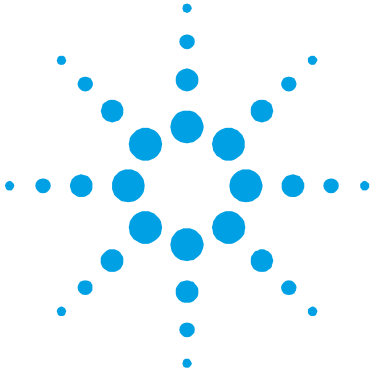

TV 551/701 SEM Navigator

Pump models
969-8935, 969-8936969-8937, 969-8938
Controller models
969-8976, 969-8977

User Manual

Manual de Instrucciones

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CAUTION

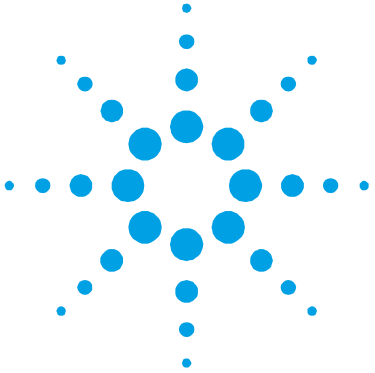
A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

TV 551/701 SEM Navigator

Contents



4
Manual de istrucciones

Traducción de las instrucciones originales

Indicaciones de Seguridad para Bombas Turbomoleculares

Las bombas Turbomoleculares descritas en el siguiente manual de instrucciones tienen una elevada cantidad de energía cinética debido a la alta velocidad de rotación en combinación a la masa específica de sus rotores.

En el caso de un daño del sistema, por ejemplo por un contacto entre el rotor y el estator o por una rotura del rotor, la energía de rotación podría ser liberada.

¡ADVERTENCIA!

Para evitar daños a los equipos y prevenir lesiones a los operadores, es necesario seguir atentamente las instrucciones de instalación descritas en el presente manual!

Información general

Este equipo es para uso profesional. El usuario ha de leer atentamente el presente manual de instrucciones y cualquier otra información suplementaria facilitada por Agilent antes de usar el aparato. Agilent se considera libre de posibles responsabilidades debidas al incumplimiento total o parcial de las instrucciones, al uso impropio por parte de personal no preparado, a operaciones no autorizadas o a un uso contrario a las normas nacionales específicas.

El TV 551/701 SEM Navigator es un sistema integrado compuesto por una bomba turbomolecular para aplicaciones de alto y ultra alto vacío integrada por el controler correspondiente. El sistema puede bombear cualquier tipo de gas o de composición gaseosa, pero no es adecuado para bombear líquidos o partículas sólidas. El efecto de bombeo se obtiene mediante una turbina rotativa de alta velocidad (42000 r.p.m. máx.) movida por un motor eléctrico trifásico de alto rendimiento. El TV 551/701 SEM Navigator no posee ningún agente contaminante y por lo tanto es adecuado para aplicaciones que requieren un vacío' "limpio".

Asimismo, el TV 551/701 SEM Navigator posee conectores auxiliares con los que se puede alimentar un ventilador adicional, accionar la válvula de ventilación, pilotarla a distancia con un ordenador host conectado mediante línea serial (RS 232/RS 485).

A continuación se facilita toda la información necesaria para garantizar la seguridad del operador al usar el aparato. En el anexo "Technical Information" se facilita información más detallada.

Este manual utiliza los siguientes símbolos convencionales:

¡ADVERTENCIA!

Los mensajes de advertencia atraen la atención del operador sobre un procedimiento o una operación específica que, al no realizarse correctamente, podría provocar graves lesiones personales.

¡ATENCIÓN! Los mensajes de atención se visualizan antes de los procedimientos que, de no cumplirse, podrían provocar daños al aparato.

NOTA Las notas contienen informaciones importantes extrapoladas del texto.

Almacenamiento

Para garantizar el nivel máximo de funcionalidad y fiabilidad de las bombas turbomoleculares Agilent, deberán aplicarse las siguientes instrucciones:

- durante el transporte, desplazamiento y almacenamiento de las bombas no deberán superarse las siguientes condiciones ambientales:
  - temperatura: entre –20 °C y 70 °C;
  - humedad relativa: entre 0 y 95 % (no condensante);
- el cliente deberá activar siempre las bombas turbomoleculares en modalidad Soft-Start al recibirlas y ponerlas en funcionamiento por primera vez;
- el período máximo de almacenamiento de una bomba turbomolecular es de diez meses a contar de la fecha de envío al cliente.

¡ATENCIÓN! En caso de superarse por cualquier motivo el período máximo permitido de almacenamiento, será necesario devolver la bomba al fabricante. Para mayores informaciones al respecto, se ruega contactar con el representante local de Agilent.

Preparación para la instalación

El TV 551/701 SEM Navigator se suministra en un embalaje especial de protección; si se observan daños, que podrían haberse producido durante el transporte, ponerse en contacto con la oficina local de ventas. Durante la operación de desembalaje, tener cuidado de que no se caiga el TV 551/701 SEM Navigator y de no someterlo a golpes o vibraciones. No abandonar el embalaje en el medio ambiente. El material es completamente reciclable y cumple con la directiva CEE 85/399 para la preservación del medio ambiente.

¡ATENCIÓN! Para evitar problemas de desgasificación, no tocar con las manos desnudas los componentes destinados a exponerse al vacío. Utilizar siempre guantes u otra protección adecuada.

NOTA El TV 551/701 SEM Navigator no puede dañarse permaneciendo simplemente expuesto a la atmósfera. De todas formas, se aconseja mantener cerrada la bomba hasta que se instale en el sistema para evitar su posible contaminación por polvo.

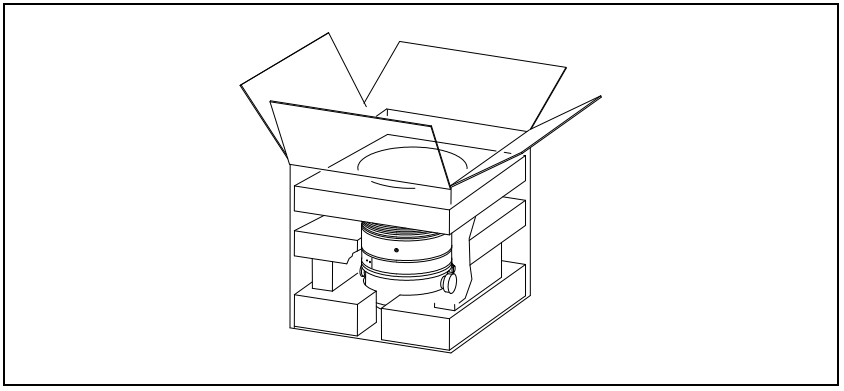


Figura 1

Instalación

¡ATENCIÓN! Despegar el adhesivo y quitar el tapón de protección sólo al conectar la bomba al sistema.

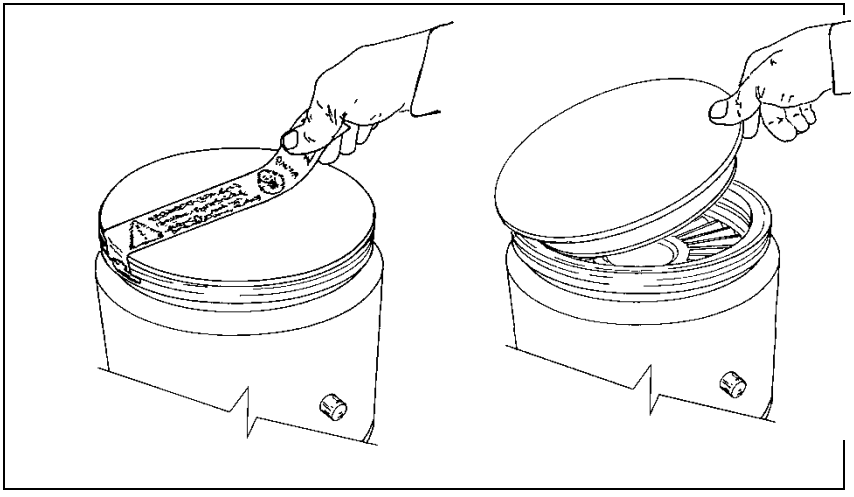


Figura 2

No instalar ni/o utilizar la bomba en lugares expuestos a agentes atmosféricos (lluvia, hielo y nieve), polvo y gases agresivos, en lugares explosivos o con alto riesgo de incendio.

Durante el funcionamiento es necesario que se respeten las condiciones ambientales siguientes:

- presión máxima: 2 bares por encima de la presión atmosférica
- temperatura: de +5 °C a +35 °C (véase gráfico en el anexo “Technical Information”)
- humedad relativa: 0-95 % (no condensadora).

Cuando existan campos electromagnéticos, la bomba ha de protegerse mediante pantallas oportunas. Véase el anexo “Technical Information” para más detalles.

El TV 551/701 SEM Navigator ha de conectarse a una bomba primaria (véase diagrama en “Technical Information”).

Fijación de la bomba

¡ADVERTENCIA!

En caso de dañarse el rotor, la conexión entre la bomba y el sistema puede ser sometida a un par de fuerza excesivo. En estas circunstancias, la conexión podría no resistir a dicho par de fuerza y, como consecuencia, la bomba podría separarse del sistema o el motor podría separarse respecto del contenedor de la bomba. En este caso fragmentos de metal pueden ser proyectados por la bomba o por el sistema, con consiguiente grave riesgo de lesiones o muerte y/o daños a los aparatos adyacentes.

Fijar el TV 551/701 SEM Navigator en posición estable, montando la brida de entrada de la turbo-bomba en la contrabrida del sistema, con conexión capaz de resistir a un par de 8600 Nm en torno a su propio eje.
A modo de ejemplo, la brida ISO-K puede fijarse con mordazas de acero de alta resistencia (como el modelo Agilent IC 63250 DCMZ). En la siguiente tabla se indican, respecto de cada brida, la cantidad de mordazas IC 63250 DCMZ necesarias y el par de apriete con el cual fijarlas.

Tab. 1

BRIDA	N.	PAR DE APRIETE
ISO 160 K	10	35 Nm
ISO 200 K	8	35 Nm

Para más detalles véase el anexo “Technical Information”.

El TV 551/701 SEM Navigator puede instalarse en cualquier posición.

NOTA El TV 551/701 SEM Navigator no puede fijarse utilizando su base.

ATTENTION! El TV 551/701 SEM Navigator pertenece a la segunda categoría de instalación (o sobretensión) prevista por la normativa EN 61010-1. Por lo tanto este dispositivo debe ser conectado a una línea de alimentación adecuada para dicha categoría. El TV 551/701 SEM Navigator tiene conectores para las entradas/salidas y para la comunicación serial que deben ser conectados a los circuitos externos de manera que ninguna parte bajo tensión quede accesible. Controlar que el aislamiento del dispositivo conectado al TV 551/701 SEM Navigator mantenga una acción aisladora incluso en caso de verificarse una avería, de conformidad con lo establecido por la normativa EN 61010-1.

Para instalar los accesorios opcionales, véase “Technical Information”.

Uso

En este apartado se citan los procedimientos operativos principales. Antes de usar el sistema realizar todas las conexiones eléctricas y neumáticas. Durante el posible calentamiento de la cámara de vacío, la temperatura de la brida de entrada no ha de ser superior a 120ºC.

¡ADVERTENCIA!

No hacer funcionar nunca la bomba si la brida de entrada no está conectada al sistema o no está cerrada con la brida de cierre.
No tocar la turbobomba y sus posibles accesorios durante las operaciones de calentamiento. La alta temperatura puede provocar lesiones a las personas.

¡ATENCIÓN!

Evítense golpes, oscilaciones o bruscos desplazamientos de la turbobomba durante su funcionamiento. Los cojinetes podrían dañarse. Para el envío de aire de la bomba utilizar aire o gas inerte sin polvo o partículas. La presión de entrada a través de la puerta deberá ser inferior a 2 bar (por encima de la presión atmosférica). Para bombear gases agresivos estas bombas están dotadas de una puerta específica mediante la cual es necesario suministrar a la bomba un caudal de gas inerte (Nitrógeno o Argón) para proteger los rodamientos (véase el anexo "Technical Information").

¡ADVERTENCIA!

Cuando la bomba se utiliza para bombear gases tóxicos, inflamables o radioactivos, seguir los procedimientos apropiados típicos de cada gas.No usar la bomba cuando haya gases explosivos.

Encendido y Uso del TV 551/701 SEM Navigator

Para encender el TV 551/701 SEM Navigator basta con suministrar la tensión de alimentación. El controlador incorporado reconoce automáticamente la presencia de las señales de interbloqueo y de arranque y activa la bomba.

La primera salida de la bomba se realiza en el modo “Soft Start” que, al final del ciclo de puesta en marcha, se deshabilita automáticamente, por lo tanto cuando la bomba se ponga en marcha posteriormente se hará sin “Soft Start”. Para volver a utilizar una puesta en marcha “Soft Start” activa es necesario rehabilitar la forma anteriormente indicada mediante software (véase el apartado “RS 232 COMMUNICATION DESCRIPTION” en el anexo “Technical Information”).

El LED verde LD1 situado en el panel de la base del TV 551/701 indica, con la frecuencia de su parpadeo, las condiciones operativas del sistema:

- encendido fijo: la bomba está en rotación normal;
- parpadea lentamente (periodo de 400 ms aproximadamente): el sistema está en estado de rampa, o de frenado, o de stop, o de “waiting for iterlock” ;
- parpadea rápidamente (periodo de 200 ms aproximadamente): condición de error.

Parada del TV 551/701 SEM Navigator

Para parar el TV 551/701 SEM Navigator nte con desenchufarlo de la corriente. El controler incorporado detiene inmediatamente la bomba.

¡ADVERTENCIA!

Para seguridad del operador el controlador Turbo-V debe ser alimentado con cable de alimentación de 3 hilos (véase tabla de partes disponibles para pedido) provisto de un enchufe (aprobado internacionalmente). Utilizar el cable y el enchufe junto con un tomacorriente adecuadamente conectado a tierra para evitar descargas eléctricas y cumplir con los requerimientos de las normas CE. Las altas tensiones que se desarrollan en el controlador pueden provocar graves daños o incluso resultar fatales. Desconectar el cable de alimentación antes de ejecutar las operaciones de mantenimiento en el interior de la unidad.

Parada de Emergencia

Para detener en condiciones de emergencia el TV 551/701 SEM Navigator es necesario desconectar del controlador el cable de alimentación.

Mantenimiento

El TV 551/701 SEM Navigator no necesita ningún mantenimiento. Cualquier operación deberá ser realizada por personal autorizado.

¡ADVERTENCIA!

Antes de realizar cualquier operación en el sistema desconectarlo de la corriente, enviar aire de la bomba abriendo la válvula oportuna, esperar hasta que el rotor se pare completamente y esperar a que la temperatura superficial de la bomba sea inferior a 50 °C.

En caso de avería se podrá utilizar el servicio de reparación Agilent o el “Agilent advanced exchange service”, que permite obtener un sistema regenerado para sustituir el averiado.

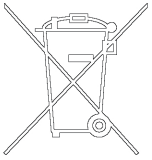
NOTA

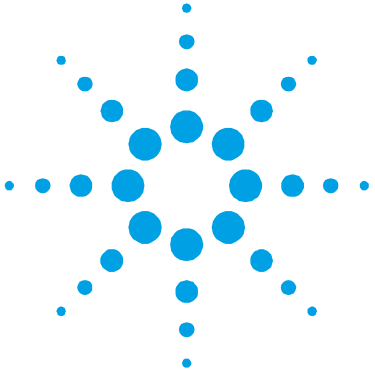
Antes de enviar al fabricante un sistema para su reparación o “advanced exchange service”, es imprescindible cumplimentar y remitir a la oficina local de ventas la ficha de “Seguridad y Salud” adjunta al presente manual de instrucciones. Una copia de la misma se deberá introducir en el embalaje del sistema antes de enviarlo.

En caso de que el sistema se tenga que desguazar, eliminarlo respetando las normas nacionales específicas.

Eliminación

Significado del logotipo "WEEE" presente en las etiquetas. El símbolo que se indica a continuación, es aplicado en observancia de la directiva CE denominada "WEEE".
Este símbolo **(válido sólo para los países miembros de la Comunidad Europea)** indica que el producto sobre el cual ha sido aplicado, NO debe ser eliminado junto con los residuos comunes sean éstos domésticos o industriales, y que, por el contrario, deberá ser sometido a un procedimiento de recogida diferenciada.
Por lo tanto, se invita al usuario final, a ponerse en contacto con el proveedor del dispositivo, tanto si éste es la casa fabricante o un distribuidor, para poder proveer a la recogida y eliminación del producto, después de haber efectuado una verificación de los términos y condiciones contractuales de venta.





16
Instructions for Use

Original Instructions

Safety Guideline for Turbomolecular Pumps

Turbomolecular pumps as described in the following operating manual contain a large amount of kinetic energy due to the high rotational speed in combination with the specific mass of their rotors.

In case of a malfunction of the system for example rotor/stator contact or even a rotor crash the rotational energy may be released.

WARNING!

To avoid damage to equipment and to prevent injuries to operating personnel the installation instructions as given in this manual should be strictly followed!

General Information

This equipment is destined for use by professionals. The user should read this instruction manual and any other additional information supplied by Agilent before operating the equipment. Agilent will not be held responsible for any events occurring due to non-compliance, even partial, with these instructions, improper use by untrained persons, non-authorized interference with the equipment or any action contrary to that provided for by specific national standards.

The TV 551/701 SEM Navigator is an integrated system with a turbo-molecular pump for high and ultra-high vacuum applications with its relevant controller. The system can pumps any type of gas or gas compound. It is not suitable for pumping liquids or solid particles. The pumping action is obtained through a high speed turbine (max. 42000 rpm) driven by a high-performance 3-phase electric motor. The TV 551/701 SEM Navigator is free of contaminating agents and, therefore, is suitable for applications requiring a "clean" vacuum.

It is equipped with auxiliary connectors to supply an additional fan, to control the vent valve, to be controlled from a remote site by means of an host computer connected through a serial line (RS232 or RS485).

The following paragraphs contain all the information necessary to guarantee the safety of the operator when using the equipment. Detailed information is supplied in the appendix "Technical Information".

This manual uses the following conventions

WARNING! **Warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.**

CAUTION! The caution messages are displayed before procedures which, if not followed, could cause damage to the equipment

NOTE Notes contain important information taken from the text.

Storage

In order to guarantee the maximum level of performance and reliability of Agilent Turbomolecular pumps, the following guidelines must be followed:

- when shipping, moving and storing pumps, the following environmental specifications should not be exceeded:
  - temperature range: -20 °C to 70 °C
  - relative humidity range: 0 to 95 % (non condensing)
- the turbomolecular pumps must be always soft-started when received and operated for the first time by the customer
- the shelf life of a turbomolecular pump is 10 months from the shipping date.

CAUTION! If for any reason the shelf life time is exceeded, the pump has to be returned to the factory. Please contact the local Agilent Vacuum Sales and Service representative for informations.

Preparation for Installation

The TV 551/701 SEM Navigator is supplied in a special protective packing. If this shows signs of damage which may have occurred during transport, contact your local sales office.

When unpacking the system, be sure not to drop it and avoid any kind of sudden impact or shock vibration to it.

Do not dispose of the packing materials in an unauthorized manner. The material is 100% recyclable and complies with EEC Directive 85/399.

CAUTION! In order to prevent outgassing problems, do not use bare hands to handle components which will be exposed to vacuum. Always use gloves or other appropriate protection.

NOTE Normal exposure to the environment cannot damage the TV 551/701 SEM Navigator. Nevertheless, it is advisable to keep it closed until it is installed in the system, thus preventing any form of pollution by dust.

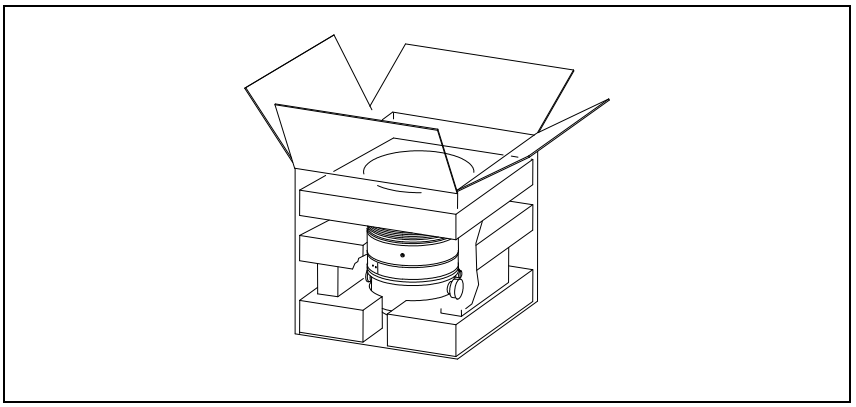


Figure 1

Installation

CAUTION! Do not remove the adhesive and protective cap before connecting the turbopump to the system.

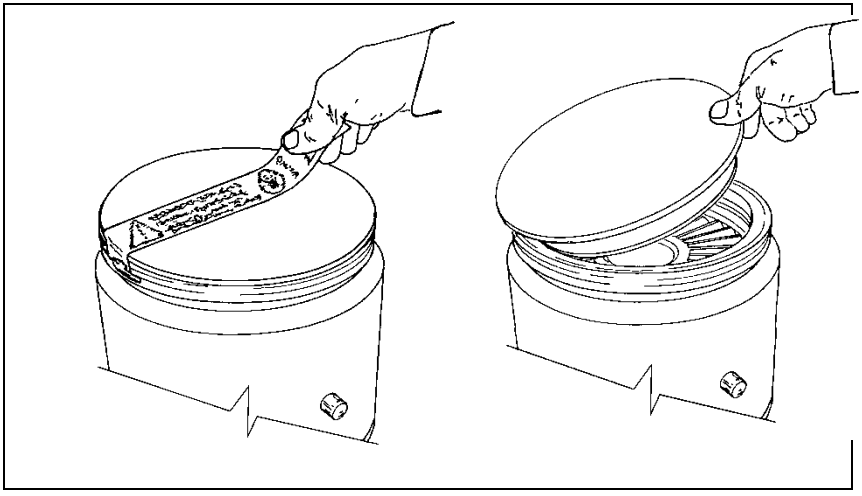


Figure 2

Do not install or use the pump in an environment exposed to atmospheric agents (rain, snow, ice), dust, aggressive gases, or in explosive environments or those with a high fire risk. During operation, the following environmental conditions must be respected:

- maximum pressure: 2 bar above atmospheric pressure
- temperature: from +5 °C to +35 °C (see the diagram pressure-temperature in the appendix “Technical Information”)
- relative humidity: 0 - 95 % (non-condensing)

In the presence of magnetic fields the pump must be protected using a ferromagnetic shield. See the appendix "Technical Information" for detailed information.

The TV 551/701 SEM Navigator must be connected to a primary pump (see "Technical Information").

Pump Fixing

WARNING!

If a rotor failure occurs, the connection of the pump to the system could be subjected to a significant torque. If the connection is not sufficient to withstand that torque, the pump could detach from the system or the motor housing could detach from the pump envelope. In this case metal fragments could be projected from the pump or system, which could cause serious injury or death and/or damage to surrounding equipment.

Fix the TV 551/701 SEM Navigator in a stable position, mounting the inlet flange of the turbopump to the system counter-flange, with a connection capable of withstanding a torque of 8600 Nm around its axis. For example the ISO-K flange can be fixed using high strength steel clamps (like Agilent model IC63250DCMZ). The following table shows, for each flange, the necessary number of IC63250DCMZ clamps and the relevant fixing torque.

Tab. 1

FLANGE	N.	FIXING TORQUE
ISO 160 K	10	35 Nm
ISO 200 K	8	35 Nm

See the appendix "Technical Information" for a detailed description. The TV 551/701 SEM Navigator can be installed in any position.

NOTE The TV 551/701 SEM Navigator cannot be fixed by means of its base.

CAUTION! The TV 551/701 SEM Navigator belongs to the second installation (or overvoltage) category as per directive EN 61010-1. Connect the device to a mains line that satisfy the above category. The TV 551/701 SEM Navigator has Input/Output and serial communication connectors that must be connected to external circuits in such a way that no electrical part is accessible. Be sure that the insulation of the device connected to the TV 551/701 SEM Navigator is adequate even in the case of single fault as per directive EN 61010-1.

Use

This paragraph details the fundamental operating procedures. Make all electrical an pneumatic connections before the use of the system. While heating the vacuum chamber, the temperature of the inlet flange must not exceed 120 °C.

WARNING!

Never use the turbopump when the inlet flange is not connected to the vacuum chamber. Do not touch the turbopump or any of its accessories during the heating process. The high temperatures may cause burns.

CAUTION!

Avoid impacts, oscillations or harsh movements of the pump when in operation. The bearings may become damaged. Use air or inert gas free from dust or particles for venting the pump. The pressure at the vent port must be less than 2 bar (above atmospheric pressure). For pumping aggressive gases, these pumps are fitted with a special port to allow a steady flow of inert gas (like N_2, Ar) for pump bearing protection (see the appendix "Technical Information").

WARNING!

When employing the pump for pumping toxic, flammable, or radioactive gases, please follow the required procedures for each gas disposal. Do not use the pump in presence of explosive gases.

Switching on and Use of TV 551/701 SEM Navigator

To switch on the TV 551/701 SEM Navigator it is necessary to supply the mains. The integrated controller automatically recognizes the interlock and start signals presence and start up the pump. The first pump start up is in “Soft Start” mode. When the start up cycle is finished, the “Soft Start” mode automatically is disabled, and the following start ups are without the “Soft Start” mode. To re-enable the “Soft Start” mode it must be activated by the suitable software command (see the paragraph “RS 232/485 COMMUNICATION DESCRIPTION” in the appendix “Technical Information”). The green LED located on the TV 551/701 SEM Navigator base front panel indicates with its flashing frequency the system operating conditions:

- with no flashing: the pump is normally rotating;
- slowly flashing (period of about 400 ms): the system is in ramp, or in braking, or in Stop, or in “Waiting for interlock” status;
- fast flashing (period of about 200 ms): error condition.

TV 551/701 SEM Navigator Switching off

To switch off the TV 551/701 SEM Navigator it is necessary to remove the mains. The integrated controller immediately stops the pump.

WARNING!

The Turbo-V controller must be powered with 3-wire power cord (see orderable parts table) and plug (internationally approved) for user's safety. Use this power cord and plug in conjunction with a properly grounded power socket to avoid electrical shock and to satisfy CE requirements. High voltage developed in the controller can cause severe injury or death. Before servicing the unit, disconnect the input power cable.

Emergency Stop

To immediately stop the TV 551/701 SEM Navigator in an emergency condition it is necessary to remove the supply cable from the mains plug.

Maintenance

The TV 551/701 SEM Navigator does not require any maintenance. Any work performed on the system must be carried out by authorized personnel.

WARNING!

Before carrying out any work on the system, disconnect it from the mains, vent the pump by opening the appropriate valve, wait until the rotor has stopped turning and wait until the surface temperature of the pump falls below 50 °C.

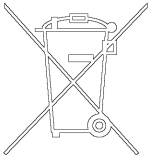
In the case of breakdown, contact your local Agilent service center who can supply a reconditioned system to replace that broken down.

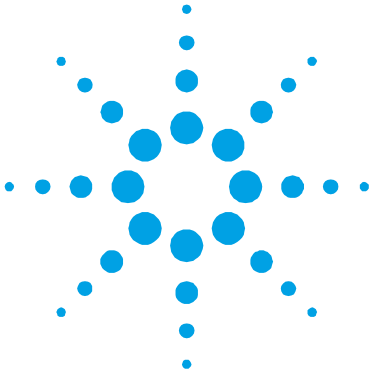
NOTE Before returning the system to the constructor for repairs, or replacement with a reconditioned unit, the "Health and Safety" sheet attached to this instruction manual must be filled-in and sent to the local sales office. A copy of the sheet must be inserted in the system package before shipping.

If a system is to be scrapped, it must be disposed of in accordance with the specific national standards.

Disposal

Meaning of the "WEEE" logo found in labels. The following symbol is applied in accordance with the EC WEEE (Waste Electrical and Electronic Equipment) Directive. This symbol **(valid only in countries of the European Community)** indicates that the product it applies to must NOT be disposed of together with ordinary domestic or industrial waste but must be sent to a differentiated waste collection system. The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.





17
Technical Information

Original Instructions

Agilent Technologies

Description of the TV 551/701 Navigator

The TV 551/701 SEM Navigator pumping system consists of a pump with a dedicated controller fixed to it. The system is available in two models for TV 551 and two models for TV 701. The models of each group differ in the high vacuum flange.

The TV 551 SEM Navigator pump two models are:

- Model 969-8935 with ISO 160 K high vacuum flange;
- Model 969-8936 with ISO 160 F high vacuum flange.

The TV 701 SEM Navigator pump two models are:

- Model 969-8937 with ISO 200 K high vacuum flange;
- Model 969-8938 with ISO 200 F high vacuum flange.

The following figures show the four models. The controller is available as an option in two models:

- Model 969-8976 for TV 551 SEM Navigator;
- Model 969-8977 for TV 701 SEM Navigator.

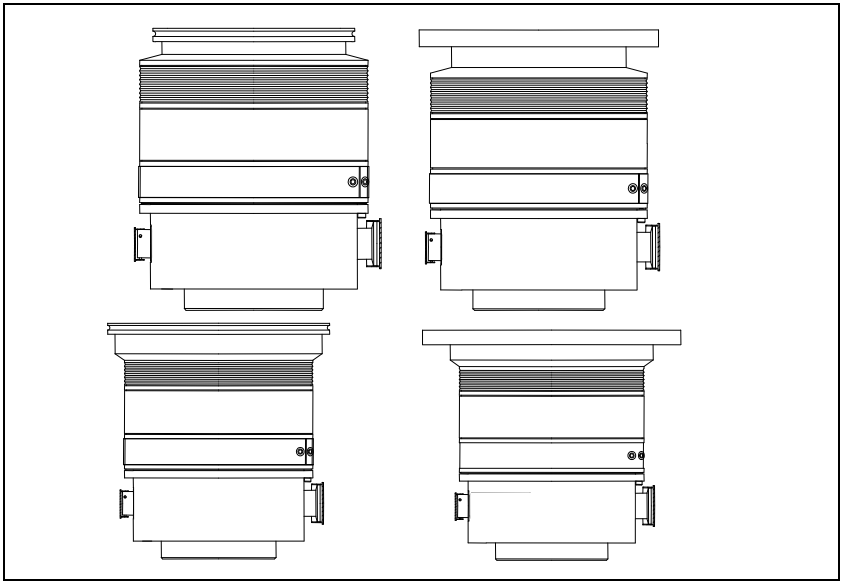


Figure 3 Model 969-8935, Model 969-8936, Model 969-8937, Model 969-8938

Pump Description

The pump consists of a high frequency motor driving a turbine fitted with 8 bladed stages and 4 Macrotorr stages. The turbine rotates in an anticlockwise direction when viewed from the high vacuum flange end. The envelope is made of STT. The turbine is made of high-strength aluminium alloy, machined from a single block.

Proceeding from the high vacuum to the for vacuum region, the turbine stages sequence is:

- 1st stage with a blade angle of 40°,
- 2nd stage with a blade angle of 34°,
- 3rd stage with a blade angle of 28°,
- 4th and 5th stages with a blade angle of 24°,
- 6th stage with a blade angle of 20°,
- 7th and 8th stages with a blade angle of 16°.

The Macrotorr stages are in the form of four discs.

The turbine rotor is supported by permanently lubricated high precision ceramic ball bearings installed on the forevacuum side of the pump.

The static blades of the stator are made of stainless steel. These are supported and accurately positioned by spacer rings.

The Macrotorr stators are in the form of self-positioning machined discs with pumping channels and an opening restricted by the corresponding rotor discs. These are made of aluminium alloy.

The pump can be water cooled or air cooled: in the first case the customer can use the dedicated channels on the pump body, in the second case an external optional fan is available.

A thermistor sensor is mounted near the upper bearing to prevent the pump from overheating.

The pump is balanced after assembly with a residual vibration amplitude less than 0.01 µm.

The pump can operate in any position and can be supported on the high vacuum flange. The connection of the forevacuum on the side of the pump is a KF 25 NW flange.

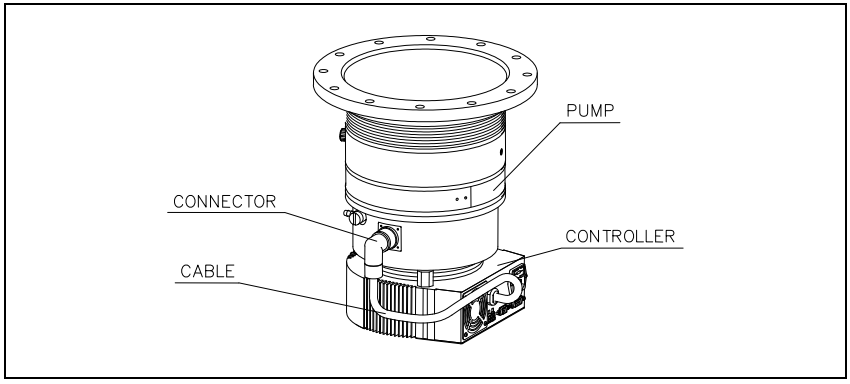


Figure 4

Controller Description

The dedicated controller is a solid-state frequency converter which is driven by a single chip microcomputer and is composed of two PCBs which include power supply and 3-phase output, analog and input/output section, microprocessor and digital section.

The power supply, together with the 3-phase output, converts the single phase AC mains supply into a 3-phase, low voltage, medium frequency output which is required to power the pump.

The controller can be operated by a remote host computer via the serial connection or via remote I/O signals. A Windows-based software is available (optional).

Technical Specification

Tab. 2

CHARACTERISTIC	TV 551 SEM	TV 701 SEM
Pumping speed (with inlet screen) N_2: He: H_2:	 ISO160: 550 l/s 600 l/s 510 l/s	 ISO200: 690 l/s 620 l/s 510 l/s
Compression ratio N_2 He H_2	 1×10^9 1×10^7 1×10^6	 1×10^9 1×10^7 1×10^6
Base pressure (According to standard DIN 28 428, the base pressure is that measured in a leak-free test dome, 48 hours after the completion of test dome bake-out, with a Turbopump fitted with a ConFlat flange and using the recommended pre-vacuum pump)	with minimum recommended mechanical pump: $< 1 \times 10^{-10}$ mbar ($< 1 \times 10^{-10}$ Torr) with minimum recommended diaphragm pump: 2×10^{-9} mbar (1.5×10^{-9} torr)	
Inlet flange	ISO 160	ISO 200
Foreline flange	KF 25 NW	
Rotational speed	42840 rpm	
Start-up time	< 6 minutes	
Recommended forepump Mechanical Diaphragm	 Agilent DS 302 Agilent SH 100	
Operating position	Any	
Operating ambient temperature	+5 °C to +35 °C	
Cooling requirements	Forced air or water cooling (use water with electrical conductivity ≤ 500 µS/cm)	

CHARACTERISTIC	TV 551 SEM TV 701 SEM
Cooling water	flow: 200 l/h (0.89 GPM) temperature: + 10 ° C to + 30 °C pressure: 3 to 5 bar (45 to 75 Psi)
Bakeout temperature	120 °C at inlet flange max. (CF flange) 80 °C at inlet flange max. (ISO flange)
Vibration level (when water cooled) (Data measured with an indicated bearing temperature of 20 °C: see vibration graph in the following figure)	bearing peak: < 45 mm/sec^2 residual unbalance: < 350 mm/sec^2
Lubricant	permanent lubrication
Noise level	<45 dB(A) at 1 meter
Power supply: Input voltage: Input freq.: Max input power: Stand-by power: Max operating power:	 100 to 240 Vac 50/60 Hz 500 VA 30 to 35 W TV 551 SEM: 325 W (water cooling) 220 W (air cooling) TV 701 SEM: 350 W (water cooling) 250 W (air cooling)
Protection fuse	1 x 6.3 A
Compliance with:	UNI EN 292-1 UNI EN 292-2 EN-CENELEC 55011 IEC 1000-4-2 (ex 801-2) IEC 1000-4-3 (ex 801-3) IEC 1000-4-4 (ex 801-4) EN 61010-1 (IEC 1010-1) EN 1012-2
Installation category	II
Pollution degree	2
Power cable	With European or NEMA plug 3 meters long (optional)

CHARACTERISTIC	TV 551 SEM TV 701 SEM
Serial communication (Navigator kit)	RS232 cable with a 9-pin D type male connector and a 9-pin D type female connector, and Navigator software (optional)
Storage temperature	-20 °C to +70 °C
Weight kg (lbs): pump controller	 19.4 (43) 5.4 (12)

NOTE When the TV 551/701 SEM Navigator has been stored at a temperature less than 5 °C, wait until the system has reached the above mentioned temperature.

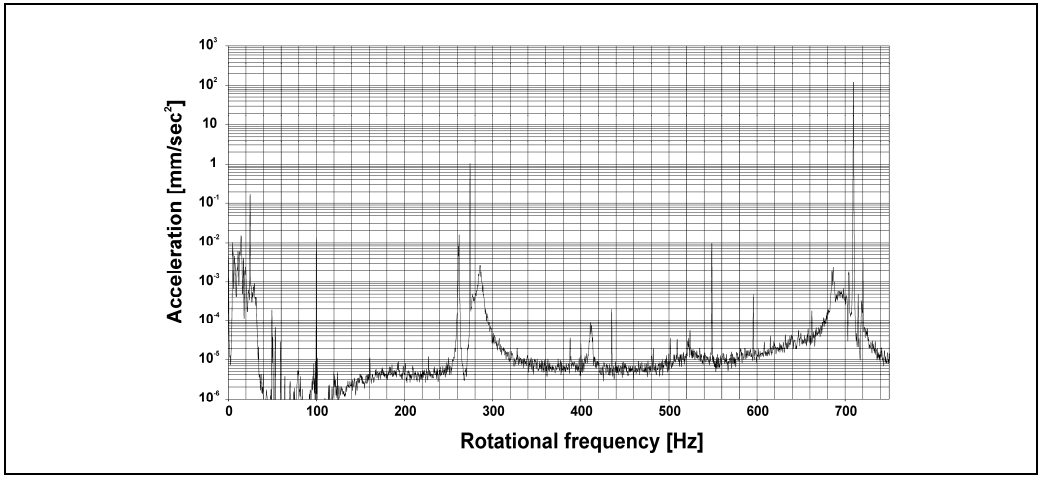


Figure 5 Vibration graph

TV 551/701 SEM Navigator Outline

The following figures show the TV 551/701 SEM Navigator outlines (dimensions are in inches [mm]).

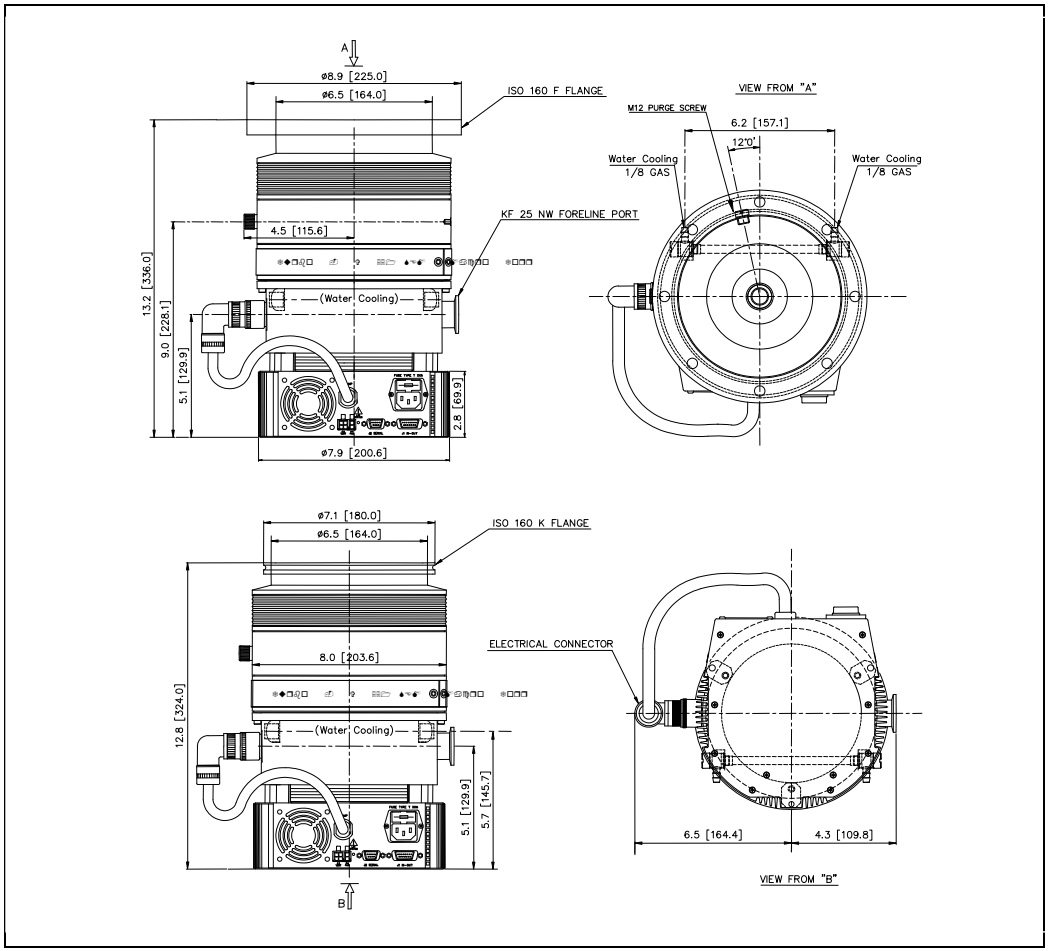


Figure 6 TV 551 SEM Navigator outline

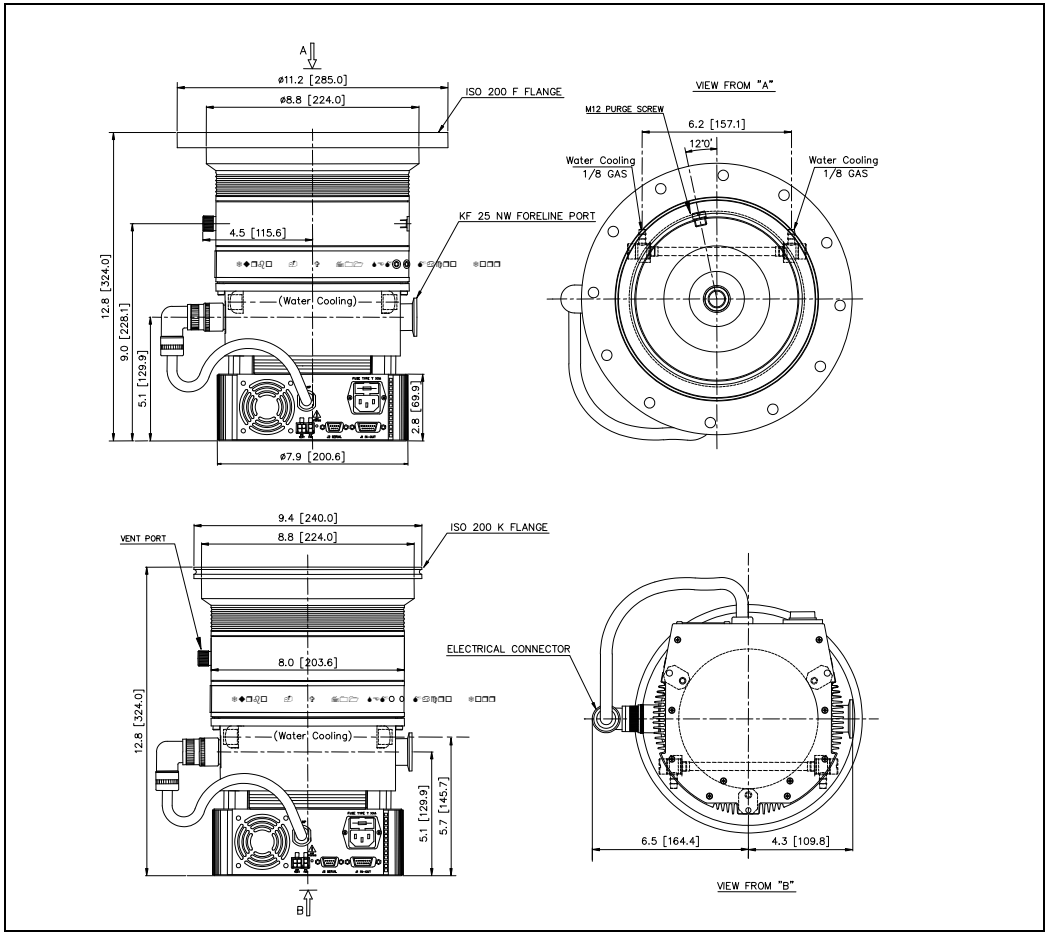


Figure 7 TV 701 SEM Navigator outline

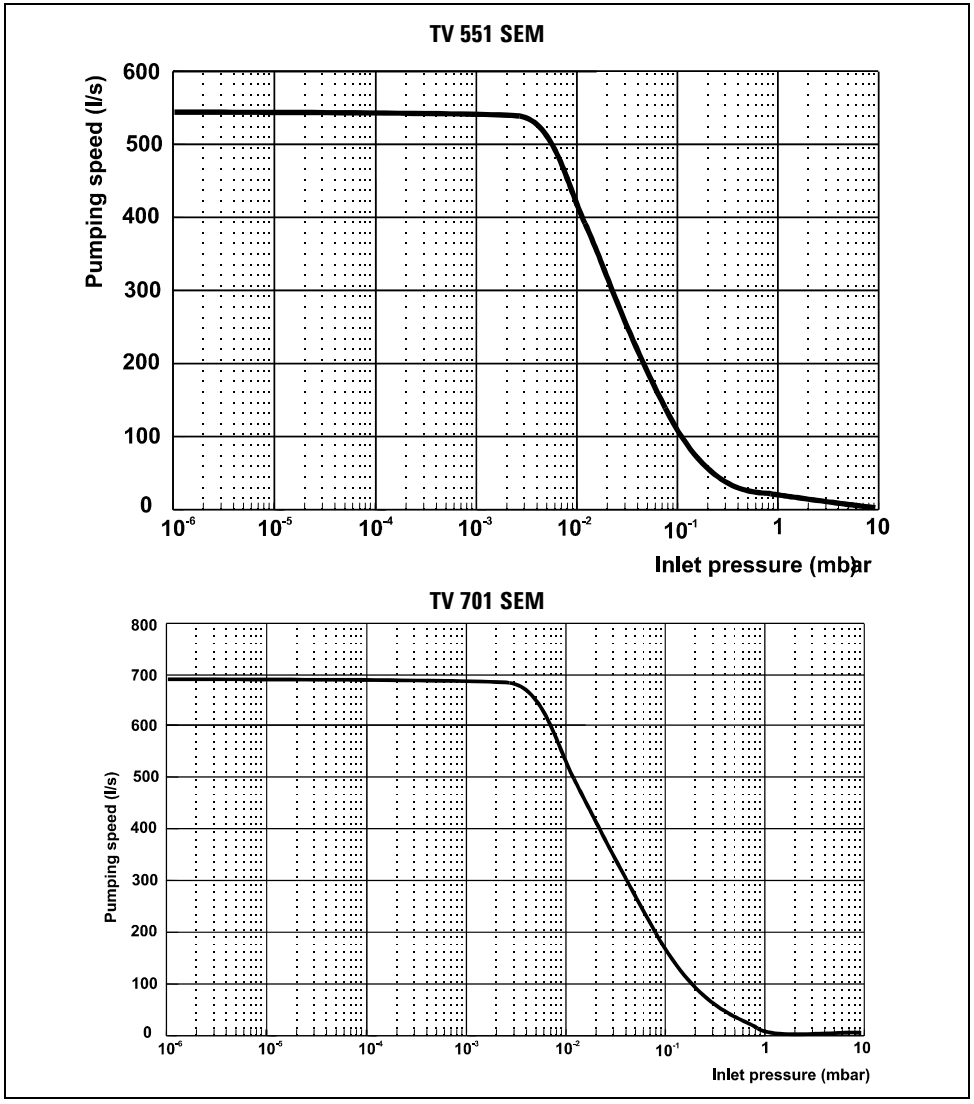


Figure 8 Graph of nitrogen pumping speed vs inlet pressure (with inlet screen)

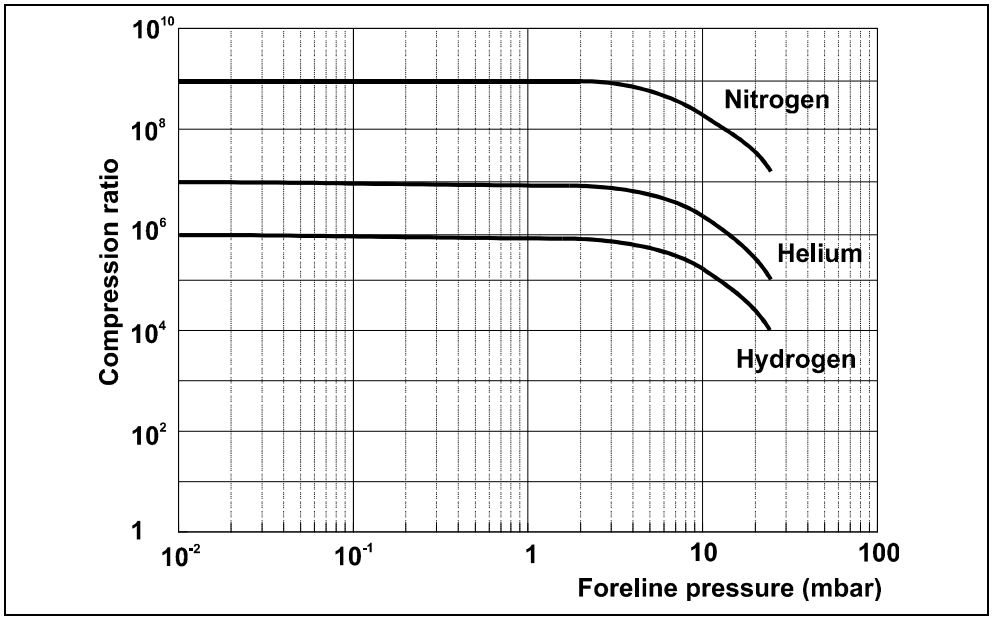


Figure 9 Graph of compression ratio vs foreline pressure

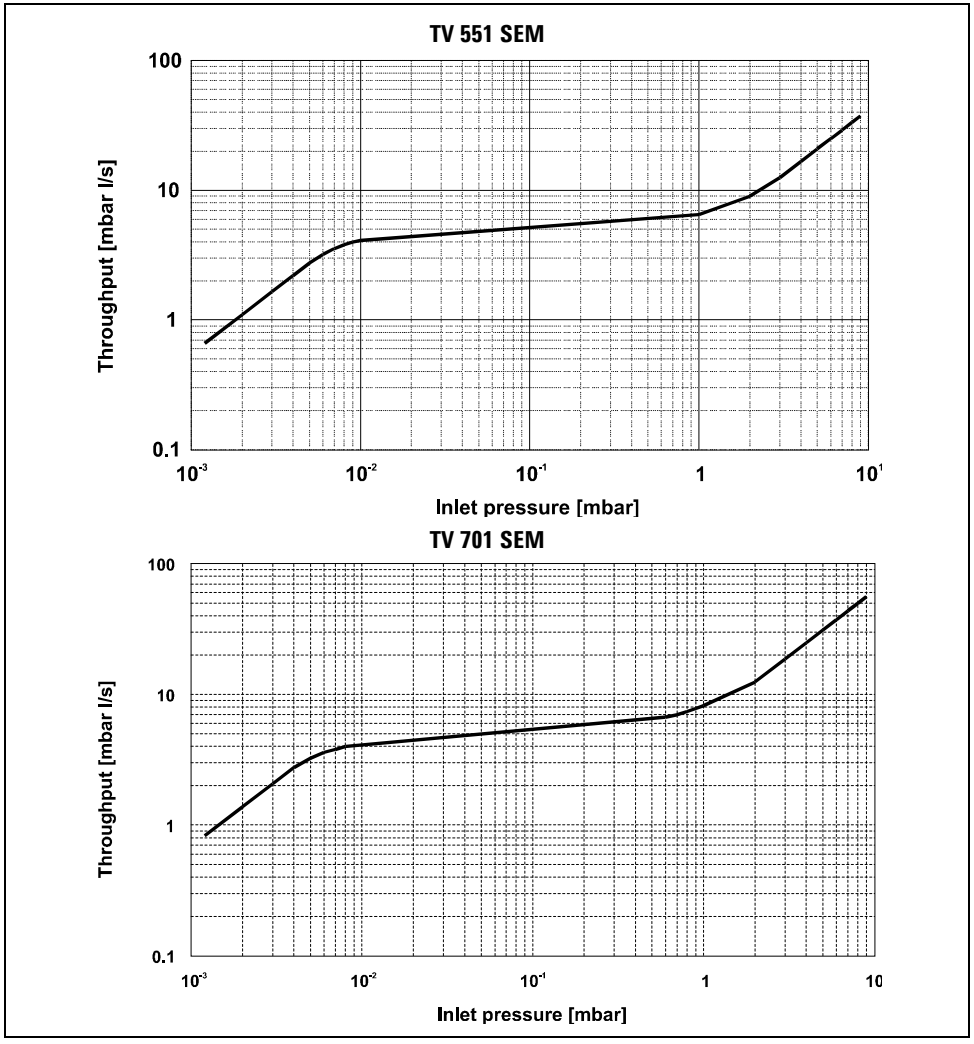


Figure 10 Graph of nitrogen throughput vs inlet pressure using the recommended mechanical forevacuum pump

Interconnections

The following figure shows the TV 551/701 SEM interconnections.

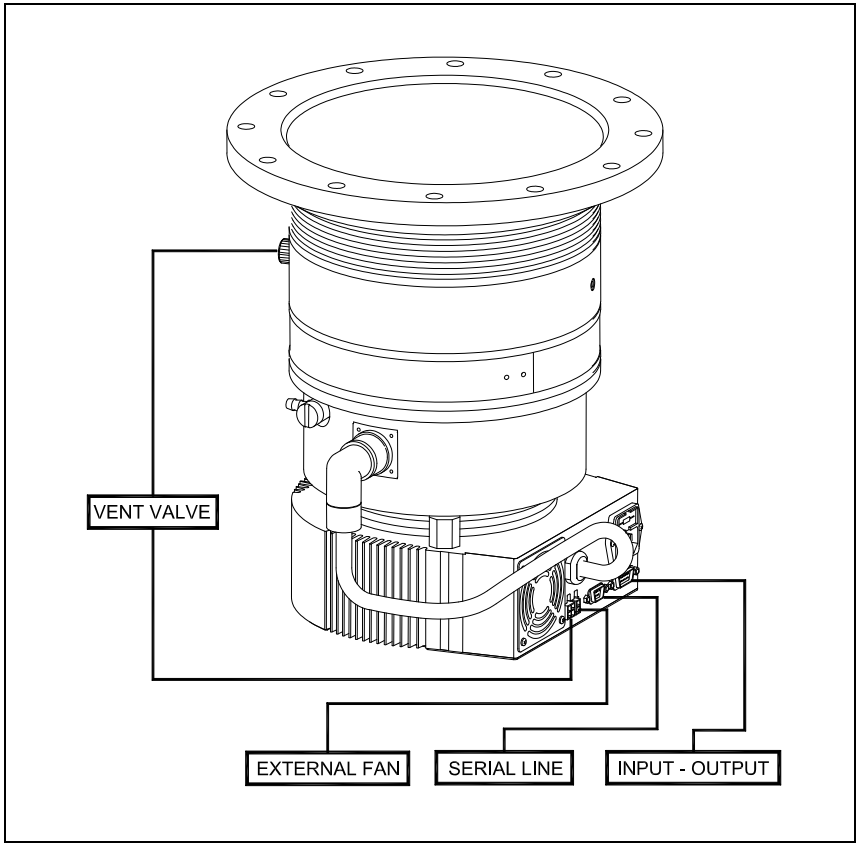


Figure 11

P3 – Vent

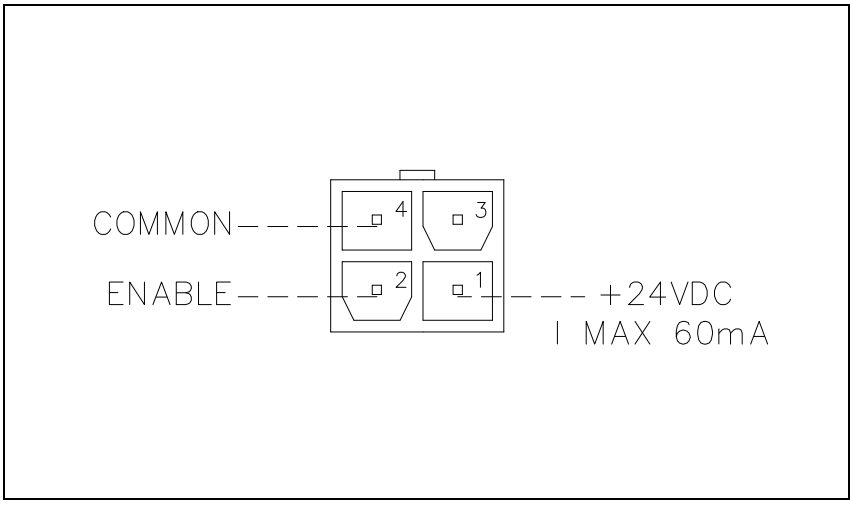


Figure 12

This is a dedicated 24 Vdc connector to control the optional vent valve.

P4 – External Fan

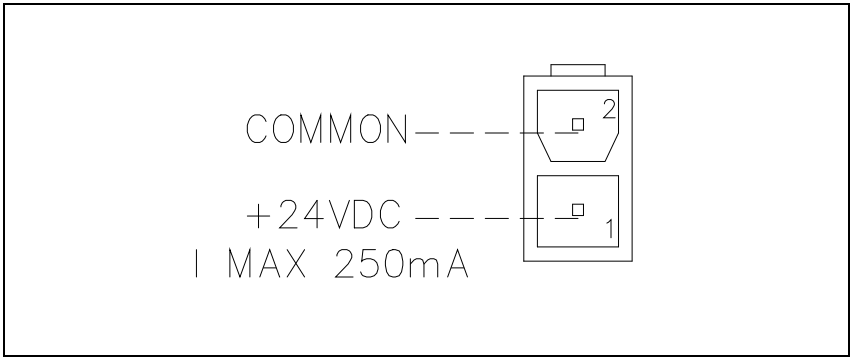


Figure 13

This is a dedicated 24 Vdc connector to supply the optional external fan.

J1 - In-Out

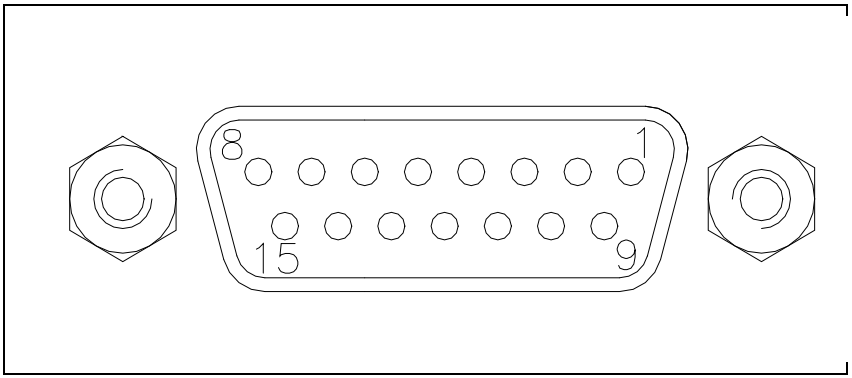


Figure 14

This connector carries all the input and output signals to remote control the TV 551/701 SEM Navigator.

It is a 15-pins D type connector; the available signals are detailed in the table, the following paragraphs describe the signal characteristics and use.

Tab. 3

PIN N.	SIGNAL NAME	INPUT/OUTPUT
1	START/STOP (+)	I
2	START/STOP (-)	I
3	INTERLOCK (+)	I
4	INTERLOCK (-)	I
5	SPEED SETTING (+)	I
6	SPEED SETTING (-)	I
7	SOFT START (+)	I
8	SOFT START (-)	I
9	+24 Vdc	O
10	SPARE	
11	PROGRAMMABLE SET POINT	O

PIN N.	SIGNAL NAME	INPUT/OUTPUT
12	SPARE	
13	FAULT OUTPUT	O
14	PROGRAMMABLE ANALOG SIGNAL (+)	O
15	GROUND PROGRAMMABLE ANALOG SIGNAL (-)	O

Signal Description

START/STOP: input signal to start or stop the pump. With the supplied cover connector the START/STOP (+) signal is connected to the +24 Vdc pin and the START/STOP (-) signal to the GROUND pin: in this condition the pump automatically starts as soon as the controller recognises the input supply ("Plug & Pump").

INTERLOCK: input signal to control the pump rotation. With the supplied cover connector the INTERLOCK (+) signal is connected to the +24 Vdc pin and the INTERLOCK (-)signal to the GROUND pin.

SPEED SETTING: PWM input signal to set the pump speed. The PWM signal characteristics must be the following:

- frequency: 100 Hz +/-20 %
- amplitude: 0 - 24 V max
- duty cycle range: from 25 % to 75
- %
  corresponding to a pump speed from 272 Hz (25 %) to 714 Hz (75 %) linearly.

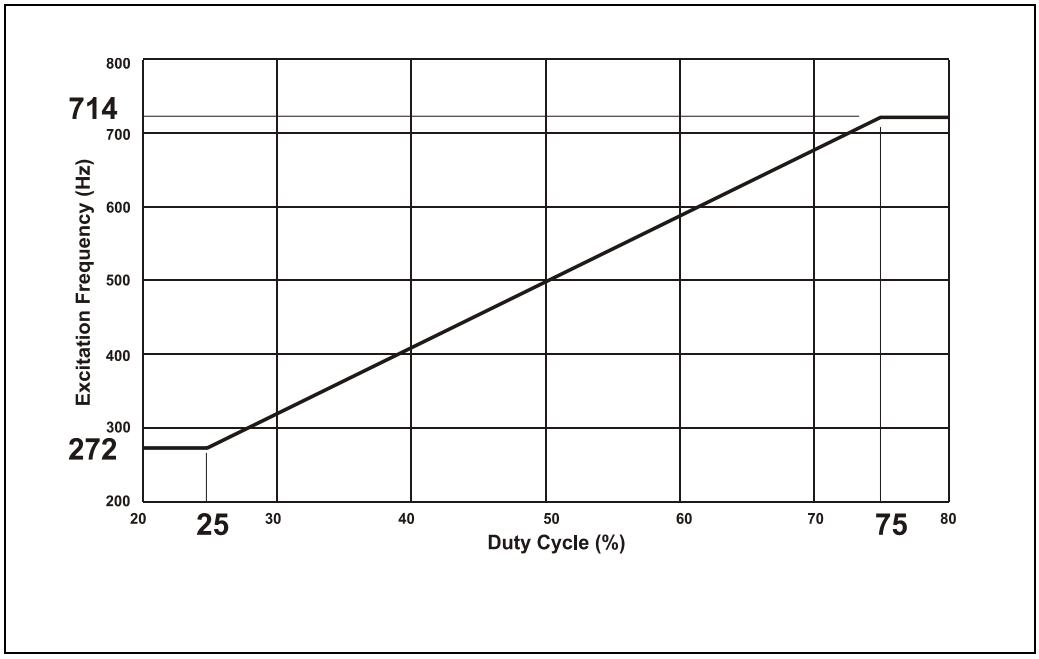


Figure 15

If any signal isn't applied (no connection) the pump speed is set to "High Speed" (714 Hz max and settable by window "121").

If a continuous signal is applied (pin 5 fixed at +24 V and pin 6 fixed to ground) the pump speed is set to "Low Speed".

The Low Speed frequency is settable by window "117" (see "RS232/RS485 Communication Description").

SOFT START: this input is used to provide a "soft start" to the pump; in this condition the ramp-up time could be up to 45 min.

PROGRAMMABLE ANALOG SIGNAL: this output signal is a voltage (from 0 to 10 Vdc) proportional to a reference quantity (frequency or power) set by the user. The default setting is the frequency (see the following example diagrams).

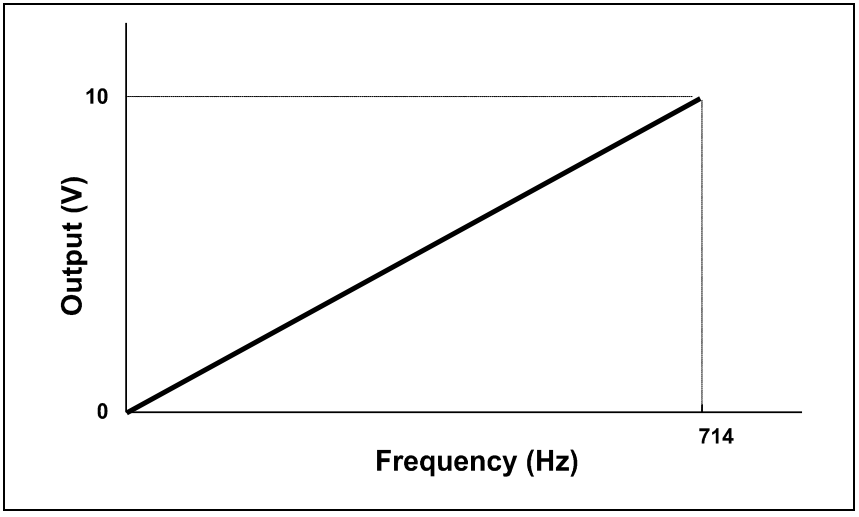


Figure 16 The screen can be mounted on each pump model.

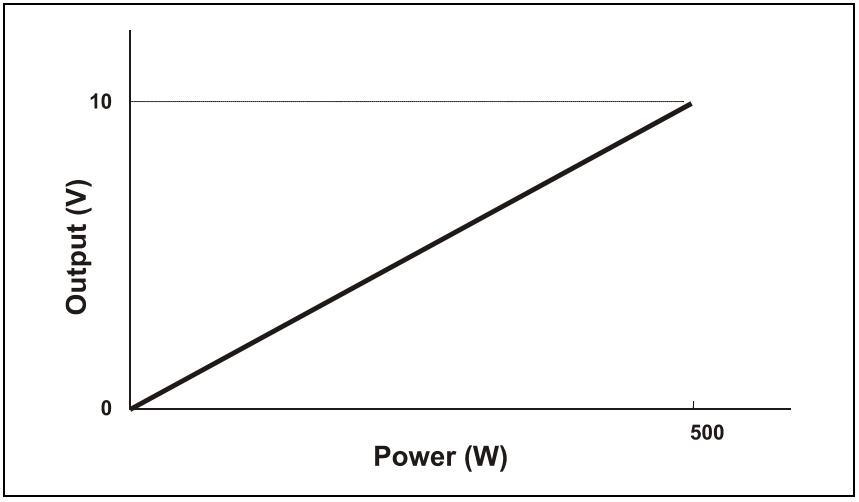


Figure 17

FAULT: this open collector output signal is ON when a system fault condition is detected.

PROGRAMMABLE SET POINT: this open collector output signal is enabled when the reference quantity chosen (frequency, current or time) is higher than the set threshold. The signal can be "high level active" (that is the output is normally at 0 Vdc and becomes 24 Vdc when activated), or "low level active" (that is the output is normally at 24 Vdc and becomes 0 Vdc when activated). Moreover, if the reference quantity is the frequency or the current drawn, it is possible to set the hysteresis (in % of the threshold value) to avoid bouncing.

For example:

- reference quantity: frequency
- threshold: 500 Hz
- hysteresis: 1 %
- activation type: "high level"

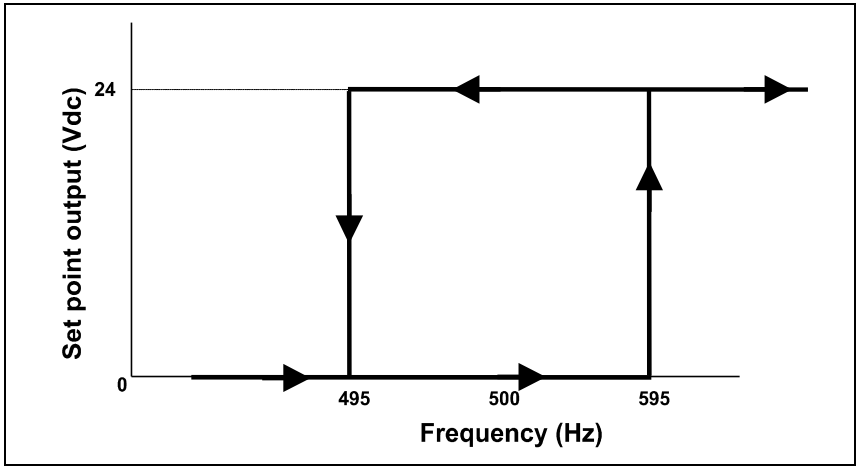


Figure 18

The set point output stays at 0 Vdc until the frequency becomes higher than 505 Hz (that is 500 Hz + 1 % of 500 Hz), then the output goes at 24 Vdc and stays at 24 Vdc until the frequency becomes lower than 495 Hz (that is 500 Hz – 1 % of 500 Hz).

It is possible to delay the set point checking for a programmable delay time.

The PROGRAMMABLE SET POINT signal has the following default settings:

- reference quantity: frequency
- thereshold: 643 Hz
- hysteresis: 2 %
- activation type: high level
- delay time: 0 second

NOTE The Navigator Software (optional) allows the operator to set all the programmable feature.

When no external input-output device is available this connector must be closed with the supplied mating connector that short-circuits the START and INTERLOCK inputs with the GROUND input (see the following figure).

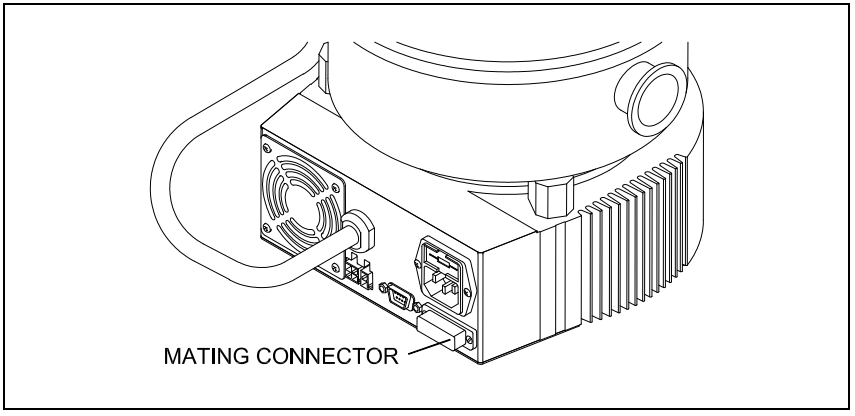


Figure 19

How to Connect the Output Open Collector of the Controller

Here below there are the typical connections of the output open collector of TV551/701 SEM Navigator to an external system. Two cases are considered:

- the customer supplies the 24 Vdc
- the customer does not supply the 24 Vdc.

Please note that on the connector a 24 Vdc, 60 mA voltage, a GROUND signal and the open collector pin are available.

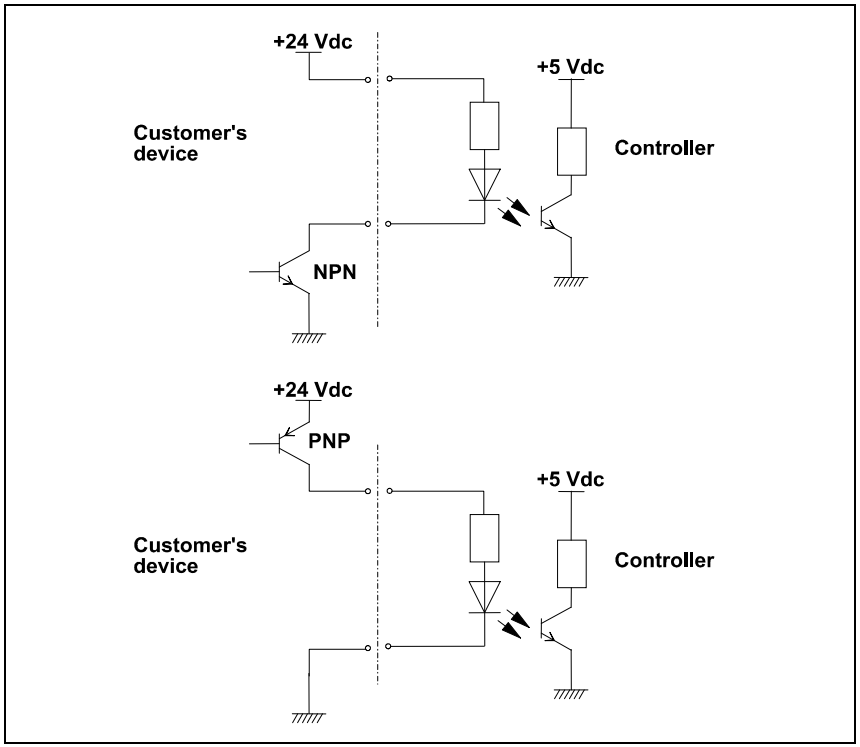


Figure 20 Case 1

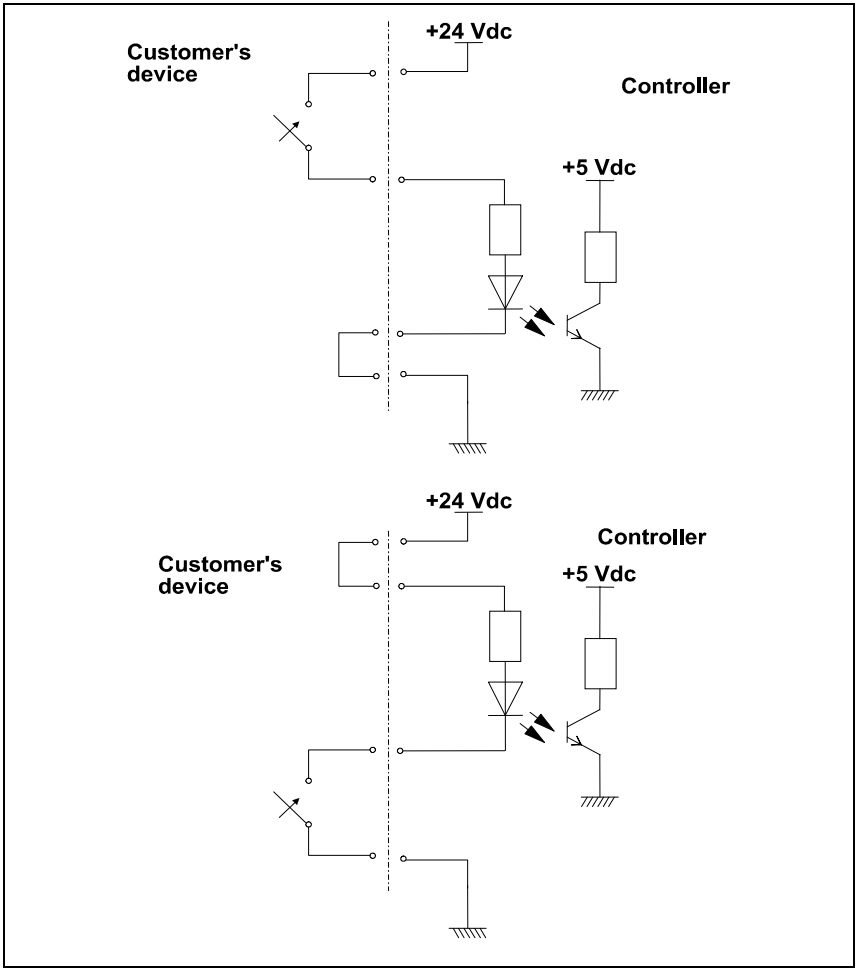


Figure 21 Case 2 with relay utilization

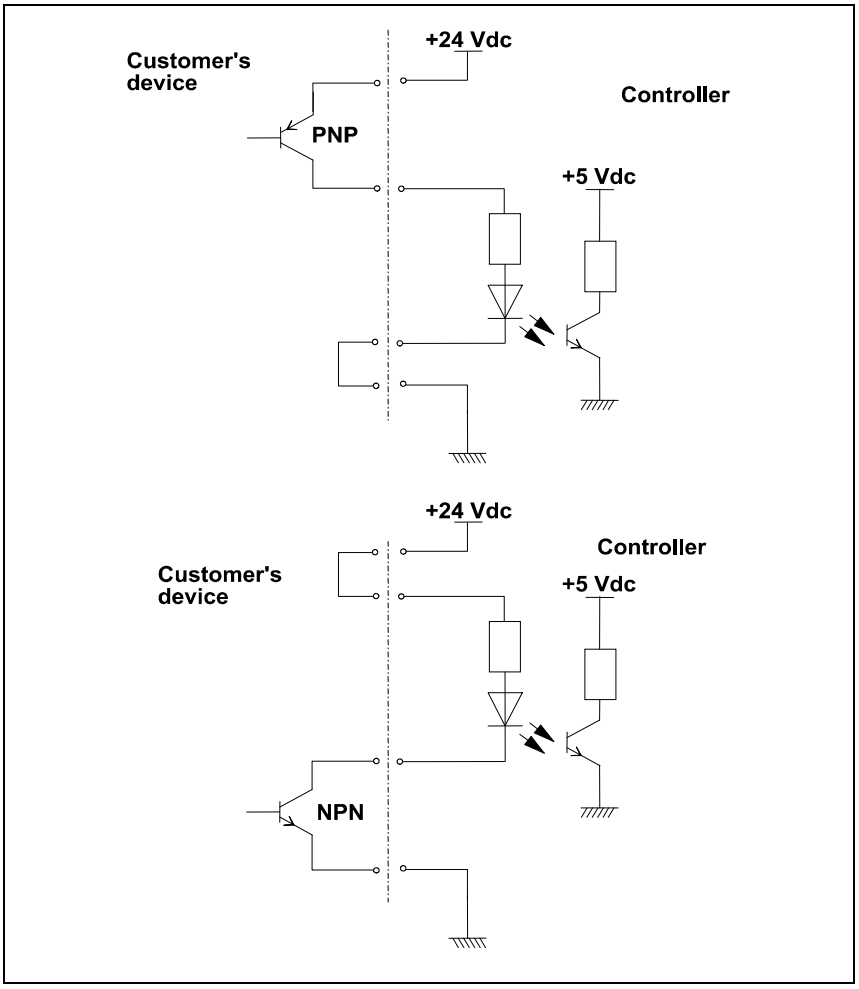


Figure 22 Case 2 with transistor utilization

J2 – Serial

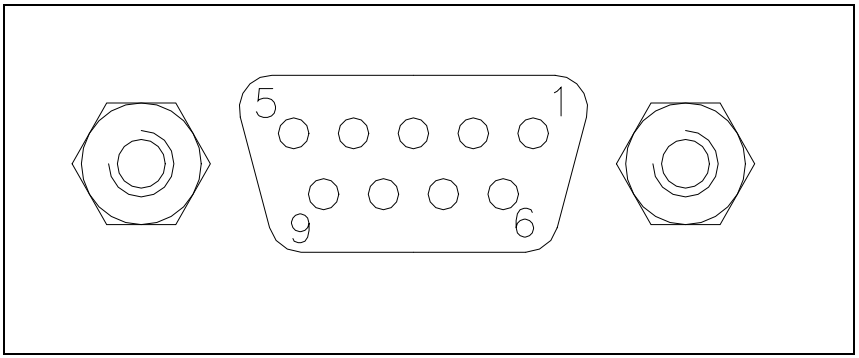


Figure 23

This is a 9 pin D-type serial input/output connector to control via an RS 232 or RS 485 connection the TV 551/701 SEM.

Tab. 4

PIN N.	SIGNAL NAME
1	SPARE
2	TX (RS232)
3	RX (RS232)
4	SPARE
5	GND
6	A + (RS485)
7	SPARE
8	B – (RS485)
9	RESERVED

Note that the vent valve can also be controlled by means of the serial connection.

A serial communication kit with a serial cable and the Navigation software is available (optional).

RS 232/RS 485 Communication Description

Both the RS 232 and the RS 485 interfaces are available on the connector J2.

The communication protocol is the same (see the structure below), but only the RS 485 manages the address field. Therefore to enable the RS 485 is necessary to select the type of communication as well as the device address by means of the Navigator software.

Communication Format

- 8 data bit
- no parity
- 1 stop bit
- baud rate: 600/1200/2400/4800/9600 programmable

Communication Protocol

The communication protocol is a MASTER/SLAVE type where:

- Host = MASTER
- Controller = SLAVE

The communication is performed in the following way:

1 the host (MASTER) send a message + CRC to the controller (SLAVE);

2 the controller answer with an answer + CRC to the host.

The MESSAGE is a string with the following format:

<STX>+<ADDR>+<WIN>+<COM>+<DATA>+<ETX>+<CRC>

where:

NOTE When a data is indicated between two quotes ('...') it means that the indicated data is the corresponding ASCII character.

- <STX> (Start of transmission) = 0x02
- <ADDR> (Unit address) = 0x80 (for RS 232)
  <ADDR> (Unit address) = 0x80 + device number (0 to 31) (for RS 485)
- <WIN> (Window) = a string of 3 numeric character indicating the window number (from '000' to '999'); for the meaning of each window see the relevant paragraph.
- <COM> (Command) = 0x30 to read the window, 0x31 to write into the window
- <DATA> = an alphanumeric ASCII string with the data to be written into the window. In case of a reading command this field is not present. The field length is variable according to the data type as per the following table:

Tab. 5

Data Type	Field Length	Valid Characters
Logic (L)	1	'0' = OFF '1' = ON
Numeric (N)	6	'-', '.', '0' . . . '9' right justified with '0'
Alphanumeric (A)	10	from blank to '_' (ASCII)

- <ETX> (End of transmission) = 0x03
- <CRC> = XOR of all characters subsequent to <STX> and including the <ETX> terminator. The value is hexadecimal coded and indicated by two ASCII character.

The addressed SLAVE will respond with an ANSWER whose structure depends from the MESSAGE type.

When the MESSAGE is a reading command, the SLAVE will respond transmitting a string with the same structure of the MESSAGE.

NOTE Using the RS 485 interface, the message structure remains identical to the one used for the RS 232 interface, the only difference being that the value assigned to the ADDRESS <ADDR>

The controller can answers with the following response types:

Tab. 6

Type	Length	Value	Description
Logic	1 byte	-	After a read instruction of a logic window
Numeric	6 bytes	-	After a read instruction of a numeric window
Alphanumeric	10 bytes	-	After a read instruction of an alphanumeric window
ACK	1 byte	(0x6)	The command execution has been successfully completed
NACK	1 byte	(0x15)	The command execution has been failed
Unknown Window	1 byte	(0x32)	The specified window in the command is not a valid window
Data Type Error	1 byte	(0x33)	The data type specified in the command (Logic, Numeric or Alphanumeric) is not accorded with the specified Window
Out of Range	1 byte	(0x34)	The value expressed during a write command is out of the range value of the specified window
Win Disabled	1 byte	(0x35)	The specified window is Read Only or temporarily disabled (for example you can't write the Soft Start when the Pump is running)

Examples

Command: START
Source: PC
Destination: Controller

02	80	30	30	30	31	31	03	42	33
STX	ADDR	WINDOW			WR	ON	ETX	CRC	

Source: Controller
Destination: PC

02	80	06	03	38	35
STX	ADDR	ACK	ETX	CRC	

Command: STOP
Source: PC
Destination: Controller

02	80	30	30	30	31	30	03	42	32
STX	ADDR	WINDOW			WR	OFF	ETX	CRC	

Source: Controller
Destination: PC

02	80	06	03	38	35
STX	ADDR	ACK	ETX	CRC	

Command: SOFT-START (ON)
Source: PC
Destination: Controller

02	80	31	30	30	31	31	03	42	32
STX	ADDR	WINDOW			WR	ON	ETX	CRC	

Source: Controller
Destination: PC

02	80	06	03	38	35
STX	ADDR	ACK	ETX	CRC	

Command: SOFT-START (OFF)
Source: PC
Destination: Controller

02	80	31	30	30	31	30	03	42	33
STX	ADDR	WINDOW			WR	OFF	ETX	CRC	

Source: Controller
Destination: PC

02	80	06	03	38	35
STX	ADDR	ACK	ETX	CRC	

Command: READ PUMP STATUS
Source: PC
Destination: Controller (with address = 3)

02	83	32	30	35	30	03	38	37
STX	ADDR	WINDOW			RD	ETX	CRC	

Source: Controller (with address = 3 in stop status)
Destination: PC

02	83	32	30	35	30	30	30	30	30	30	03	38	37
STX	ADDR	WINDOW			DATA (STATUS)						ETX	CRC	

Command: READ SERIAL TYPE
Source: PC
Destination: Controller (with address = 3 in 485 mode)

02	83	35	30	34	30	03	38	31
STX	ADDR	WINDOW			WR	ETX	CRC	

Source: Controller
Destination: PC

02	83	35	30	34	30	31	03	42	30
STX	ADDR	WINDOW			RD	DATA	ETX	CRC	

Window-Meanings

Tab. 7

N.	Read/ Write	Data Type	Description	Admitted Values
000	R/W	L	Start/Stop (in remote mode the window is a read only)	Start = 1 Stop = 0
001	R/W	L	Low Speed activation	NO = 0 YES = 1 (default = 0)
008	R/W	L	Remote (default) or Serial configuration	Remote = 1 Serial = 0 (default = 1)
100	R/W	L	Soft Start (write only in Stop condition)	YES = 1 NO = 0
101	R/W	N	Set Point type	0 = Frequency 1 = Current 2 = Time (default = 0)
102	R/W	N	Set Point threshold (expressed in Hz, mA or s)	(default = 643)
103	R/W	N	Set Point delay: time between the pump start and the set point check (seconds)	0 to 99999 (default = 0)
104	R/W	L	Set Point signal activation type: the signal can be "high level active" or "low level active"	0 = high level active 1 = low level active (default = 0)
105	R/W	N	Set point hysteresis (in % of threshold)	0 to 100 (default = 2)
106	R/W	L	Water cooling	0 = NO 1 = YES
107	R/W	L	Active Stop	0 = NO

N.	Read/ Write	Data Type	Description	Admitted Values
			(write only in stop)	1 = YES
108	R/W	N	Baud rate	600 = 0 1200 = 1 2400 = 2 4800 = 3 9600 = 4 (default = 4)
109	W	L	Pump life/ cycle time/ cycle number reset	To reset write '1'
110	R/W	L	Interlock type (default = 1)	Impulse = 0 Continuous = 1
111	R/W	L	Analog output type: output voltage signal proportional to frequency or power	0 = frequency 1 = power (default = 0)
117	R/W	N	Low Speed frequency (Hz)	272 to "Maximum rotational frequency" (win 121) (default = 476)
120	R/W	N	Rotational frequency setting (Hz)	272 to 714 (default = 714)
121	R/W	N	Maximum rotational frequency in Hz (active only in Stop condition)	272 to 714 (default = 714)
122	R/W	L	Set vent valve on/off (on = closed)	On = 1 Off = 0 (default = 1)
123 124	Reserved to Agilent service			
125	R/W	L	Set the vent valve operation	Automatic = 0 (see note 1.) On command = 1 (see note 2.)
126	R/W	N	Vent valve opening delay (expressed in 0.2 sec)	0 to 65535 (corresponding to 0 to 13107 sec)

N.	Read/ Write	Data Type	Description	Admitted Values
130	Reserved to Agilent service			
200	R	N	Pump current in mA dc	
201	R	N	Pump voltage in Vdc	
202	R	N	Pump power in W (pump current x pump voltage duty cycle)	
203	R	N	Driving frequency in Hz	
204	R	N	Pump temperature in °C	0 to 70
205	R	N	Pump status	Stop = 0 Waiting intlk = 1 Starting = 2 Auto-tuning = 3 Braking = 4 Normal = 5 Fail = 6
206	R	N	Error code	Bit description: see the following figure
300	R	N	Cycle time in minutes (zeroed by the reset command)	999999
301	R	N	Cycle number (zeroed by the reset command)	9999
302	R	N	Pump life in hours (zeroed by the reset command)	999999
320 to 399	Reserved to Agilent service			
400	R	A	CRC EPROM (QE)	QE5XXXX (where “XXXX” are variable)
402	R	A	CRC Param. (PA)	PA5XXXX (where “XXXX” are variable)

N.	Read/ Write	Data Type	Description	Admitted Values
500	Reserved to Agilent service			
503	R/W	N	RS 485 address	0 to 31 (default = 0)

NOTE

1. Automatic means that when the controller stops, the vent valve is opened with a delay defined by window n. 126; when the controller starts, the vent valve is immediately closed.

2. On command means that the vent valve is opened or closed by means of window n. 122.

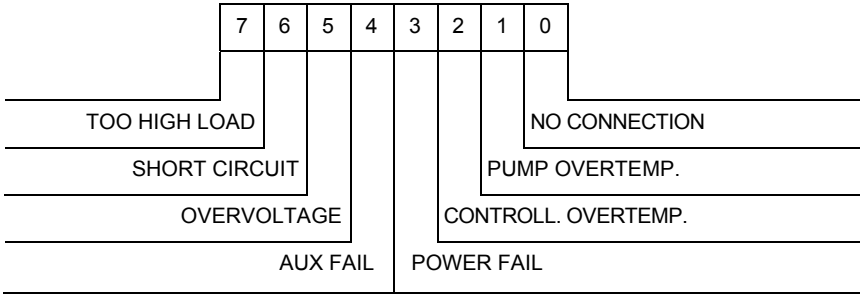


Figure 24 Window N. 206 Bit Description

Inlet Screen Installation

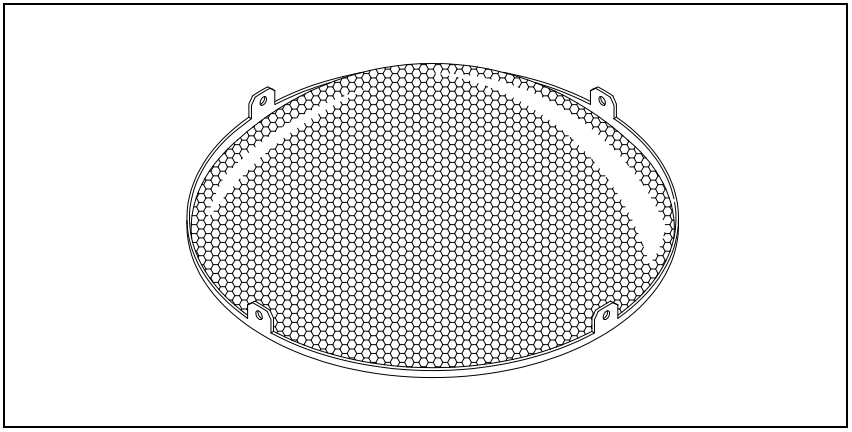


Figure 25

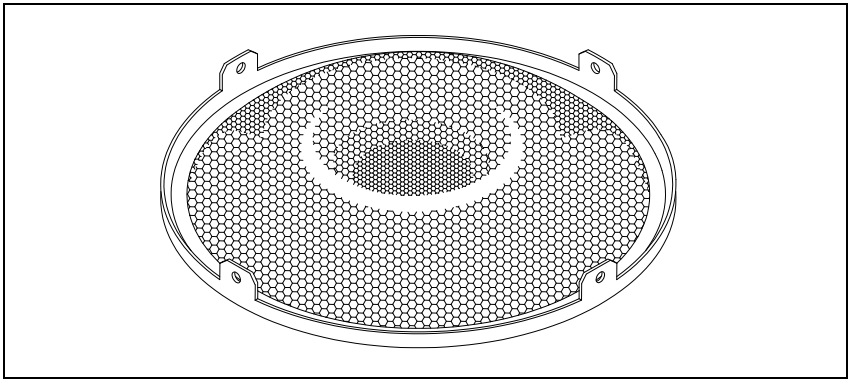


Figure 26

The inlet screens mod. 969-9304 and 969-9316 prevents the blades of the pump from being damaged by debris greater than 0.7 mm diameter.

The inlet screen, however, does reduce the pumping speed by about 10 %.

The inlet screen is fitted in the upper part of the pump, as shown in the figure.

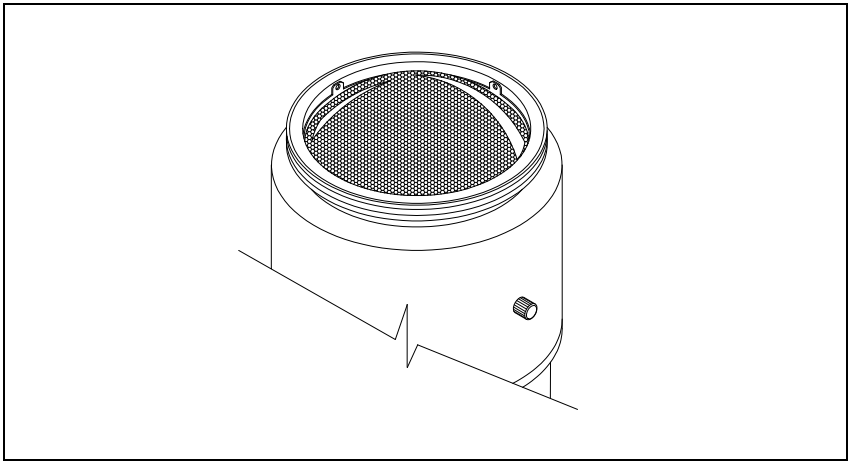


Figure 27

The screen can be mounted on each pump.

The screen can be removed as shown in the following figure.

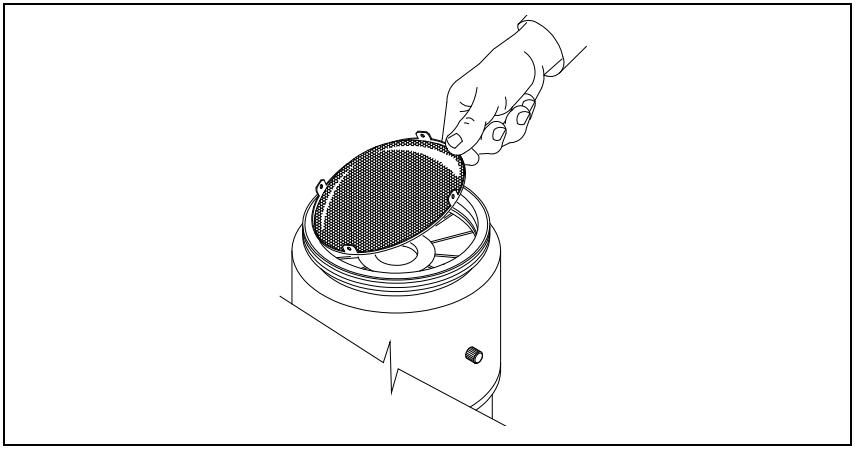


Figure 28

The following figure shows the overall flange dimensions with the protection screen fitted on pump with ISO flange and pump with CFF flange.

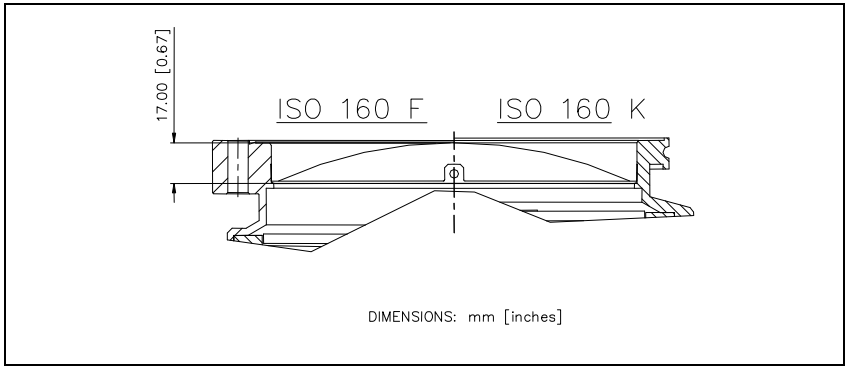


Figure 29

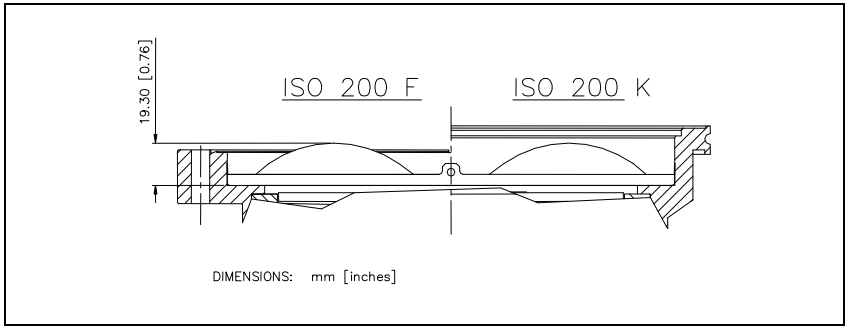


Figure 30

Air Cooling Kit Installation

TV 551/701 SEM with Navigator Controller

An air cooling kit (mod. 969-9339) is available to improve the TV 551/701 SEM cooling during heavy operational conditions (optional).

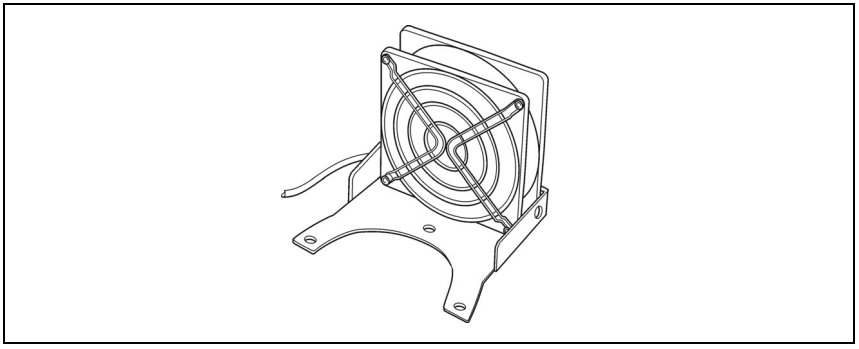


Figure 31

Fan specifications:

- air flow: 200 m^3/h
- input voltage: 24 Vdc
- dimensions: 127 x 127 x 38 mm (5 x 5 x 1.5 in.)
- power: 4.7 W

The fan bracket is shaped so that it can be mounted close to the pump.

To fix the fan to the TV 551/701 SEM case execute the following procedure (see the following figure):

1 Fix the fan to the suitable bracket by means of the furnished screws;

2 Fix the bracket to the pump body between the pump and the controller;

3 Connect the fan supply to the P4 connector of the controller.

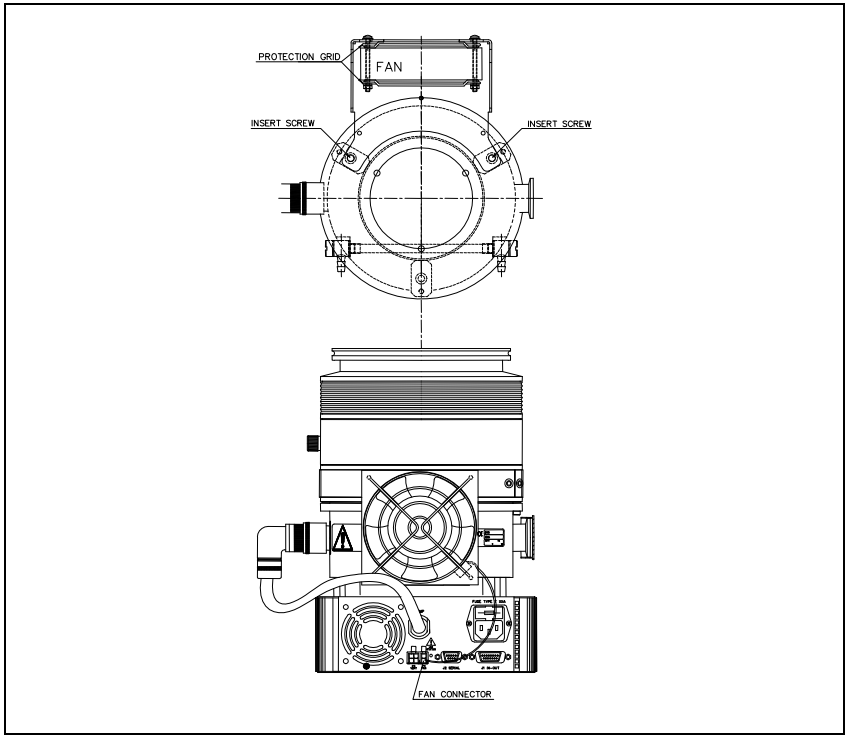


Figure 32

TV 551/701 SEM Pump with Standard Rack Controller

When the TV 551/701 SEM pumps are used with the standard rack controller, it is necessary to utilize the air cooling kit model 969-9314.

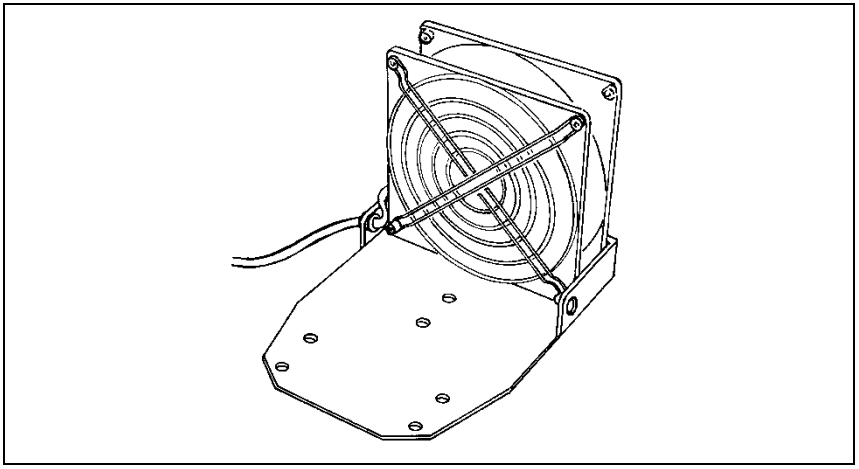


Figure 33

Fan specification:

- air flow: 25 l/s (51 CFM)
- input voltage: 120 Vac 50-60 Hz
- maximum power: 17 W
- dimensions: 119 x 119 mm (4.69 x 4.79 inches)

To fix the fan to the pump, position it ensuring that the holes in the plate line up with those in the pump base. Insert the respective washers and screws and tighten with a screwdriver.

Connect the fan to the controller.

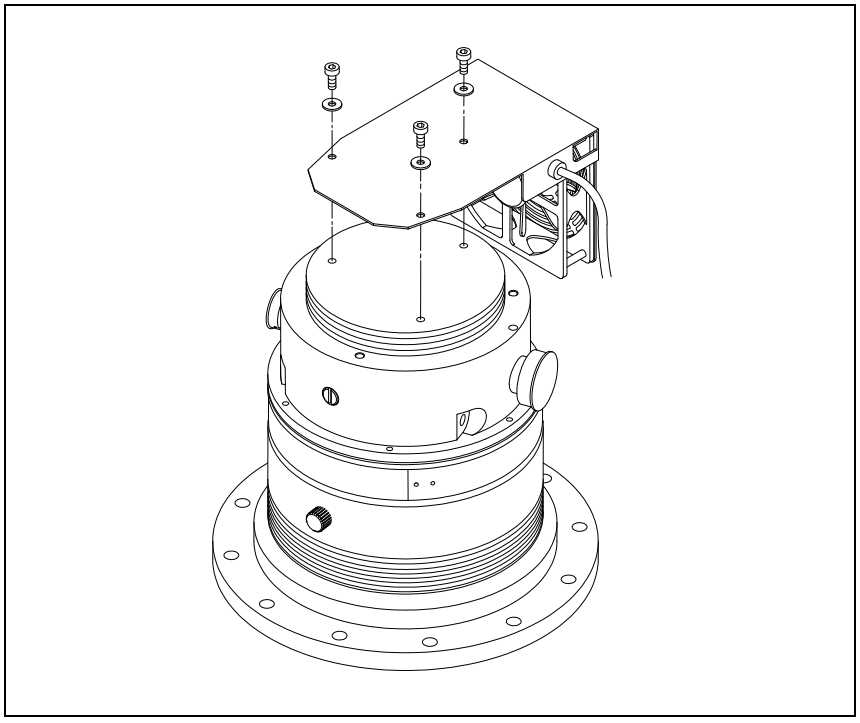


Figure 34

Water Cooling Kit Installation

The water cooling kit mod. 969-9347 or 969-9337 must be installed when the pump is used under heavy load conditions or when air cooling is insufficient.

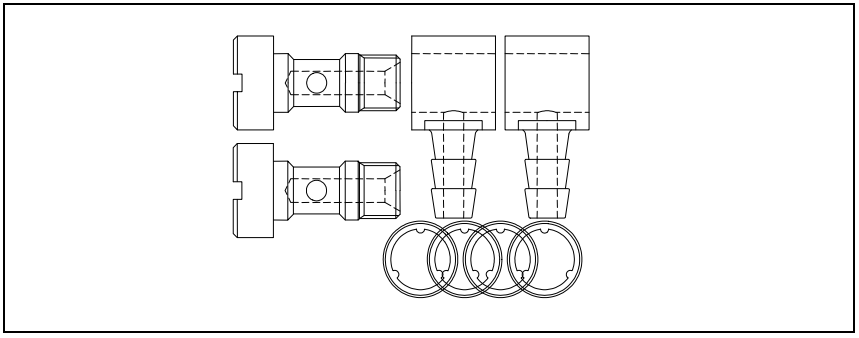


Figure 35 Model 969-9337

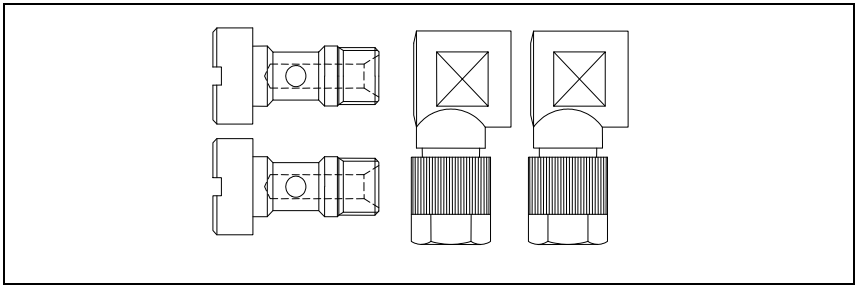


Figure 36 Model 969-9347

The kit is assembled as shown in the figure.

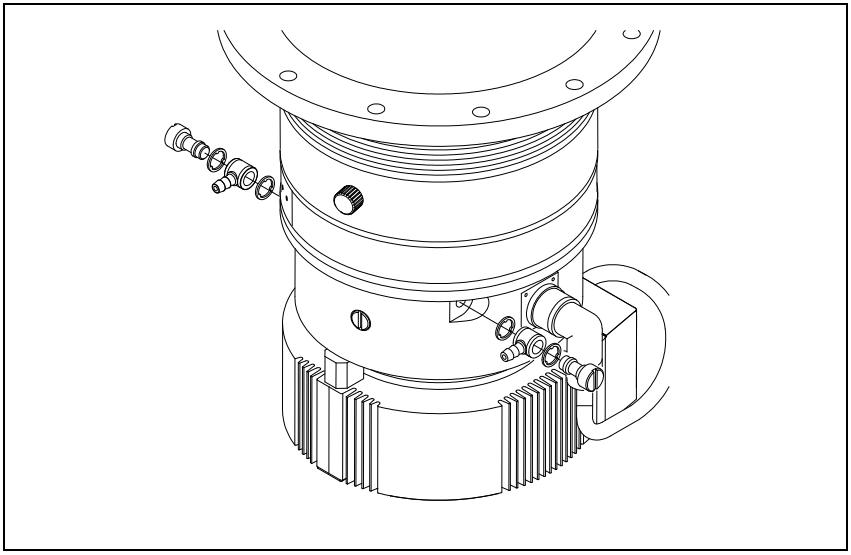


Figure 37 Model 969-9347

Two rubber or plastic hoses from the water supply must be fitted to the two water cooling banjos.

Cooling may be carried out either through an open circuit with eventual discharge of the water, or using a closed circuit cooling system.

The water temperature must be between +10 °C and +30 °C, with an inlet pressure between 3 and 5 bar. This allows a flow of about 200 l/h.

NOTE The water electrical conductance must be ≤ 500 µs/cm. When the conductance is higher, in closed water circuit, the use of up to 20 % of Ethyl-Glycole is suggested.

Vent Accessories

The vent valve and vent device allow to avoid undesired venting of the pump during temporary power failure and enables an automatic vent operation.

TV 551/701 SEM Navigator Controller Compatible

Vent Valve mod. 969-9834

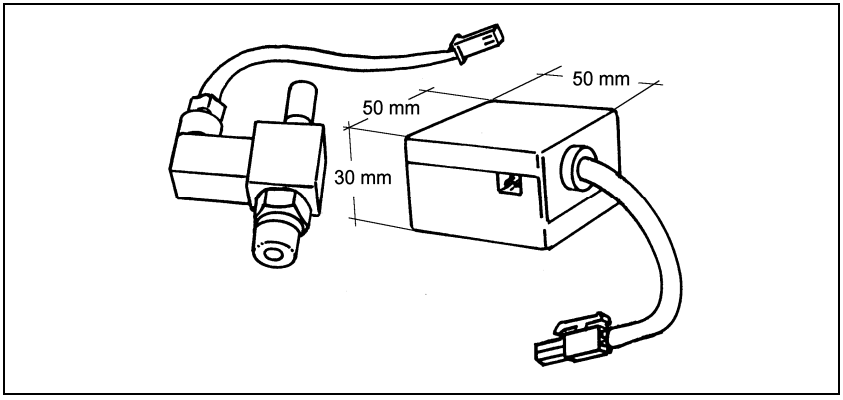


Figure 38

This vent valve waits before opening a minimum time of about 5 sec. This time can be increased up to about 220 min. by means of a setting of the Navigator software (optional).

To install the vent valve, unscrew the threaded plug (see figure below).

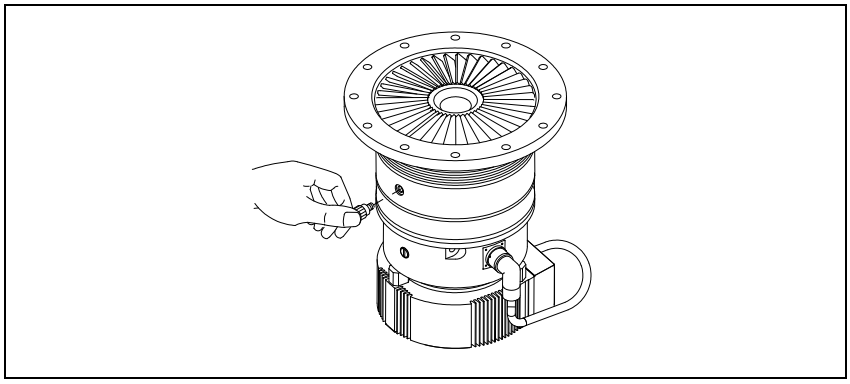


Figure 39

Then screw the vent valve into the pump and tighten it using a 16 mm hexagonal spanner with a torque of 2.5 Nm.

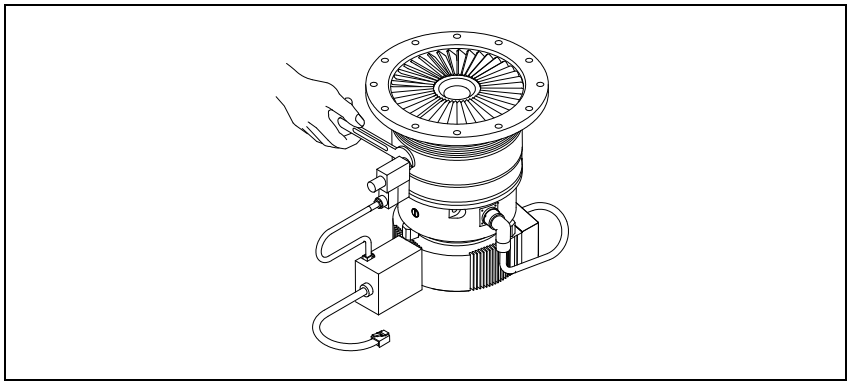


Figure 40

CAUTION! Do not overtighten the valve as this may damage the thread on the pump.

Then connect the cable from the valve to the suitable connector on the controller (see the preceding paragraph “INTERCONNECTIONS”).

Standard Rack Controller Compatible

Vent Valve mod. 969-9843

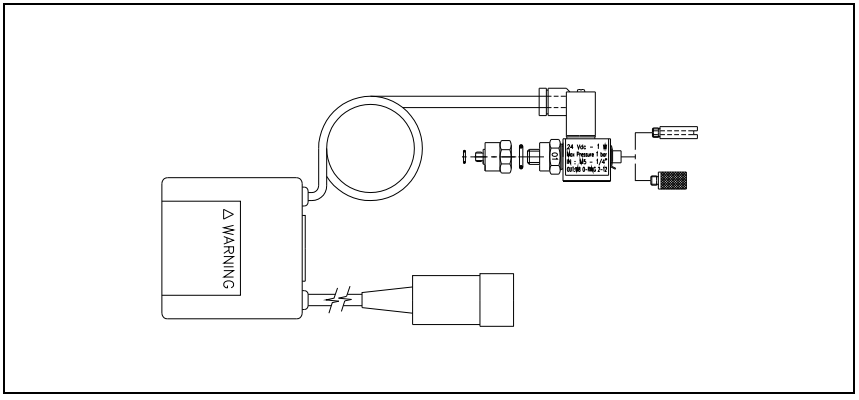


Figure 41

This vent valve has a fixed delay time of about 5 sec. This value can be used only with rack controller.
To install the vent valve execute the same steps as the vent valve model 969-9834 (see the above paragraph).

Vent Device mod. 969-9831

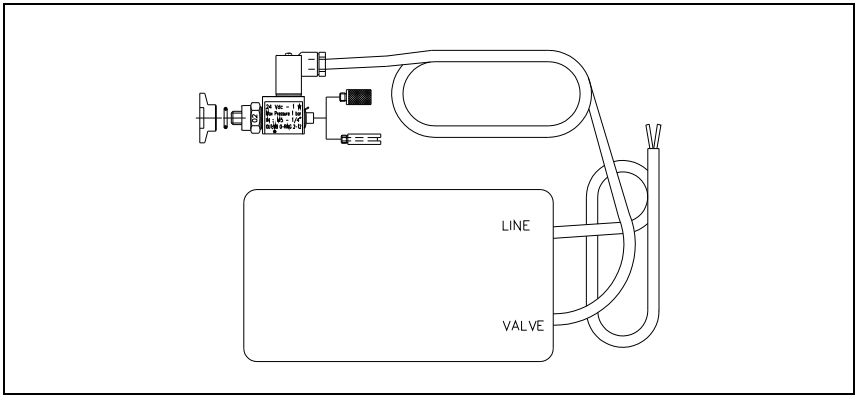


Figure 42

The vent device has adjustable delay time (up to 36 min.). This value can be used only with rack controller.

To install the vent device unscrew and remove the threaded plug (see the following figure).

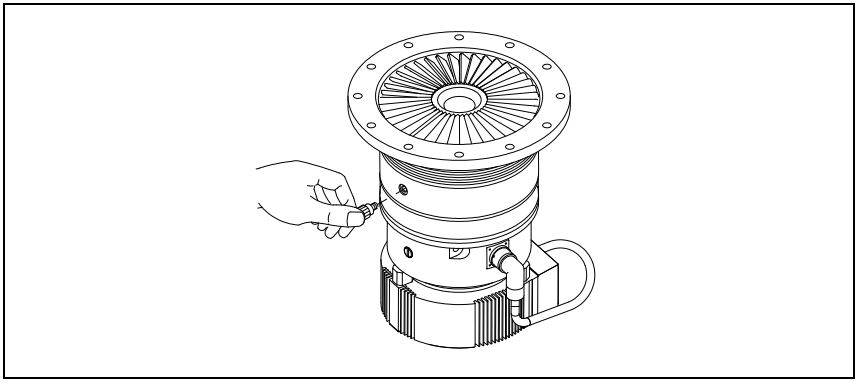


Figure 43

Screw the flange mod. 969-9108 on the pump, taking care of the o-ring right position. Assemble the seal ring and lock the vent device in position using the KF klamp.

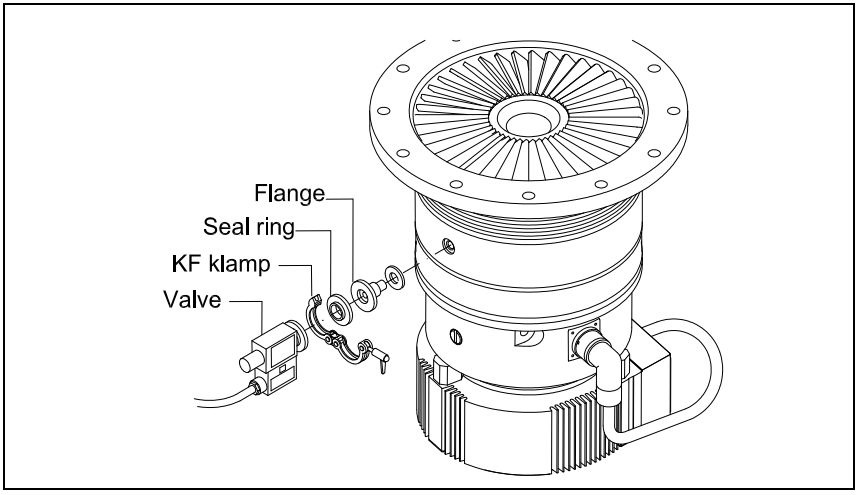


Figure 44

Vibration Isolators

Single Damper

Two vibration isolators are available as accessories. The four models part number are the following:

- model 969-9345 for ISO 160 K flange;
- model 969-9346 for ISO 200 K flange;
- model 969-9373 for ISO 160 F flange;
- model 969-9374 for ISO 200 F flange.

They typically reduce the vibration transmitted from the TV 551/701 SEM Navigator to the system by a factor D>20. For more information, please refer to the relevant instruction manual.

Double Damper

This is a high performance damper and typically is able to reduce transmitted vibrations by a factor D>100. In the following picture its transfer function is shown. It is available in two versions:

- model 969-9377 for ISO 160 F flange;
- model 969-9378 for ISO 200 F flange.

For more information, please refer to the relevant instruction manual.

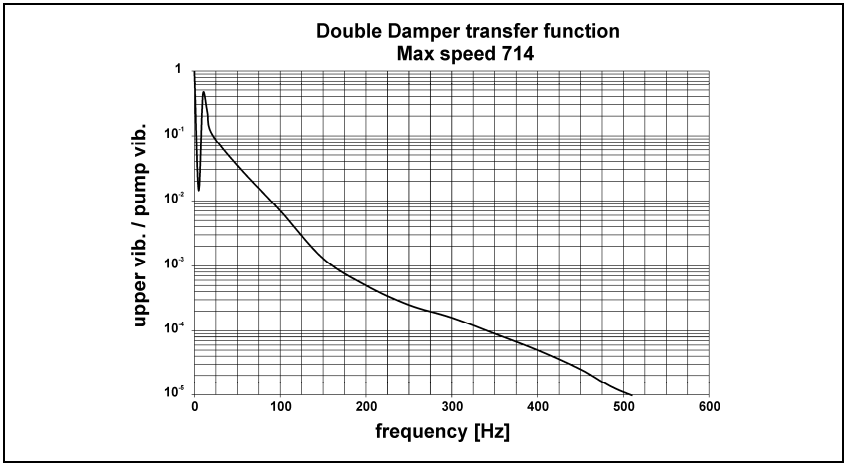


Figure 45

Purge Valve Installation

A gas purge valve is available to protect the pump bearings against particulate and corrosive gases that could move into the pump.

To install the gas purge valve it is necessary to unscrew the purge port cover as shown in the following figure,

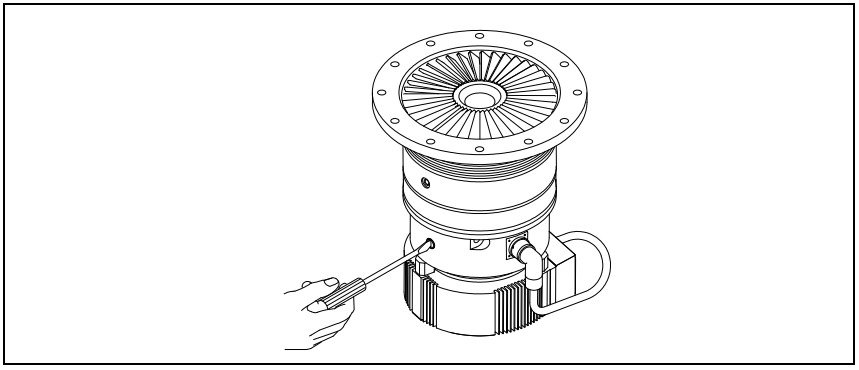


Figure 46

and then screw the gas purge valve (with a torque of 2.5 Nm) as shown in the following figure.

Figure 47

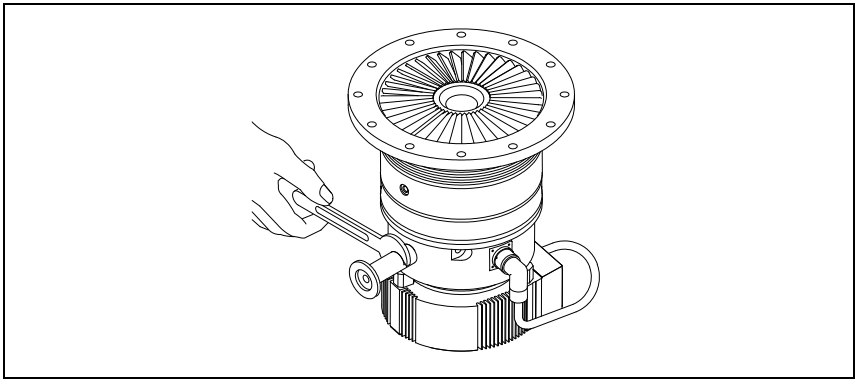


Figure 48

Serial Cable Installation

The supplied serial cable must be installed when the TV 551/701 SEM Navigator or the optional vent valve have to be controlled by means of a remote computer.

The cable is installed fixing the 9 pin D-type connector into the P2 serial connector as shown in the following figure.

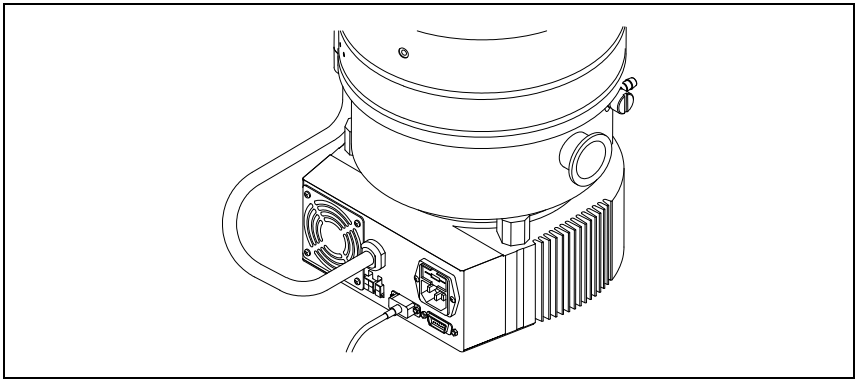


Figure 49

TV 551/701 SEM Controller Installation

The controller can be mounted in two position:

- bottom mounting (as per the complete system)
- side mounting.

To install the controller execute the following procedures.

Bottom Mounting

See the following figure.

1. Turn the pump upside-down;
2. Place the three fixing blocks with the through holes toward the inside, and fix them with the three M6 screws to the pump bottom;
3. Place the controller on the blocks, with the pump cable toward the pump body;
4. Fix the controller to the blocks by means of the three socket head screws M5;
5. Turn the pump again;
6. Plug the line card and connect the pump cable to the pump;
7. Connect the mating connector with the jumper on the interlock signal to start the pump.

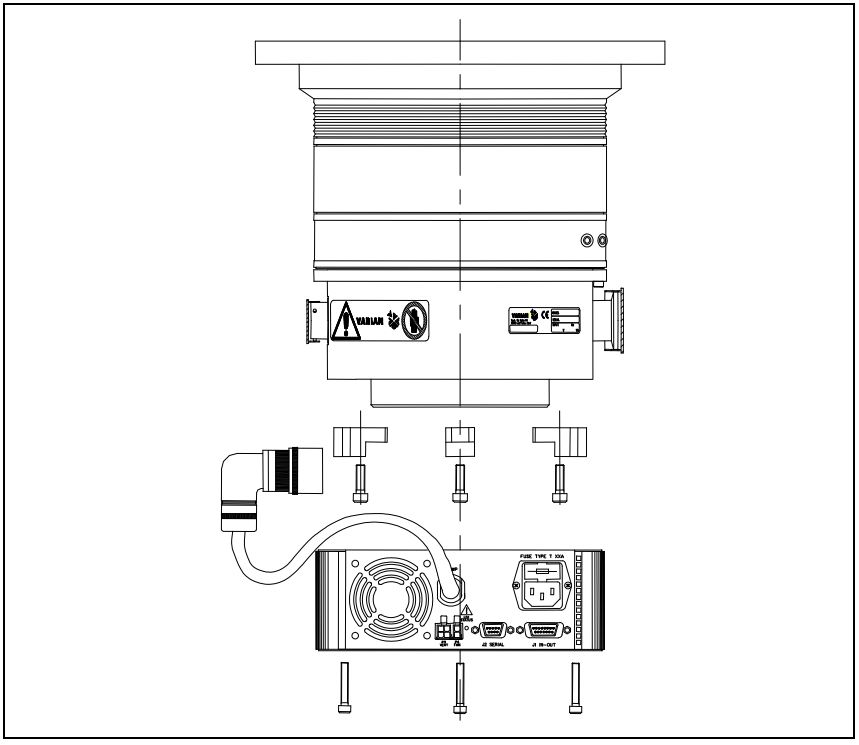


Figure 50

Side Mounting

NOTE The L-shaped bracket (P/N 969-9349) is available as an option.

See the following figure.

1. Place the L-shaped bracket on the controller, with the pump cable toward the bracket, and fix it by means of the three socket head screws M5, the washers and the nuts. The 6 holes on the bracket allows to mount the controller with the rotation angle that you like;
2. Turn the pump upside-down;
3. Place the bracket on the pump bottom (the hole on the bracket has the same diameter as the pump bottom flange);
4. Screw a little bit the three screws M6 in the holes on the pump bottom;
5. Rotate the bracket until the controller is on the chosen position;
6. Tighten the screws properly;
7. Turn the pump again;
8. Plug the line card and connect the pump cable to the pump;
9. Connect the mating connector with the jumper on the interlock signal to start the pump.

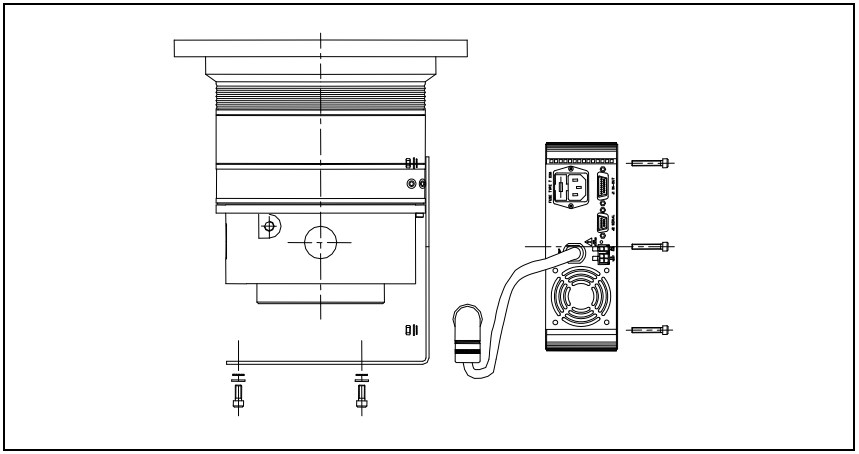


Figure 51

Connection A - HIGH VACUUM FLANGE

For ISO-K flange connections, fix the two flanges with the clamps as shown in the figure.

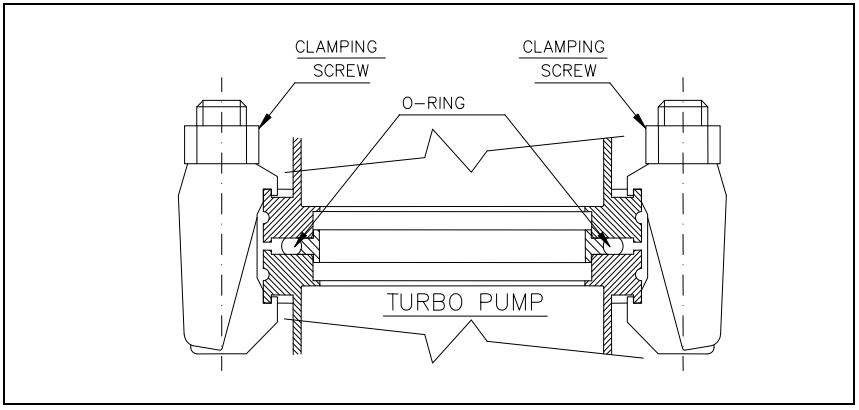


Figure 52

WARNING!

It is mandatory to connect the pump in such a way to withstand the torque specified in the "INSTRUCTION FOR USE" section. Specifically pay attention to clamp design, material of clamps and bolts and bolt fixing torque.

To facilitate assembly and dismantling, apply Fel-pro C-100 high temperature lubricant to the screw threads protruding from the flange and between the nuts and flange.

Note that the connections can be made only with the bolt in the lower side.

Attach the units and tighten each one in turn. Repeat the sequential tightening until the flange faces meet.

CAUTION! Exercise care when tightening nuts and bolts to avoid creating dents in the envelope as this may cause the pump rotor to lock.

Connection Configurations

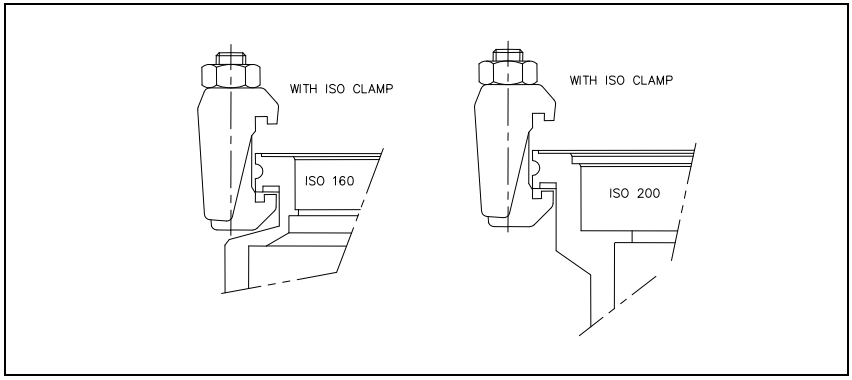


Figure 53

Connection B - FORE-VACUUM PUMP

A flange KF 25 NW is available to connect the Turbo-V551/701 SEM pump to the fore-vacuum pump. A hose or vacuum approved pipe can be used. If a rigid pipe is used, any vibration generated by the mechanical pump must be eliminated through the use of bellows.

NOTE The Turbo-V551/701 SEM pump is characterized by its high compression ratio also for oil vapors. When using a mechanical oil-sealed pump, it is advisable to install a suitable trap between the turbopump and the fore-vacuum pump in order to prevent oil backstreaming.

Connection C – ELECTRICAL

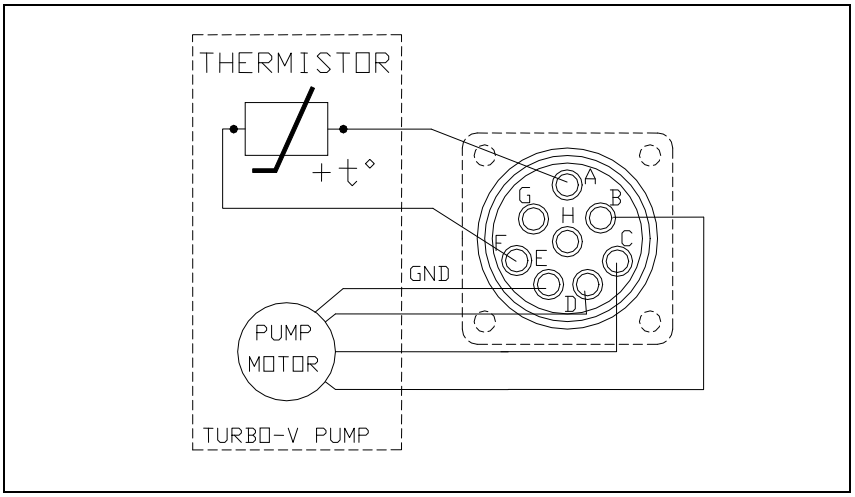


Figure 54

The turbopump is connected to the controller through an 8-pin connector. Pins B, C and D are the 3-phase supply to the motor, pins A and F are connected to the temperature sensor (NTC type, 30 KΩ resistance at 25 °C) and pin E is connected to the pump ground; pins G and H are not connected.

If the temperature sensor is disconnected, the pump will not start. To prevent damage to the pump when the temperature exceeds 60 °C, the sensor automatically cuts out the power supply.

Pump Used with Corrosive Gases

To prevent damage to the bearings, an inert gas must flow into the pump body around the upper bearing towards the forevacuum line. To supply the inert purge gas (e. g. nitrogen) to the pump through the purge port, connect a gas purge valve between the pressure regulator and the pump.

Adjust the pressure regulator in order to read a gas flow rate of 0.1 to 0.8 mbar l/s.

CAUTION! To prevent bearing damage, Agilent suggests a minimum purge gas flow rate of 10 sccm (0.17 mbar l/s). This value can be exceeded, according to the process requirements. Please contact Agilent for specific applications.

The purge gas throughput with the recommended forepump of 15 m^3 /h (11 CFM) allows to achieve a high vacuum pressure in the 10^{-8} mbar range. The recommended gas flow maintains a pressure into the pump body higher than the forevacuum pressure. The recommended procedure to vent the system and the pump avoiding the contact between the pump bearings and the corrosive gas is described in the following points:

1. Close the corrosive gas flow into the system.
2. Leaving the Turbo-V pump and the backing pump running and the purge gas flowing, wait for enough time to evacuate the corrosive gas from the system.
3. Turn off the Turbopump.
4. Open the Turbo-V vent port slowly until to reach atmospheric pressure in the system.
5. When the Turbo-V pump and the backing pump are stopped and the system is at atmospheric pressure, for a better bearing protection it is advisable to leave the purge gas flowing into the Turbo-V pump, with the chamber or the Turbo-V vent valve opened, to avoid system overpressures. If the vent valve can't be kept opened, the backing pump should be left operating.

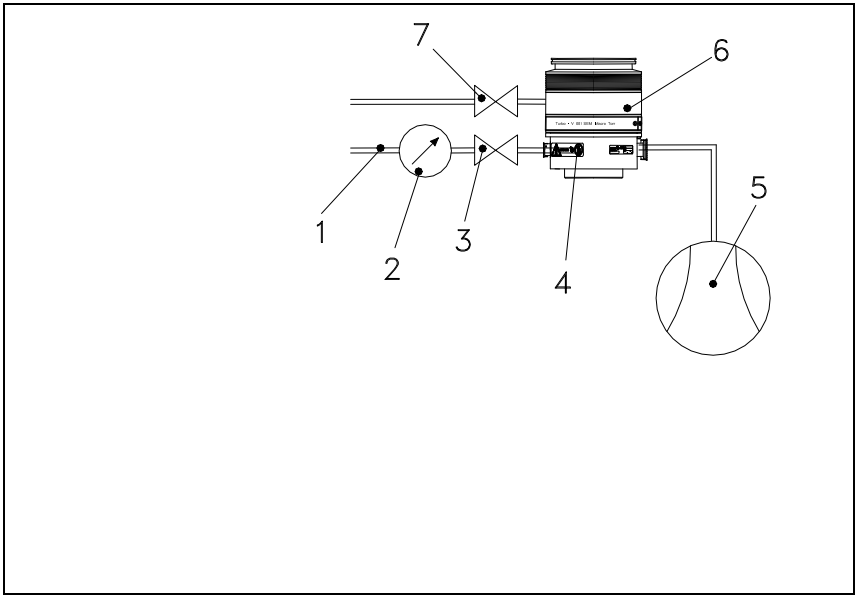


Figure 55 Purge layout

Tab. 8

1	Purge gas line
2	Pressure regulator
3	Gas purge valve
4	Gas purge port
5	Forevacuum pump
6	Turbopump
7	Vent valve

Pump Used in Presence of Magnetic Fields

Magnetic fields induce eddy currents in the rotor of a turbomolecular pump that tend to oppose to its rotation.

The result is increased electrical power consumption by the motor, most of which is dissipated in the rotor.

Since the rotor is not in contact with the stator the above power can leave the rotor mainly by radiation and hence the rotor may be overheated while static parts of the pump remain cool.

This effect is strongly dependant from the intensity, time function and distribution of the magnetic field.

In general, therefore, an increase in pump current can be expected.

If this increase is lower than 50 % of the current value drawn by the motor in high vacuum operation, no particular problem should be expected.

However if the effect is grater, than the case should be carefully reviewed by Agilent's specialist. As a matter of fact, in case of high magnetic fields, also important forces might be generated and applied to the rotor.

Accessories and Spare Parts

Tab. 9

Description	Part number
Mains cable NEMA Plug, 3m long	969-9958
Mains cable European Plug, 3m long	969-9957
Serial cable and Navigator Software	969-9883
Inlet screen DN 160	969-9304
Inlet screen DN 200	969-9316
Water cooling kit (plastic model)	969-9347
Water cooling kit (metallic model)	969-9337
Air cooling kit for standard rack controller	969-9314
Air cooling kit for Navigator controller	969-9339

Description	Part number
Bracket for Navigator Controller side mounting	969-9349
Single vibration isolator ISO 160 K	969-9345
Single vibration isolator ISO 200 K	969-9346
Single vibration isolator ISO 160 F	969-9373
Single vibration isolator ISO 200 F	969-9374
Double vibration isolator ISO 160 F	969-9377
Double vibration isolator ISO 200 F	969-9378
Vent flange, NW 10 KF / M8	969-9108
Vent device with adjustable delay time for standard rack controller	969-9831
Vent valve for standard rack controller	969-9843
Vent valve for Navigator Controller	969-9834
Purge valve with KF16 flange 10 SCCM	969-9239
Purge valve with 1/4 Swagelock 10 SCCM	969-9240
Purge valve KF16 20 SCCM	969-9241
Purge valve 1/4 Swagelock 20 SCCM	969-9242
Forepump DS 302, with 1 ph., universal motor	949-9325
Forepump SH 100	SH010001UNIV
Triscroll Dry Vacuum Pump PTS 300 single phase, universal motor	PTS03001UNIV
Triscroll Dry Vacuum Pump PTS 300 3 phase, universal motor	PTS03003UNIV

Agilent Technologies

Vacuum Products Division

Dear Customer,

Thank you for purchasing an Agilent vacuum product. At Agilent Vacuum Products Division we make every effort to ensure that you will be satisfied with the product and/or service you have purchased.

As part of our Continuous Improvement effort, we ask that you report to us any problem you may have had with the purchase or operation of our products. On the back side you find a Corrective Action request form that you may fill out in the first part and return to us.

This form is intended to supplement normal lines of communications and to resolve problems that existing systems are not addressing in an adequate or timely manner.

Upon receipt of your Corrective Action Request we will determine the Root Cause of the problem and take the necessary actions to eliminate it. You will be contacted by one of our employees who will review the problem with you and update you, with the second part of the same form, on our actions.

Your business is very important to us. Please, take the time and let us know how we can improve.

Sincerely.

Giampaolo LEVI

Vice President and General Manager
Agilent Vacuum Products Division

Note: Fax or mail the Customer Request for Action (see backside page) to Agilent Vacuum Products Division (Torino) – Quality Assurance or to your nearest Agilent representative for onward transmission to the same address.

CUSTOMER REQUEST FOR CORRECTIVE / PREVENTIVE / IMPROVEMENT ACTION

TO: AGILENT VACUUM PRODUCTS DIVISION TORINO – QUALITY ASSURANCE

FAX N°: XXXX-011-9979350

ADDRESS: AGILENT TECHNOLOGIES ITALIA S.p.A. – Vacuum Products Division –

Via F.lli Varian, 54 – 10040 Leinì (TO) – Italy

E-MAIL: vpd-qualityassurance_pdl-ext@agilent.com

NAME	COMPANY	FUNCTION

ADDRESS:

TEL. N° : _____ FAX N° : _____

E-MAIL: _____

PROBLEM / SUGGESTION :

REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.):

DATE _____

CORRECTIVE ACTION PLAN / ACTUATION (by AGILENT VPD) LOG N° _____

XXX = Code for dialing Italy from your country (es. 01139 from USA; 00139 from Japan, etc.)

Agilent Technologies

Agilent Technologies

Vacuum Products Division
Instructions for returning products

Dear Customer:

Please follow these instructions whenever one of our products needs to be returned.

1) Complete the attached Request for Return form and send it to Agilent Technologies (see below), taking particular care to identify all products that have pumped or been exposed to any toxic or hazardous materials.

2) After evaluating the information, Agilent Technologies will provide you with a Return Authorization (RA) number via email or fax, as requested.
Note: Depending on the type of return, a Purchase Order may be required at the time the Request for Return is submitted. We will quote any necessary services (evaluation, repair, special cleaning, eg).

3) **Important steps for the shipment of returning product:**
   - Remove all accessories from the core product (e.g. inlet screens, vent valves).
   - Prior to shipment, drain any oils or other liquids, purge or flush all gasses, and wipe off any excess residue.
   - If ordering an Advance Exchange product, **please use the packaging from the Advance Exchange to return the defective product.**
   - Seal the product in a plastic bag, and package product carefully to avoid damage in transit. You are responsible for loss or damage in transit.
   - Agilent Technologies is not responsible for returning customer provided packaging or containers.
   - **Clearly label package with RA number.** Using the shipping label provided will ensure the proper address and RA number are on the package. Packages shipped to Agilent without a RA clearly written on the outside cannot be accepted and will be returned.

4) Return only products for which the RA was issued.

5) **Product being returned under a RA must be received within 15 business days.**

6) **Ship to the location specified on the printable label, which will be sent, along with the RA number, as soon as we have received all of the required information.** Customer is responsible for freight charges on returning product.

7) Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.

RETURN THE COMPLETED **REQUEST FOR RETURN** FORM TO YOUR NEAREST LOCATION:

EUROPE:	**NORTH AMERICA:**	**PACIFIC RIM:**
Fax: 00 39 011 9979 330		
Fax Free: 00 800 345 345 00	Fax: 1 781 860 9252	please visit our website for individual
Toll Free: 00 800 234 234 00	Toll Free: 800 882 7426, Option 3	office information
vpt-customercare@agilent.com	vpl-ra@agilent.com	http://www.agilent.com

Agilent Technologies

Vacuum Products Division
Request for Return Form
(Health and Safety Certification)

Please read important policy information on Page 3 that applies to all returns.

1) CUSTOMER INFORMATION

Company Name:	**Contact Name:**
Tel: **Email:**	**Fax:**
Customer Ship To:	**Customer Bill To:**
Europe only: **VAT reg. Number:**	USA/Canada only: ☐ **Taxable** ☐ **Non-taxable**

2) PRODUCT IDENTIFICATION

Product Description	Agilent P/N	Agilent S/N	Original Purchasing Reference

3) TYPE OF RETURN (**Choose one from each row** and supply Purchase Order if requesting a billable service)

3A. ☐ Non-Billable ☐ Billable ➡ New PO # (hard copy must be submitted with this form):

3B. ☐ Exchange ☐ Repair ☐ Upgrade ☐ Consignment/Demo ☐ Calibration ☐ Evaluation ☐ Return for Credit

4) HEALTH and SAFETY CERTIFICATION

AGILENT TECHNOLOGIES CANNOT ACCEPT ANY PRODUCTS CONTAMINATED WITH BIOLOGICAL OR EXPLOSIVE HAZARDS, RADIOACTIVE MATERIAL, OR MERCURY AT ITS FACILITY.
Call Agilent Technologies to discuss alternatives if this requirement presents a problem.

The equipment listed above (check one):

☐ **HAS NOT** pumped or been exposed to any toxic or hazardous materials. OR

☐ **HAS** pumped or been exposed to the following toxic or hazardous materials. If this box is checked, the following information must also be filled out. Check boxes for all materials to which product(s) pumped or was exposed:

☐ Toxic ☐ Corrosive ☐ Reactive ☐ Flammable ☐ Explosive ☐ Biological ☐ Radioactive

List all toxic/hazardous materials. Include product name, chemical name, and chemical symbol or formula:

_____

NOTE: If a product is received at Agilent which is contaminated with a toxic or hazardous material that was not disclosed, **the customer will be held responsible** for all costs incurred to ensure the safe handling of the product, and **is liable** for any harm or injury to Agilent employees as well as to any third party occurring as a result of exposure to toxic or hazardous materials present in the product.

Print Name: **Authorized Signature:** ..... **Date:**

5) FAILURE INFORMATION:

Failure Mode (REQUIRED FIELD. See next page for suggestions of failure terms):
Detailed Description of Malfunction: (Please provide the error message)
Application (system and model):

I understand and agree to the terms of Section 6, Page 3/3.
Print Name: **Authorized Signature:** ..... **Date:**

Agilent Technologies

Vacuum Products Division
Request for Return Form
(Health and Safety Certification)

Please use these Failure Mode to describe the concern about the product on Page 2.

TURBO PUMPS and TURBO CONTROLLERS

APPARENT DEFECT/MALFUNCTION		POSITION	PARAMETERS	
- Does not start	- Noise	- Vertical	Power:	Rotational Speed:
- Does not spin freely	- Vibrations	-Horizontal	Current:	Inlet Pressure:
- Does not reach full speed	-Leak	-Upside-down	Temp 1:	Foreline Pressure:
- Mechanical Contact	-Overtemperature	-Other:	Temp 2:	Purge flow:
- Cooling defective	-Clogging	.....	OPERATING TIME:	

ION PUMPS/CONTROLLERS

- Bad feedthrough	- Poor vacuum
- Vacuum leak	- High voltage problem
- Error code on display	- Other

VALVES/COMPONENTS

- Main seal leak	- Bellows leak
- Solenoid failure	- Damaged flange
- Damaged sealing area	-Other

LEAK DETECTORS

- Cannot calibrate	-No zero/high backround
- Vacuum system unstable	- Cannot reach test mode
- Failed to start	- Other

INSTRUMENTS

- Gauge tube not working	- Display problem
- Communication failure	- Degas not working
- Error code on display	- Other

SCROLL AND ROTARY VANE PUMPS

- Pump doesn't start	- Noisy pump (describe)
- Doesn't reach vacuum	- Over temperature
- Pump seized	- Other

DIFFUSION PUMPS

- Heater failure	- Electrical problem
- Doesn't reach vacuum	- Cooling coil damage
- Vacuum leak	- Other

Section 6) *ADDITIONAL TERMS*

Please read the terms and conditions below as they apply to all returns and are in addition to the Agilent Technologies Vacuum Product Division – Products and Services Terms of Sale.

- Customer is responsible for the freight charges for the returning product. Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.
- Customers receiving an Advance Exchange product agree to return the defective, rebuildable part to Agilent Technologies **within 15 business days**. Failure to do so, or returning a non-rebuildable part (crashed), will result in an invoice for the non-returned/non-rebuildable part.
- Returns for credit toward the purchase of new or refurbished Products are subject to prior Agilent approval and may incur a restocking fee. Please reference the original purchase order number.
- Units returned for evaluation will be evaluated, and a quote for repair will be issued. If you choose to have the unit repaired, the cost of the evaluation will be deducted from the final repair pricing. A Purchase Order for the final repair price should be issued within 3 weeks of quotation date. Units without a Purchase Order for repair will be returned to the customer, and the evaluation fee will be invoiced.
- A Special Cleaning fee will apply to all exposed products per Section 4 of this document.
- If requesting a calibration service, units must be functionally capable of being calibrated.

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