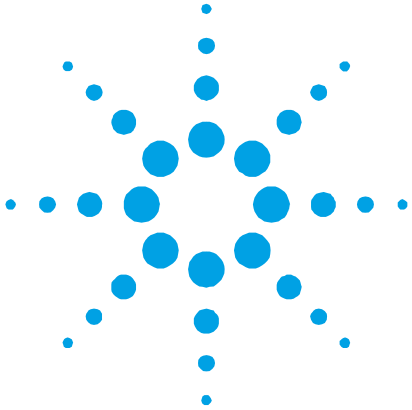

DS 42 Dual Stage Rotary Vane Pump

Models:

949-9308, 949-9309

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

87-900-977-01 (E)

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Agilent Technologies

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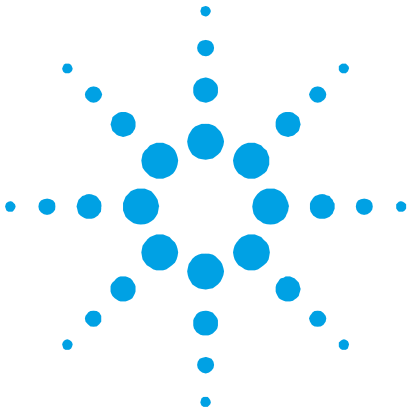
CAUTION

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

WARNING

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

DS 42 Dual Stage Rotary Vane Pump



4
Instructions for Use

Original Instructions

Agilent Technologies

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.

DS42 pumps are dual-stage, rotary vane pumps oil sealed, driven by a single-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.

Symbols used

The following symbols are used consistently throughout in all illustration:

Suction flange

Filling up operating fluid

Exhaust flange

Gas Ballast valve

Storage

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

- temperature: from -15° to +60 °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. 13 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.

Figure 1

Figure 2

Figure 3

Figure 4

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)

WARNING!

Protect against short circuits and overload by installing on Agilent Device electrical main line an automatic circuit breaker of proper capacity (see table here below):

Tab. 1

P/N	110 Vac	220 Vac
949-9308	4 A	
949-9309		2.5 A

CAUTION!

Before starting the pump, fill up with lubricating oil as the pump is delivered empty.

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 figures below). Be very careful not to invert exhaust and suction. Maximum pressure inside the oil container must not exceed 1.5 bar (abs.) Non-observance of these precautions may be dangerous for the pump and the operator.

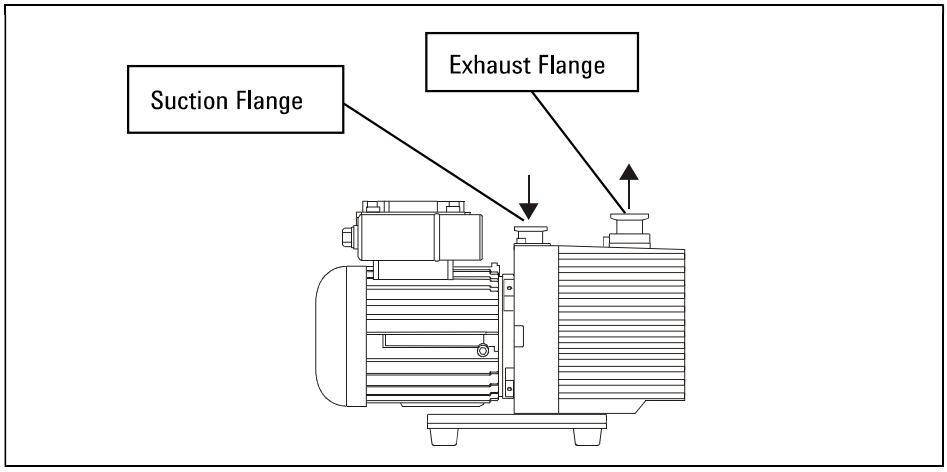


Figure 5

CAUTION! Check that your electrical mains voltage corresponds to that indicated on the motor's plate.

Connect the pump to the power supply.

Use

Before being put into service, in order to reach maximum vacuum, the pump must be left running for about an hour with the gas ballast valve open. This will eliminate any humidity from the oil.

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

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

There are no special procedures for switching the pump off; it needs only to be disconnected from the electric power.

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.

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 "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 pump package before shipping.

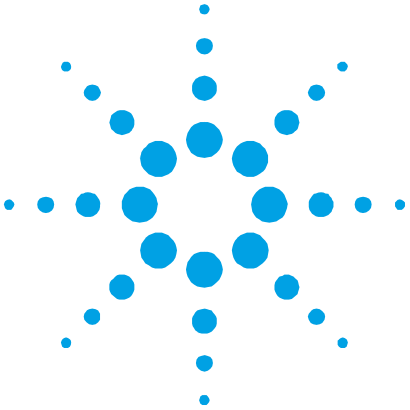
If a pump is to be scrapped, it must be disposed of in accordance with the specific national standards.

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.



5 Technical Information

Original Instructions

Section I

Technical Description

DS42 is a dual-stage, rotary vane pump oil sealed, driven by a singlephase electric motor.

It is available in two models:

- DS 42 949-9308 120 V / 60 Hz nominal voltage
- DS 42 949-9309 220-240 V / 50-60 Hz nominal voltage

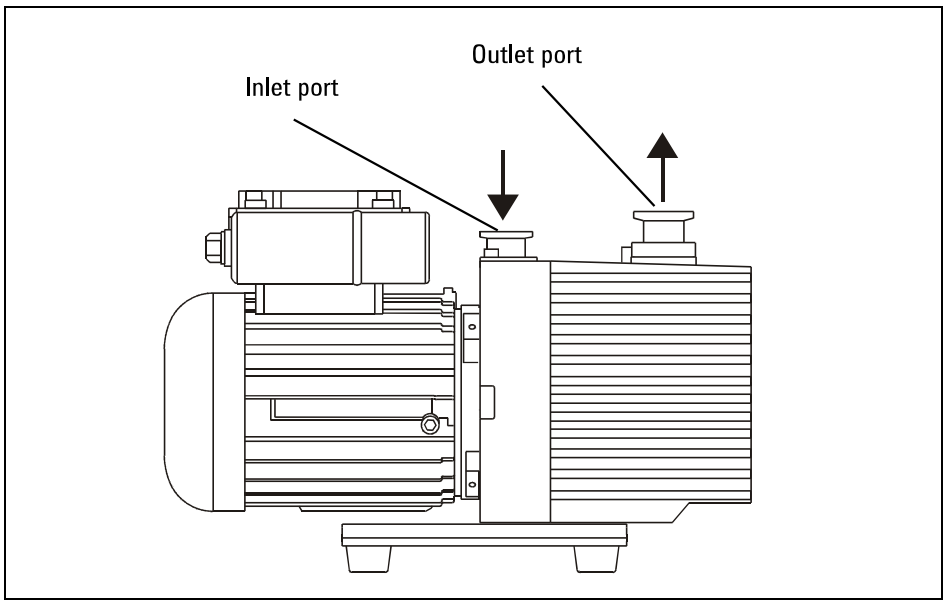


Figure 6

This vacuum pump is suitable for pumping non corrosive gases.

The main features are:

- all materials are carefully selected to provide extended life;
- a high capacity gas ballast device allow to pump condensable vapors;
- all the parts composing the pump are fully replaceable due to the close machining tolerances and to the centering obtained by using reference pins;
- 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 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 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.

There is one oil seal on the rotor shaft, preventing oil from seeping out of the pump. This seal acts on a bushing fitted onto the shaft.

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

Lubrication

The pump's lubricating system is force-feed type. Oil circulation is obtained by means of a gear pump connected to the rotor shaft.

The required flow of oil under pressure passes through ducts that are drilled in the walls of the pump and lubricates the bushings and the inside parts.

Vacuum Seals

The seals in the circuit are obtained by means of VITON gaskets. Sealing of the rotor shaft is guaranteed by a rotating gasket with dustguard lip.

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

Gas Ballast Valve

When the pump sucks in vapors, these condense during compression and mix with the oil, forming an emulsion (an aqueous vapor, for example) or a solution (organic solvent vapors, for example).

A number of problems arise from this, such as the impossibility of obtaining high vacuums, the alteration of the properties of the oil, could cause scaling on parts of the pump.

To avoid this, during compression at the second stage, atmospheric air is let into the pump through an adjustable valve, or "gas ballast valve", located at the top of the pump.

In this way, the discharge valve of the second stage opens through the effect of the atmospheric air before the partial pressure of the vapor reaches saturation point, thus preventing condensation from occurring. The vapors are expelled mixed with air.

Technical Data

The following table lists the main technical data of the DS42.

Tab. 2

Technical data	Hz	Units	Value
FREE AIR DISPLACEMENT	60	l/min (cfm)	45.5 (1.6)
	50	l/min (m^3/h)	38 (2.3)
PUMPING SPEED *	60	cfm	1.2
	50	m^3/h	1.8
ULTIMATE PARTIAL PRESSURE *		mbar	10^{-4}Range
ULTIMATE TOTAL PRESSURE *		mbar	$4x10^{-3}$
ULTIMATE TOTAL PRESSURE WITH GAS BALLAST *		mbar	$2x10^{-2}$
WATER VAPOR TOLERANCE		mbar	15
WATER VAPOR CAPACITY		g/h	60
OIL CAPACITY min/max		l	0.6
MOTOR RATING 1ph	50/60	kW	0.3
NOMINAL ROTATION SPEED	50	rpm	2910
	60	rpm	3480
OIL TEMPERATURE (pump operating) **		°C	60
		°F	140
Installation category	II		
Pollution degree	2		
OPERATING TEMPERATURE RANGE		°C	12-40
WEIGHT		Kg	11.0
		lb	24
INLET FLANGE		DN	16
EXHAUST FLANGE		DN	16

Technical data	Hz	Units	Value
Dimensions:			
- length		mm	309
- width		mm	173
- height		mm	192
Input single phase versions			
Nominal voltages:	50/60	V	220-240
	60	V	120
Maximum currents:	50	A	1.8
	60	A	2.7
Fuse (slow-blow type)			6
Lubricant 949-9305			RV Fluid DS 31 Type

* According to PNEUROP 6602

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

Safety Precautions

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 period 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 13 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 equipment 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.

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 ensure that the pump has not suffered any damage during shipping.

Preliminary Operations

Before starting the pump, fill up with lubricating oil as the pumps are delivered empty.

NOTE A tin of oil is included in the packing.

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.

CAUTION! Assure a free space all around the pump at minimum of 20 cm to allow proper air circulation.

Section II

Electrical Motor

It's in accordance with major international standards (UL, CSA, CE).

The correct cable for electrical wiring is a three wires (Ph+N+Earth) cable. The wire section has to be at least 1 mm^2 (AWG17) and the cable external diamenter has to be between 7 mm to 12 mm.

CAUTION! Before connecting to the mains, check that your electrical mains voltage corresponds to the motor voltage.

WARNING! **A switch on circuit breaker must be included in the building installation. It shall be in the close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.**

NOTE If you start a pump at low temperature, the current absorbed by the motors will be for several seconds higher than the nominal one, for this reason the fuse or the protection device on the line must be of the slow-blow type.

WARNING! **Disconnect the motor from the mains before opening the electrical box.**

WARNING! **Close the motor electrical box cover before connecting to the main.**

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

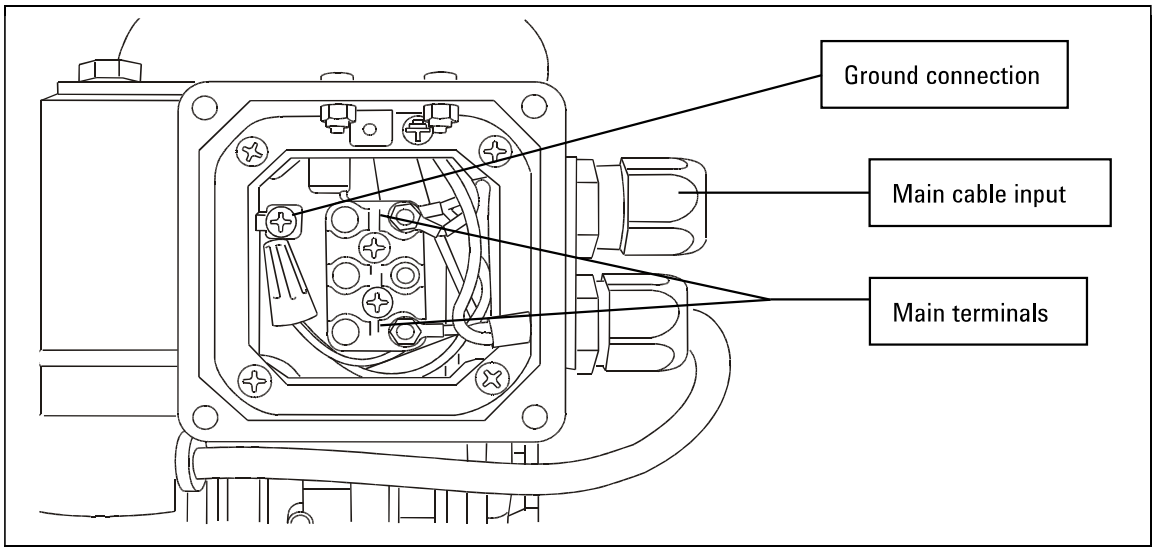


Figure 7 Motor Electrical box

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.

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 Application of an oil trap filter is necessary to avoid 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 glass window of the level indicator and/or expelling the oil seal gasket.

Starting and Running the Pump

Before being put into service, in order to reach maximum vacuum, the pump must be left running for about an hour with the gas ballast valve open. This will eliminate any humidity from the oil.

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

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

If the pump is sucking in environments with liquids or vapors, it is important to leave it to run with the gas ballast open so as to avoid condensation of the vapors and contamination of the lubricating oil as a result. When there is no danger of the oil being contaminated, the gas ballast valve should be closed to reduce the pump's power absorption.

The gas ballast valve will prove useful in the cold season when, due to the lower room temperatures, it takes longer for the pump to reach rated temperature when switched on. Compression of the air forced in by the gas ballast valve develops heat, which in turn increases temperature of the oil faster.

NOTE If gases without vapors are sucked in, you are advised to open the gas ballast device from time to time in order to eliminate the traces of humidity they contain.

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.

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.

If the pump is expected to be stopped for a lengthy period, or in any case if it has pumped in large amounts of vapors, it is good practice to run it with the gas ballast open and the inlet line closed for a few minutes before switching off in order to limit the risk of corrosion or scaling due to pollution of the oil by condensed vapors.

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.**

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 voltages. 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 connection may cause serious damage to operators. 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 provided 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 CO_2 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.

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, 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.

d Always check the lubricant and that it is properly distributed through the pump; inadequate lubrication may damage the pump seriously.

Maintenance Actions

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 rubbercomponents 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.

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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 Rotary Vane Fluid DS31 Type. The Rotary Vane Fluid DS31 Type 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 Agilent Rotary Vane Fluid DS31 Type characteristics

Property	Unit of measure	Rotary Vane Fluid DS31 Type
Vapour pressure @ 25 °C	Torr	$<1x10^{-6}$
Boiling point @ 0,01 torr	°C (°F)	159 (318,2)
Viscosity @ 40 °C	cSt (SUS)	37 (258)
Viscosity @ 100 °C	cSt (SUS)	5.9 (52,7)
Pour point	°C (°F)	-15 (+5)
Flash point	°C (°F)	233 (451)
Fire point	°C (°F)	269 (516)
Density @ 25 °C	g/ml	0.867

Scheduled Maintenance

Tab. 4

FREQUENCY	PUMP STATUS (*)	OPERATION
MONTHLY	R	OIL LEVEL CHECKING
TWICE YEARLY	S	CLEANING THE INLET FILTER

(*) R=RUNNING
S=STOPPED

NOTE When the pump is equipped with:

- a filter for dust on the inlet side
- a condensation separator on the inlet side these items must also be maintained, by following the Manufacturer's instructions.

Malfunctions

Please note the following instructions should the pump malfunction.

CAUTION

Hot surface!
Danger of burns if hot pats are touched. The surface temperature of the pump may rise above 105 °C in case of malfunction.

Carry oput work on the pump only after it has cooled to a safe temperature.