°C or lower than the setting value due to a failure of the TMS heater.
The "ALARM" LED illuminates and "ALARM" signal is output from remote input/output terminal block.



- ◇ An abnormality/error is not detected until approx. one hour after the TMS unit is started on even if the temperature is -10°C or lower than the setting value.

5 Maintenance



- ◇ Stop the STP pump, and remove TMS power cable, before performing maintenance of the TMS control unit (such as fuse replacement).
DO NOT touch any place other those specified when performing maintenance or inspecting the TMS control unit because it could cause shock, malfunction, or short circuit.

5.1 Replacing the Fuse



- ◇ Remove the probable causes of the blown fuse (Ex. a problem with the remote input signal, and other) before replacing the fuse.
- ◇ Always use specified and rated fuses.



- ◇ If fuses are blown frequently even after they are replaced, contact Service office.
- ◇ Each fuse is attached for replacement.

The following are protective fuses used in the TMS control unit.

F1:250 V, 0.5 A (Normal acting fuse)
For control power protection

F2:250 V, 2 A (Normal acting fuse)
For TMS heater protection

F3:250 V, 0.5 A (Normal acting fuse)
For TMS valve protection

F4:250 V, 1.5 A (Normal acting fuse)
For solenoid valve heater protection

Table 5.1 Recommended Spare Parts

Product name	Type	Specification
Fuse for F1, F3	MQ4-500mAN1 (SOC)	0.5 A, 250 V Normal acting type φ 5.2×20 mm
Fuse for F2	MQ4-2AN1 (SOC)	2.0 A, 250 V Normal acting fuse φ 5.2×20 mm
Fuse for F4	MQ4-1.5AN1 (SOC)	1.5 A, 250 V Normal acting fuse φ 5.2×20 mm

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6 Specifications of the TMS Unit

6.1 Specifications of the TMS Unit

Table 6.1 Specifications of the TMS Unit

Item		Specification
Setting temperature		60 °C
Safety function	High-temperature error	70 °C or more
	Low-temperature error*1	50 °C or lower
Ambient temperature range		0 to 40 °C
Storage temperature range		-25 to 55 °C
Input voltage	For heater and valve	110 VAC +/-10 %
	For control	15 VDC +/-10 %
Input power	For heater and valve	100 VA (when TMS heater is ON) 4 VA (when TMS heater is OFF)
	For control	2.5 W
Temperature control system		TMS heater and TMS valve ON/OFF control.
Panel indication LED		<ul style="list-style-type: none"> ● POWER ON (Green LED) ● ALARM (Red LED)
Input/Output terminals		<ul style="list-style-type: none"> ● POWER IN (J1) (3pin) ● HEATER OUT (J2) (3pin) ● COOLING VALVE OUT (J3) (3pin) ● ISO VLV OUT (J4) (3pin) ● TC IN (5pin) ● INTERFACE (9pin)
Input/Output cables		<ul style="list-style-type: none"> ● TMS power cable ● TMS sensor cable

6.2 Accessories

Table 6.2 Accessories

Name	Q'ty	Remarks
TMS control unit	1	
TMS valve	1	3 port, with connector on one side (1.5 m)
TMS heater	1	with heat insulator and connector on one side (1.5 m)
TMS power cable	1	with connectors at each end (1.5 m)
TMS sensor cable	1	with connectors at each end (1.5 m)
Spare fuse	250 V, 0.5 A	1 For F1, F3
	250 V, 2.0 A	1 For F2
	250 V, 1.5 A	1 For F4
Instruction manual	1	

*1 : Low-temperature error is not detected within one hour after the TMS unit starts.

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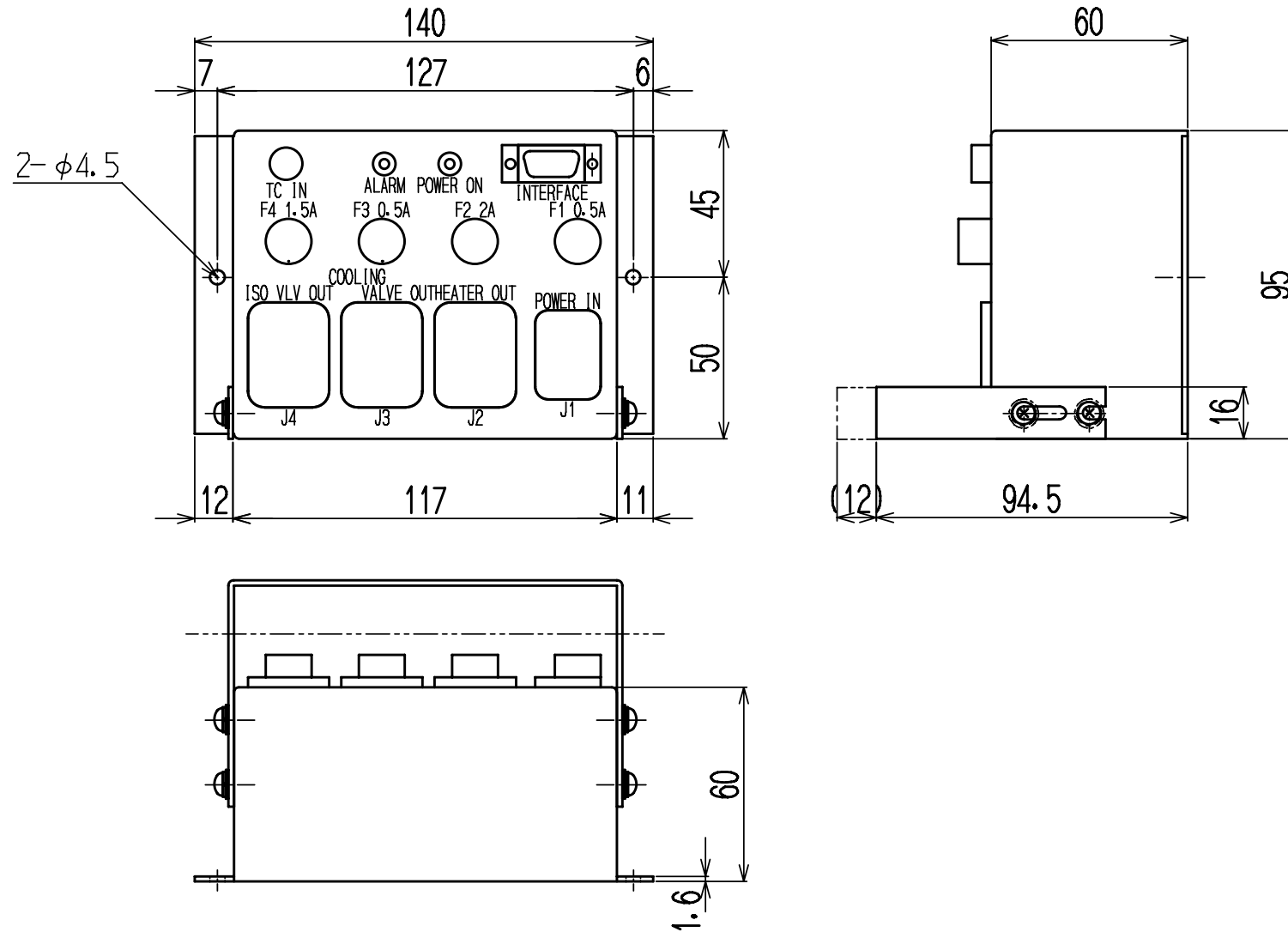


Figure 6.1 External Appearance of the TMS Control Unit

7 Specifications of the STP Pump

7.1 Specifications of the STP Pump

Table 7.1 Specifications of the STP Pump

Item		Model name
Flange size	Inlet port	ISO100
	Outlet port	KF40
Cooling water port (external diameter)		1/4 inch
TMS setting temperature		60 °C
Pumping speed *1	N ₂ L/s	280
	He L/s	260
	H ₂ L/s	280
Compression ratio *1	N ₂	>10 ⁸
	He	5×10 ⁵
	H ₂	1.2×10 ⁴
Ultimate pressure *1 Pa(Torr)		6.5×10 ⁻⁶ (5×10 ⁻⁸)
Maximum working pressure*1 Pa(Torr)		3 (25×10 ⁻³)
Allowable backing pressure*1 Pa(Torr)		65 (0.5)
Max throughput*1 Pa·m ³ /sec (SCCM)		0.42 (250)
Rotational speed rpm		44000 (Rotational speed setting range: 25000~44000)
Starting time min		3
Stopping time min		3
Vibration μ m(0-P)		<0.01 (at 44000 rpm)
Noise dB		<50 (at 44000 rpm)
Baking temperature °C		<120 (Not use with TMS unit)
Lubricating oil		Not necessary
Installation position		Free
Cooling method		Water cooling
Cooling water	Amount of water L/min	1.5 or more
	Temperature °C	10 to 20
	Water pressure Pa (kgf/cm ²)	2.9×10 ⁵ (3)
Standard baking pump L/min		>1000
Mass kg		11
Ambient temperature °C		0 to 40
Storage temperature °C		-25 to 55

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

*1 : It is measured on our measuring method at 44000 rpm. The performance varies with the rated speed.

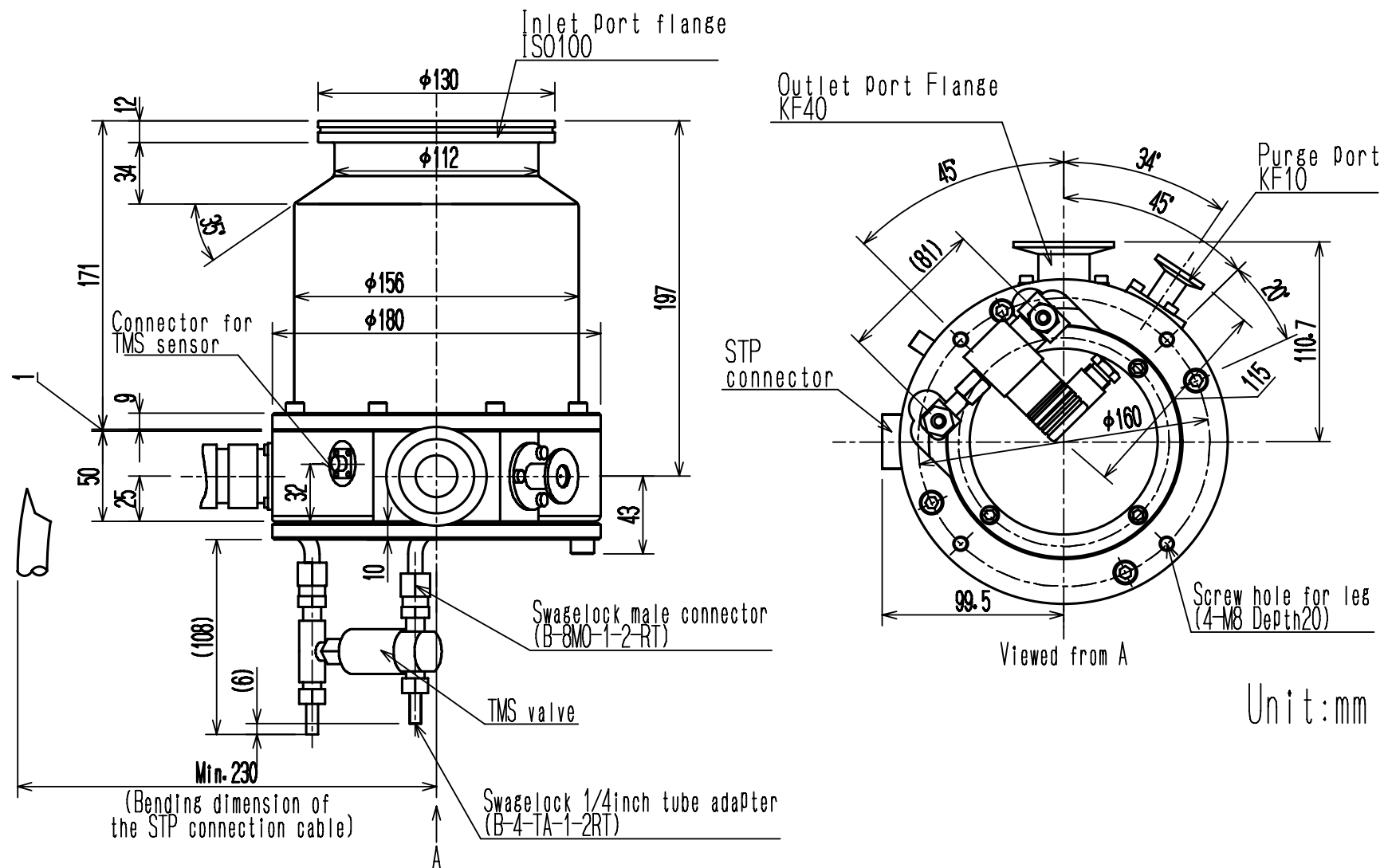


Figure 7.1 External Appearance of the STP Pump

UNIT CONVERSION TABLE

Length

m	cm	mm	inch
1	100	1.00×10^3	39.4
0.01	1	10.0	0.394
1×10^{-3}	0.10	1	39.4×10^{-3}
25.4×10^{-3}	2.54	25.4	1

Mass

g	kg	lb.
1	1.00×10^{-3}	2.20×10^{-3}
1×10^3	1	2.20
454	0.454	1

Pressure

Pa	Torr	kgf/cm ²
1	7.50×10^{-3}	1.02×10^{-5}
133	1	1.36×10^{-3}
9.81×10^4	736	1

For more information, contact the nearest Service Office.

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