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MS40+ Single Stage Rotary Vane Pumps

Models:

949-9225, 949-9240, 949-9241

**Manuale di Istruzioni
Bedienungshandbuch
Notice de Mode D'Emploi
User Manual**

87-901-008-01 (E)

05/2013

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CAUTION

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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.

MS40+ Single Stage Rotary Vane Pumps



MS40+ Single Stage Rotary Vane Pumps

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Original Instructions

General Information

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

The MS40+ Single Stage Rotary Vane Pumps are single-stage, rotary vane pumps oil sealed, driven by a three-phase electric motor.

These high vacuum pumps are suitable for pumping non corrosive gases.

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

When transporting and storing the pumps, the following environmental requirements should not be exceeded:

- temperature: from -20° to +70 °C
- relative humidity: 0 – 95 % (non-condensing)

Preparation for Installation

The pump is supplied in a special protective packing. If this shows signs of damage which may have occurred during transport, contact your local sales office.

Total weight of the pack, including the pump, is approx. 35 Kg.

When unpacking the pump, 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.

NOTE

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

NOTE

The pump is provided with some standard accessories:

- 1 9 pin "D" connector for I/O (female) (excluding model 949-9241)
 - 1 9 pin "D" connector for RS232 (male) (excluding model 949-9241)
 - IEC320 retention spring
-

4 Instructions for Use
Preparation for Installation

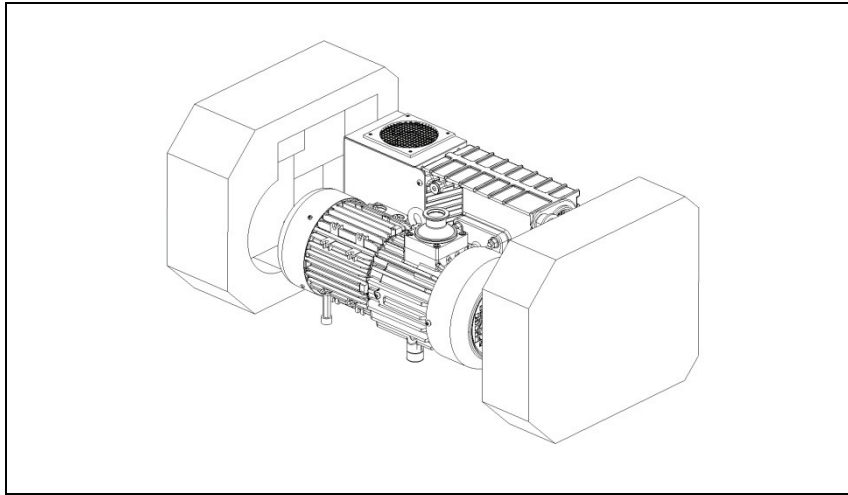


Figure 1

Installation

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

- temperature: from +12 °C to +40 °C
- relative humidity: 0 – 95 % (non-condensing)
- IP value.

CAUTION!

Before starting the pump, check the oil level.

WARNING!



Take out the protective caps on the suction and exhaust flanges before doing anything else. In the event of an accidental start-up, the air inside the pump could violently expel the protective caps and harm the operator.

WARNING!



During installation, pay maximum attention that the suction flange is connected to the vacuum chamber and the exhaust flange is not closed (see the following figure). The pump must not be used as a compressor. Maximum pressure inside the oil container must not exceed 1.5 bar (abs.). Non-observance of these precautions may be dangerous for the machine and the operator.

4 Instructions for Use

Installation

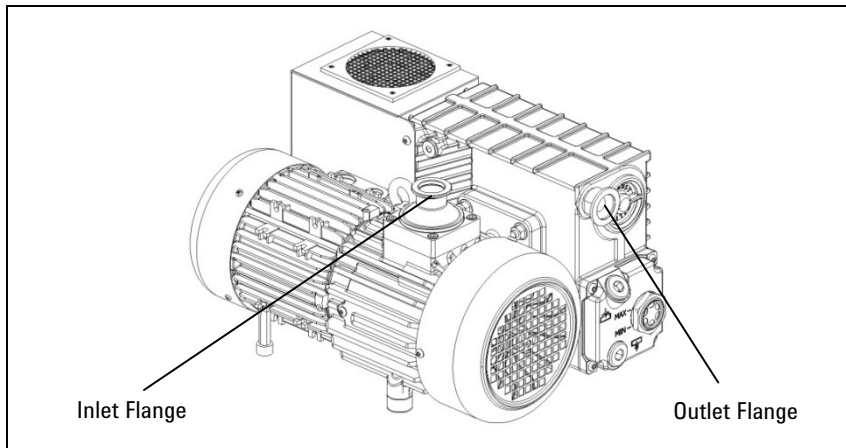


Figure 2

CAUTION!

Check that your electrical mains voltage corresponds to the range indicated on controller label.

Connect the pump to the power supply.

Use

There are no special procedures for switching the pump on; it needs only to be connected to the electric power by means of the bipolar switch.

WARNING!



The pump is designed for operation with neutral or non-corrosive fluids. It is absolutely forbidden to use potentially explosive or flammable substances.

Maintenance

Personnel responsible for pump operation and maintenance must be well-trained and must be aware of the accident prevention rules.

WARNING!



Death may result from contact with high voltages. Always take extreme care and observe the accident prevention regulations in force.

WARNING!



When machine is powered take care on account of moving parts and high voltages.

4 Instructions for Use

Maintenance

WARNING!



If you have to perform maintenance on the pump after a considerable time in operation, leave it to cool as temperature of the outer surface may be in excess of 60 °C.

WARNING!



Always disconnect the power supply to the pump before starting maintenance work. Place a special warning signs over the power supply breaker switch: **MACHINE UNDERGOING MAINTENANCE - DO NOT POWER ON.** When finished, remove the safety warning.

WARNING!



Do not change the oil immediately after stopping the machine as the oil temperature may still be high.

NOTE

Before returning the pump to the constructor for repairs the "Health and Safety Certification" 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 pump package before shipping.

If a pump 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.



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Disposal

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Section I

Technical Description

The MS40+ Single Stage Rotary Vane Pumps are rotary vane pumps oil sealed, driven by a three-phase electric motor.

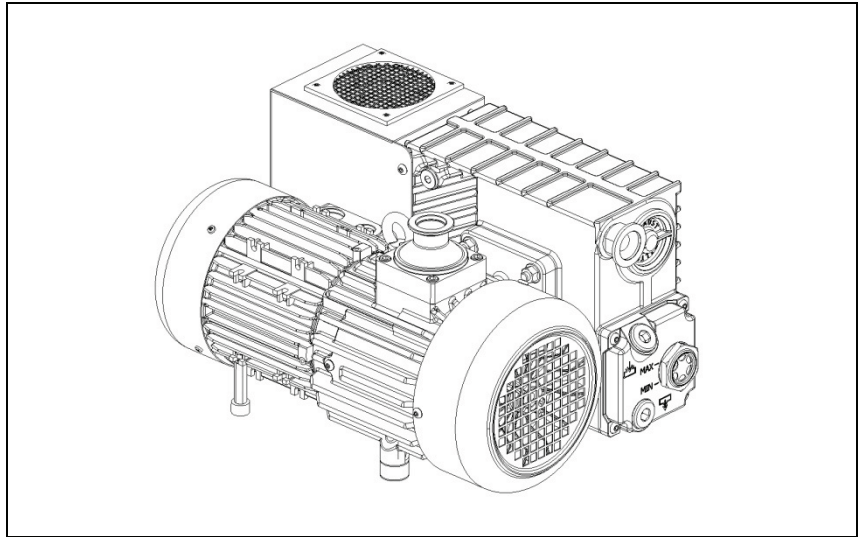


Figure 3

These vacuum pumps are suitable for pumping non corrosive gases.

The main features are:

- all parts in direct contact with the fluid pumped are free of copper alloys;
- all materials are carefully selected to provide extended life;
- due to its design features and low number of gaskets, the pump requires little maintenance, disassembly and reassemble are easy and require minimal time.

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.

5 Technical Information

Vacuum Seals

The pump is equipped with a special anti-suckback device which automatically isolates the vacuum system when the pump stops. This avoids rises in pressure or oil flow in the vacuum system while air is allowed back into the stator chambers.

The air entering the pump after the anti-suckback device has closed prevents the oil in the casing from filling the stator chambers.

Vacuum Seals

A special feature of this pump is the low number of gaskets that are employed.

The seals in the circuit are obtained by means of VITON gaskets.

Sealing of the rotor shaft is guaranteed by a rotating gasket with dust-guard lip.

The suction flange and duct are sealed by mean of OR gaskets.

Anti-Suckback Device

The pump is equipped with a special anti-suckback device to avoid air pressure rises and/or oil back-flow towards the evacuated vessel when the pump is switched off. This device has a shutter which automatically closes the suction duct.

In this way the pump and vacuum system are completely isolated from each other and air can enter the pump without any risk for the vacuum produced in the system.

The device includes some special features, namely:

- drive obtained avoiding any form of contamination of the inlet duct by fluids (oil and/or air). Thanks to this, when the pump is started again, the pumpdown to vacuum conditions is extremely fast as these contaminants are not present and no degas-sing is therefore required.

Technical Data

The following table lists the main technical data of the MS40+ Single Stage Rotary Vane Pumps.

Tab. 1

TECHNICAL DATA	RPM	UNITS	949-9225	949-9240	949-9241
PUMPING SPEED (at 5 mbar inlet pressure)	1450	m ³ /h	40	40	40
ULTIMATE TOTAL PRESSURE *		mbar	5x10 ⁻²	5x10 ⁻²	5x10 ⁻²
OIL CAPACITY min/max		l	1	1	1
MOTOR RATING 3ph		Kw	0.75	0.75	0.75
ROTATIONAL FREQUENCY min/max		Hz	40-60	40-60	40-60
NOISE LEVEL		dB(A)	≤ 62	≤ 62	≤ 62
OIL TEMPERATURE		°C	60	60	60
(pump operating) **		°F	140	140	140
IP Value			20		
Installation category			II		
Pollution degree			2		
OPERATING TEMPERATURE RANGE		°C	12 – 40	12 – 40	12 – 40
WEIGHT		Kg	33	33	33
		lb	72.7	72.7	72.7
INLET FLANGE		DN	25KF	40KF	40KF
EXHAUST FLANGE		DN	25KF	25KF	25KF
Main Dimensions:					
- length		mm	418	418	418
- width		mm	297	297	297
- height		mm	228	228	228
Nominal Input Voltage		V	200-240	200-240	200-240
Input frequency		Hz	50 / 60	50 / 60	50 / 60
Max input power		VA	1200	1200	1200
Internal Main Fuse (TT type)		A	12.5	12.5	12.5

* According to PNEUROP 6602

** At ultimate total pressure, 20 °C (68 °F) room temperature

Dimensions

The following figure shows the pumps layout and dimensions:

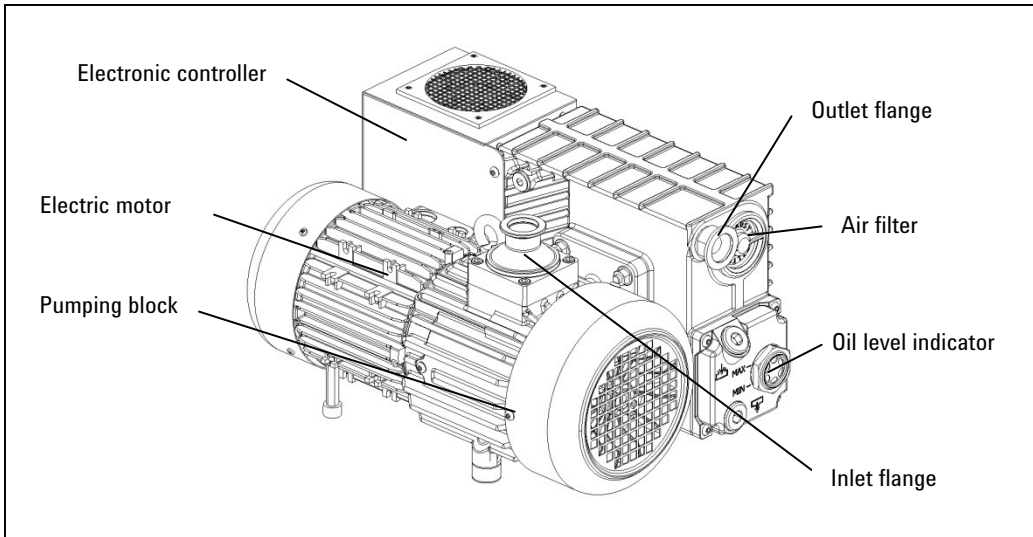


Figure 4 MS40+ Single Stage Rotary Vane Pumps layout

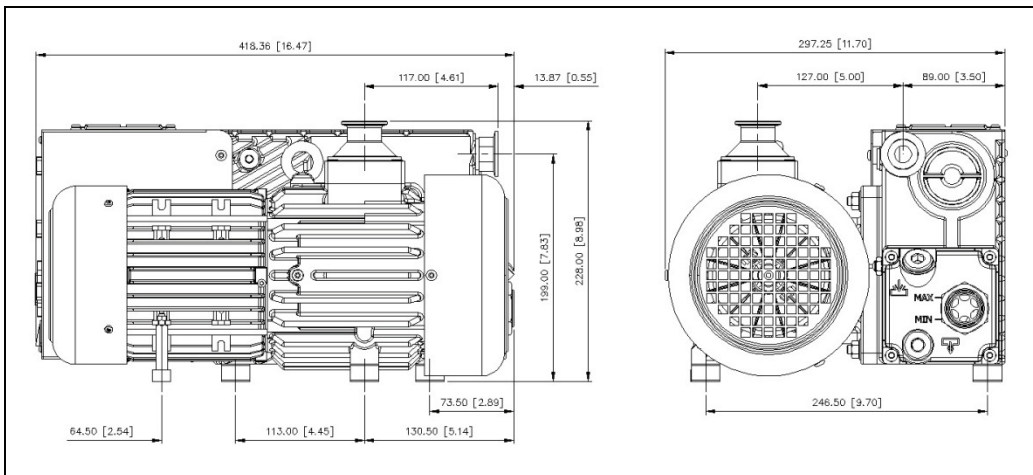


Figure 5 MS40+ Single Stage Rotary Vane Pumps dimensions

Safety Precautions

- Always carry the pump by means of the ring-bolt provided.
 - The pump must be set in position taking the upmost care in order to avoid accidental falls.
-

WARNING!



In case of a need to handle the pump after a pe-riod of operation, it must be left to cool first as the external surface temperature may be in excess of 60 °C.

Transport and Installation

The pumps are shipped to the customer inside cardboard boxes.

Total weight of the pack, including the pump, is about 35 Kg.

The case must be handled with care, using appropriate lifting equipment.

CAUTION!

When moving the case, ensure that it is securely bound to the lifting equipment and that the equip-ment is strong enough to support the weight.

The pump's working environment is a traditional industrial environment. Naturally sites with corrosive vapors or excessive heat are best avoided.

Room temperature should ideally be between 12 °C and 40 °C.

If the temperature is not inside this range, consult Agilent technical service for the changes required.

5 Technical Information

Transport and Installation

Setting the pump in position should be performed as follows:

- Pump laid on the ground. There are no special instructions for this type of installation, except that the floor should be as flat as possible and suited to bear the weight of the pump (it should ideally be a concrete floor) and of any accessories mounted on it. Note that the pump is stable on its base plate and it should not be necessary to anchor it to the floor with bolts and screws; also vibrations to and from the pump are greatly reduced by the use of rubber feet.
- Pump off the ground. In this case, the user must design a suitable support structure, remembering the following points:
 - the plane supporting the pump must be perfectly horizontal;
 - the structure should be adequately rigid;
 - the relevant safety precautions should be applied.

Note also that the pump should be attached to the supporting structure after replacing the rubber feet with special anti-vibration feet, which should be screwed to the pump base and to the supporting plane.

After taking the pump out of its packing case, you are advised to make the following checks:

- a Ensure that the pump has not suffered any damage during shipping.
- b Check that there are no uncovered or loose parts.

Preliminary Operations

Before starting the pump, check for oil level.

CAUTION!

Oil must be poured into the casing through the special threaded plughole and NOT through the suction line.

WARNING!



Take out the protective caps on the suction and exhaust flanges before doing anything else. In the event of an accidental start-up, the air inside the pump could violently expel the protective caps and harm the operator.

Section II

Connection to the Electric Supply

CAUTION!

It is recommended to connect the pump to the power supply through a dedicated safety switch on the main electrical panel of the installation, or in proximity of the power supply connection point.

Connections to the Inlet and Exhaust Flanges

Remove the protective caps from both flanges. Connect the system to be evacuated to the inlet flange, using a centering ring with OR and a locking collar.

NOTE

For guaranteed reliable sealing, use an OR gasket in Perbunan or Viton.

The inlet duct is equipped with a sieve filter preventing solid particles from entering and damaging the pump.

NOTE

When the gases to be pumped out contain dust, it is advisable to insert a dust filter before the inlet flange.

NOTE

When the gases to be pumped out contain large quantities of vapor, it is advisable to include a condense separator before the inlet flange.

To make best use of the pump's capacity, use only short, straight piping, with a diameter not smaller than that of the inlet flange.

5 Technical Information

Connections to the Inlet and Exhaust Flanges

NOTE

If rigid piping is used, it is good practice to use a flexible joint in order to avoid undue forcing of the connection on the pump.

The exhaust duct must be connected to a pipe that will take away the pumped out gases.

NOTE

An internal oil mist eliminator avoids pollution of the surrounding atmosphere by the oil present in the exhaust duct during pump operation.

CAUTION!

Never block the pump exhaust line. This would cause overpressure in the casing with the risk of breaking the oil tank.

Starting and Running the Pump

WARNING!



The pump is designed for operation with neutral or non-corrosive fluids. It is absolutely forbidden to use potentially explosive or flammable substances.

NOTE

If the pump is started with cold oil, initially more than normal noise will be heard; this will last for a few minutes only until the oil reaches its working temperature.

There are no special instructions for normal operation of the pump, which is delivered to you after completion of a running cycle in the factory.

NOTE

To allow the pump starting you have to wire properly the interlock pins by connecting the mating connector provided with the pump.

NOTE

For repetitive work cycles, with brief time intervals in between, it is better not to stop the pump.

Stopping the Pump

There are no special procedures for switching the pump off; it needs only to be disconnected from the electric power by means of the bipolar switch. When the pump is stopped, the anti-suckback device makes it possible to maintain vacuum in the vessel connected on the inlet flange of the pump.

Safety Rules

Personnel responsible for pump operation and maintenance must be well-trained and must be aware of the accident prevention rules. The accident prevention precautions contained in this section must be respected at all times during operation and maintenance of the pump to avoid damage to operators and to the pump. These precautions are provided in the form of WARNING and CAUTION notes.

WARNING!

Operating procedures, technical information and precautions which, if not respected and/or implemented correctly may cause body harm to operators.



NOTE

Before connecting the IEC320 mains cable, install the Retention Spring provided with the MS40+. The Retention Spring has to be fastened to IEC320 connector lateral screws.

NOTE

Use the Retention Spring to secure the mains cable into the IEC320 socket.

CAUTION!

Operating procedures, technical information and precautions, which, if not respected and/or implemented correctly, may cause damage to the pump.

Warning Notes

- a** Death may result from contact with high volt-ages. Always take extreme care and observe the accident prevention regulations in force.
- b** Always disconnect the power supply to the pump before maintenance work. Place a special warning signs over the power supply breaker switch: **MACHINE UNDERGOING MAINTENANCE - DO NOT POWER ON.**
- c** If you are performing maintenance after the pump has been operating for a considerable time, allow sufficient time for it to cool as the external surface temperature may be in excess of 60 °C.
- d** Failure to provide the pump with an earth con-nection may cause serious damage to opera-tors. Always ensure that there is an earth connection and that it complies with the standards.
- e** When cleaning the pump and its component parts, avoid the use of flammable or toxic solvents, such as benzin, benzol, ether or alcohol. The recommendation is to use a soap and water solution, preferably in ultrasound washing machines, taking care to dry all the cleaned parts at temperatures under 100 °C in order to eliminate residual moisture.
- f** Prolonged overloads or breakdowns may cause the electric motor to overheat, and to release noxious smoke; remove the power immediately as a precaution and do not approach the pump at least until you have pro-vided ventilation to drive out the smoke. Take care not to breathe in the fumes remaining inside the pump in the course of repair work.
- g** In case of fire, do not throw water on the pump. Switch the power off and use CO₂ extinguishers.
- h** Carefully inspect the flanges to ensure that there is no dust, oil, dirt or defects of the mating surfaces, before making the required connections.
- i** Ensure that all joints and couplings are locked correctly before starting the pump again after repair work.

5 Technical Information

Warning Notes

- j Do not wear any objects that may become entangled in the mechanisms and/or act as conductors (chains, bracelets, etc.).**
- k Ensure that the tools to be used are in perfect working condition and have insulating grips, where necessary. Check that the insulating material of the cables and that the conductors of the test equipment do not show any signs of damage.**
- l Do not replace the oil immediately after stopping the machine as the oil may still be at high temperature.**
- m Perform repairs in clean and, where possible, dustfree areas. Protect all the clearances of connection points with suitable plastic caps and cover the machined surface areas of all parts stripped down until they are put back on the pump again.**

Caution Notes

- a** Before putting the pump back into operation after a breakdown, inspect it and check carefully for any other signs of damage.
- b** Use only tools that are in perfect working order and specially designed for the job; use of inappropriate or ineffective tools may cause serious damage.
- c** Perform repairs in clean and, where possible, dust-free areas. Protect all the clearances of connection points with suitable plastic caps and cover the machined surface areas of all parts stripped down until they are put back on the pump again.
- d** Always check the lubricant and that it is properly distributed through the pump; inadequate lubrication may damage the pump seriously.
- e** Give the parts some form of marking as you strip them down to ensure that you reassemble them again in the proper order.
- f** Check that there are no scratches or grooves on the machined shafts, in their seats inside the pump or on machine-ground surfaces. Slight scratches and abrasions may be eliminated with very fine emery paper or by a little light grinding.
- g** Before putting a group together, always spread a little oil over inner parts and mating surfaces. Replace all seals with original spare parts before reassembling components.

Maintenance Actions

Maintenance may be seen as the totality of all scheduled and unscheduled maintenance work.

- **SCHEDULED MAINTENANCE:** Maintaining the nominal state of operation.

Tab. 2

Oil level checking	Daily (before every starting)
Oil change	8.000 hours (light applications)
Exhaust filter replacement	If oil mist at exhaust or yearly
Anti such-back valve checking	6 months
Fan cover cleaning	6 months

NOTE

The scheduled maintenance is supported by an automatic timer provided by the electronic controller. After 8000 h of operation the status led starts blink-ing (400 ms period) orange. The led blinking highlights that is necessary to change the oil. To switch off the alarm it's necessary to use the serial interface (see window list in the following pages). It is possible to read the Scheduled Maintenance timer by using the serial interface.

- **UNSCHEDULED MAINTENANCE:** Restoring the nominal state of operation.

NOTE

The frequency with which repairs are performed depends on the process and presence of substances that shorten pump life (dust, abrasives, solvents, water, chemically aggressive substances).

The pump must be cleaned at regular intervals of time.

CAUTION!

Do not clean with Alcohol the plastic or rubber components of the pump.

Use only the strictly necessary amount of lubricant; an excess of lubricating oil, like when there is none, may sometimes compromise proper operation of the pump.

Only the recommended lubricants, or lubricating oils with similar characteristics and known and experimented quality, should be used. Oil changes must be made with the oil at a sufficiently high temperature, after leaving the pump to cool for a few minutes following operation.

The drain and filler plugs must not be left open any longer than is strictly necessary. When performing maintenance, look out for all signals that may precede a breakdown, in particular:

- traces of corrosion;
- oil leaks;
- slack joints or couplings.

Maintenance technicians must:

- be aware of all applicable national directives concerning accident prevention during work on motor-driven pumps and should know how to apply them;
- have read and understood all the sections on "Safety Rules";
- be familiar with the essential design features and operation of the pump;
- know how to use and consult the pump documentation;
- be concerned about proper operation of the pump;
- make a note of any irregularities in operation of the pump and take the necessary action, where appropriate.

Use original spare parts wherever possible and repair a broken part as best as possible on site or send it back to the manufacturer for repairs. For all problems arising, or to order spare parts, refer to our service department.

Here following the correct procedures for MS40+ Oil Change and Filter Cartridge Replacement are described.

Oil and Filter Cartridge Replacement Procedures

Oil Change Procedure

1. Place a tank for waste oil under the oil drain plug.

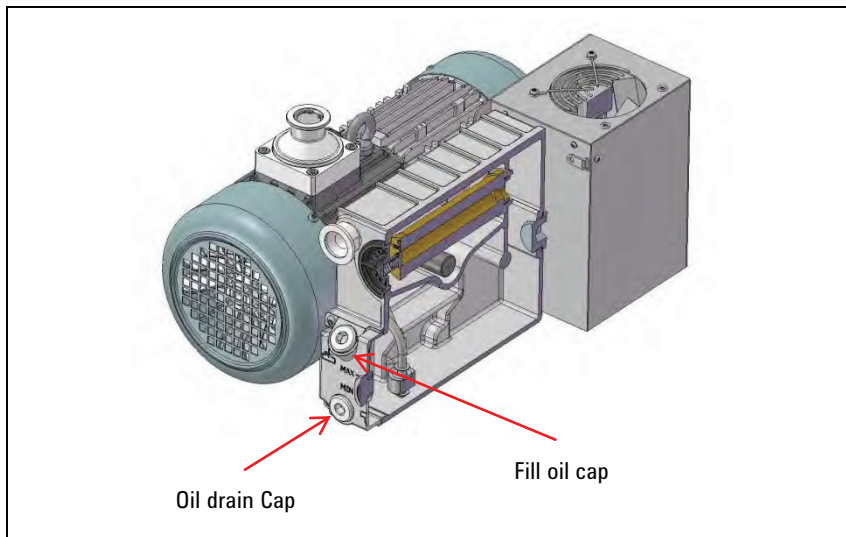


Figure 6

2. Unscrew slowly the oil drain cap rotating it anti-clock wise using a 10mm hex key. Let the oil flow out. In the meantime clean the inside of the drain plug.
3. After closing the drainage hole with its plug make the pump perform a number of turns, giving it a brief current pulse, so as to let residual oil in the pump chambers flow out. Then drain off the residual oil again.
4. After the oil has been drained, close the drain plug tight; take the tank of waste oil away and clean thoroughly, using rags of cotton or other suitable material to dry.

5. Open the fill oil cap using a 10 mm hex key and add 1 liter of SW60 oil.
6. Close the oil fill cap tight.
7. Replace the cartridge filter as per following slide.

Filter Cartridge Replacement Procedure

1. Unscrew the cap rotating it anti-clock wise, by hand or socket wrench with size 19 mm.
2. Pull out the cartridge filter.

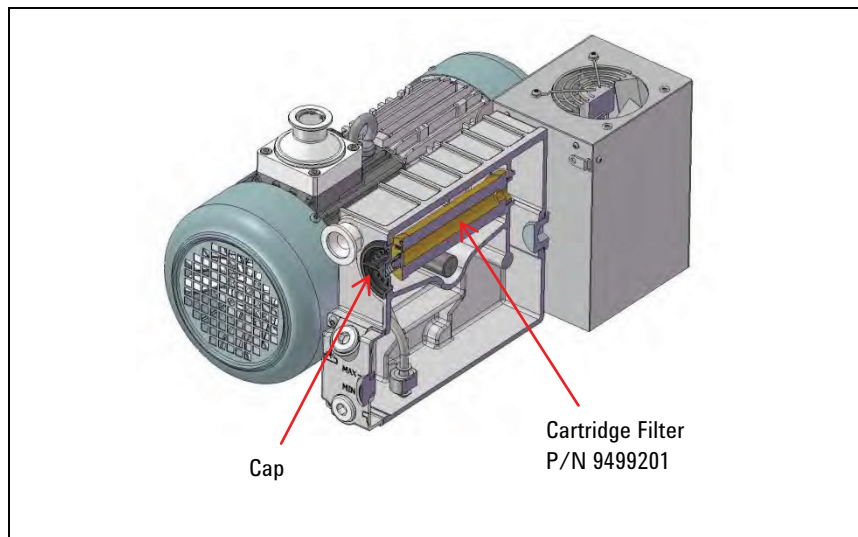


Figure 7

3. Insert new cartridge filter and double check it is in the right position (inserted in the appropriate hole).
4. Tighten the cap rotating clock wise, by hand or socket wrench with size 19 mm.

Lubricants

It will be readily understood how important adequate lubrication is to high technology pumps like the Agilent vacuum pumps. Correct use of appropriate lubricants makes a significant contribution to achieving best performance and warding off defects.

When handling lubricants, the following sanitary protection measures should be observed at all times:

- Avoid prolonged, excessive or repeated contact of the skin with products for lubrication, and also avoid directly inhaling the fumes or vapors of such products.
- Protect the skin by wearing appropriate clothes and equipment (e.g. special suits, glasses or, where permitted by the safety regulations, gloves) or by applying a special protective product.
- Clean the skin carefully after contact with the lubricants by washing freely with water and soap.
- Apply a skin cream after washing.
- Take off and change clothes or shoes on which oil has been spilled.
- Never put rags dripping with oil into the pockets of your clothes.

When disposing of waste lubricants, observe the following environment protection regulations:

- The lubricants risk contaminating the water and the ground! Therefore never pour lubricating products on to the ground, into water or in the sewage system. All violations of these rules are liable to persecution as provided for by law. When using lubricants always keep oil can nearby.
- Take care in draining off waste oils. In disposal of these products respect all regulations in force concerning waste oil disposal.

The recommended lubricating oil is the Agilent SW60 oil. The SW60 oil is a general purpose mechanical pump fluid specifically engineered to provide superior performance in high speed direct drive mechanical pumps.

These precisely distilled fluids (100 % solvent refined neutral paraffinic oil) deliver lower base pressure capability, faster pump-down cycles, and reduced maintenance requirements on both the pump and the fluid.

It is absolutely necessary to continue using the lubricants initially used to fill the tank. If this is not possible for organizational or business reasons, use only products with the same characteristics as the previous oils.

Only use of lubricants of suitable quality will guarantee safe operation of the pumps.

CAUTION!

Mineral oils and the PFPE oil are incompatible. To change from one type to another, the pump must be stripped down completely and all parts washed carefully to eliminate all oil residues.

If you expect to have to use other lubricants, first find out if the two products are compatible. In cases of doubt, the lubricant used up to that time must be flushed out by way of a pump flushing procedure.

CAUTION!

To avoid the risk of contaminating the oil, absolute cleanliness of the pump and surrounding area must be ensured during the lubrication procedures.

Tab. 3 SW60 oil characteristics

Property	Unit of measure	SW60
Vapour Pressure @ 25 °C	Torr	5x10 ⁻⁸
Viscosity @ 40 °C	cSt	55
Max Temperature	°C	150
Flash point	°C	220

SW60 Oil Description

SW oil have superior features;

- Reduced deposits, thanks to the absence of heavy metals (ashless);
- Odorless;
- Exceptional lubricating properties and protection against the most common solvents, and high oxidation resistance;
- High anti-emulsifying power with water;
- Minimal variations in viscosity according to temperature;
- Very low volatility (vapor tension) and thus suitable for use on high vacuum pumps;
- Resistance to aging under the effect of atmospheric agents (ozone, water, light);
- Chemical and physiological inertia of primary importance, and extremely high anti-emulsifying properties.

This special type of oil is suitable for use in environments containing noble or inert gases.

The SW60 oil described is combustible. If during normal use the vacuum pump should take in mixtures with an oxygen content greater than 21 % or pure oxygen, this should cause:

- Oxidation of the oil and thus the loss of its lubricating properties, with serious damage to the pump itself;
- Formation of conditions favorable to explosion in the pump tank.

Pump Electronic Controller

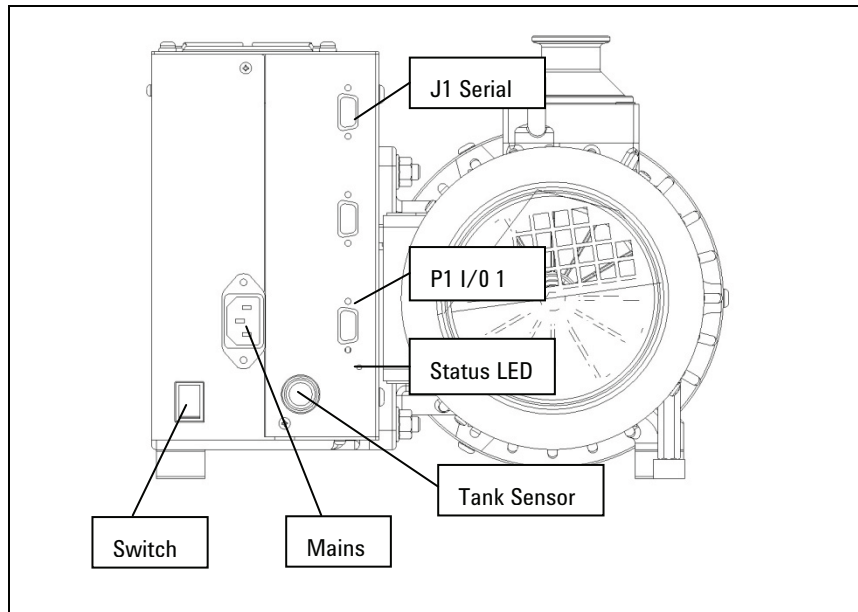


Figure 8

Technical Specifications

- Input voltage: 200V-240V 50/60 Hz
- Max input power: 1200 VA
- Output voltage: 240 Vrms 3ph;
Max frequency: 64 Hz (factory setting)
- Starting phase maximum power: 950 W
- Normal Operation maximum power: 950 W
- Maximum room temperature: 40 °C
- Protection level: IP 20

5 Technical Information

Pump Electronic Controller

- CE mark:

Tab. 4

EN55011 cat "B"	EN61000-4-5
EN61000-3-2	RF EN61000-4-6
EN61000-3-3	EN61000-4-8
ESD EN61000-4-2	EN61000-4-11
EN61000-4-3	EN61010-1
EN6100-4-4	

- CSA mark:
 - EN61010-1, Installation category II, pollution degree 2
 - EN60950

NOTE

Before connecting the IEC320 mains cable, install the Retention Spring provided with the MS40+. The Retention Spring has to be fastened to IEC320 connector lateral screws.

NOTE

Use the Retention Spring to secure the mains cable into the IEC320 socket.

Input/Output Communications

P1 – I/O

Tab. 5

PIN N.	SIGNAL NAME	IN / OUT
1	Interlock. Status (N.O. relay contact)	out
2	Speed setting (0-10V)	in
3	Oil level (relay contact)	out
4	Start (-)	in
5	Ground	out
6	Interlock. Status (N.O. relay contact)	out
7	Oil level (relay contact)	out
8	Start (+)	in
9	24V	out

- Interlock: N.O. Relay contact – It is closed as soon as the rotational frequency exceed the threshold defined with window no.102 (plus histerisys defined by window 105). Factory set 40 Hz.
- Speed setting: Electric motor speed setting – linear setting between 1V=15 Hz and 9 V= Win.120 setting:
 - High speed (60 Hz): Vin>9 V
 - Low speed (40 Hz): Vin<1 V

5 Technical Information

Pump Electronic Controller

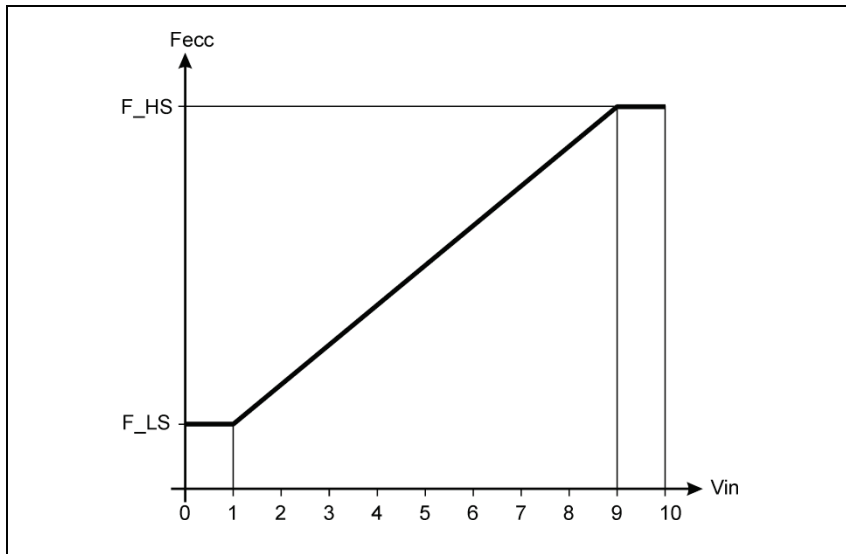


Figure 9

- Oil level: N.O. Relay contact – It is closed as soon as the oil level comes down under the minimum level – The pump is not stopped but the following starting is disabled.
- Start/stop: If the inverter is managed by remote port it manage the pump starting – if you are operating in serial mode it enables the starting. (pin 8 to pin 9 / pin 4 to pin 5).
- Rotational speed setting by analog input (0-10 V).

NOTE

The pump operation is I/O signals dependent so you must always plug-in the provided mating connector to start the pump.

RS 232/RS 485 Communication Description

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

J2 – Serial Port

Tab. 6

PIN N.	SIGNAL NAME
1	+ 5 V out
2	TX (RS232)
3	RX (RS232)
4	Spare
5	GND
6	A+ (RS485)
7	Spare
8	B- (RS485)
9	Spare

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

NOTE

The RS-485 is a 2-wire (gnd optional) half-duplex communication link.

Communication Format

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

Communication Protocol

The communication protocol is a MASTER/SLAVE type where:

- Host = MASTER
- Controller = SLAVE

The communication is performed in the following way:

1. the host (MASTER) send a MESSAGE + CRC to the controller (SLAVE);
2. the controller answer with an ANSWER + CRC to the host.

The MESSAGE is a string with the following format:

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

Where:

NOTE

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

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

Tab. 7

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 answers with the following response types:

Tab. 8

Type	Length	Value	Description
Logic	1 byte	-	after a read instruction of a logic window
Numeric	6 bytes	-	after a read instruction of a numeric window
Alphanumeric	10 bytes	-	after a read instruction of an alphanumeric window
ACK	1 byte	(0x6)	the command execution has been successfully completed
NACK	1 byte	(0x15)	the command execution has been failed
Unknown Window	1 byte	(0x32)	the specified window in the command is not a valid window
Data Type Error	1 byte	(0x33)	the data type specified in the command (Logic, Numeric or Alphanumeric) is not accorded with the specified Window

5 Technical Information

RS 232/RS 485 Communication Description

Type	Length	Value	Description
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)

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>

Examples

Command: START

Source: PC

Destination: Pump

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

Source: Pump

Destination: PC

02	80	06	03	38	35
STX	ADDR	ACK	ETX	CRC	

Command: STOP

Source: PC

Destination: Pump

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

Source: Pump
Destination: PC

02	80	06	03	38	35
STX	ADDR	ACK	ETX	CRC	

Command: READ PUMP STATUS

Source: PC
Destination: Pump (with address = 3)

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

Source: Pump (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		

Window Meanings

Tab. 9

WIN	TYPE	R/W	DESCRIPTION
000	L	RW	START/STOP (1= START ; 0= STOP)
008	L	RW	REMOTE/SERIAL CONFIGURATION (1= Remote ; 0= Serial)
102	N	RW	SET POINT VALUE [Hz] (0 – 100)
105	N	RW	SET POINT HYSTERESIS [%] (0 – 100)
108	N	RW	BAUD RATE (0-4) [600, 1200, 2400, 4200, 9600]
120	N	RW	ROTATIONAL FREQUENCY SETTING [Hz] (40 - 60)
127	N	R	ROTATIONAL FREQUENCY SETTING [rpm] (read only)
200	N	R	BUS CURRENT [mA]
201	N	R	3PHASE VOLTAGE [Vrms]
202	N	R	POWER [W]
203	N	R	DRIVING FREQUENCY [Hz]
205	N	R	STATUS (0=stop; 1=wait interlock; 2=start; 3=autotuning; 5=normal; 6=fail)

5 Technical Information

RS 232/RS 485 Communication Description

WIN	TYPE	R/W	DESCRIPTION
206	N	R	ERROR CODE: Bit 7: Motor blocked; Bit 6: shortcircuit; Bit 5: Undervoltage/Overvoltage; Bit 4:Motor overtemp; Bit 3: Verify line; Bit 2: Controller overtemp; Bit 1: Bus Undervoltage; Bit 0: overcurrent
207	N	R	OUTPUT FREQUENCY [rpm]
211	N	R	JGBT TEMPERATURE [°C]
216	N	R	CONTROLLER TEMPERATURE [°C]
222	N	R	POWER SUPPLY TEMPERATURE [°C]
225	N	R	OIL LEVEL (0=level ok; Bit 0: underlevel; Bit 1: maintenance)
233	N	R	ROTATIONAL FREQUENCY [rpm]
300	N	R	CYCLE TIME [min]
301	N	R	CYCLE NUMBER
302	N	R	PUMP LIFE [h]
305	N	R	TIME WITH OIL UNDER LEVEL [min]
306	N	R	TIME WITH DIRTY FILTER [min]
307	N	R	TIME CONTROLLER STAND BY
319	A	RW	CONTROLLER MODEL NUMBER
320	A	RW	PUMP MODEL NUMBER
321	A	RW	PUMP SPECIAL MODEL NUMBER
322	A	RW	PUMP SERIAL NUMBER
323	A	RW	CONTROLLER SERIAL NUMBER
358	N	RW	MAINTENACE TIMER [hours]
362	N	R	LAST HOUR TEMPERATURE AVERAGE [°C]
364	N	R	LAST HOUR AVERAGE POWER [W]
365	N	R	LAST HOUR AVERAGE FREQUENCY [Hz]
382	N	R	LAST HOUR AVERAGE TEMPERATURE [°C]
384	N	R	AVERAGE POWER [W]
400	A	R	PROGRAM LISTING CRC
402	A	R	PARAMETER LISTING CRC
406	A	R	PROGRAM LISTING CODE & REVISION
407	A	R	PARAMETER LISTING CODE & REVISION
503	N	RW	RS485 SERIAL ADDRESS SETTING [0-31]
504	L	RW	SERIAL TYPE SELECT (0=RS232; 1=RS485)

Operational Limits

Tab. 10

INPUT VOLTAGE (V)	CONTROLLER STATUS
< 180	Power fail
180 – 264	Operative
> 264	Power fail

Status LED

Tab. 11

LED STATUS	CONTROLLER STATUS
Off	Stop
Green blinking	Ramp – Autotuning
Green	Normal Operation
Red	Fail
Red blinking	Oil level fail
Orange + Off	Reset + selftest
Orange blinking	Maintenance required

NOTE

When you switch the controller on an electronic self-test is performed, during such phase you'll see the led Orange for 1 sec. And turned off for two other seconds. Immediately after the first phase the controller perform a specific test on the pump rotor in order to be sure that it isn't locked.

Electronic Self-Test

When you switch the pump on with the main On/Off switch the pump doesn't start immediately but it starts only after about two seconds.

This test time isn't required if the pump is already powered as when it is operated in remote or serial mode.

Rotor Lock Test

The rotational frequency is checked continuously. If the rotor remains still for more than 20 sec. the pump status is changed to "Fail".

Oil Level Check

The oil level is continuously checked even when the pump is in Stop status. If the oil level check highlights at low level while the pump is OFF, it won't start again. If the oil level check highlights at low level during the pump operation, it will continue to run but, if you switch the pump off it will be impossible to start again.

NOTE

If the electronic controller status is "Oil Under-level" the pump starting is not allowed.

NOTE

If the oil level check fails (low level) the pump doesn't stop. The test only activates the output described above.

An Oil level sensor fail is highlighted by means of quick status led blinking and RS232 window (see "Status led" and "Window meaning" tables).

Accessories

Tab. 12

PART NUMBER	DESCRIPTION
949-9201	MS40+ Exhaust filter
949-9202	MS40+ 1 Litre Oil Tank
949-9203	Maintenance kit
949-9396	Power cable EU
949-9400	208Vac US Power cable
949-9398	Power cable UK
949-9399	Power cable IEC320
969-9883	T-PLUS Navigator SW (w/serial cable)

5 Technical Information
Accessories

Vacuum Products Division

Dear Customer,

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

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

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

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

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

Sincerely,



Giampaolo LEVI

*Vice President and General Manager
Agilent Vacuum Products Division*

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

Vacuum Products Division Instructions for returning products

Dear Customer:

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

- 1) Complete the attached Request for Return form and send it to Agilent Technologies (see below), taking particular care to identify all products that have pumped or been exposed to any toxic or hazardous materials.
- 2) After evaluating the information, Agilent Technologies will provide you with a Return Authorization (RA) number via email or fax, as requested.

Note: Depending on the type of return, a Purchase Order may be required at the time the Request for Return is submitted. We will quote any necessary services (evaluation, repair, special cleaning, eg).

3) Important steps for the shipment of returning product:

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

- 4) Return only products for which the RA was issued.
- 5) **Product being returned under a RA must be received within 15 business days.**
- 6) **Ship to the location specified on the printable label, which will be sent, along with the RA number, as soon as we have received all of the required information.** Customer is responsible for freight charges on returning product.
- 7) Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.

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

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

1) CUSTOMER INFORMATION

Company Name:		Contact Name:	
Tel:	Email:	Fax:	
Customer Ship To:		Customer Bill To:	
Europe only: VAT reg. Number:		USA/Canada only: <input type="checkbox"/> Taxable <input type="checkbox"/> Non-taxable	

2) PRODUCT IDENTIFICATION

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

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

- 3A. Non-Billable Billable **➔ New PO # (hard copy must be submitted with this form):**
- 3B. Exchange Repair Upgrade Consignment/Demo Calibration Evaluation Return for Credit

4) HEALTH and SAFETY CERTIFICATION

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

The equipment listed above (check one):

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

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

Toxic Corrosive Reactive Flammable Explosive Biological Radioactive

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

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

Print Name: _____ **Authorized Signature:** **Date:** _____

5) FAILURE INFORMATION:

Failure Mode (REQUIRED FIELD. See next page for suggestions of failure terms):

Detailed Description of Malfunction: (Please provide the error message)

Application (system and model):

I understand and agree to the terms of Section 6, Page 3/3.

Print Name: _____ **Authorized Signature:** **Date:** _____

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

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

TURBO PUMPS and TURBO CONTROLLERS

APPARENT DEFECT/MALFUNCTION	POSITION	PARAMETERS
<ul style="list-style-type: none"> - Does not start - Does not spin freely - Does not reach full speed - Mechanical Contact - Cooling defective 	<ul style="list-style-type: none"> - Noise - Vibrations - Leak - Overtemperature - Clogging 	<ul style="list-style-type: none"> - Vertical - Horizontal - Upside-down - Other:
		<ul style="list-style-type: none"> Power: Rotational Speed: Current: Inlet Pressure: Temp 1: Foreline Pressure: Temp 2: Purge flow: OPERATING TIME:

ION PUMPS/CONTROLLERS

<ul style="list-style-type: none"> - Bad feedthrough - Vacuum leak - Error code on display 	<ul style="list-style-type: none"> - Poor vacuum - High voltage problem - Other
---	--

VALVES/COMPONENTS

<ul style="list-style-type: none"> - Main seal leak - Solenoid failure - Damaged sealing area 	<ul style="list-style-type: none"> - Bellows leak - Damaged flange - Other
--	---

LEAK DETECTORS

<ul style="list-style-type: none"> - Cannot calibrate - Vacuum system unstable - Failed to start 	<ul style="list-style-type: none"> - No zero/high background - Cannot reach test mode - Other
---	--

INSTRUMENTS

<ul style="list-style-type: none"> - Gauge tube not working - Communication failure - Error code on display 	<ul style="list-style-type: none"> - Display problem - Degas not working - Other
--	---

SCROLL AND ROTARY VANE PUMPS

<ul style="list-style-type: none"> - Pump doesn't start - Doesn't reach vacuum - Pump seized 	<ul style="list-style-type: none"> - Noisy pump (describe) - Over temperature - Other
---	--

DIFFUSION PUMPS

<ul style="list-style-type: none"> - Heater failure - Doesn't reach vacuum - Vacuum leak 	<ul style="list-style-type: none"> - Electrical problem - Cooling coil damage - Other
---	--

Section 6) ADDITIONAL TERMS

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

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