

# **IPS - Integrated Pumping System**

**Model**  
**9698205M016**

## **Instruction Manual**

**87-901-012-01**

**10/2017**



**Agilent Technologies**

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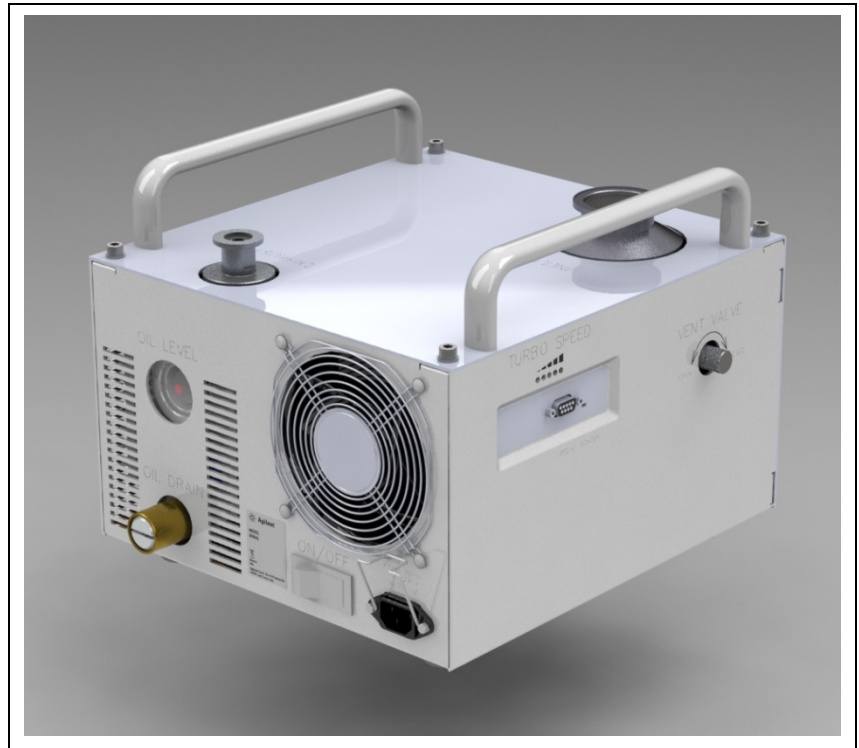
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A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION**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

### WARNING

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

# IPS - Integrated Pumping System



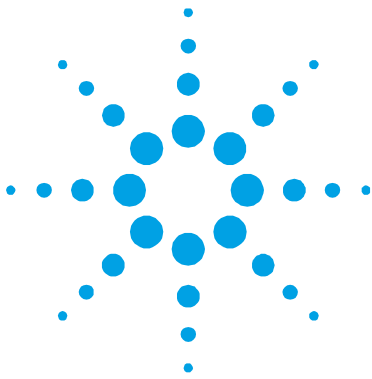


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## **Safety Guideline for Turbomolecular Pumps**

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 Agilent before operating the equipment. Agilent will not be held responsible for any events occurring due to non-compliance, even partial, with these instructions, improper use by untrained persons, non-authorized interference with the equipment or any action contrary to that provided for by specific national standards.

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.

---

**1 Installation Procedure**  
**General Information**

## Safety Symbols

SYMBOLS	SYMBOLS DESCRIPTIONS
	<p>Access denied to active pacemaker's holders. The device is marked with this symbol to indicate that pacemaker holders must not come in contact with the device itself.</p>
	<p>Electric hazard. The device is marked with this symbol when the operator, due to the presence of an high voltage, must refer to the user manual in order to protect himself from electrical shock risks.</p>
	<p>Magnetic field hazard. The device is marked with this symbol to inform the operator about the presence of a magnetic field.</p>
	<p>Hot surface hazard. The device is marked with this symbol when the operator must avoid the contact with potentially hot surfaces which may cause burns.</p>

## Storage

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

- when shipping, moving and storing pumps, the following environmental specifications should not be exceeded;
- temperature range: -40F to +158F (-40 °C to 70 °C);
- relative humidity range: 0 to 90% (non-condensing);
- the shelf life of a turbomolecular pump is 12 months from the shipping date, the shipping date can be found on the external packaging.

**CAUTION!**

If for any reason the shelf life time is exceeded, the pump has to be returned to the factory. Please contact the local Elekta Service representative for information.

---

## **Preparation for Installation**

The Elekta Pumping System is supplied in a special protective packing. If this shows signs of damage which may have occurred during transport, contact your local Elekta 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 94/62 and subsequent amendments.

---

**CAUTION!**

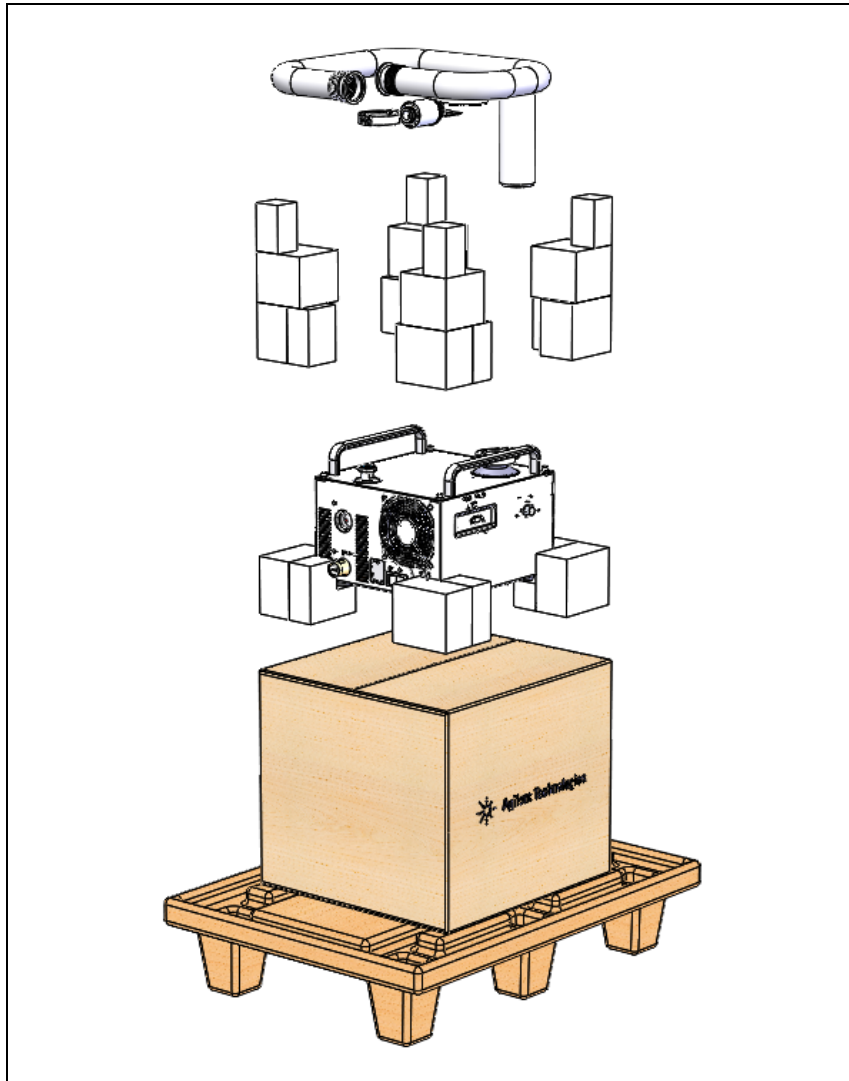
In order to prevent outgassing problems, do not use bare hands to handle components which will be exposed to vacuum. Always use gloves or other appropriate protection.

---

**NOTE**

Normal exposure to the environment cannot damage the Elekta Pumping System. Nevertheless, it is advisable to keep it closed until it is installed in the system, thus preventing any form of pollution by dust.

---



**Figure 1** Packaging of the IPS - Integrated Pumping System.

## Installation

**CAUTION!**

Do not remove the stainless steel protective flange until you are ready to connect the turbomolecular pump to the system.

---

Install this device indoors only, and in any case, do not use the pump in an environment exposed to atmospheric agents (rain, snow, ice), dust, aggressive gases, or in explosive environments or those with a high fire risk. During operation, the following environmental conditions must be respected:

- maximum pressure: 2 bar above atmospheric pressure
- temperature: from 54F to 95F (+12 °C to +35 °C)
- relative humidity: 0 - 90% (non-condensing)

In the presence of magnetic fields the pump must be protected using a ferromagnetic shield.

The Elekta Pumping System must be installed in the horizontal position. Fix the Elekta Pumping System in a stable position.

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

## Use

This paragraph details the fundamental operating procedures.

Make all electrical and pneumatic connections before the use of the system.

While heating the vacuum chamber, the temperature of the inlet flange must not exceed 176F (80 °C).

---

**WARNING!**

Never use the turbopump when the inlet flange is not connected to the vacuum chamber or is not blanked.



**WARNING!**

Never switch the system on before removing the exhaust blanked adapter.



**WARNING!**

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



## 1 Installation Procedure

### Use

---

#### **WARNING!**



**Avoid impacts or harsh movements of the pump when in operation, which could result in equipment damage or operator injury.**

---

#### **CAUTION!**

Use inert gas free from dust, particles or humidity (like dry air) 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 pump in presence of explosive gases.**

**The pump is designed to pump high throughput of N<sub>2</sub>, Ar and lighter gas. Should you need to pump gases heavier than Ar, please contact Agilent technical support for information.**

---

#### **NOTE**

When the Elekta pumping system has been stored at a temperature less than 12 °C, wait until the Elekta pumping system has reached the above mentioned temperature. Do not operate the Elekta Pumping System at temperatures below 54F (12 °C).

---

#### **NOTE**

To optimize the Elekta Pumping System ramp-up is recommended to start the system at least 68F (20 °C).

---

**CAUTION!**

The bearings of the turbomolecular pump are lubricated by a solid grease which is maintenance free provided the pump is used regularly.

Avoid long term storage if possible.

When long term storage is necessary the pump should be run for at least 1 hour every 6 months to re-distribute the grease within the turbomolecular pump bearing.

Failure to observe this maintenance may lead to premature wear and could result in failure of the bearings.

---

## **Operating Procedure**

### **Switching on and Use of Elekta Pumping System**

To switch on the Elekta Pumping System it is sufficient to supply the mains and then move the external switch to ON position.

Immediately after the switch ON the system perform a short auto test, in this phase all the LEDs will lighted and will ring a short acoustic signal.

The integrated controller automatically recognizes the mains presence and starts-up the pump.

The blue LED "STATUS" located on the Elekta Pumping System base front panel indicates with its flashing frequency the system operating modes:

- ON steadily: standalone mode (no serial communication);
- slowly flashing (period of about 50 ms): interface mode, active serial communication.

See the appendix "Technical Information" for a detailed description of the Elekta Pumping System control panel and specific parts.

### **Elekta Pumping System Switching off**

To switch off the Elekta Pumping System it is sufficient to move the external switch to the OFF position. The integrated controller immediately switches off the pumps (the rotary vane pump stops immediately, and the turbomolecular pump begins to slow down). After switching off the system wait 15 to 20 seconds for the turbomolecular pump to slow down then turn the vent valve 1/4 turn anti-clockwise to vent the system.

## Emergency Stop

To immediately stop the Elekta Pumping System in an emergency condition it is possible to remove the supply cable from the mains plug or move the external switch to the OFF position.

## Maintenance

The Elekta Pumping System does not require any particular maintenance (except the oil change made on a yearly basis and filling up). 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 122F (50 °C).**

---

In the case of breakdown, contact your local Elekta Service organization.

**NOTE**

Before returning the system to the constructor for repairs, the "Request for Return" 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.

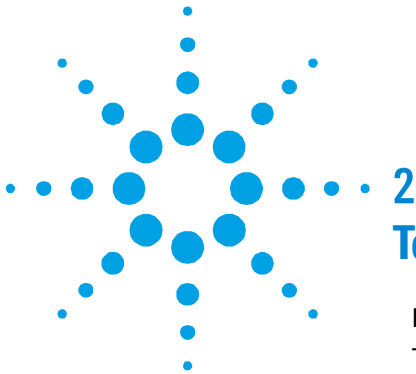
The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.



For more information refer to:

<http://www.agilent.com/environment/product/index.shtml>

**1 Installation Procedure  
Disposal**



## 2 Technical Information

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## Description of the Elekta Pumping System

The Elekta pumping system consists of a turbomolecular pump, a forepump and an electronic controller able to manage both the pumps and the communication of the system with external devices. The Elekta pumping system is specifically designed for roughing of vacuum chambers and Ion pumps.

### NOTE

The internal electronic controller manages the electrical power providing the right amount of it to ROTARY VANE PUMP and TURBOMOLECULAR PUMP according to the vacuum system status and operative phase.

During the initial roughing stage, all electrical power is supplied to the rotary vane pump in order to achieve the shortest roughing time. During this period the turbomolecular pump will be OFF.

Once the system pressure reaches the correct level to take advantage of the turbomolecular pump performance the pump will be switched ON. This initial phase is variable and depends on the oil temperature of the rotary pump. The normal length is between a few seconds and 16 minutes.

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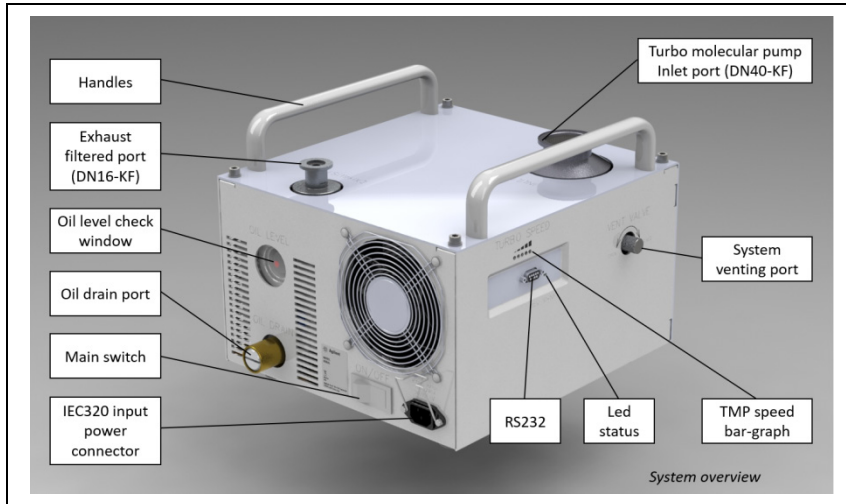
### NOTE

The roughing initial stage (ROTARY VANE PUMP on, TURBOMOLECULAR PUMP off) length is variable in according to ROTARY VANE PUMP oil temperature. The normal length is between a few seconds with warm oil and sixteen minutes with cold oil.

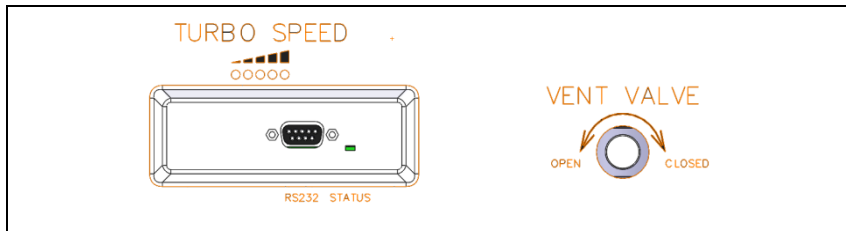
---

## 2 Technical Information

### Description of the Elekta Pumping System



**Figure 2** IPS - Integrated Pumping System.



**Figure 3** Front panel.

## Turbopump Description

The pumping system is equipped with a 80l/s turbomolecular pump DN40-KF flanged.

The turbopump consists of a high frequency motor driving a turbine fitted with 9 bladed stages and 3 TwisTorr stages. The turbine rotates in an anticlockwise direction when viewed from the high vacuum flange end.

The turbine is made of high-strength aluminum alloy, machined from a single block.

The TwisTorr stages are in the form of four disks.

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 TwisTorr stators are in the form of selfpositioning machined disks. On each disk there are parallel spiral pumping channels designed to pump in centrifugal direction on one side and in centripetal direction on the other side. These are made of aluminum alloy.

During normal operation, the motor is fed with a voltage of 54 Vac three-phase at 1350 Hz. 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.

## System Venting Port

The manual valve located on the right side of front panel allows the user to vent the system (TURBOMOLECULAR PUMP and foreline pump) as soon as the system has been switched off.

Rotate the valve anticlockwise to open the venting port.

---

**CAUTION!** Never open the valve during the system operation.

**NOTE**

After the pumping system has been switched off, wait 15-20 seconds to allow the turbomolecular pump to slow down before opening the vent valve.

The right way to vent the system is to turn the venting valve anticlockwise (1/4 of a turn).

---

## Controller Description

The integrated controller is a solid-state frequency converter which is driven by a single chip digital signal processor and is composed of a PCB which includes a two-independent channels power supply with a 3-phase AC output, analog and input/output section, digital signal processor 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 TURBOMOLECULAR PUMP on first channel and the ROTARY VANE PUMP on second channel.

## **Analog I/O & RS232 Ports and Status LED**

The controller can be operated by a remote host computer via the serial connection (RS232) (see “Interconnections” section).

**Tab. 1**

<b>Control Name</b>	<b>Description</b>
RS232	Serial input-output connector to control the Elekta Pumping System via an RS 232
STATUS LED	ON steadily: standalone mode (no serial communication); Slowly flashing (period of about 50 ms): interface mode, active serial communication.

## Turbomolecular Pump Speed Bar-Graph

A LED bar-graph managed by the internal electronic controller is located on the front side.

The bar-graph is made by five blue LEDs.

The Turbomolecular pump speed bar-graph provides direct information about the TURBOMOLECULAR PUMP rotational speed.

Typically, it may take up to 16 minutes of pumping for the Turbo molecular pump to reach the full rotational speed. Failure to reach full speed may indicate a leak on the vacuum chamber being pumped. Further investigation may be required.

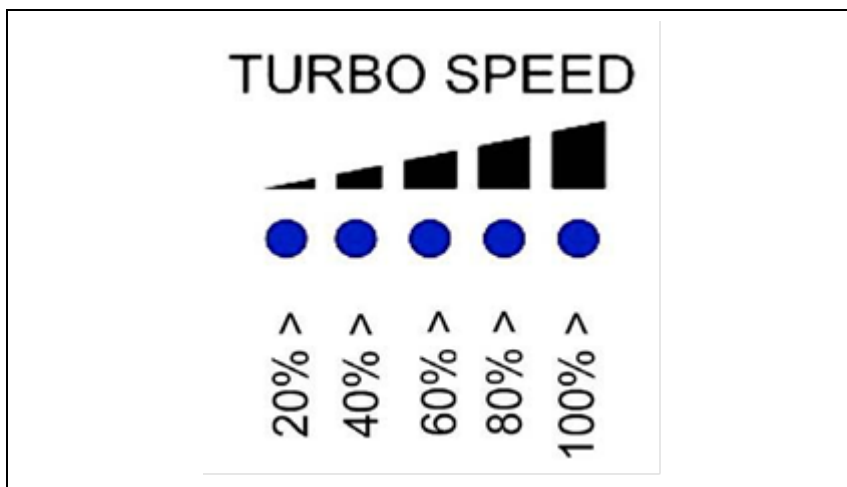


Figure 4

## **Main Switch**

The Elekta pumping system is activated by means of a bipolar switch located on the left side. The same switch provides a protection against current overload and short-circuits.

## Input Power Connector

The Elekta pumping system get its mains by means of an IEC320 power connector.

The IEC320 connector is equipped with a retention spring able to prevent the power cord plug becoming accidentally disconnected.

**CAUTION!**

Be sure that the power cord plug is fastened by means of the retention spring before switching the system on.

---

Tab. 2

Control Name	Description
MAIN CONNECTOR	Main socket for power supply. (100-240 Vac 50/60HZ)
MAIN SWITCH	Main thermal switch (max 5A)

## **Rotary Vane Forepump Description**

Rotary Vane Pump integrated into the Elekta Pumping System is a dual stage oil sealed rotary vane pump, driven by a three-phase electric motor. This vacuum pump is suitable for pumping non-corrosive gases.

All materials are carefully selected to provide extended life.

Due to its design features and low number of gaskets, the pump requires no maintenance.

The pump works with force-feed lubrication, provided by an auxiliary gear-pump driven by the rotor of the vacuum pump itself. This ensures proper lubrication even when pressures are close to atmospheric.

The main features are:

- all materials are carefully selected to provide extended life;
- all the parts composing the pump are fully replaceable due to the close machining tolerances and to the centering obtained by using reference pins.

The pump works with force-feed lubrication, provided by an auxiliary vane-pump driven by the rotor of the vacuum pump itself. This ensures proper lubrication even when pressures are close to atmospheric.

The entire pump functional block is immersed in the oil contained in the casing. The oil guarantees perfect sealing of the discharge valves, enters the pump to ensure lubrication and sealing of the parts inside, facilitates heat dissipation and reduces pump noise.

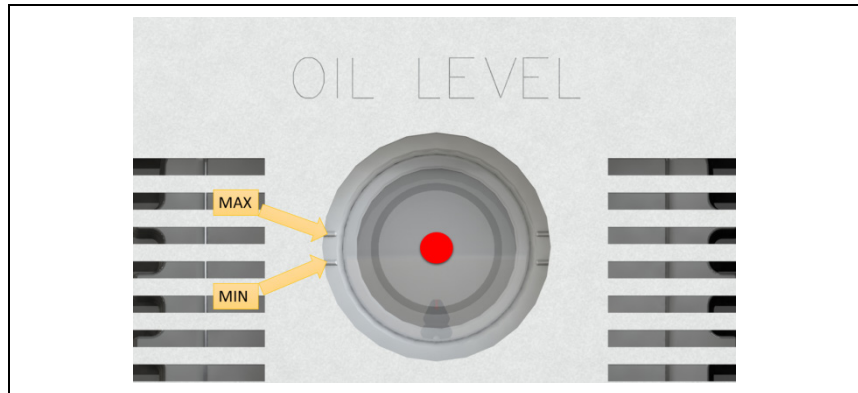
The pump is equipped with a special antisuckback device.

The vacuum pumps are connected directly to the electrical motor through a magnet coupling, so that motion is transmitted even in case of poor alignment.

## Oil Level Check Window

The Elekta pumping system is equipped with an inspection window useful to check the ROTARY VANE PUMP oil level.

**CAUTION!** Be sure that oil level is located between the MINIMUM and the MAXIMUM lines before switching the system on.



**Figure 5**

If the oil level is under the MINIMUM line add some oil following the procedure described in the section “Maintenance”.

## Oil Drain Port

The Elekta pumping system is equipped with an oil drain port located on the left side under the oil level inspection window.

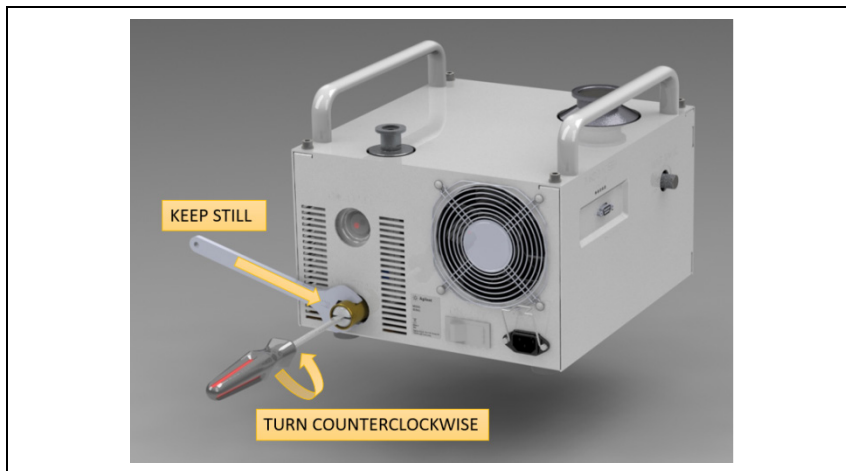
The port is useful for draining the rotary pump oil during the oil change procedure" (see chapter "Oil Change" in the "Maintenance" section.

The visible part of oil drain port is an adapter connected to the Rotary Vane Pump oil drain port. The adapter protrudes out of the system and it is closed by means of a slotted screw.

**NOTE**

Always keep the adapter still (by means of a 22 mm spanner) while the flat screwdriver is driven.

If the hexagonal socket screw is unscrewed and the adapter is not kept still, the adaptor may unscrew and oil may leak inside the unit.



**Figure 6**

## Exhaust Filtered Port

The Elekta pumping system is equipped with an exhaust adapter hermetically closed before shipping.

The blanking system is a safety system and allows the port to be opened automatically if the system is accidentally switched on before the exhaust port opening (avoiding possible damages to the equipment and injury to the operators).

Before switching the system on the blanked exhaust adapter has to be removed and exchanged with the DN16-KF exhaust filter included in the accessory kit.

## **Inlet Screen Installation**

The inlet screen provided with the system prevents the blades of the pump from being damaged by debris greater than 0.7 mm diameter.

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

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

## Technical Specification

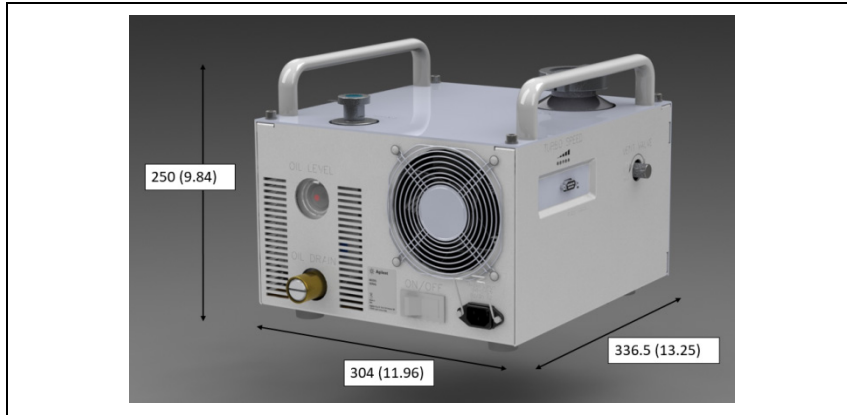
The following table details the main technical specifications of the IPS - Integrated Pumping System.

**Tab. 3**

Pumping speed (l/s)	N2: 49 l/s He: 38 l/s H2: 36 l/s
Inlet flange	DN40 KF
Rotational speed	81000 RPM
Start-up time	< 16 minutes
Operating position	Standing on a flat surface
Operating ambient temperature	54F to 95F (+12 to +35 ° C)
Bakeout temperature	80° C at inlet flange max (ISO flange)
Noise level	55 dB (A) at 1 meter
Lubricant	permanent lubrication
Power supply (Line type): Input voltage: Input frequency: Max input power:	100–240 Vac 50/60 Hz 50/60 Hz
Protection thermal Switch	5 A
Compliance with:	EN 61010-1 2010 EN 61010-1 2010
Installation category	II
Pollution degree	2
Power connection	IEC320
Serial communication (kit)	RS232 cable with a 9-pin D type male connector and a 9-pin D type female connector, and software (optional)
Storage temperature	-40F to 158F (- 40 °C to + 70° C)
Weight kg (lbs)	17 (37.4)

## Elekta Pumping System Outline

The following figure shows the Elekta pumping system outline. Dimensions are in mm (inches).

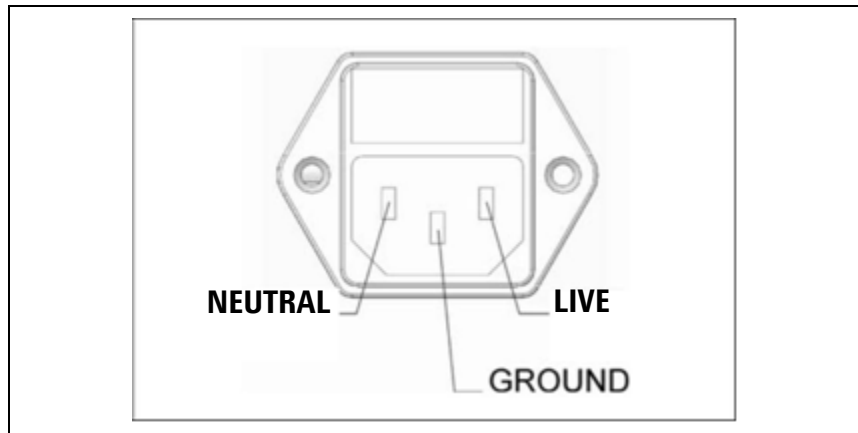


**Figure 7**

## Interconnections

### Input Power Connector and Main Switch

The following figure shows the input power connector.

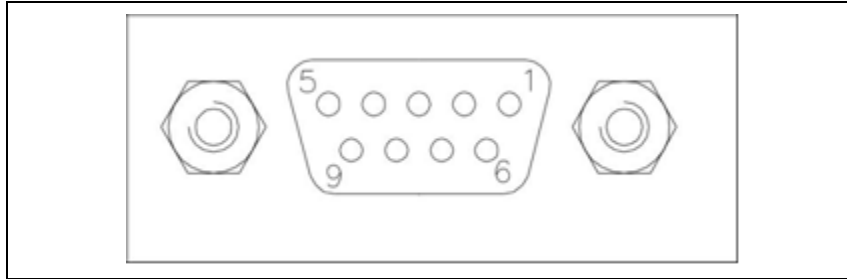


**Figure 8**

The system is switched on/off by means of a bipolar switch wired into the power circuit.

The same switch provides protection against current overload and short-circuit by opening automatically the electrical circuit if the absorbed current exceeds 5A.

## RS232 Connector



**Figure 9**

This is a 9 pin D-type serial input/output connector to control the Elekta pumping system via an RS 232 connection.

**Tab. 4**

<b>Pin N.</b>	<b>Signal Name</b>
1	+5 V (OUT)
2	TX (RS232)
3	RX (RS232)
4	Not used
5	GND
6	Not used
7	Not used
8	Not used
9	Not used

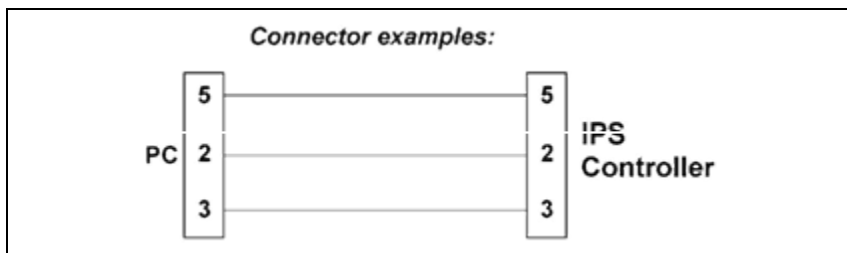
A serial communication kit with a serial cable and the Navigation Software is available (optional).

## RS 232 Communication Description

The RS 232 interface are available on the connector labelled “Serial”.

### Communication Format

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



**Figure 10** RS 232 Connection.

The communication port mating connector is supplied with the RS232 PCB (AMP/Cannon or equivalent 9-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.

## 2 Technical Information

### RS 232 Communication Description

**NOTE**

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

---

## Serial Communication Descriptions

This unit can communicate via “Window” protocol.

# 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.

## 2 Technical Information

### Window Protocol

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

Tab. 5

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

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

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

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

The controller can answer with the following response types:

**Tab. 6**

<b>Response Type</b>	<b>Response Length</b>	<b>Response Value</b>	<b>Description</b>
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 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)

**2 Technical Information**  
**Window Protocol**

## 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	

**2 Technical Information**  
**Window Protocol**

**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: REAL 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

To get the complete list of windows available to manage the Elekta pumping system, refer to the following table

Tab. 7

WIN	Read/Write	Data Type	Name	Description	Admitted Values	Unit of Measure
0	R/W	L	Start/Stop	Start/Stop Commands	0/1	-
1	R/W	L	Low Speed TMP	Low Speed command TMP		-
8	R/W	L	Remote/Serial	It configures Controller in Remote or Serial operation		-
61	R/W	L	Low Speed RVP	Low Speed command RVP		-
100	R/W	L	Soft Start TMP	Enable/Disable Soft Start Option TMP		-
102	R/W	N	Set point Value TMP	It defines the threshold value for Set Point	0-65535	Hz/mA/s
103	R/W	N	Set point Delay TMP	It defines the set point mask time from start	0-65535	s
105		N	Set point hysteresis TMP	It defines the percentage value of Set Point Hysteresis	0-100	%
108	R/W	N	Baud Rate	It defines the serial communication baud rate (0 = 1200 bit/s, 1 = 2400 bit/s, 2 = 4800 bit/s, 3 = 9600 bit/s, 4 = 19200 bit/s)	0-4	-
200	R	N	Current TMP	It reads the actual value of the bus current supplied by controller to electric motor		mA

## 2 Technical Information

### Window Protocol

WIN	Read/ Write	Data Type	Name	Description	Admitted Values	Unit of Measure
	R	N	Voltage TMP	It reads the actual value of the bus voltage supplied by controller to electric motor		
201						
202	R	N	Power TMP	It reads the actual value of power supplied by controller to electric motor		W
203	R	N	Frequency TMP	This is the actual exciting frequency		Hz
204	R	N	Pump temperature TMP	Pump temperature		°C
205	R	N	Status TMP	0=Stop, 2=Ramp, 3=Autotuning, 5=Normal, 6=Fail		-
206	R	N	Error Code TMP	This location has a bit significant: 7(MSB) TOO_HIGHLOAD 6 SHORTCIRCUIT 5 --- 4 --- 3 POWER_FAIL 2 Controller OVERTEMP 1 Pump OVERTEMP 0 no connection to pump		-
225	R	N	Oil Level	0=Level OK, 1=Underlevel, 2=Sensor open, 3=Sensor short		-
262	R	N	Power RVP	It reads the actual value of power supplied by controller to electric motor		W
263	R	N	Driving Frequency RVP	This is the actual exciting frequency		Hz
265	R	N	Status RVP	0=Stop, 2=Ramp, 3=Autotuning, 5=Normal, 6=Fail		-

<b>WIN</b>	<b>Read/ Write</b>	<b>Data Type</b>	<b>Name</b>	<b>Description</b>	<b>Admitted Values</b>	<b>Unit of Measure</b>
266	R	N	Error Code RVP	This location has a bit significant: 7 Motor Block 6 Shortcircuit 5 Undervoltage 4 Motor OverTemp 3 Power fail 2 Controller OverTemp 1 (Oil OverTemp) 0 Spare		-
300	R	N	Cycle Time	It indicates the time of the last cycle (from the last start to now if the pump is running)		Min
301	R	N	Cycle number	It indicates the number of cycles start/stop during all the pump life.		-
302	R	N	Pump Life	It indicates the total hours of system life		H
305	R	N	Time With Oil Under Level	It indicates the running time with oil under level		Min
319	R	A	Controller Model	It is the Controller Model		-
320	R	A	Pump P/N TMP	It is the Part Number of Pump TMP		-
322	R	A	Pump S/N TMP	It is the Serial Number of Pump TMP		-
323	R	A	Controller Serial Number	It is the Serial Number of Controller		-
324	R	A	Pump Modification Level TMP	It is the upgrading level of the pump TMP		-
380	R	A	Pump P/N RVP	It is the Part Number of Pump RVP		-
406	R	A	Program Listing	It indicates code and release of embedded Program Listing		-

## 2 Technical Information

### Window Protocol

<b>WIN</b>	<b>Read/ Write</b>	<b>Data Type</b>	<b>Name</b>	<b>Description</b>	<b>Admitted Values</b>	<b>Unit of Measure</b>
407	R	A	Parameter Listing	It indicates code and release of embedded Parameter Listing		-
503	R	N	RS485 Address	t defines the serial address in RS485 communication (accessible with every serial address)	0-31	-
504	R	N	Serial type	It switches from RS232 and RS485 serial type.		-

## Maintenance

### Rotary Vane Pump Oil Filling-Up

It is necessary to refill the ROTARY VANE PUMP oil every time the level is under the MINIMUM line. The recommended procedure for refilling the Rotary Vane Pump oil is described below:

- Check the oil level
- Unscrew the system exhaust filter
- Locate the funnel provided (accessory kit) into the exhaust port vacated by the exhaust filter
- Pour the oil provided with the system (accessory kit) into the funnel until the oil level reaches the MAX line
- Remove the funnel and screw down the exhaust filter on the exhaust port.

### Rotary Vane Pump Oil Change

It is recommended that the rotary vane pump oil is replaced every 12 months. The recommended procedure for changing the Rotary Vane Pump oil is described below:

- Unscrew the system exhaust filter
- By means of a proper spanner (22 mm) keep the oil drain adapter still, avoiding that it could be unscrewed while you remove the oil drain cap.
- Remove the oil drain cap (flat screwdriver)
- Allow the oil to drain into a suitable container and dispose of according to local regulations.
- Close the oil drain cap (keeping the oil drain adapter still)

## 2 Technical Information

### Maintenance

- Locate the funnel provided (accessory kit) into the exhaust port vacated by the exhaust filter
- Pour the oil provided with the system (P/N: X3703-64006 “AVF20S VACUUM PUMP FLUID”) into the funnel until the oil level reaches the MAX line.
- Remove the funnel and screw down the exhaust filter on the exhaust port.

#### **CAUTION!**

The bearings of the turbomolecular pump are lubricated by a solid grease which is maintenance free provided the pump is used regularly.

Avoid long term storage if possible.

When long term storage is necessary the pump should be run for at least 1 hour every 6 months to re-distribute the grease within the turbomolecular pump bearing.

Failure to observe this maintenance may lead to premature wear and could result in failure of the bearings.

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## Troubleshooting

Tab. 8

Symptom	Possible cause
First phase of roughing longer than 16 min: <ul style="list-style-type: none"> <li>• Rotary Vane Pump: On</li> <li>• Turbo Molecular Pump: Off</li> </ul>	Device temperature lower than 54F(12 °C). Move the device to an environment where the temperature is higher than 54F(12 °C) and wait for system temperature to increase before switching it on.
First phase of roughing longer than 16min: <ul style="list-style-type: none"> <li>• Rotary Vane Pump: On</li> <li>• Turbo Molecular Pump: Off</li> </ul>	Vacuum system gross-leak. Leak-check the critical areas of vacuum system to locate and eliminate the leak.
First phase of roughing longer than 16 min: <ul style="list-style-type: none"> <li>• Rotary Vane Pump: On</li> <li>• Turbo Molecular Pump: Off</li> </ul>	Venting valve not properly closed. Turn the venting valve clockwise to close it.
Turbo Molecular Pump doesn't speed within 35 minutes	Vacuum system leak. Leak-check the critical areas of vacuum system to locate and eliminate the leak.
System stopped Status LED fast blinking (200 ms)	A failure has occurred to the Integrated Pumping System. Check oil level, if the oil level is correct, please contact your local Elekta service organization.

## Accessories Kit

The Elekta pumping system is provided with a series of accessories useful for system connection, operation and maintenance.

**Tab. 9**

Inlet screen	No.1	SR03.661198
Clamp NW40	No.2	KQ40AWP
Blank flange NW40	No.1	KF400000SB
Conical Reducer NW40/NW25	No.1	KRC2540S
Centre Ring NW40 SST/Viton	No.1	KC40SV
Flexible coupling NW40 48 in.	No.1	KL01504800
Exhaust Filter	No.1	X3703-68000
0.5l. GP Oil bottle	No.1	X3703-64006
IEC320 Male/Female power cable	No.1	-
Oil refill funnel	No.1	-



## ***Vacuum Products Division***

*Dear Customer,*

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

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

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

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

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

*Sincerely,*

A handwritten signature in black ink, appearing to read "Giampaolo LEVI".

*Giampaolo LEVI*

*Vice President and General Manager  
Agilent Vacuum Products Division*

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

## CUSTOMER REQUEST FOR CORRECTIVE / PREVENTIVE / IMPROVEMENT ACTION

TO: AGILENT VACUUM PRODUCTS DIVISION TORINO – QUALITY ASSURANCE FAX

N°: XXXX-011-9979350

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

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

E-MAIL: [vpd-qualityassurance\\_pdl-ext@agilent.com](mailto:vpd-qualityassurance_pdl-ext@agilent.com)

NAME	COMPANY	FUNCTION
<p>ADDRESS:</p> <p>TEL. N° : <span style="margin-left: 200px;">FAX N° :</span></p> <p>E-MAIL:</p>		
<p>PROBLEM / SUGGESTION :</p>          <p>REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.):</p>          <p style="text-align: right;">DATE</p>		
<p>CORRECTIVE ACTION PLAN / ACTUATION (by AGILENT VPD)</p>		<p>LOG N°</p>

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

## Vacuum Products Division Instructions for returning products

Dear Customer,

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

Complete the attached **Request for Return form** and send it to Agilent Technologies (see below), taking particular care to include the completed **Health and Safety** declaration Section. No work can be started on your unit until we receive a completed copy of this form.

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

### Product preparation

- Remove all accessories from the core product (e.g. inlet screens, vent valves).
- Prior to shipment and if applicable for your product, drain any oils or other liquids, purge or flush all gasses, and wipe off any excess residue.
- If ordering an Advance Exchange product, please use the packaging from the Advance Exchange to return the defective product.
- Seal the product in a plastic bag, and package product carefully to avoid damage in transit. You are responsible for loss or damage in transit.
- Include a copy of the Health and Safety Declaration in the shipping documentation on the outside of the shipping box of your returning product.
- Clearly label package with RA number. Using the shipping label provided will ensure the proper address and RA number are on the package. Packages shipped to Agilent without a RA clearly written on the outside cannot be accepted and will be returned.
- Return only products for which the RA was issued.

### Shipping

- Ship to the location specified on the printable label, which will be sent, along with the RA number, as soon as we have received all of the required information. Customer is responsible for freight charges on returning product.
- Return shipments must comply with all applicable Shipping Regulations (IATA, DOT, ADR, etc.) and carrier requirements.

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

#### EUROPE:

Fax: 00 39 011 9979 330

Fax Free: 00 800 345 345 00

Toll Free: 00 800 234 234 00

[vpt-customer@agilent.com](mailto:vpt-customer@agilent.com)

#### NORTH AMERICA:

Fax: 1 781 860 9252

Toll Free: 800 882 7426

[vpl-ra@agilent.com](mailto:vpl-ra@agilent.com)

#### PACIFIC RIM:

please visit our website for individual  
office information

<http://www.agilent.com>

**TERMS AND CONDITIONS**

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

- Unless otherwise pre-negotiated, customer is responsible for the freight charges for the returning product. Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.
- Agilent Technologies is not responsible for returning customer provided packaging or containers.
- Customers receiving an Advance Exchange product agree to return the defective, rebuildable part to Agilent Technologies **within 15 business days**. Failure to do so, or returning a non-rebuildable part (crashed), will result in an invoice for the non-returned/non-rebuildable part.
- Returns for credit toward the purchase of new or refurbished Products are subject to prior Agilent approval and may incur a restocking fee. Please reference the original purchase order number.
- Units returned for evaluation will be evaluated, and a quote for repair will be issued. If you choose to have the unit repaired, the cost of the evaluation will be deducted from the final repair pricing. A Purchase Order for the final repair price should be issued within 3 weeks of quotation date. Units without a Purchase Order for repair will be returned to the customer, and the evaluation fee will be invoiced.
- Products returned that have not been drained from oil will be disposed.
- A Special Cleaning fee will apply to all exposed products
- If requesting a calibration service, units must be functionally capable of being calibrated.

Customer information		
Company :	Contact Name:	
Address:	Tel:	Fax:
	Email:	

Equipment			
Product description	Agilent PartNo	Agilent Serial No	Original Purchasing Reference
Failure description		Type of process (for which the equipment was used)	

Type of return
<input type="checkbox"/> Non Billable <input type="checkbox"/> Billable <input checked="" type="checkbox"/> New PO # (hard copy must be submitted with this form): _____ <input type="checkbox"/> Exchange <input type="checkbox"/> Repair <input type="checkbox"/> Upgrade <input type="checkbox"/> Consignment/Demo <input type="checkbox"/> Calibration <input type="checkbox"/> Evaluation <input type="checkbox"/> Return for Credit

Health and safety	Substances (please refer to MSDS forms)			
The product has been exposed to the following substances: (by selecting 'YES' you MUST complete the table to the right)	* Agilent will not accept delivery of any product that is exposed to radioactive, biological, explosive substances or dioxins, PCB's without written evidence of decontamination.			
	Trade name	Chemical name	Chemical Symbol	CAS Number
Toxic	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Harmful	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Corrosive	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Reactive	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Flammable	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Explosive (*)	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Radioactive (*)	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Biological (*)	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Oxidizing	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Sensitizer	<input type="checkbox"/> YES <input type="checkbox"/> NO			
Other dangerous substances	<input type="checkbox"/> YES <input type="checkbox"/> NO			

Goods preparation
If you have replied YES to one of the above questions. Has the product been purged? <input type="checkbox"/> YES <input type="checkbox"/> NO If yes, which cleaning agent/method:
Has the product been drained from oil? <input type="checkbox"/> YES <input type="checkbox"/> NOT APPLICABLE I confirm to place this declaration on the outside of the shipping box. <input type="checkbox"/>

<b>I declare that the above information is true and complete to the best of my knowledge and belief. I understand and agree to the terms and conditions on page 2 of this document.</b>	
Name:	Authorized Signature:
Position:	
Date:	

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

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