



**VARIAN**   
*vacuum technologies*

## ***Turbo-V70 pumps***

**969-9357 series**  
**969-9358 series**  
**969-9359 series**  
**969-9360 series**

- (I) *MANUALE DI ISTRUZIONI*
- (D) *BEDIENUNGSHANDBUCH*
- (F) *NOTICE DE MODE D'EMPLOI*
- (E) *MANUAL DE INSTRUCCIONES*
- (P) *MANUAL DE INSTRUÇÕES*
- (NL) *BEDRIJFSHANDLEIDING*
- (DK) *INSTRUKSTIONSBOG*
- (S) *BRUKSANVISNING*
- (N) *INSTRUKSJON MANUAL*
- (FIN) *OHJEKÄSIKIRJA*
- (GR) *ΟΔΗΓΙΕΣ ΧΡΗΣΕΩΣ*
- (H) *FELHASZNÁLÓI KÉZIKÖNYV*
- (PL) *PODRECZNIK INSTRUKCJI*
- (CZ) *NÁVOD K POUŽITÍ*
- (SK) *NÁVOD NA OBSLUHU*
- (SLO) *PRIROČNIK ZA NAVODILA*
- (GB) *INSTRUCTION MANUAL*

# ***Turbo-V 70***



**VARIAN**



*vacuum technologies*

*Dear Customer,*

*Thank you for purchasing a VARIAN vacuum product. At VARIAN Vacuum Technologies 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 product. 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,*

**Sergio PIRAS**

*Vice President and General Manager  
VARIAN Vacuum Technologies*

*Note: Fax or mail the Customer Request for Action (see backside page) to VARIAN Vacuum Technologies (Torino) - Quality Assurance or to your nearest VARIAN representative for onward transmission to the same address.*

**CUSTOMER REQUEST FOR CORRECTIVE / PREVENTIVE / IMPROVEMENT ACTION**

TO : VARIAN VACUUM TECHNOLOGIES TORINO - QUALITY ASSURANCE

FAX N° : XXXX - 011 - 9979350

ADDRESS: VARIAN S.p.A. - Via F.lli Varian, 54 - 10040 Leinì (Torino) - Italy

E-MAIL : marco.marzio@varianinc.com

NAME _____	COMPANY _____	FUNCTION _____
<p>ADDRESS : _____</p> <p>TEL. N° : _____ FAX N° : _____</p> <p>E-MAIL : _____</p>		
<p>PROBLEM / SUGGESTION :</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>		
<p>REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.) :</p> <p>_____</p> <p>_____</p> <p>_____</p> <p style="text-align: right;">DATE _____</p>		

<p>CORRECTIVE ACTION PLAN / ACTUATION (by VARIAN VTT)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>LOG N° _____</p>
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XXXX = Code for dialing Italy from your country ( es. 01139 from USA; 00139 from Japan, etc.)

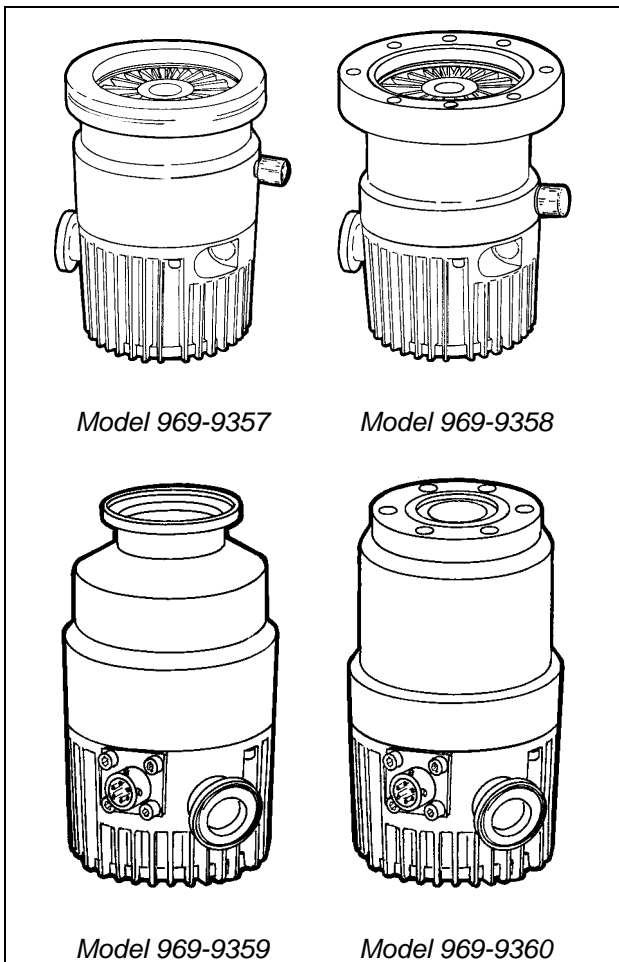


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**DESCRIPTION OF THE TURBOPUMP**

The Turbo-V70 pump is available in four versions. The difference between the two versions lies purely in the high vacuum connection. The four versions are:

- Model 969-9357 with ISO 63 high vacuum flange
- Model 969-9358 with ConFlat 4.5" external diameter high vacuum flange
- Model 969-9359 with KF 40 NW high vacuum flange
- Model 969-9360 with ConFlat 2.75" external diameter high vacuum flange



The Turbo-V70 pump consists of a high frequency motor driving a turbine fitted with 11 bladed stages. The turbine rotates in an anticlockwise direction when viewed from the high vacuum flange end.

The turbine is made of high-strength, light aluminium alloy, and is machined from a single block of aluminium. The turbine blades have five different angles, from 42° to 12°.

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 fabricated in stainless steel. These are supported and accurately positioned by spacer rings.

During normal operation, the motor functions with a power feed at 54 Vac three-phase at 1250 Hz. To reduce losses during start-up to a minimum, the frequency increases according to a ramp with a higher initial voltage/frequency ratio.

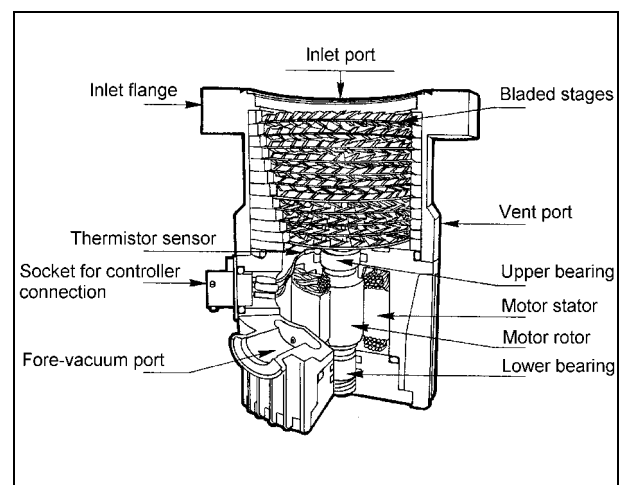
The external body of the pump is fitted with fins which allow the pump itself to function with natural convection air cooling. Kits are available for water cooling or forced air cooling to cool the pump in the cases where it is used under heavy load or when natural convection is insufficient for cooling purposes.

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

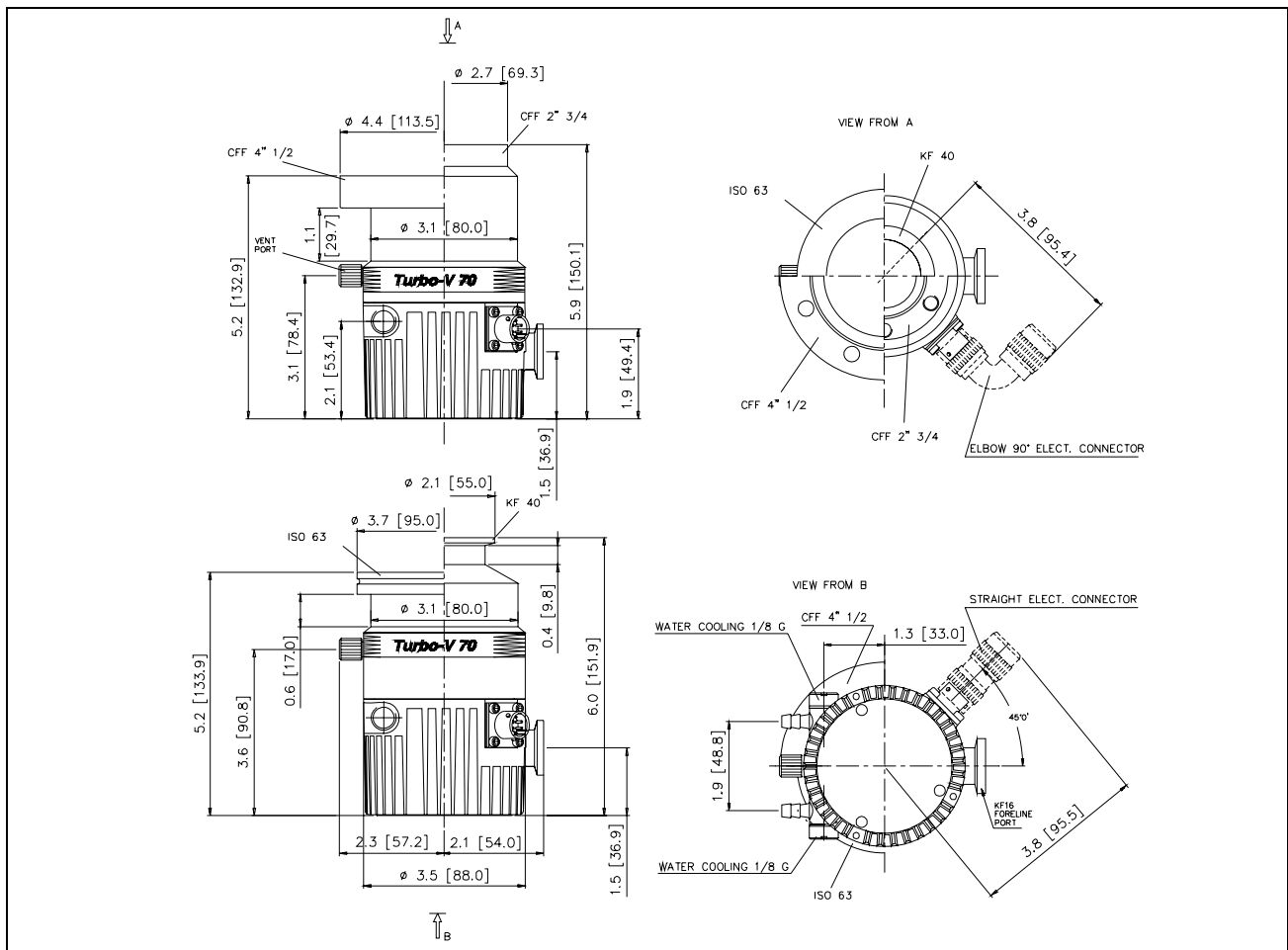
The thermistor sensor, the motor stator windings and the earth are connected to a Turbo-V controller through a 6 pin socket on the side of the pump.

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 or on its base. The connection of the forevacuum on the side of the pump is a KF 16 NW flange.



TECHNICAL SPECIFICATION

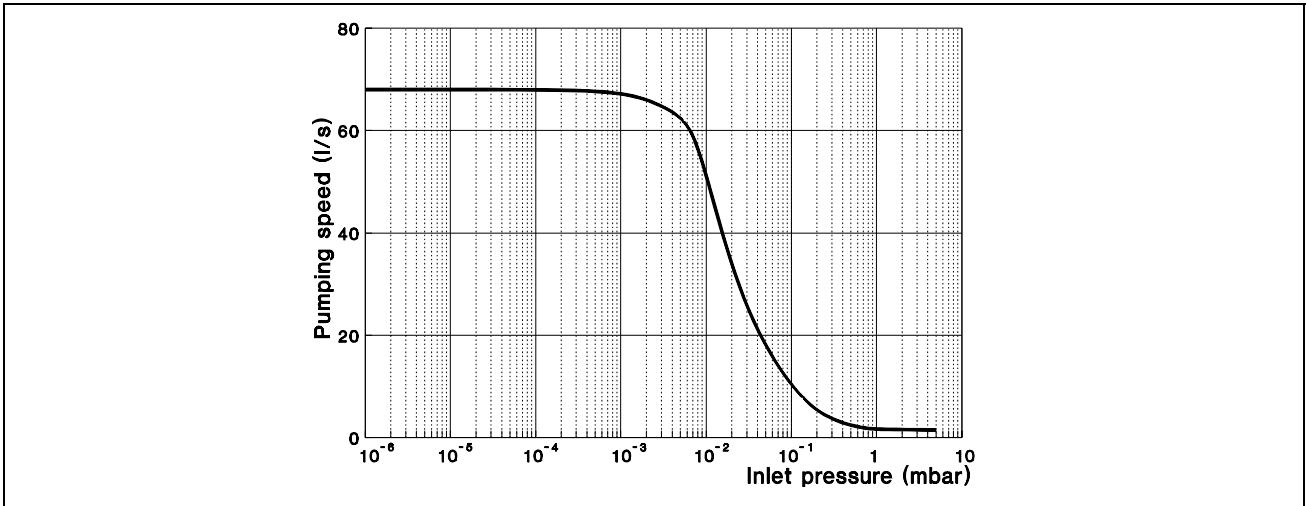


Pumping speed (l/s)	With CF 4.5" or ISO 63: N <sub>2</sub> : 68 l/s He: 60 l/s H <sub>2</sub> : 45 l/s	With CF 2.75" or KF 40 NW: N <sub>2</sub> : 45 l/s He: 50 l/s H <sub>2</sub> : 41 l/s
Compression ratio	N <sub>2</sub> : 5 x 10 <sup>7</sup> He: 4 x 10 <sup>3</sup> H <sub>2</sub> : 4 x 10 <sup>2</sup>	
Base pressure*	1 x 10 <sup>-9</sup> mbar (8 x 10 <sup>-10</sup> Torr)	
Inlet flange	CF 4.5" O.D. ISO63 CF 2.75" O.D. KF 40 NW	
Foreline flange	KF 16 NW	
Rotational speed	75000 RPM	
Start-up time	< 60 seconds	
Recommended forepump	mechanical: Varian DS102	
Operating position	any	
Cooling requirements	Natural air convection Forced air or water optional	

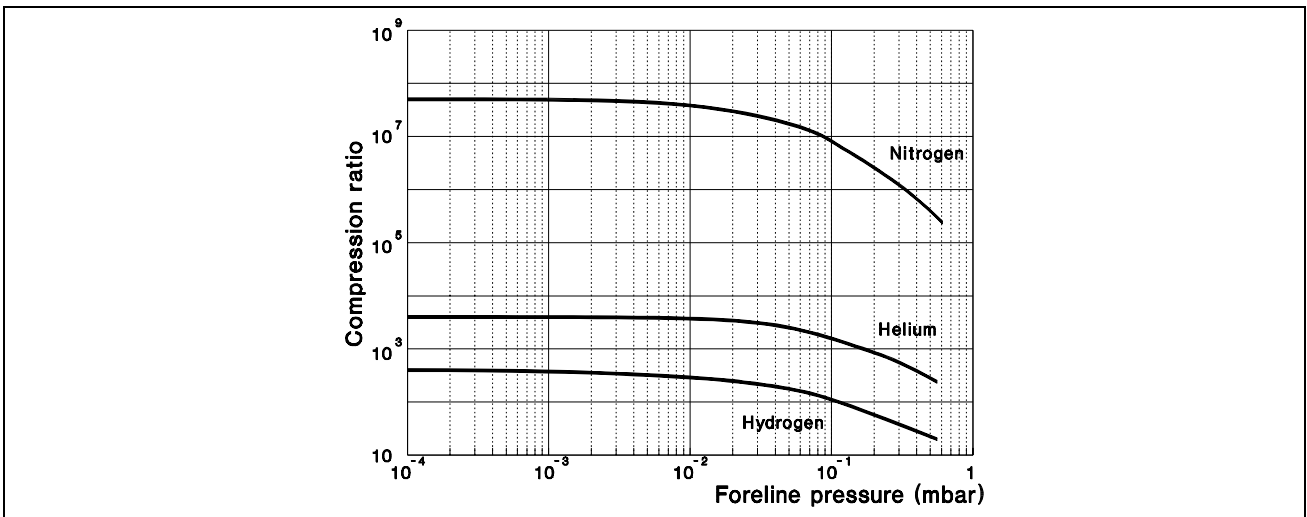
Operating ambient temperature	+ 5° C to + 35° C
Coolant water	flow: 10 l/h (0.05 GPM) temperature: + 10° C to + 30° C pressure: 2 to 4 bar (30 to 60 Psi)
Bakeout temperature	120° C at inlet flange max. (CF flange) 80° C at inlet flange max. (ISO flange)
Vibration level (displacement)	< 0.01 μm at inlet flange
Noise level	45 dB (A) at 1 meter
Input	54 Vac, three phase, 1250 Hz
Lubricant	permanent lubrication
Installation category	II
Pollution degree	2
Storage temperature	- 20° C to + 70° C
Weight kg (lbs)	ISO: 1.6 (6) CFF: 2.3 (4)

\* 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.

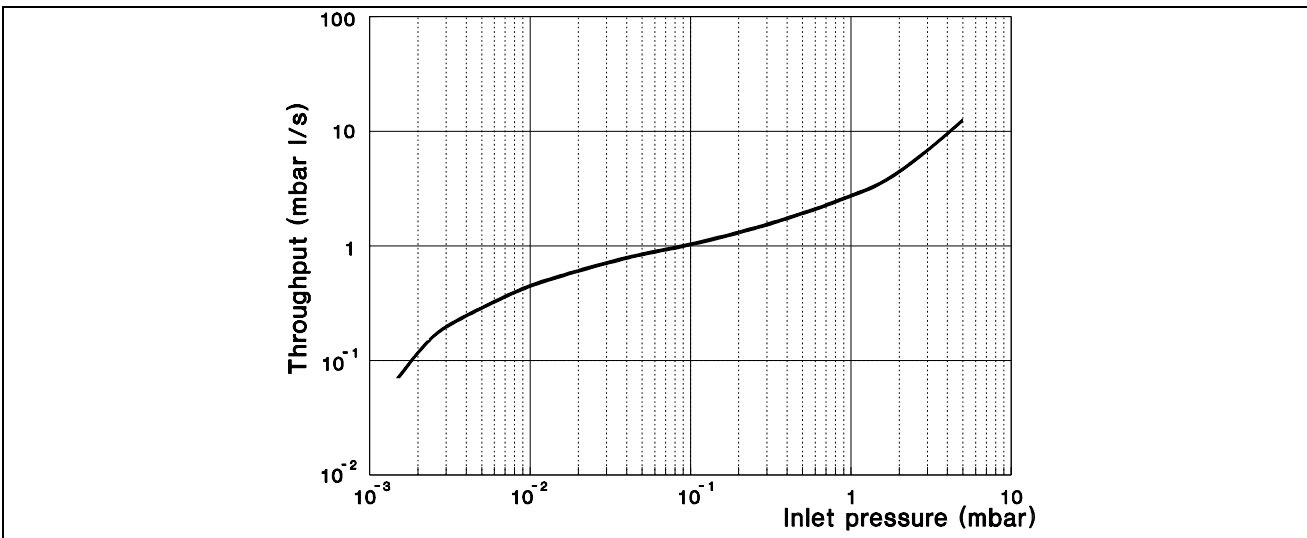




Graph of nitrogen pumping speed against inlet pressure



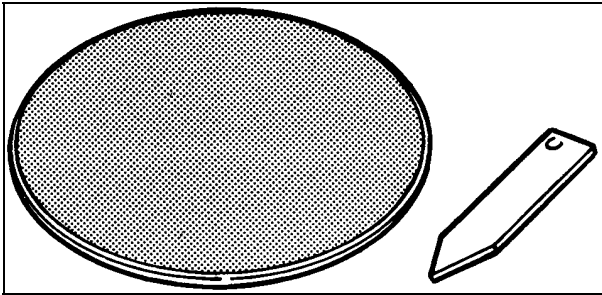
Graph of compression ratio against foreline pressure



Graph of nitrogen throughput against inlet pressure using the recommended mechanical forevacuum pump



**INLET SCREEN INSTALLATION**



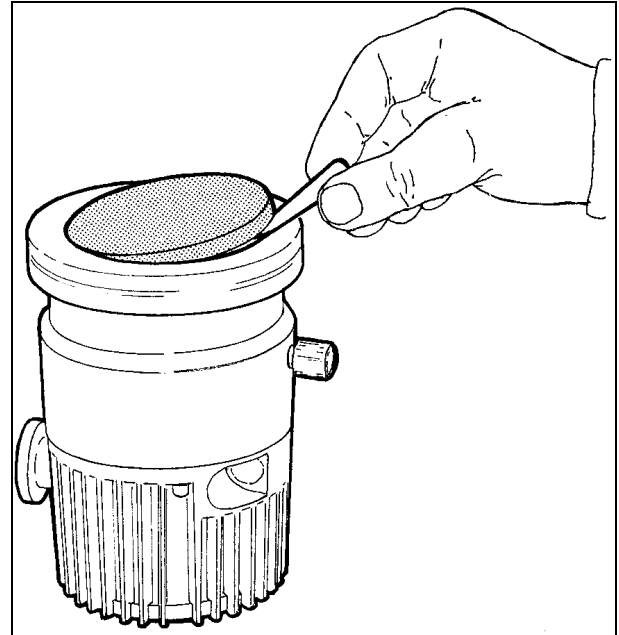
The inlet screens mod. 969-9300 and 969-9309 prevent the blades of the pump from being damaged by debris greater than 0.7 mm diameter.

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

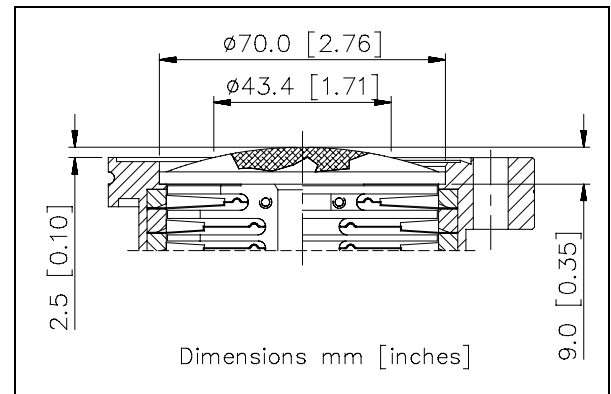
The inlet screen is fitted in the upper part of the pump, as shown in the figure.



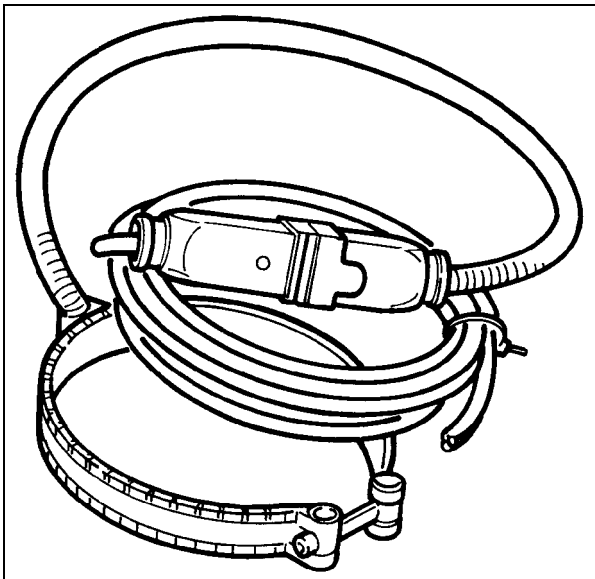
The screen can be mounted on either pump series and is supplied with a small tab for easy removal (see figure).



The following figure shows the overall flange dimensions with the protection screen fitted on pump with ISO flange (on the left side) and pump with 4.5" CFF flange (on the right side).



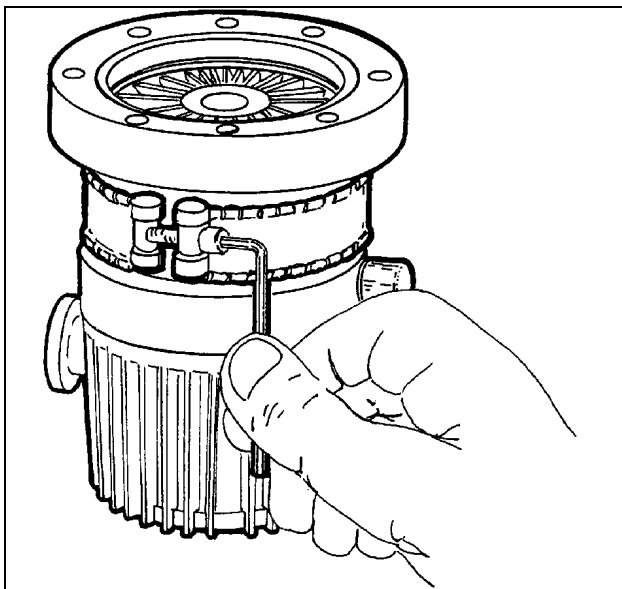
**HEATER BAND INSTALLATION**



The heater band model 969-9801 and 969-9802 can be used to heat the pump casing when a bakeout is needed.

The heater band is applied to the upper part of the pump envelope, as shown in the figure, and heats it to a temperature of about 80° C.

The heater band must be mounted such that there is perfect thermal contact with the pump wall to obtain fast and efficient heating.



Switch on the heater while the turbopump is in operation. If, for any reason, the turbopump body overheats, it will be automatically cut out by the thermistor sensor.

**NOTE**

*The turbopump must be "baked" only when operating with an inlet pressure less than  $10^{-4}$  mbar and with water cooling.*

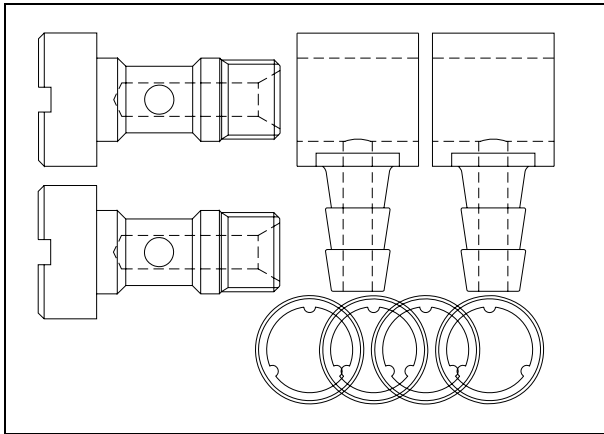
**CAUTION**

If the chamber of the system is "baked" at a high temperature, a shield should be installed to prevent thermal radiation heating the high vacuum flange on the pump. The maximum temperature allowed for the inlet flange is 120° C.

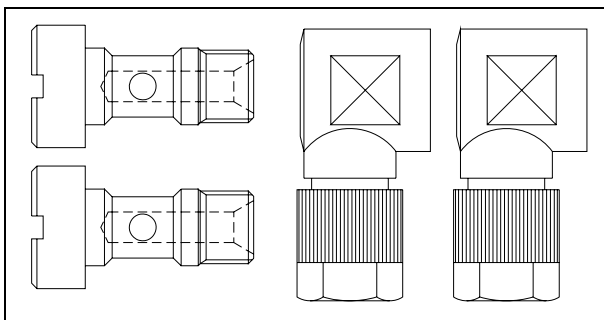
**WATER COOLING KIT INSTALLATION**

Two types of water cooling kits are available to be mounted when the pump is used under heavy load conditions or when air cooling is insufficient.

The two model part numbers are: 969-9337 (metallic model), and 969-9347 (plastic model).



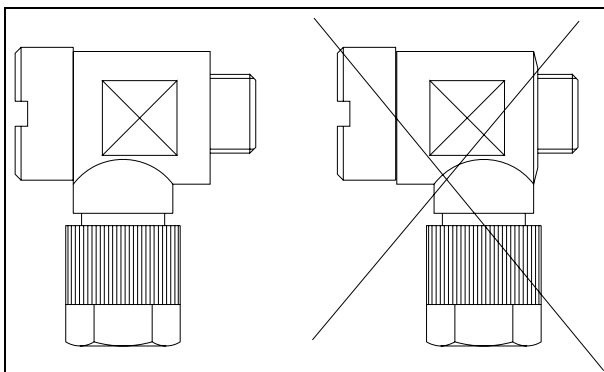
Model 969-9337



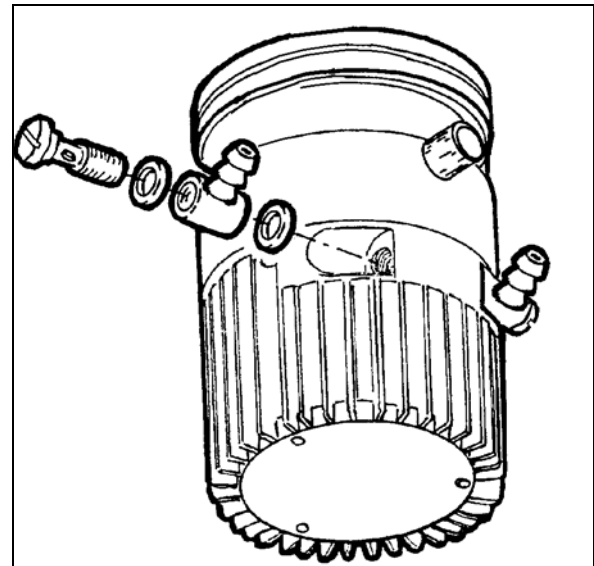
Model 969-9347

**CAUTION**

The items of the plastic model kit must be assembled as shown in the following figure



The assembled kit must be screwed into the suitable holes of the pump body with a recommended closing torque of 5 Nm.



Two 6 mm (1/4") internal diameter rubber or plastic hoses from the water supply must be fitted to the two nozzles.

**NOTE**

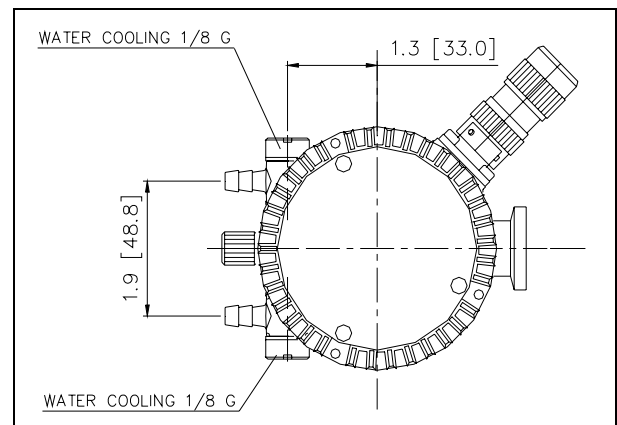
These hoses must be held on the respective nozzles using hose clips to avoid that the tube do not detach during operation.

The plastic model must be screwed into the suitable holes of the pump. Cooling may be carried out either through an open circuit with eventual discharge of the water, or using a closed circuit cooling system. In both cases, the water temperature must be between +10°C and +30°C, with an inlet pressure between 2 and 4 bar. This allows a flow of about 10 l/h.

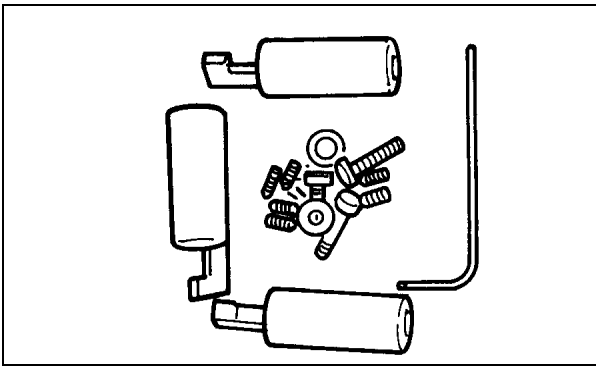
**NOTE**

The water electrical conductance must be  $\leq 500 \mu\text{s/cm}$ . When the conductance is higher, in closed water circuit, the use of up to 20% of Ethyl-Glycole is suggested.

The overall dimensions with the water cooling kit mounted are shown in the figure.



**BASE FIXING KIT INSTALLATION**

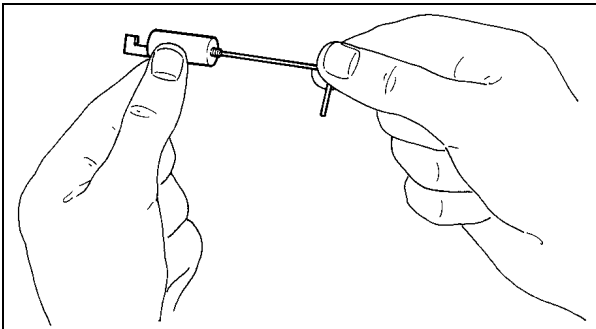


The kit mod. 969-9326 enables the pump to be fixed at the base.

Open the package containing the feet and respective screws.

Insert the three grub screws in the three feed from the rear, as shown in the diagram, and screw them in ensuring that they do not protrude from the other end.

Use the Allen key supplied for this purpose.

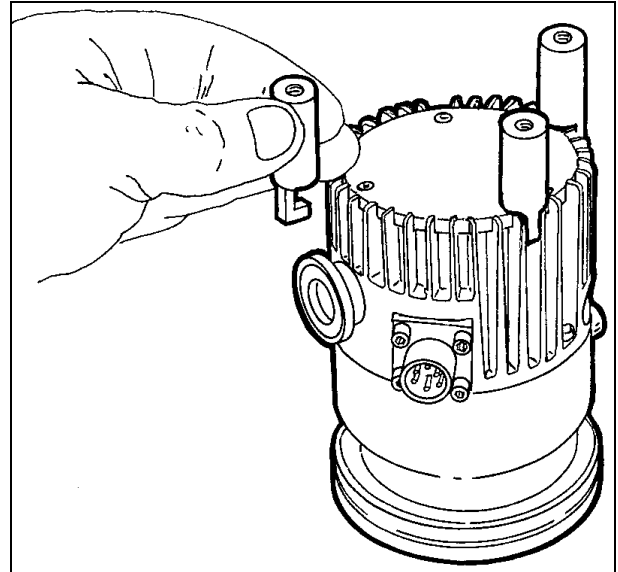


Turn the pump upside down

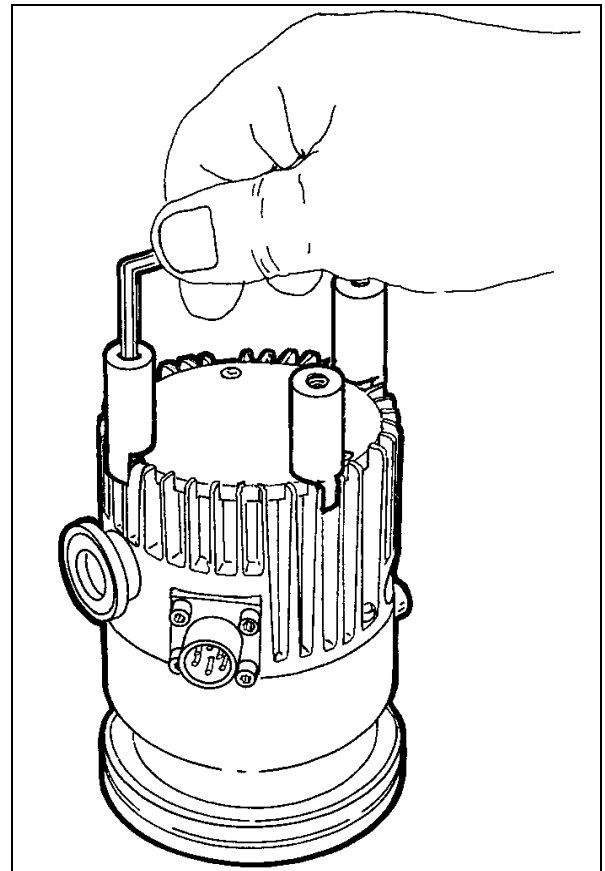
**CAUTION**

Before overturning the pump, remove the protection screen, if fitted.

Insert the three feet as shown in the figure, bearing in mind that the position must be as indicated in the figure.

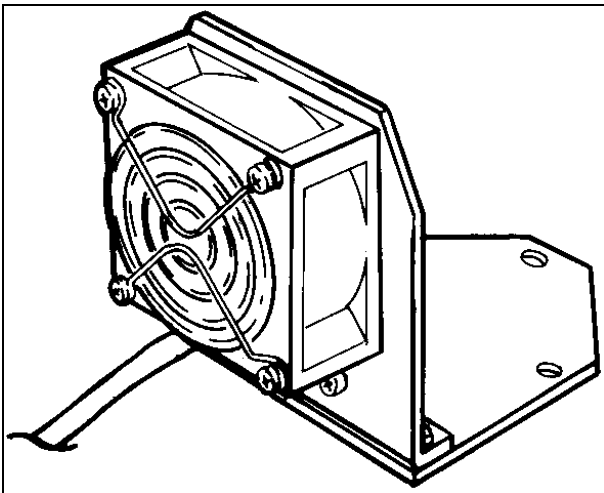


For the feet to the pump by tightening the previously inserted grub screws with the Allen key.



Turn the pump the right way up. Fix the pump to a base by using the three screws provided (M4 thread) in the holes in the three feet.

**AIR COOLING KIT INSTALLATION**



A fan kit model 969-9310 is available for air cooling the pump, when natural air convection is insufficient.

Fan specification:

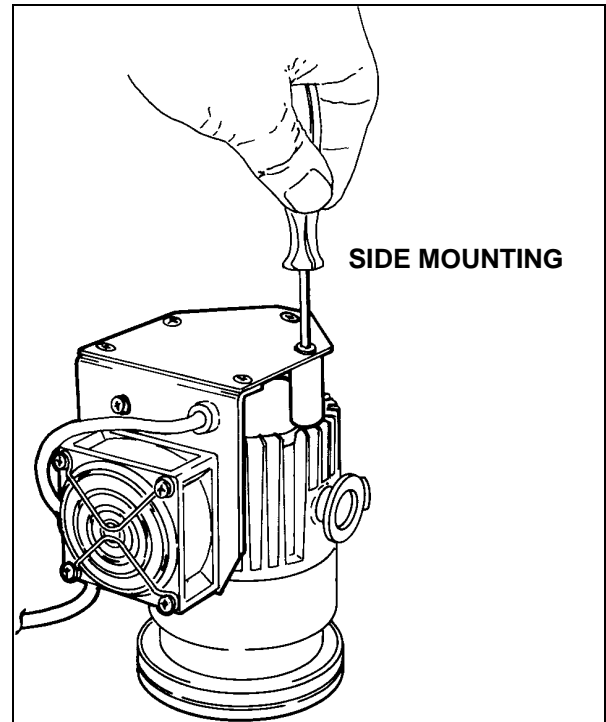
- air flow: 9 l/s (10 CFM)
- input voltage: 24 Vdc
- maximum power: 2.16 W
- dimensions: 60x60 mm (2.36x2.36 inches)

Open the package containing the feet and respective screws and install them as indicated in the installation of the base fixing kit.

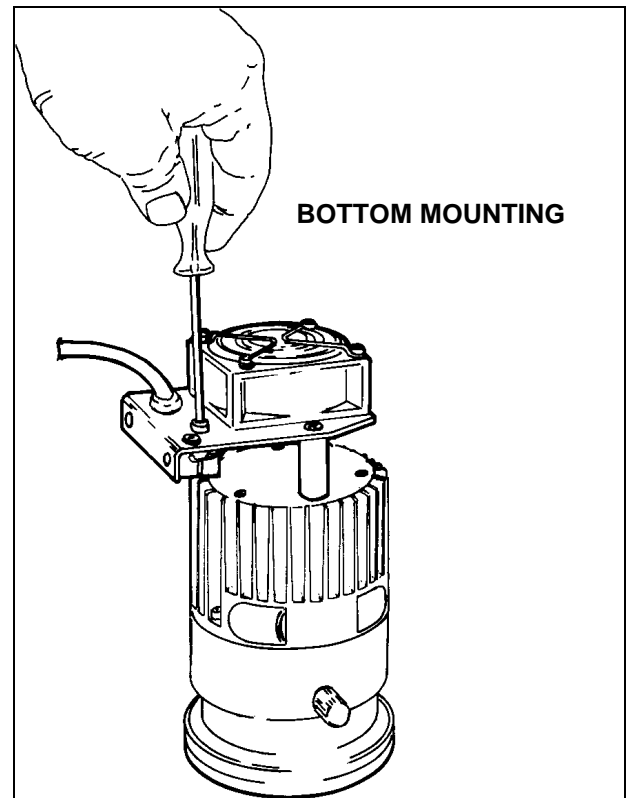
Position the fan on the pump, ensuring that the holes in the plate line up with those in the feet.

Insert the respective washers and screws and tighten with a screwdriver.

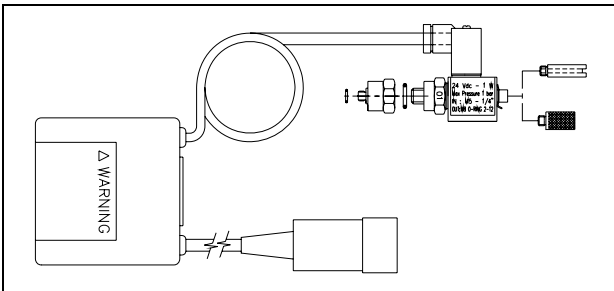
Connect the fan to the controller.



The fan can also be mounted under the pump as shown in the figure.

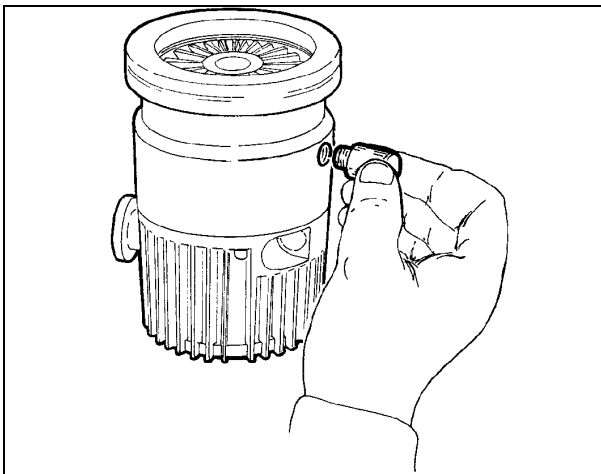


**VENT VALVE INSTALLATION**



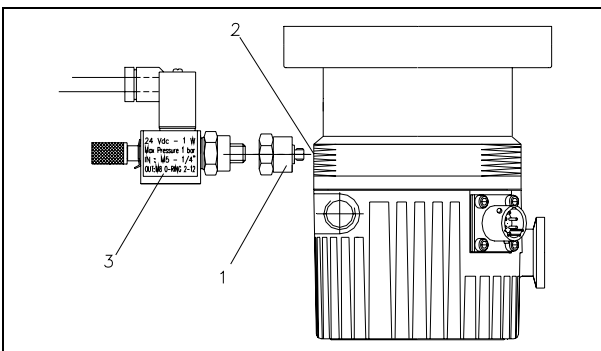
The vent valve mod. 969-9843 enables undesired pump aeration during a temporary power failure (5 sec maximum) to be avoided, and enables an automatic vent operation.

Unscrew the threaded plug.



Screw the adapter (1) into the vent hole (2) of the pump.

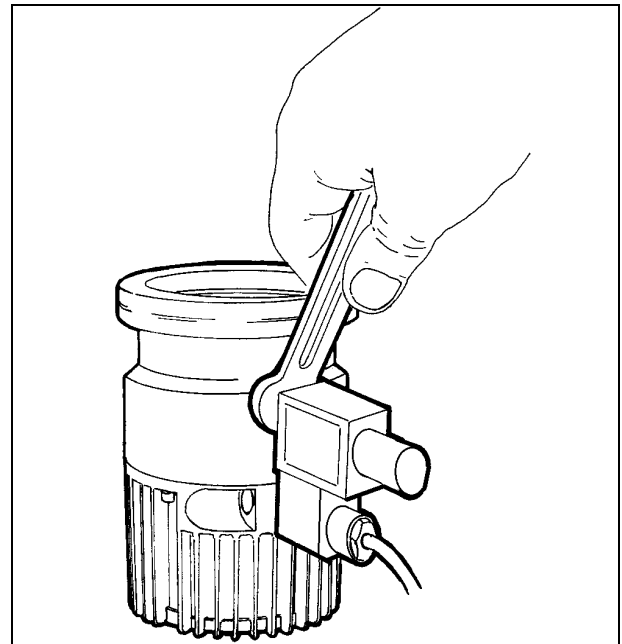
Fix the valve (3) to the adapter (1).



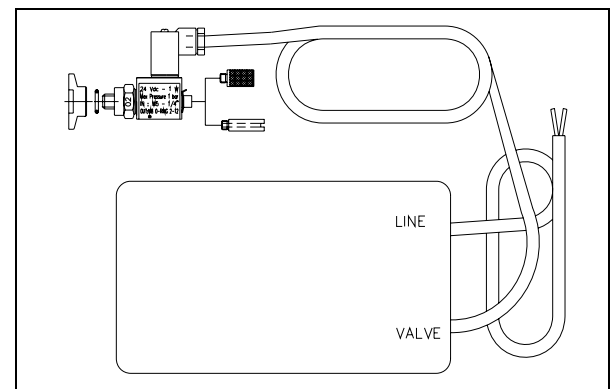
Tighten the valve using a 16 mm hexagonal spanner.

**CAUTION**

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

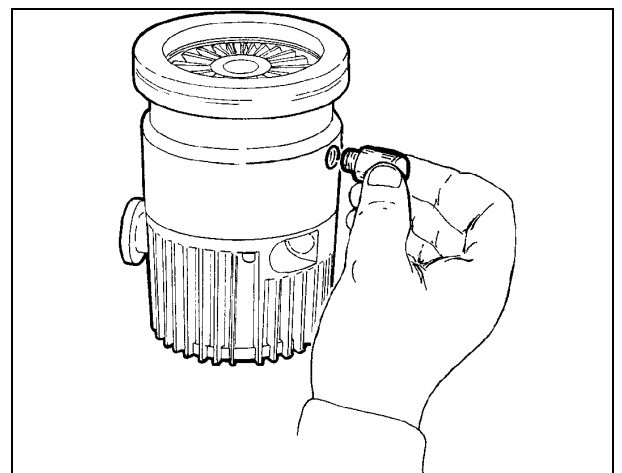


**VENT DEVICE INSTALLATION**



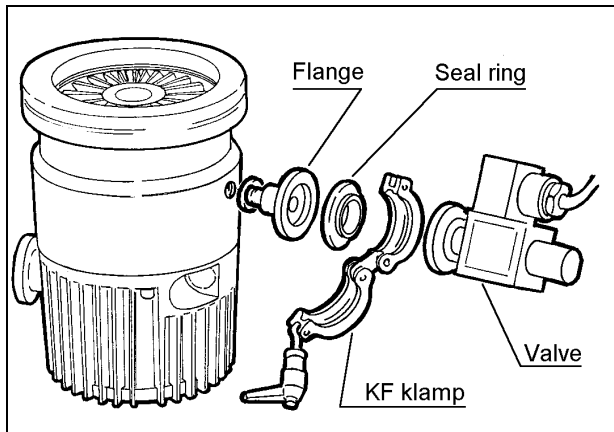
The vent device mod. 969-9831 allows to avoid undesired pump aeration of the pump during a temporary power failure (adjustable time up to 36 min.), and enables an automatic vent operation.

Unscrew and remove the threaded plug.



Screw the flange mod. 969-9109 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.



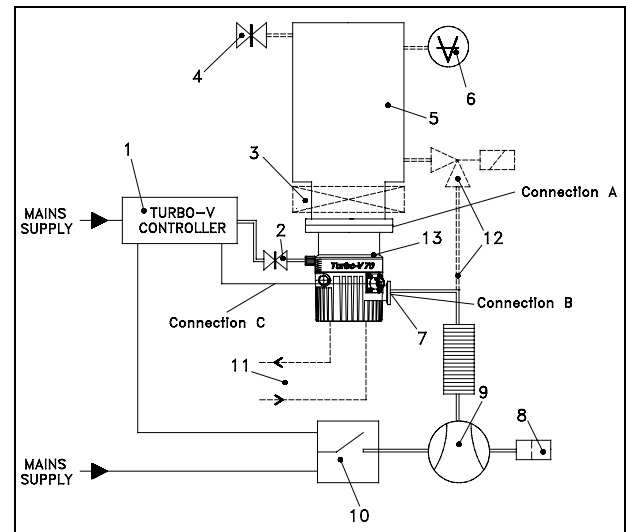
### VIBRATION ISOLATOR INSTALLATION

A vibration damper model 969-9340 for ISO 63 inlet flange version pump is available as accessories.

It typically reduces the vibration transmitted from the Turbo-V 70 pump to the system by a factor of 20.

Please refer to the relevant instruction manual.

### TYPICAL LAYOUT DIAGRAM

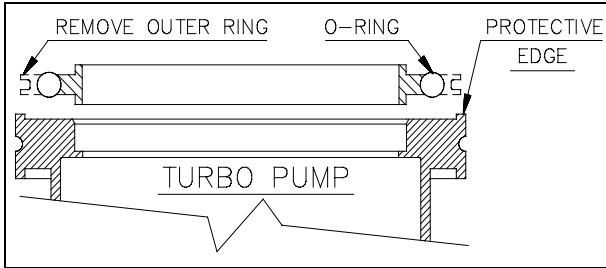


1. Turbo-V controller
2. Vent valve
3. Vacuum pump shut-off valve (optional)
4. System vent valve (optional)
5. Vacuum chamber
6. Ionization gauge
7. Fore-vacuum pump connecting flange
8. Oil mist eliminator
9. Fore-vacuum pump with internal one-way valve
10. Fore-vacuum pump control relay
11. Connection for water cooling
12. Roughing line with valve (optional)
13. Turbopump

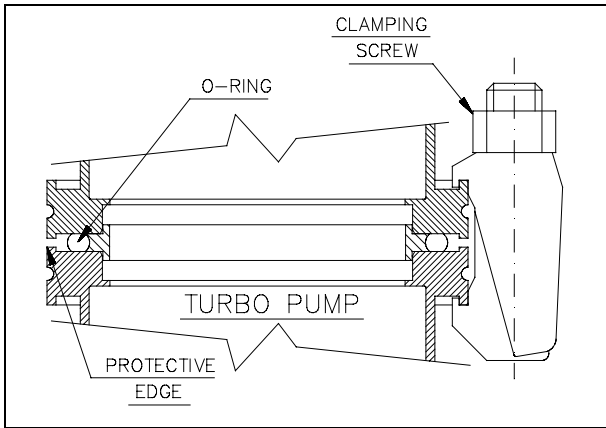


**Connection A - HIGH VACUUM FLANGE**

To connect the Turbo-V70 pump to the ISO inlet flange, remove the outer ring and position the centering ring as shown in the figure.



Then fix the two flanges with the clamps or claws as shown in the figure.



For ConFlat flange connections we recommend using Varian hardware.

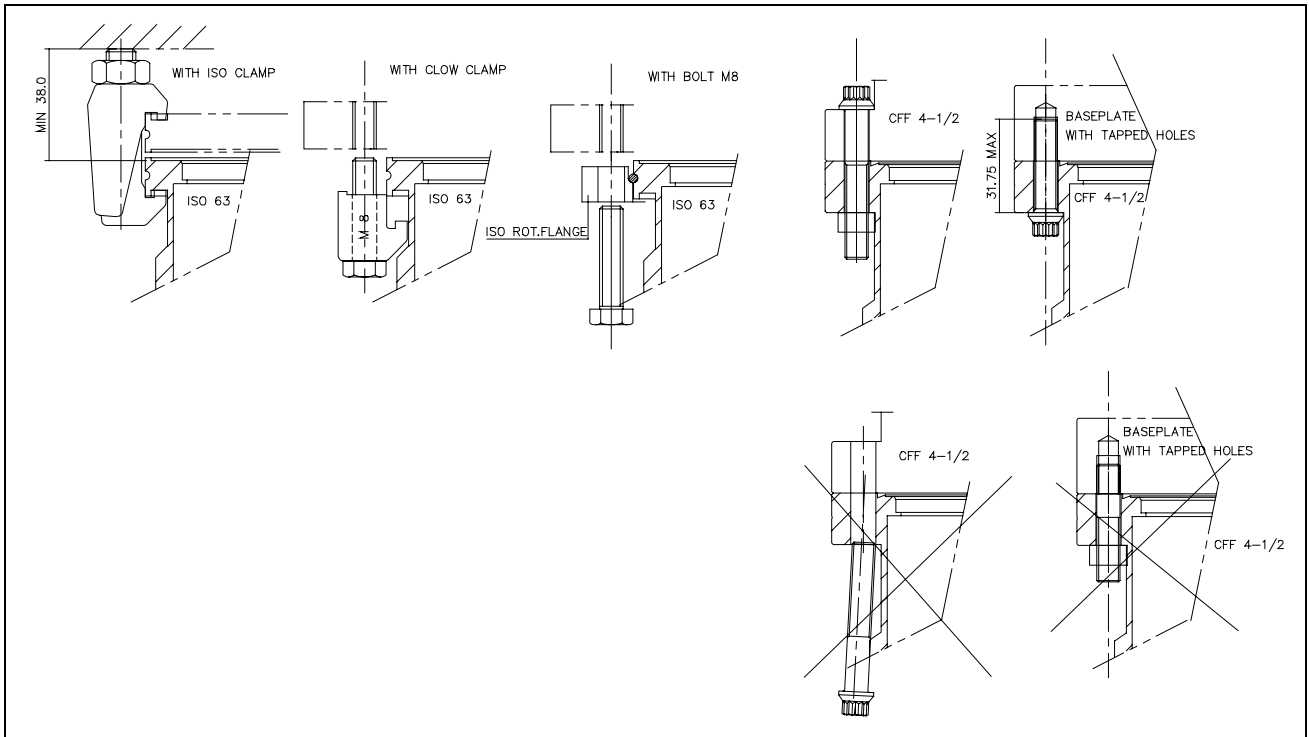
To facilitate assembly and dismantling, apply Felpro C-100 high temperature lubricant to the screw threads protruding from the flange and between the nuts and flange. Note that the 2.75" CF flange has six blind holes.

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**



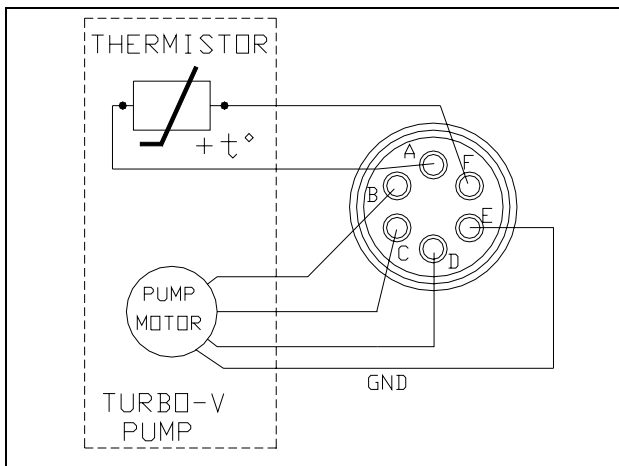
**Connection B - FORE-VACUUM PUMP**

A flange KF 16 NW is available to connect the Turbo-V 70 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-V 70 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 back-streaming.*

**Connection C - ELECTRICAL**



The turbopump is connected to the controller through an 6-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.

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.

**ACCESSORIES**

DESCRIPTION	PART NUMBER
Inlet screen DN40	969-9309
Inlet screen DN63	969-9300
Heather band, 120 V	969-9802
Heather band, 220 V	969-9801
Water cooling kit	969-9337
Plastic water cooling kit	969-9347
Air cooling kit	969-9310
Vibration damper, DN 63 ISO	969-9340
Vent flange NW 10 KF	969-9109
Vent valve with fixed delay time	969-9843
Vent valve with adjustable delay time	969-9831
Mechanical forepump Varian DS102	949-9315
Base fixing kit	969-9326

For a complete overview of Varian's extensive product lines, please refer to the Varian catalog.



# Request for Return



1. A Return Authorization Number (RA#) **WILL NOT** be issued until this Request for Return is completely filled out, signed and returned to Varian Customer Service.
2. Return shipments shall be made in compliance with local and international **Shipping Regulations** (IATA, DOT, UN).
3. The customer is expected to take the following actions to ensure the **Safety** of workers at Varian: (a) Drain any oils or other liquids, (b) Purge or flush all gasses, (c) Wipe off any excess residues in or on the equipment, (d) Package the equipment to prevent shipping damage, (for Advance Exchanges please use packing material from replacement unit).
4. Make sure the shipping documents clearly show the RA# and then return the package to the Varian location nearest you.

**North and South America**  
 Varian Vacuum Technologies  
 121 Hartwell Ave  
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 Fax: +1 781 8609252

**Europe and Middle East**  
 Varian SpA  
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 Phone: +39 011 9979111  
 Fax: +39 011 9979330

**Asia and ROW**  
 Varian Vacuum Technologies  
 Local Office

### CUSTOMER INFORMATION

Company name: .....	
Contact person: Name: .....	Tel: .....
Fax: .....	E-Mail: .....
Ship Method: .....	Shipping Collect #: ..... P.O.#: .....
<u>Europe only:</u> VAT reg. Number: .....	<u>USA only:</u> <input type="checkbox"/> Taxable <input type="checkbox"/> Non-taxable
Customer Ship To: .....	Customer Bill To: .....
.....	.....
.....	.....

### PRODUCT IDENTIFICATION

Product Description	Varian P/N	Varian S/N	Purchase Reference

### TYPE OF RETURN (check appropriate box)

<input type="checkbox"/> Paid Exchange	<input type="checkbox"/> Paid Repair	<input type="checkbox"/> Warranty Exchange	<input type="checkbox"/> Warranty Repair	<input type="checkbox"/> Loaner Return
<input type="checkbox"/> Credit	<input type="checkbox"/> Shipping Error	<input type="checkbox"/> Evaluation Return	<input type="checkbox"/> Calibration	<input type="checkbox"/> Other .....

### HEALTH and SAFETY CERTIFICATION

Varian Vacuum Technologies **CAN NOT ACCEPT** any equipment which contains **BIOLOGICAL HAZARDS** or **RADIOACTIVITY**. Call Varian Customer Service to discuss alternatives if this requirement presents a problem.

The equipment listed above (check one):

**HAS NOT** been exposed to any toxic or hazardous materials

OR

**HAS** been exposed to any toxic or hazardous materials. In case of this selection, check boxes for any materials that equipment was exposed to, check all categories that apply:

Toxic  Corrosive  Reactive  Flammable  Explosive  Biological  Radioactive

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

.....

Print Name: ..... Customer Authorized Signature: .....

Print Title: ..... Date: ...../...../.....

**NOTE:** If a product is received at Varian 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 Varian employees as well as to any third party occurring as a result of exposure to toxic or hazardous materials present in the product.

Do not write below this line

Notification (RA)#: ..... Customer ID#: ..... Equipment #: .....



# Request for Return



## FAILURE REPORT

### TURBO PUMPS and TURBOCONTROLLERS

<input type="checkbox"/> Does not start <input type="checkbox"/> Does not spin freely <input type="checkbox"/> Does not reach full speed <input type="checkbox"/> Mechanical Contact <input type="checkbox"/> Cooling defective	<input type="checkbox"/> Noise <input type="checkbox"/> Vibrations <input type="checkbox"/> Leak <input type="checkbox"/> Overtemperature	<b>POSITION</b> <input type="checkbox"/> Vertical <input type="checkbox"/> Horizontal <input type="checkbox"/> Upside-down <input type="checkbox"/> Other: .....	<b>PARAMETERS</b> Power:                      Rotational Speed: Current:                     Inlet Pressure: Temp 1:                      Foreline Pressure: Temp 2:                      Purge flow: <hr/> <b>OPERATION TIME:</b>
<b>TURBOCONTROLLER ERROR MESSAGE:</b>			

### ION PUMPS/CONTROLLERS

<input type="checkbox"/> Bad feedthrough <input type="checkbox"/> Vacuum leak <input type="checkbox"/> Error code on display	<input type="checkbox"/> Poor vacuum <input type="checkbox"/> High voltage problem <input type="checkbox"/> Other
Customer application:	

### VALVES/COMPONENTS

<input type="checkbox"/> Main seal leak <input type="checkbox"/> Solenoid failure <input type="checkbox"/> Damaged sealing area	<input type="checkbox"/> Bellows leak <input type="checkbox"/> Damaged flange <input type="checkbox"/> Other
Customer application:	

### LEAK DETECTORS

<input type="checkbox"/> Cannot calibrate <input type="checkbox"/> Vacuum system unstable <input type="checkbox"/> Failed to start	<input type="checkbox"/> No zero/high background <input type="checkbox"/> Cannot reach test mode <input type="checkbox"/> Other
Customer application:	

### INSTRUMENTS

<input type="checkbox"/> Gauge tube not working <input type="checkbox"/> Communication failure <input type="checkbox"/> Error code on display	<input type="checkbox"/> Display problem <input type="checkbox"/> Degas not working <input type="checkbox"/> Other
Customer application:	

### PRIMARY PUMPS

<input type="checkbox"/> Pump doesn't start <input type="checkbox"/> Doesn't reach vacuum <input type="checkbox"/> Pump seized	<input type="checkbox"/> Noisy pump (describe) <input type="checkbox"/> Over temperature <input type="checkbox"/> Other
Customer application:	

### DIFFUSION PUMPS

<input type="checkbox"/> Heater failure <input type="checkbox"/> Doesn't reach vacuum <input type="checkbox"/> Vacuum leak	<input type="checkbox"/> Electrical problem <input type="checkbox"/> Cooling coil damage <input type="checkbox"/> Other
Customer application:	

## FAILURE DESCRIPTION

(Please describe in detail the nature of the malfunction to assist us in performing failure analysis):

**NOTA:** Su richiesta questo documento è disponibile anche in Tedesco, Italiano e Francese.

**REMARQUE :** Sur demande ce document est également disponible en allemand, italien et français.

**HINWEIS:** Auf Anfrage ist diese Unterlage auch auf Deutsch, Italienisch und Französisch erhältlich.

## Sales and Service Offices

### France and Benelux

#### Varian s.a.

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Fax: (33) 1 69 86 29 88  
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From Benelux Fax: (31) 118 67 15 69

### Canada

#### Central coordination through:

#### Varian Vacuum Technologies

121 Hartwell Avenue  
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### China

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### Germany and Austria

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### India

#### Varian India PVT LTD

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### Italy

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#### Vacuum Technologies

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#### Varian Vacuum Technologies

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### Mexico

#### Varian, S. de R.L. de C.V.

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### Taiwan

#### Varian Technologies Asia Ltd.

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### UK and Ireland

#### Varian Ltd.

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### United States

#### Varian Vacuum Technologies

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### Other Countries

#### Varian Inc.

#### Vacuum Technologies

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Italy  
Tel: (39) 011 997 9 111  
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### Customer Support & Service:

#### North America

Toll-Free: 1 800 882 7426  
vtl.technical.support@varianinc.com

#### Europe

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#### China

Toll-Free: 800 820 8266  
vtc.technical.support@varianinc.com

#### Japan

Toll-Free: 0120 655 040  
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#### Taiwan

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### Worldwide Web Site, Catalog and Order On-line:

www.varianinc.com

Representative in most countries

