VARIAN

vacuum technologies

TPS-mobile

Models:

969-8400	**969-8401**
969-8402	**969-8403**
969-8404	**969-8405**
969-8406	**969-8411**
969-8412	**969-8413**
969-8416	**969-8417**
969-8418	**969-8419**
969-8420	**969-8421**
969-8422	**969-8423**
969-8424	**969-8425**
969-8426	**969-8427**
969-8428	**969-8429**
969-8430	**969-8431**
969-8432	**969-8433**

87-901-005-01(A)
MARCH 2010

(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*

TPS-mobile

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

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 VARIAN VTT) LOG N° _____

_____

_____

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

VARIAN

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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 Varian before operating the equipment. Varian 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 TPS-mobile is an integrated system with a turbo-molecular pump for high and ultra-high vacuum applications associated with its relevant controller and its primary pump. The system can pump 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 driven by a high-performance 3-phase electric motor.
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 standard protocol:

⚠ WARNING!

The 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

The notes contain important information taken from the text.

STORAGE

In order to guarantee the maximum level of performance and reliability of Varian pumping systems, the following guidelines must be followed:

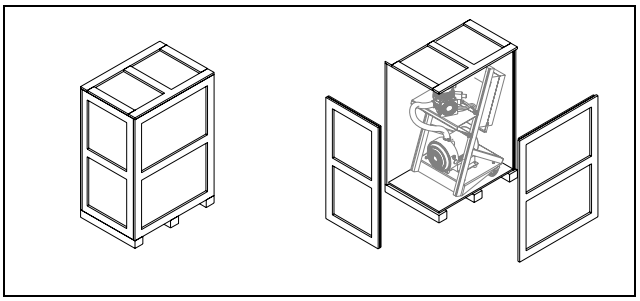
- when shipping, moving and storing pumps, the following environmental specifications should not be exceeded:
  - temperature range: -20 °C to +70 °C
  - relative humidity range: 0 to 95% (non condensing)
- the turbomolecular pumps must be always soft-started when received and operated for the first 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 pumping system has to be returned to the factory. Please contact the local Varian Vacuum Sales and Service representative for informations.

PREPARATION FOR INSTALLATION

The TPS-mobile 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 TPS-mobile. Nevertheless, it is advisable to keep it closed until it is installed in the system, thus preventing any form of pollution by dust.

The models reported on this User Manual are based on the Varian pumping system platform named TPS-mobile, differences introduced by different PNs are related to TMP and Forepump integrated in the specific system and to the main voltage applicable to the system.
The differences between the different TPS-mobile PNs affect just systems performance, operation and using procedure is the same for every TPS-mobile.
The information reported is applicable to the entire platform (all PNs) apart from specific TMP, Forepump or main voltage.

INSTALLATION

CAUTION

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

Do not install or use the pumping system 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
- relative humidity: 0 - 95% (non-condensing)

In the presence of magnetic fields the pumping system must be protected using a ferromagnetic shield.
The TPS-mobile have to be placed on a flat floor. Place the TPS-mobile in a stable position connecting the inlet flange of the turbopump to a counter-flange capable of withstanding a torque of 50 Nm around its axis (directly or by means of a flexible hose).
The turbopump with ISO inlet flange must be connected to the counter-flange by means of clamps. The following table shows, for each fixing device, the necessary number of clamps and the relevant fixing torque.

FLANGE	FIXING DEVICE	N.	FIXING TORQUE
ISO 63	M10 clamps	4	22 Nm
ISO 100 K	M10 clamps	4	22 Nm
ISO 160 K	M10 clamps	4	22 Nm

The turbopump with ConFlat inlet flange must be fixed to the vacuum chamber by means of the appropriate Varian hardware. See the appendix "Technical Information" for a detailed description.

NOTE

The TPS-mobile cannot be fixed by means of its base.

For installation of optional accessories, see "Technical Information".

USE

This paragraph details the fundamental operating procedures.
Make all electrical an pneumatic connections are properly connected 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 pumping system when the turboinlet flange is not connected to the vacuum chamber or is not blanked.

WARNING!

Do not touch the turbopump or any of its accessories during the heating process. The high temperatures may cause burns.

WARNING!

Avoid impacts or harsh movements of the pump when in operation. The bearings may become damaged and damages to the persons or the things could be taken place.

CAUTION

Use inert gas free from dust, particles or humidity (like Nitrogen) for venting the pump. The pressure at the vent port must be less than 2 bar (above atmospheric pressure).

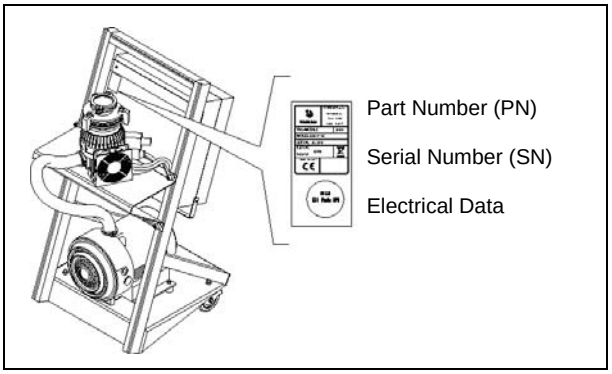
WARNING!

When employing the pump for pumping toxic, flammable, or radioactive gases, please follow the required procedures for each gas disposal.

Do not use the pumping system in presence of explosive gases.

Switching on and Use of TPS-mobile

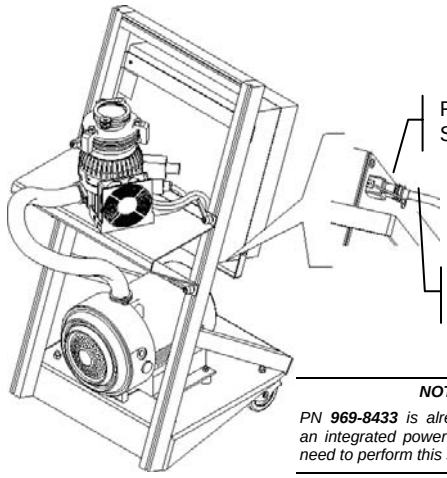
- After TPS-mobile unpacking, perform a brief visual analysis of the system to be sure that no sign of damages due to transportation is present (critical parts are: TMP flange, Forepump fastening brackets, system front panel and the system wheels).
- Check the system voltage on the Varian label stuck on the system electronic units case.



- If the voltage provided by your electrical supplier is compatible with the system voltage, you can connect the provided power cord to the

IEC320 electrical socket on the rear side of the system (see picture). The socket is provided with a retention spring to avoid accidental disconnection of power cord plug – use the spring to fasten the power cord plug.

CONNECTION TO MAIN

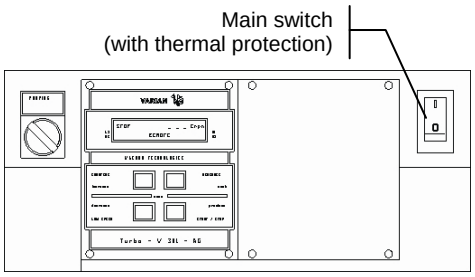


NOTE

*PN **969-8433** is already supplied with an integrated power cord so you don t need to perform this step.*

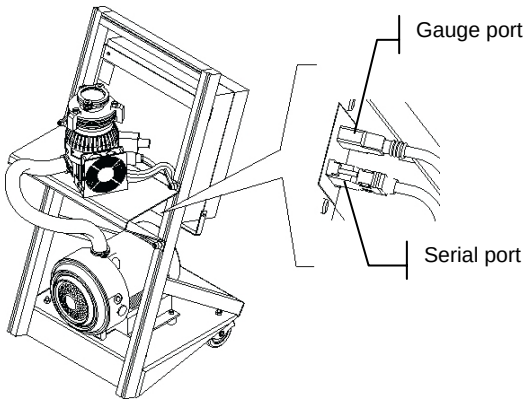
- Provide the correct voltage to the system through the power cord.
- The system is equipped with a main switch (thermal breaker) able to protect the system components against overload or short-circuits . Move the breaker switch to the position “1” to start operating with the TPS-mobile.

SYSTEM ACTIVATION



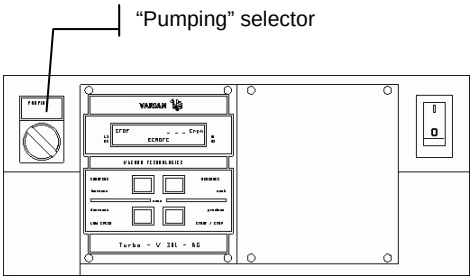
- The system activation by means of the Main Switch provides voltage to TMP controller but both TMP and Foreline pump continue to be switched off.
  The system activation allows the TMP controller to start reading the pressure data through the optional FRG-700 Full Range Gauge if it is connected to the gauge connection port on the rear side of the system.

GAUGE CONNECTION



- It is possible to start pumping by means of the selector named “Pumping”. As soon as the Pumping selector is moved to the position “1” the TMP and Foreline pump will be switched on.

START PUMPING



NOTE

PNs 9698404, 9698405, 9698406, 9698419, 9698430, 9698431, 9698432, 9698433, are not equipped with the selector named “Pumping”, the same function is provided by the pushbutton Start/Stop on the TMP controller.

TPS-mobile switching off:

- You can switch the pumps off by using the “pumping” selector (moving it to position “0”) – the TMP controller will remain ON and if a gauge is connected to the system it will be possible to continue reading the pressure even if pumps are off.
- An alternative mode for switching the pumps off is the use of Main Switch (move it to position “0”) – The system will be completely switched off and no reading or operation will be possible.

Emergency Stop

If an emergency situation occurs is possible to switch the pumps and the controller off, even disconnecting the mains cable (emergency stop).

MODIFIED STANDARD

TPS-mobile platform is suited to be tailored in according to many different needs so special *TPS-mobile* PNs can be released. Except some specific cases provided with a specific documentation this User Manual is applicable to all special unit marked as MXXXX (i.e. 969-8420M2001).

MAINTENANCE

The TPS-mobile does not require any maintenance (except Tip-seal replacement) for versions equipped with scroll pumps and oil filling-up/change for versions with Rotary Vane Pumps. 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 Varian service center.

NOTE

Before returning the system to the constructor for repairs, 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.

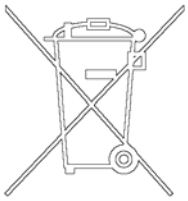
DISPOSAL

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.



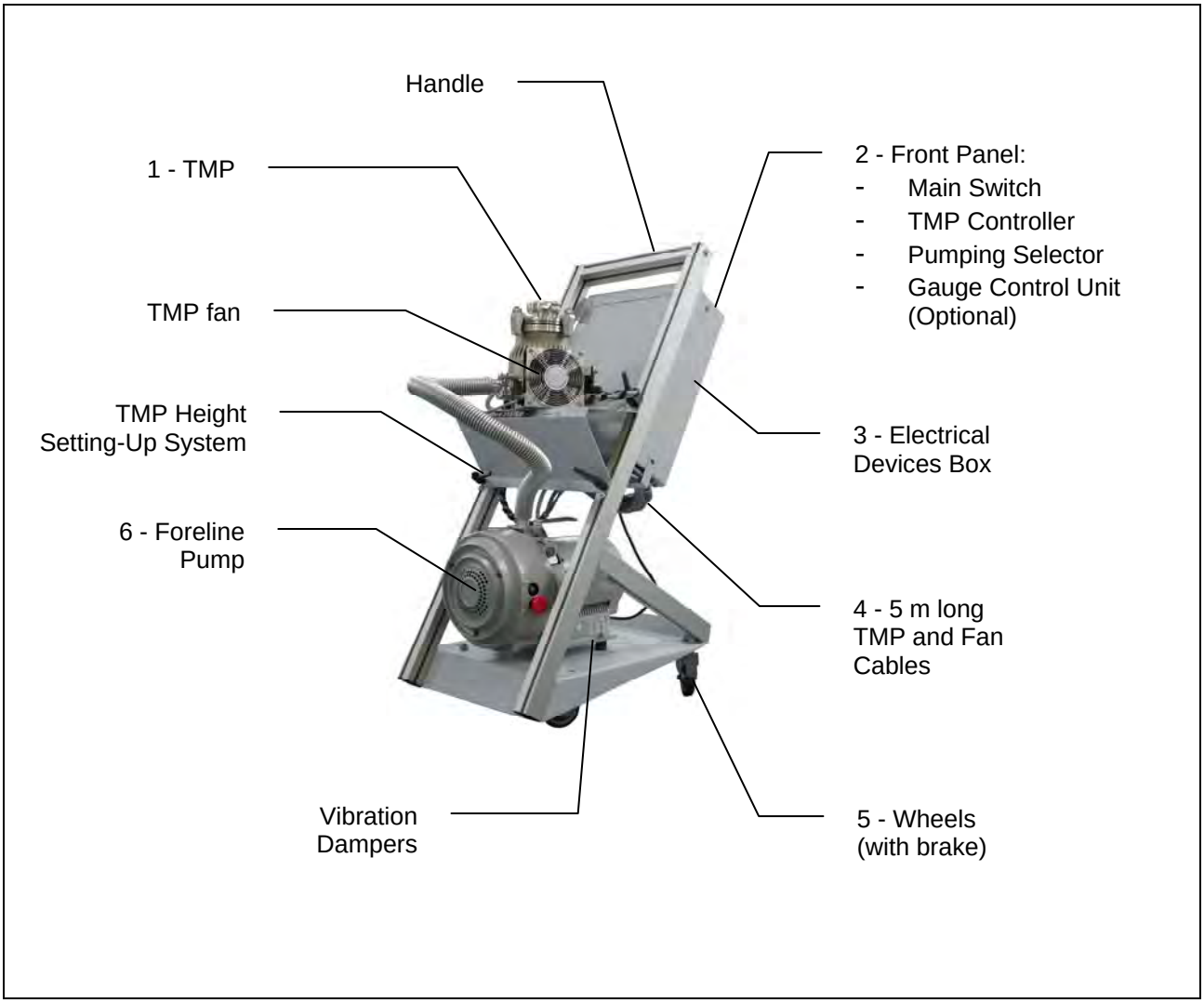
DESCRIPTION OF THE TPS-MOBILE

The TPS-mobile pumping system consists of a turbomolecular pump with an integrated controller and a forepump. It is available in twenty-eight models which differ in the TPM size, high vacuum flange, foreline pump and voltage.

The models are:

TPS-mobile 220 V			
P/N	**TMP**	**Flange**	**Foreline**
969-8413	TV81M	ISO63	DS42
969-8411	TV81M	ISO63	DS102
969-8416	TV81M	ISO63	IDP3
969-8412	TV81M	ISO63	SH110
969-8403	TV301	ISO100	DS102
969-8400	TV301	ISO100	DS302
969-8417	TV301	ISO100	DS402
969-8418	TV301	ISO100	IDP3
969-8402	TV301	ISO100	SH110
969-8401	TV301	ISO100	TS300VPI
969-8405	TV551	CFF8	DS302
969-8419	TV551	CFF8	DS402
969-8404	TV551	CFF8	TS300
969-8406	TV551	CFF8	TS600

TPS-mobile 110 V			
P/N	**TMP**	**Flange**	**Foreline**
969-8420	TV81M	ISO63	DS42
969-8421	TV81M	ISO63	DS102
969-8422	TV81M	ISO63	IDP3
969-8423	TV81M	ISO63	SH110
969-8424	TV301	ISO100	DS102
969-8425	TV301	ISO100	DS302
969-8426	TV301	ISO100	DS402
969-8427	TV301	ISO100	IDP3
969-8428	TV301	ISO100	SH110
969-8429	TV301	ISO100	TS300VPI
969-8430	TV551	CFF8	DS302
969-8431	TV551	CFF8	DS402
969-8432	TV551	CFF8	TS300
969-8433	TV551	CFF8	TS600



1 - Turbopump Description

The turbopump consists of a high frequency motor driving a turbine fitted with many bladed stages and Macrotorr stages. The turbine rotates in an anticlockwise direction when viewed from the high vacuum flange end.
The turbine is made of high-strength, light aluminum alloy, and is machined from a single block of aluminum. The turbine blades have five different angles, from 44° to 12°, while the Macrotorr stages are in the form of 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 fabricated in 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 fabricated in aluminum alloy.
During normal operation, the motor functions with a power feed at 54 Vac three-phase at 1330 Hz (TV81M), 963 Hz (TV301) or 700 Hz (TV551). To reduce losses during start-up to a minimum, the frequency increases according to a ramp with a higher initial voltage/frequency ratio.
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.

2 - Front Panel

The TPS-mobile front Panel is the system user interface where all controller elements are located.
In particular, it contains:

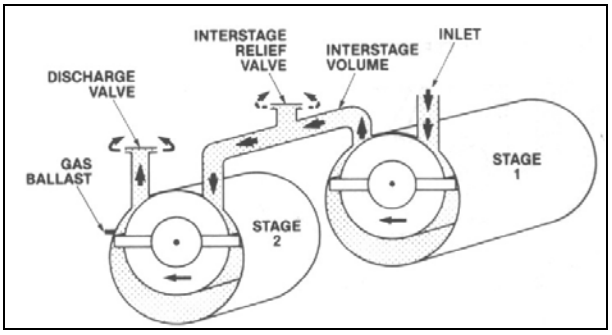
- Main Switch
  It is a protection thermal switch able to provide electrical power to the system protecting all the devices integrated in the system against overcurrents or shortcircuits.
  The nominal current of the switch is fitted in according to the system configuration (see configuration tables).
  By means of the Main Switch you provide power to the system activating the TMP controller and its ability to read pressure by means of an optional gauge (if connected).
- TMP Controller
  The integrated controller is a solid-state frequency converter which is driven by a single chip microcomputer and is composed of a PCB which includes a power supply with a 3-phase AC output, analogical and input/output section, microprocessor and digital section. The controller recognizes the mains presence and converts the single phase AC mains supply into a 3-phase, medium frequency output which is required to power the pump.
- Pumping Selector
  TPS-mobile versions equipped with TV81M or TV301 include an electrical selector named “Pumping” on the left side of the front panel.
  It is aimed to pumps management (ON/OFF). By means of “Pumping” selector you are able to start pumping; activating the pumping effect of TMP an Foreline pump.
  TPS-mobile equipped with TV551 is not provided with the “Pumping” selector; the same function is provided by the “ON” button of the TMP controller.
- Gauge Control Unit (optional)
  If needed is possible to order a special version of TPS-mobile equipped with an optional gauge controller named Varian XGS-600.
  By means of XGS-600 is possible to manage a couple of gauges to monitor pressure on system foreline by means of a convector gauge ($1x10^{-3}$ Torr to atm) and high vacuum pressure by means of a IMG-100 ($1x10^{-3}$ to $5x10^{-9}$ Torr).
- 3 - Electrical Devices Box
  It is a metal box containing all the electrical equipments useful to manage the vacuum components integrated in the TPS-mobile.
  The rear panel of the Electrical Box is equipped with:
  - Main socket – IEC 320 electrical socket for pumping system power cable connection (except the model 969-8433 equipped with an integrated power cable).
  - Gauge Port – Fireware connector for active gauge FRG-700 connection (see Chapter “Gauge Connector”).
- 4 - 5m TMP and Fan Cables
  On the rear side of Electrical Box 5 m long TMP and Fan cables are wrapped up.
  They are useful for the TMP and its fan and operation far from the pumping system.
- 5 - Wheels
  TPS-mobile is provided with four wheels allowing the system to be moved and located where vacuum is needed.
  Two out of four wheels are provided with a breaking system to avoid accidental moving of the pumping system during operation.

6 - Foreline Pumps Description

TPS-mobile can be equipped both with a dry pump (scroll type) or with an oil sealed Rotary Vane Pump.
TPS-mobile versions equipped with a scroll pump are free of contaminating agents and therefore are suitable for applications requiring “clean” vacuum.
TPS-mobile versions equipped with scroll pumps are: 969-8416, 969.8412, 969-8418, 969-8402, 969-8401, 969-8404, 969-8406, 969-8422, 969-8423, 969-8427, 969-8428, 969-8429, 969-8432 and 969-8433.
The scroll pump principle of operation is described here following.

Scroll pump creates vacuum using a simple dual scroll mechanism in which one of the nested scrolls orbits about the other, creating moving zones of captured gas.
Gas enters the scroll set at the perimeter and is displaced and compressed toward the center hub where it is exhausted.

TPS-mobile versions equipped with RVPs are: 969-8413, 969-8411, 969-8403, 969-8400, 969-8417, 969-8405, 969-8419, 969-8420, 969-8421, 969-8424, 969-8425, 969-8426, 969-8430 and 969-8431.



A metal rotor is located (eccentric) into a round pumping chamber.
Two sliding vanes are placed in the rotor. The vanes are pushed toward the stator wall either by springs. To make high-pressure ratios achievable, the principal requirement of these pumps is that the inlet and discharge always remain separated. This separation is achieved placing the rotor in close proximity to the stator, the near contact line being placed between the inlet and discharge, and spring loading the blades so that they remain in contact with the stator. In addition, oil is used to seal the end surfaces of the vanes and along the entire length of the two vanes, as well as across the ends of the rotor.
As said, the rotor in such pumps are placed inside the stator. Oil is used in these pumps for a variety of purposes: to effect a seal between the inlet and discharge areas, to lubricate, to fill the space under the discharge valve, to serve as a heat transfer medium and keep the rotor temperature within acceptable range, to flush particulate matter out of the pump.

TECHNICAL SPECIFICATION

Characteristic	969-8412	969-8416	969-8411	969-8413
Turbo Pump	TV81M	TV81M	TV81M	TV81M
TMP Flange	ISO63	ISO63	ISO63	ISO63
Forepump	SH110	IDP3	DS102	DS42
Voltage	220V / 50Hz			
Base Pressure *	1x10-8mbar (7.5x10-9Torr)			
N2 Pumping Speed (L/s)	77			
He Pumping Speed (L/s)	65			
H2 Pumping Speed (L/s)	50			
TMP Rotational Speed	80000 rpm			
Start-up time	<1 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 80°C on Inlet Flange			
Protection Breaker	14A			
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	T-Plus			
Storage Temperature	-20°C to +70°C			

Characteristic	969-8423	969-8422	969-8421	969-8420
Turbo Pump	TV81M	TV81M	TV81M	TV81M
TMP Flange	ISO63	ISO63	ISO63	ISO63
Forepump	SH110	IDP3	DS102	DS42
Voltage	110V / 60Hz			
Base Pressure *	1x10-8mbar (7.5x10-9Torr)			
N2 Pumping Speed (L/s)	77			
He Pumping Speed (L/s)	65			
H2 Pumping Speed (L/s)	50			
TMP Rotational Speed	80000 rpm			
Start-up time	<1 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 80°C on Inlet Flange			
Protection Breaker	14A			
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	T-Plus			
Storage Temperature	-20°C to +70°C			

** 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.*

NOTE

When the TPS-mobile has been stored at a temperature less than 5°C, wait until the TPS-mobile has reached the above mentioned temperature.

Characteristic	969-8406	969-8404	969-8419	969-8405
Turbo Pump	TV551	TV551	TV551	TV551
TMP Flange	CFF8	CFF8	CFF8	CFF8
Forepump	TS600	TS300	DS402	DS302
Voltage	220V / 50Hz			
Base Pressure *	1x10-9mbar (7.5x10-10Torr)			
N2 Pumping Speed (L/s)	550			
He Pumping Speed (L/s)	600			
H2 Pumping Speed (L/s)	510			
TMP Rotational Speed	40000 rpm			
Start-up time	<5 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 120°C on Inlet Flange			
Protection Breaker	14A			
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	None			
Storage Temperature	-20°C to +70°C			

Characteristic	969-8433	969-8432	969-8431	969-8430
Turbo Pump	TV551	TV551	TV551	TV551
TMP Flange	CFF8	CFF8	CFF8	CFF8
Forepump	TS600	TS300	DS402	DS302
Voltage	110V / 60Hz			
Base Pressure *	1x10-9mbar (7.5x10-10Torr)			
N2 Pumping Speed (L/s)	550			
He Pumping Speed (L/s)	600			
H2 Pumping Speed (L/s)	510			
TMP Rotational Speed	40000 rpm			
Start-up time	<5 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 120°C on Inlet Flange			
Protection Breaker	25A	20A	14A	14A
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	None			
Storage Temperature	-20°C to +70°C			

** 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.*

NOTE

When the TPS-mobile has been stored at a temperature less than 5°C, wait until the TPS-mobile has reached the above mentioned temperature.

Characteristic	969-8401	969-8402	969-8418	969-8417
Turbo Pump	TV301	TV301	TV301	TV301
TMP Flange	ISO100	ISO100	ISO100	ISO100
Forepump	TS300VPI	SH110	IDP3	DS402
Voltage	220V / 50Hz			
Base Pressure *	1x10-8mbar (7.5x10-9Torr)			
N2 Pumping Speed (L/s)	250			
He Pumping Speed (L/s)	220			
H2 Pumping Speed (L/s)	200			
TMP Rotational Speed	56000 rpm			
Start-up time	<3 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 80°C on Inlet Flange			
Protection Breaker	14A			
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	T-Plus			
Storage Temperature	-20°C to +70°C			

Characteristic	969-8400	969-8403	969-8429	969-8428
Turbo Pump	TV301	TV301	TV301	TV301
TMP Flange	ISO100	ISO100	ISO100	ISO100
Forepump	DS302	DS102	TS300VPI	SH110
Voltage	220V / 50Hz	220V / 50Hz	110V / 60Hz	110V / 60Hz
Base Pressure *	1x10-8mbar (7.5x10-9Torr)			
N2 Pumping Speed (L/s)	250			
He Pumping Speed (L/s)	220			
H2 Pumping Speed (L/s)	200			
TMP Rotational Speed	56000 rpm			
Start-up time	<3 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 80°C on Inlet Flange			
Protection Breaker	14A			
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	T-Plus			
Storage Temperature	-20°C to +70°C			

** 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.*

NOTE

When the TPS-mobile has been stored at a temperature less than 5°C, wait until the TPS-mobile has reached the above mentioned temperature.

Characteristic	969-8427	969-8426	969-8425	969-8424
Turbo Pump	TV301	TV301	TV301	TV301
TMP Flange	ISO100	ISO100	ISO100	ISO100
Forepump	IDP3	DS402	DS302	DS102
Voltage	110V / 60Hz			
Base Pressure *	1x10-8mbar (7.5x10-9Torr)			
N2 Pumping Speed (L/s)	250			
He Pumping Speed (L/s)	220			
H2 Pumping Speed (L/s)	200			
TMP Rotational Speed	56000 rpm			
Start-up time	<3 min.			
Operating Position	On a flat floor			
Ambient Temperature	+5°C to +35°C			
Bakeout Temperature	max 80°C on Inlet Flange			
Protection Breaker	14A			
Compliance with	SEE “CE” CERTIFICATE OF CONFORMITY			
Installation category	II			
Pollution Degree	2			
Serial Communication kit	T-Plus			
Storage Temperature	-20°C to +70°C			

** 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.*

NOTE

When the TPS-mobile has been stored at a temperature less than 5°C, wait until the TPS-mobile has reached the above mentioned temperature.

Conformity Certificate

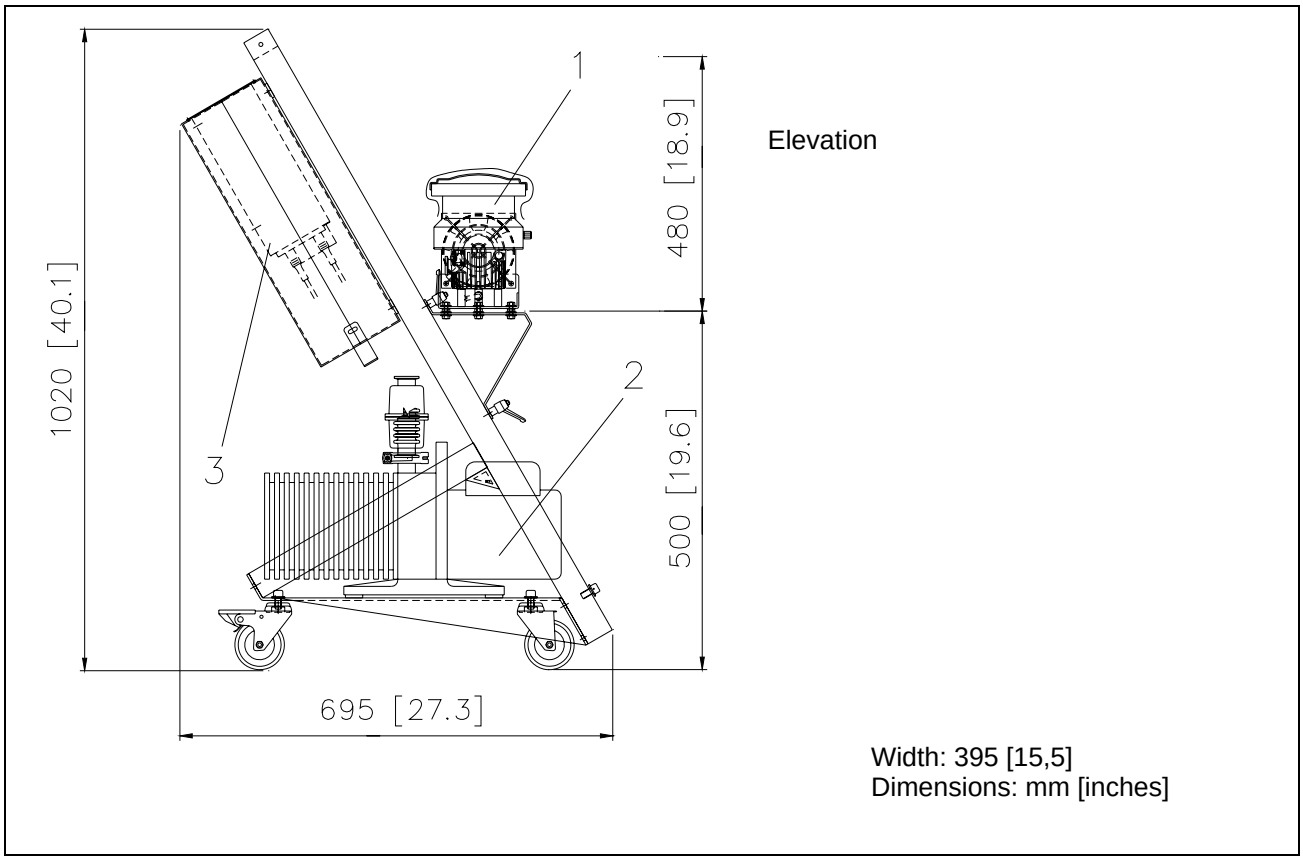
Varian S.p.A. declares, under its own responsibility, that this product complies with the essential safety requirements indicated by the Machinery Directive 2006/42/CE, by Electromagnetic Compatibility Directive 2004/108/CE and by the Low Voltage Directive 2006/95/CE. The compliance of the above mentioned product with the standards of Table 1 is hereby guaranteed.

TABLE 1

EN 61010-1	2001	Safety requirements for electrical equipment for measurement control and laboratory use
EN 61326-1	2006	Electrical equipment for measurement control and laboratory use EMC requirements
EN 1012-2	2009	Compressors and vacuum pumps - Safety requirements - Part 2: vacuum pumps
EN 12100-1	2009	Safety of machinery - Basic concepts, general principles for design – Part 1 : basic terminology, methodology
EN 12100-2	2009	Safety of machinery - Basic concepts, general principles for design – Part 2 : technical principles

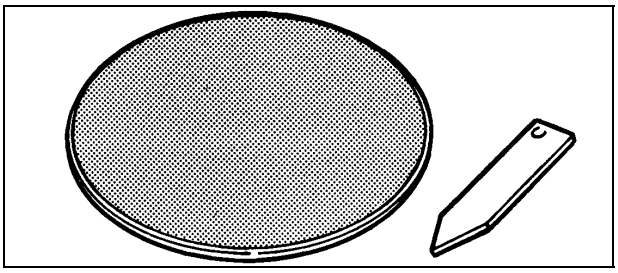
TPS-MOBILE OUTLINE

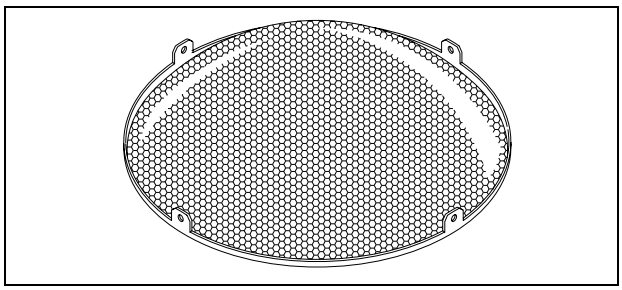
The following figure shows the TPS-mobile outline.



TURBO PUMPING SYSTEM CONNECTION

Vacuum Inlet Flange
Inlet Screen Installation





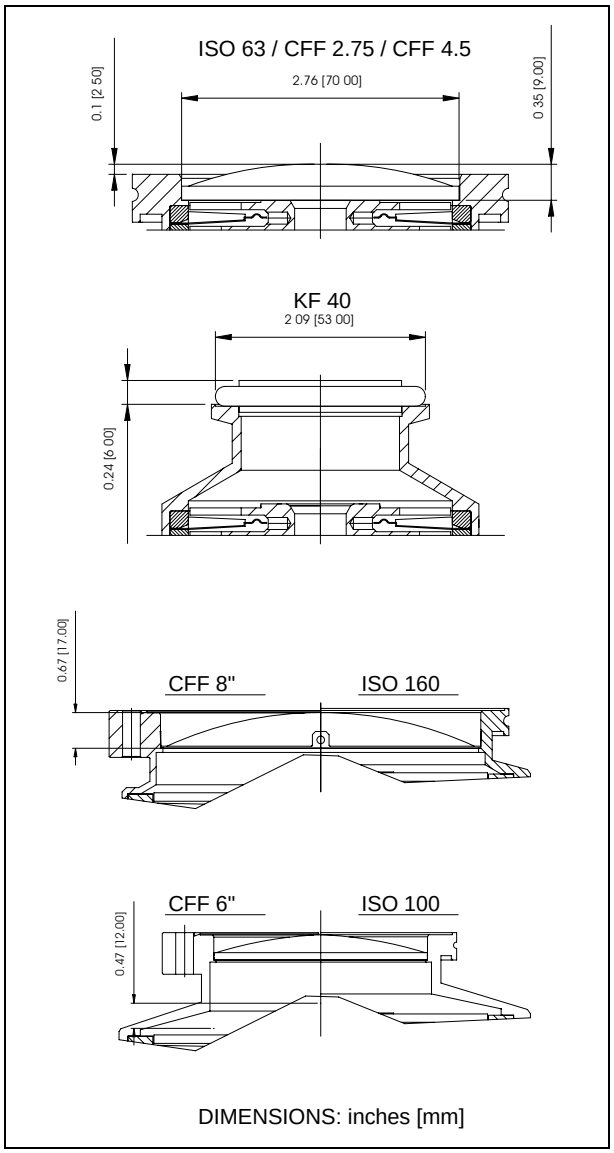
The inlet screens mod. 969-9300, 969-9309, 969-9302 and 969-9303 prevent the blades of the pump from being damaged by debris greater than 0.7 mm diameter.

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

The inlet screen is fitted in the upper part of the pump.

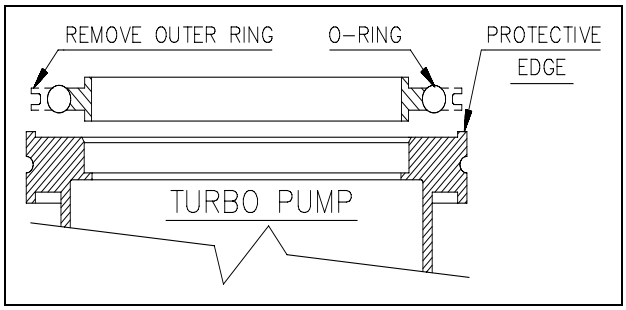
TPS-mobile is always provided with inlet screen fitted on. Varian suggest not to remove the TMP inlet screen, to avoid accidents involving the pumping system tool and/or pumping system users.

The following figure shows the overall flange dimensions with the protection screen fitted on pump with ISO flange and pump with CFF flange (dimensions are in inches [mm]).

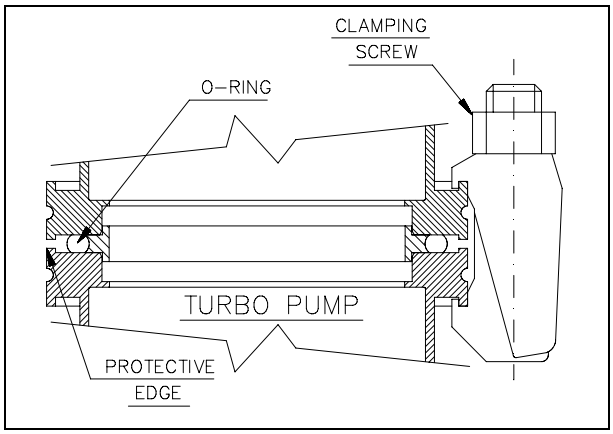


High Vacuum Flange Connection

To connect the Turbo 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.

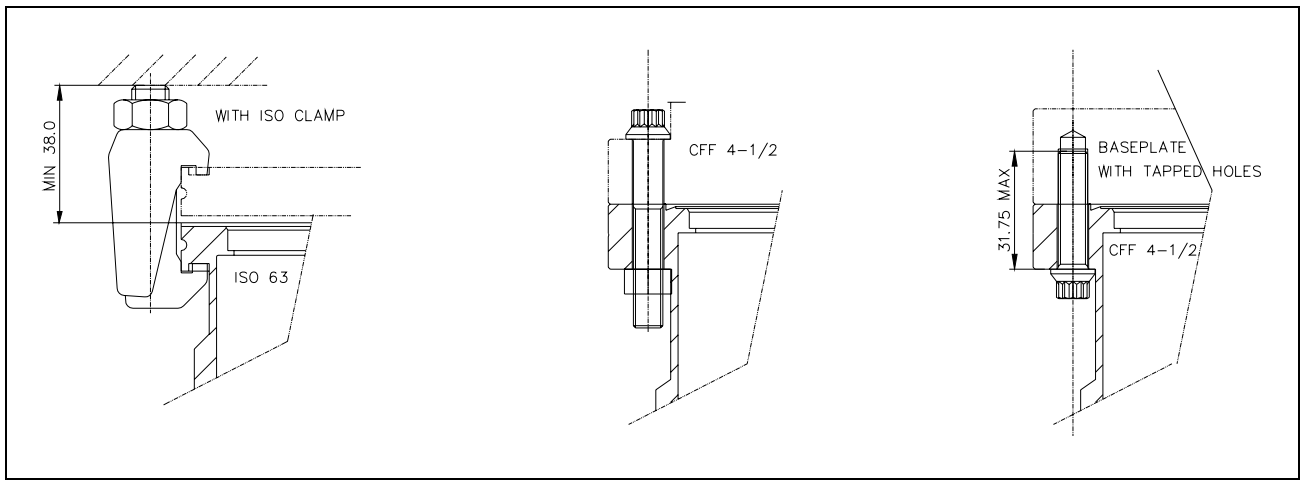
To facilitate assembly and dismantling, apply Felpro C-100 high temperature lubricant to the screw threads protruding from the flange and between the nuts and flange.

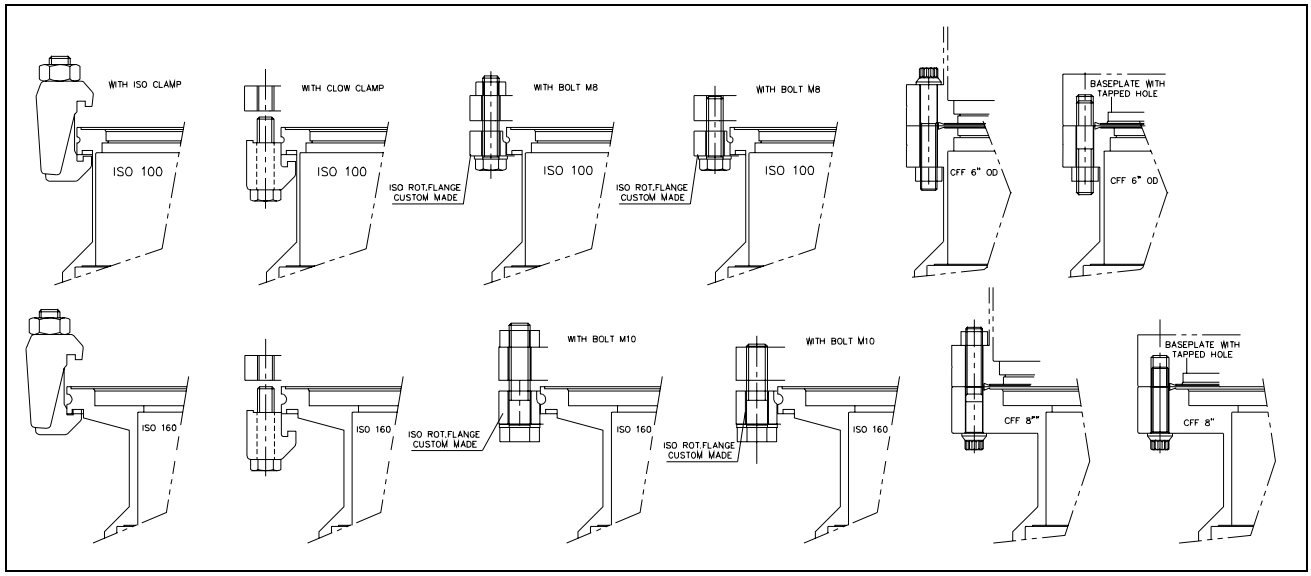
Attach the units and tighten each one in turn. Repeat the sequential tightening until the flange faces meet.

☞ CAUTION

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

High Vacuum Flange Connection Configurations

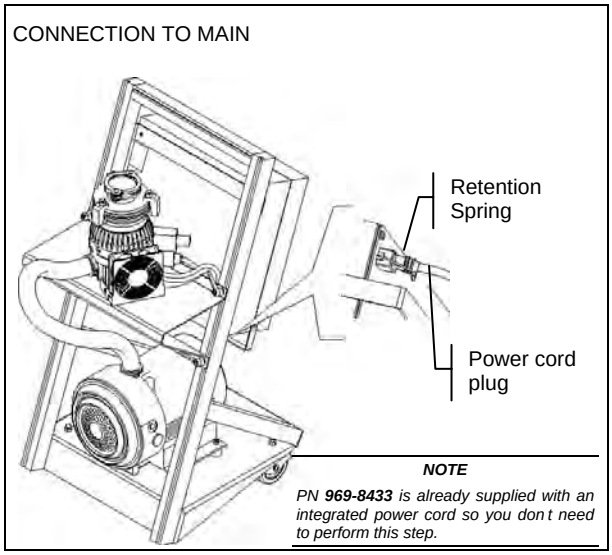




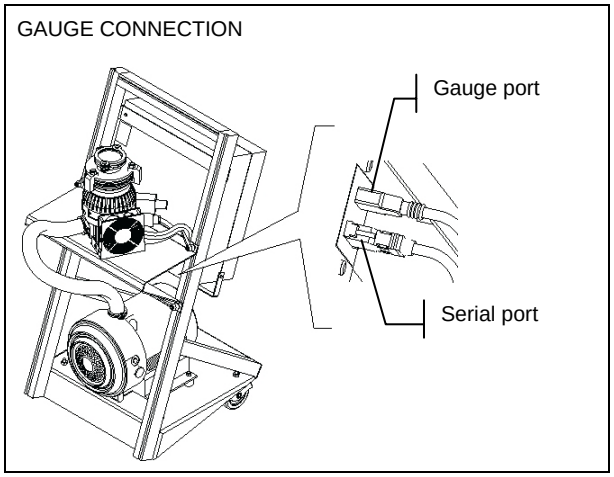
ELECTRICAL CONNECTIONS

Input Power Connector

The following figure shows the input power connector.



Gauge – Serial Line Connection



Gauge Connector

TPS-mobile is equipped with new generation gauge reading card able to drive/read a Varian Full Range Gauge FRG-700.

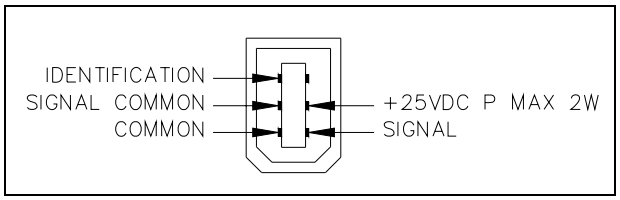
The FRG-700 Full Range Gauge is a combined technologies gauge (Inverted Magnetron plus Pirani Gauge).

FRG-700 measure from $5x10^{-9}$ mbar to atmosphere ($3.8x10^{-9}$ Torr to atmosphere) and its temperature range goes from 5°C to 55°C [41°-131°F].

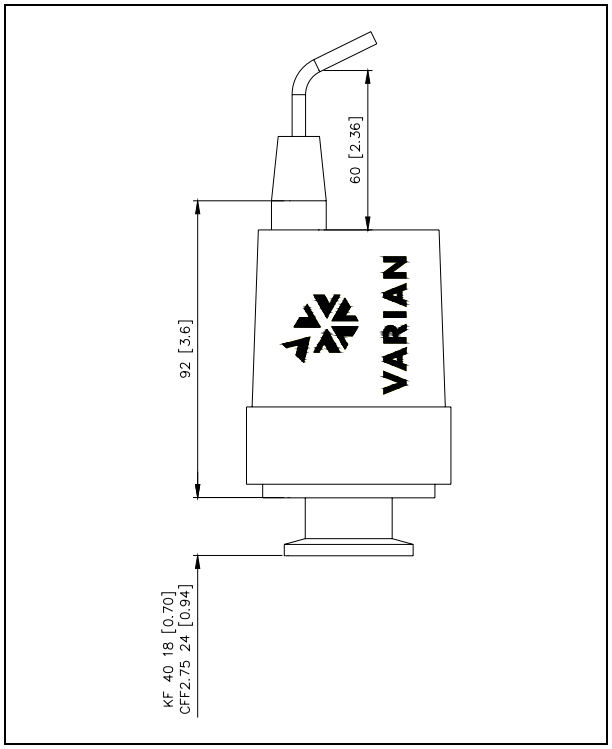
Pressure data is available on two independent reading channels:

1. Serial communication line (Win 224)
2. TMP controller display.

Pressure gauge can be connected/disconnected from the TPS-mobile during normal operation.



Gauge Connector

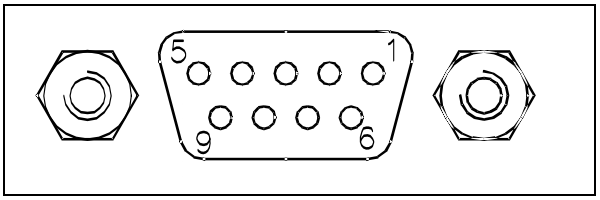


FRG-700 gauge dimension

J2 – Serial Connector

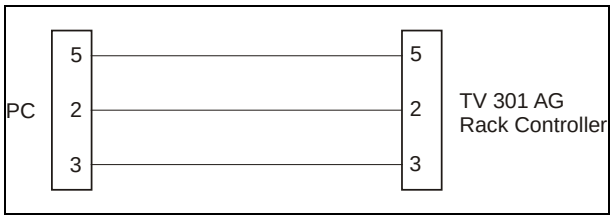
This connector provides the connection for RS – 232 and serial line.

J2 Pin-out:

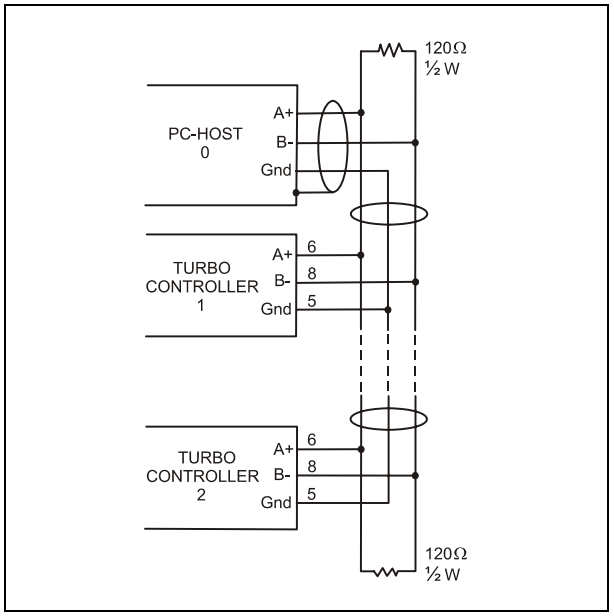


PIN N.	SIGNAL NAME
1	+5 V (OUT) (Reserved)
2	TX (RS232
3	RX (RS232
4	NC
5	GND
6	A + (RS485)
7	NC
8	B – (RS485)
9	RESERVED

Connector Examples:



RS – 232 Connection



RS – 485 Connection

The communication port mating connector is supplied with the RS 232 PCB (AMP/Cannon or equivalent 15-pin "D" type male connector).

For example, the Transmit data signal from controller (pin 2) must be connected to the host computer's receive data line (pin 2) and vice versa. Consult the host computer's instruction manual for its serial port connections.

NOTE

Varian cannot guarantee compliance with FCC regulations for radiated emissions unless all external wiring is shielded, with the shield being terminated to the metal shroud on the 0-subconnector. The cable should be secured to the connector with screws.

Serial Communication Descriptions

This unit can comunicate by two different protocol:

- protocol (old system) “letter”
- “Window” protocol (new system)

These two protocols can be used as well with 232 or 485 media.

NOTE

Please use “Window” protocol for new development.

LETTER PROTOCOL DESCRIPTION:

The default protocol is “Window”

Communication format:

- 8 data bit
- no parity
- 1 stop bit
- The baud rate is programmable via front panel from 600 to 9600 baud. The controller is factory-set for 9600 baud operation.

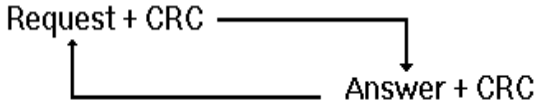
Communication protocol:

Host = Master

Turbo-V 301 Controller = Slave

The communication is performed in the following way:

Host Turbo-V 301 Controller



Request is an ASCII character identifying the action that must be performed by the controller or the requested information.

Allowed ASCII characters:

- "A" = START
- "B" = STOP
- "C" = Low Speed ON

- "D" = Low Speed OFF
- "E" = Request for operational parameters
- "F" = Pump times zeroing
- "G" = Parameters reading
- "H" = Parameters writing
- "I" = Request for operating status
- "J" = Request for numerical reading
- "K" = Request for counters reading.

CRC corresponds to the sum (with inverted sign) of all the preceding bytes.

e.g., the START command "A" in ASCII code = 41; inverted it will be: FF + 1 - 41 = BF.

CHARACTER	ASCII	CONVERTED ASCII FOR CRC CALCULATION
"A"	41h	-
CRC	-	BFh
"B"	42h	-
CRC	-	BEh
"C"	43h	-
CRC	-	BDh
"D"	44h	-
CRC	-	BCh
"E"	45h	-
CRC	-	BBh
"F"	46h	-
CRC	-	BAh
"G"	47h	-
CRC	-	B9h
"H"	48h	-
"I"	49h	-
CRC	-	B7h
"J"	4Ah	-
CRC	-	B6h
"K"	4Bh	-
CRC	-	B5h
"ACK"	06h	-
CRC	-	FAh
"NACK"	15h	-
CRC	-	EBh

Answer = after a request from the host, the Turbo-V 301 controller will answer in one of the following ways:

- ACK
- NACK
- Message

When the Request is "A, "B", "C", "D", "F", the Turbo-V 301 controller will Answer the ACK or NACK.

When the Request is "E, the **Answer** will contain the complete set of the following parameters:

BYTES	MEANING
1 MSB LSB - - - - X X X X (bits 3-0)	0 = STOP 1 = WAITING INTERLOCK 2 = STARTING 3 = NORMAL OPERATION 4, 5 = HIGH LOAD 6 = FAILURE 7 = APPROACHING LOW SPEED
2÷5	Cycle Time
6÷9	Pump Life
10÷11	Pump Temperature
12	Current*
13	Voltage*
14÷17	Frequency
18÷19	Cycle #
20	R1 Status
21	R2 Status
22	CRC

*The values for current and voltage are given as numbers, scaled from 0 to 255, where 0 corresponds to 0 V and 255 to the full scale voltage (130 V) or current (2.5 A).

When the ***Request*** is "G", the ***Answer*** will contain a string of 11 characters with the following parameters:

BYTES	MEANING
1-2	Pump cycles number (integer coded in 2 bytes)
3	Speed threshold
4-7	Run up time in seconds (long coded in 4 bytes)
8	Deat time (0 = NO 1 = YES)
9	Reserved
10	Soft Start mode (0 = NO 1=YES)
11	CRC

When the configuration parameters have to be changed, send a ***Request*** string a string with 9 characters of the following type:

"H" + ... data .... + CRC

The following parameters can be changed:

BYTES	MEANING
1	Speed threshold
2-5	Run up time in seconds (long coded in 4 bytes)
6	Deat time (0 = NO 1 = YES)
7	Reserved
8	Soft Start mode (0 = YES 1 = NO)
9	CRC

When the ***Request*** is "I" (Status readings), the ***Answer*** will contain a string of 2 characters with the following parameters:

BYTES	MEANING
1 MSB LSB - - X X X X X X	0 = STOP 1 = WAITING INTERLOCK 2 = STARTING 3 = NORMAL OPERATION 4, 5 = HIGH LOAD 6 = FAILURE 7 =APPROACHING LOW SPEED R2 status 0 = OFF 1 = ON R1 status 0 = OFF 1 = ON
2	CRC

When the Request is "J" (Numerical readings), the Answer will contain a string of 5 characters with the following parameters:

BYTES	MEANING
1	Current (0-255 scaled)
2	Voltage (0-255 scaled)
3	Rotational speed KRPM
4	Pump temperature °C (0-254 temperature reading, 255 = fail)
5	CRC

When the Request is "K" (Counters readings), the Answer will contain a string of 11 characters with the following parameters:

BYTES	MEANING
1-4	Cycle time
5-8	Pump life
9-10	Cycle number
11	CRC

On request a sample program in QBasic language is available by Varian.

Window Protocol
Description
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:

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:

Response Type	Response Length	Response 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			RD	ETX	CRC	

Source: Controller
Destination: PC

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

N.	Read/ Write	Data Type	Description	Admitted Values
000	R/W	L	Start/Stop (in remote/ Front 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	R1 Set Point type	0 = Frequency 1 = Power 2 = Time 3 = Normal 4 = Pressure (default = 3)
102	R/W	N	R1 Set Point valve (expressed in Hz, W or s)	(default = 900)
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 value)	0 to 100 (default = 2)
106	R/W	L	Water cooling	0 = NO 1 = YES
107	R/W	L	Active Stop (write only in stop)	0 = NO 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 = 1) 2 = Pump temperature 3 = Pressure
117	R/W	N	Low Speed frequency (Hz)	250 to "Maximum rotational frequency" (win 121) (default = 700)
120	R/W	N	Rotational frequency setting (Hz)	900 to "Maximum rotational frequency" (win 121) (default = 963)
122	R/W	L	Set vent valve on/off (on = closed)	On = 1 Off = 0 (default = 1)
123 124	Reserved to Varian 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)
130	Reserved to Varian service			
147	R/W	N	Vent open time See "vent connector" paragraph	0 = infinite 1 bit = 0.2 sec
155	R	N	Power limit applied Read the maximum allowable power	watt
157	R/W	N	Gas load type Select the gas load to the pump	Ø = N_2 1 = Av
161	R/W	N	Pressure Reading Connection Factor See "GAUGE CONNECTOR" for more details	0 to 10 0 = 0 10 = 1 = N_2
162	R/W	A	R1 Set Point Pressure Valve Valid if min. 101 = 4 Format X.X E. XX Where X = 0 to 9 s = + or -	
163	R/W	N	Pressure unit of measure	0 = mBar 1 = Pa 2 = Torr

N.	Read/ Write	Data Type	Description	Admitted Values
167	R/W	A	Stop speed reading Activates / deactivates the pump speed reading after Stop command	0 = disable 1 = enable
171	R/W	N	R2 Set Point Type	0 = Freq 1 = Power 2 = Time 3 = Normal 4 = Pressure
172	R/W	N	R2 Set Point Value (Hz, W, s)	
173	R/W	N	R2 Set Point Mask (sec)	
174	R/W	L	R2 Set Point Signal Activation Type	Ø = high level active 1 = low level active
175	R/W	N	R2 Set front Hysteresis (in % of R2 Valve)	
176	R	A	R2 Set Point Pressure Valve Valid in win 171 = 4 Format X.X E X.X Where: X= 0 to 9 s = + or -	
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
211	R	N	Controller Heatsink Temperature (°C)	
216	R	N	Controller Air Temperature (°C).	
224	R	A	Pressure reading Format = X.X E XX	
226	R	N	Rotation Frequency (rpm)	
300	R	N	Cycle time in minutes (zeroed by the reset command)	0 to 999999
301	R	N	Cycle number (zeroed by the reset command)	0 to 9999
302	R	N	Pump life in hours (zeroed by the reset command)	0 to 999999
320 to 399	Reserved to Varian service			
400	R	A	CRC EPROM (QE)	QE8XXXX (where “XXXX” are variable)
402	R	A	CRC Param. (PA)	PA8XXXX (where “XXXX” are variable)
404	R	A	CRC Parameter structure	"XXXX"
500	Reserved to Varian service			
503	R/W	N	RS 485 address	0 to 31 (default = 0)
504	R/W	L	Serial type select	0 = RS 232 1 = RS 485 (default = 0)

NOTES

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.*

	7	6	5	4	3	2	1	0	
TOO HIGH LOAD									NO CONNECTION
SHORT CIRCUIT									PUMP OVERTEMP.
OVERVOLTAGE									CONTROLL. OVERTEMP
AUX FAIL									POWER FAIL

Window N. 206 Bit Description

PUMPING SYSTEM COMPONENT INFO

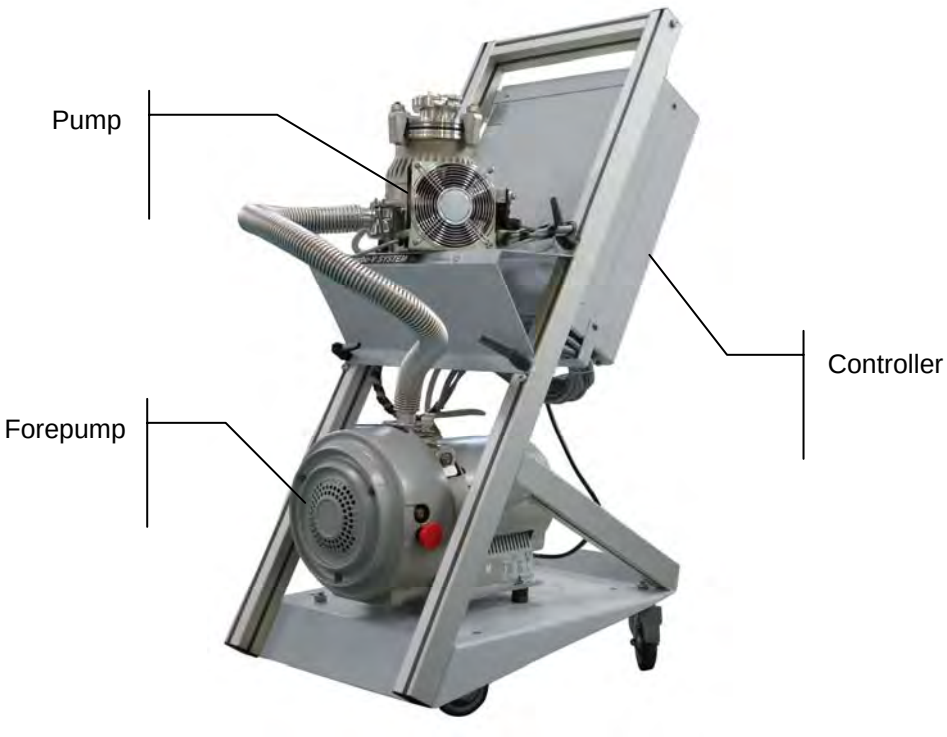
Here following the complete list of the TPS-mobile Part numbers.

By clicking on the PN referred to your system, specific information about single components integrated in your TPS-mobile will be showed beside the picture.

For each component PN, component name and user manual reference are reported.

For specific information about one of integrated components, please contact Varian Service department asking for the specific user manual.

969-8400	**969-8401**	**969-8402**	**969-8403**
969-8404	**969-8405**	**969-8406**	**969-8411**
969-8412	**969-8413**	**969-8416**	**969-8417**
969-8418	**969-8419**	**969-8420**	**969-8421**
969-8422	**969-8423**	**969-8424**	**969-8425**
969-8426	**969-8427**	**969-8428**	**969-8429**
969-8430	**969-8431**	**969-8432**	**969-8433**



ACCESSORIES AND SPARE PARTS

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, ISO 100	969-9302
Inlet screen, ISO 160	969-9303
Heater band, 120 V	969-9804
Heater band, 220 V	969-9803
Vibration isolator, ISO 100	969-9344
Vibration isolator, CF 6"	969-9334
Vibration isolator, ISO 160	969-9345
Vibration isolator, CF 8"	969-9335
Vent flange, NW 10 KF / M8	969-9108

APPENDIX 1

The following three pages gathered in the “Appendix 1” are intended as a Quick Reference Manual of the product, they contain the basic information needed to start operating with TPS-mobile.

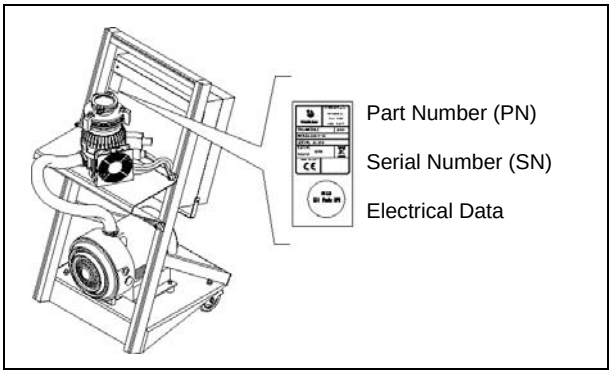
These pages are intended as a separate document and, if needed, can be printed separately and attached in paper format to the TPS-mobile for a quick reference work in the field.

The “Appendix 1” is applicable to following models:

969-8400	**969-8401**	**969-8420**	**969-8421**
969-8402	**969-8403**	**969-8422**	**969-8423**
969-8404	**969-8405**	**969-8424**	**969-8425**
969-8406	**969-8411**	**969-8426**	**969-8427**
969-8412	**969-8413**	**969-8428**	**969-8429**
969-8416	**969-8417**	**969-8430**	**969-8431**
969-8418	**969-8419**	**969-8432**	**969-8433**

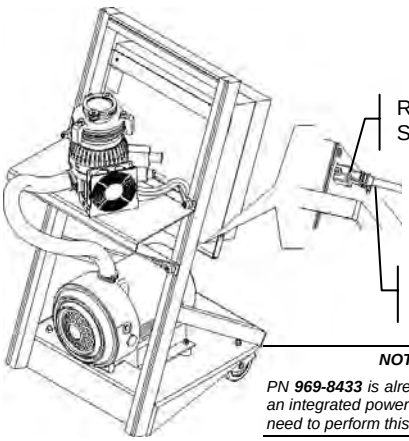
Basic information about the system activation and system components management is reported here following:

- After *TPS-mobile* unpacking, perform a brief visual analysis of the system to be sure that no sign of damages due to transportation is present (critical parts are: TMP flange, Forepump fastening brackets, system front panel and the system wheels).
- Check the system voltage on the Varian label stuck on the system electronic units case.



- If the voltage provided by your electrical supplier is compatible with the system voltage, you can connect the provided power cord to the IEC320 electrical socket on the rear side of the system (see picture). The socket is provided with a retention spring to avoid accidental disconnection of power cord plug – use the spring to fasten the power cord plug.

CONNECTION TO MAIN

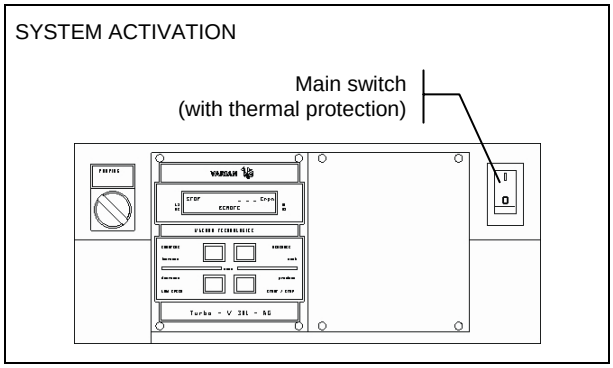


NOTE

*PN **969-8433** is already supplied with an integrated power cord so you don t need to perform this step.*

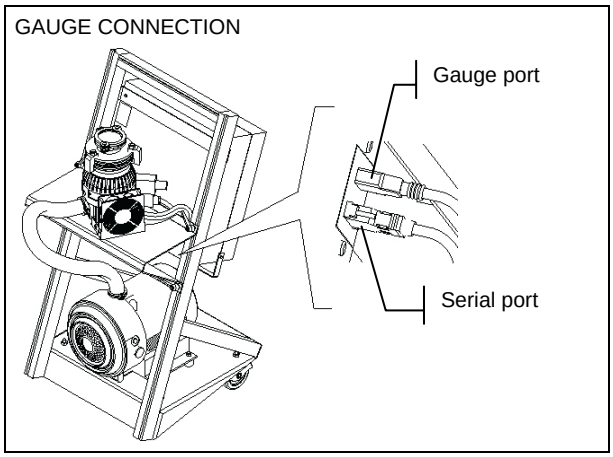
- Provide the correct voltage to the system through the power cord.
- The system is equipped with a main switch (thermal breaker) able to protect the system components against overload or short-circuits. Move the breaker switch to the position “1” to start operating with the TPS-mobile.

SYSTEM ACTIVATION



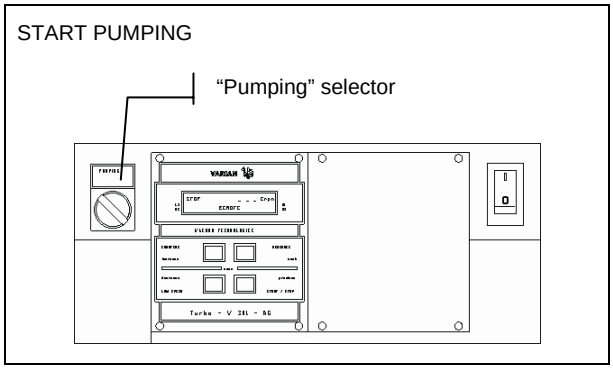
- The system activation by means of the Main Switch provides voltage to TMP controller but both TMP and Foreline pump continue to be switched off.
  The system activation allows the TMP controller to start reading the pressure data through the optional FRG-700 Full Range Gauge if it is connected to the gauge connection port on the rear side of the system.

GAUGE CONNECTION



- It is possible to start pumping by means of the selector named “Pumping”. As soon as the Pumping selector is moved to the position “1” the TMP and Foreline pump will be switched on.

START PUMPING



Note:

PNs 9698404, 9698405, 9698406, 9698419, 9698430, 9698431, 9698432, 9698433, are not equipped with the selector named “Pumping”, the same function is provided by the pushbutton Start/Stop on the TMP controller.

TPS-mobile switching off:

- You can switch the pumps off by using the “pumping” selector (moving it to position “0”) – the TMP controller will remain ON and if a gauge is connected to the system it will be possible to continue reading the pressure even if pumps are off.
- An alternative mode for switching the pumps off is the use of Main Switch (move it to position “0”) – The system will be completely switched off and no reading or operation will be possible.
- If an emergency situation occurs is possible to switch the pumps and the controller off, even disconnecting the mains cable (emergency stop).

APPENDIX 2

TROUBLESHOOTING TABLE

Symptom	Possible cause	Action
System doesn't start	Problems on main connection	Check the connection of main plug. Check possible fuses on main line
	Main switch placed on position "0"	Move the Main Switch on position "1"
Turbo pump is not able to reach the "Normal Operation Status"	Leak on vacuum system connected to the inlet flange	Check the vacuum system critical points (valves, flanges, plastic pipes,…)
	TMP Vent Valve not properly closed	Check if the vent valve is screwed completely down
	Leak on Vent Valve	Check the Vent valve sealing o-ring positioning and intactness
TMP stopped and the Controller shows the message "Pump Overtemp"	Room temperature higher than 35°C [95F]	Move the TPS-mobile in an area where the room temperature is lower than 35°C [95F]

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	Europe and Middle East	Asia and ROW
Varian Vacuum Technologies	Varian SpA	Varian Vacuum Technologies
121 Hartwell Ave	Via Flli Varian 54	Local Office
Lexington, MA 02421	10040 Leini (TO) – ITALY	
Phone : +1 781 8617200	Phone: +39 011 9979111	
Fax: +1 781 8609252	Fax: +39 011 9979330	

CUSTOMER INFORMATION

Company name: ..……………………..……...……………….………………………………...……………………...………….…...…

Contact person: Name: ……………………………………..…. Tel: ……………………….…...………………….….…....

Fax: ……………………………….…...…...…… E-Mail: ...……………………...………….…...…..….…..

Ship Method: …………….……....…… Shipping Collect #: ……………..…..………… P.O.#: ………………….…......……….

Europe only: VAT reg. Number: ………………...……………... *USA only*: ☐ Taxable ☐ 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)*

☐ Paid Exchange ☐ Paid Repair ☐ Warranty Exchange ☐ Warranty Repair ☐ Loaner Return
☐ Credit ☐ Shipping Error ☐ Evaluation Return ☐ Calibration ☐ 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 #: ……………………..

VARIAN

Request for Return

ISO 9001 REGISTERED

FAILURE REPORT

TURBO PUMPS and TURBOCONTROLLERS

☐ Does not start	☐ Noise	POSITION	PARAMETERS		
☐ Does not spin freely	☐ Vibrations	☐ Vertical	Power:	Rotational Speed:	
☐ Does not reach full speed	☐ Leak	☐ Horizontal	Current:	Inlet Pressure:	
☐ Mechanical Contact	☐ Overtemperature	☐ Upside-down	Temp 1:	Foreline Pressure:	
☐ Cooling defective		☐ Other:	Temp 2:	Purge flow:	
		…….	OPERATION TIME:		
TURBOCONTROLLER ERROR MESSAGE:					

ION PUMPS/CONTROLLERS

☐ Bad feedthrough	☐ Poor vacuum
☐ Vacuum leak	☐ High voltage problem
☐ Error code on display	☐ Other
Customer application:	

VALVES/COMPONENTS

☐ Main seal leak	☐ Bellows leak
☐ Solenoid failure	☐ Damaged flange
☐ Damaged sealing area	☐ Other
Customer application:	

LEAK DETECTORS

☐ Cannot calibrate	☐ No zero/high backround
☐ Vacuum system unstable	☐ Cannot reach test mode
☐ Failed to start	☐ Other
Customer application:	

INSTRUMENTS

☐ Gauge tube not working	☐ Display problem
☐ Communication failure	☐ Degas not working
☐ Error code on display	☐ Other
Customer application:	

PRIMARY PUMPS

☐ Pump doesn't start	☐ Noisy pump (describe)
☐ Doesn't reach vacuum	☐ Over temperature
☐ Pump seized	☐ Other
Customer application:	

DIFFUSION PUMPS

☐ Heater failure	☐ Electrical problem
☐ Doesn't reach vacuum	☐ Cooling coil damage
☐ Vacuum leak	☐ 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 Aufrage ist diese Unterlage auch auf Deutsch, Italienisch und Französisch erhältlich.

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