

Varian, Inc.  
Vacuum Technologies



SERVICE OF VACUUM PUMP SYSTEMS  
2442 Enrick Blvd. Bethlehem, PA 10020  
For Service Call (610) 625-1505  
[www.polvac.com](http://www.polvac.com)



## Dual Stage Rotary Vane Pumps

Features and Benefits 16-17

Typical Applications 18-19

Pump Models 20-37

Frequency Inverter Technology 38

Accessories 39

# Rotary Vane Pumps Features and Benefits

## A Reliable Line of Pumps to Cover the Most Demanding Industrial and Scientific Applications

Varian Vacuum Technologies' new DS line of Rotary Vane Pumps are designed and manufactured to meet the demanding requirements of various industrial and scientific applications.

Thanks to a very simple and highly reliable design, these field proven rotary vane pumps provide excellent vacuum performance. Varian's quality and manufacturing standards ensure that the DS Rotary Vane Pumps provide high pumping stability for light gases, low noise, minimal oil backstreaming, and a long operating life.

Varian's DS Rotary Vane Pumps conform with CE requirements, and all pump motors are UL and CSA approved. Varian's world class technical support organization makes the DS Rotary Vane Pump cost-effective and well suited for a wide range of applications.

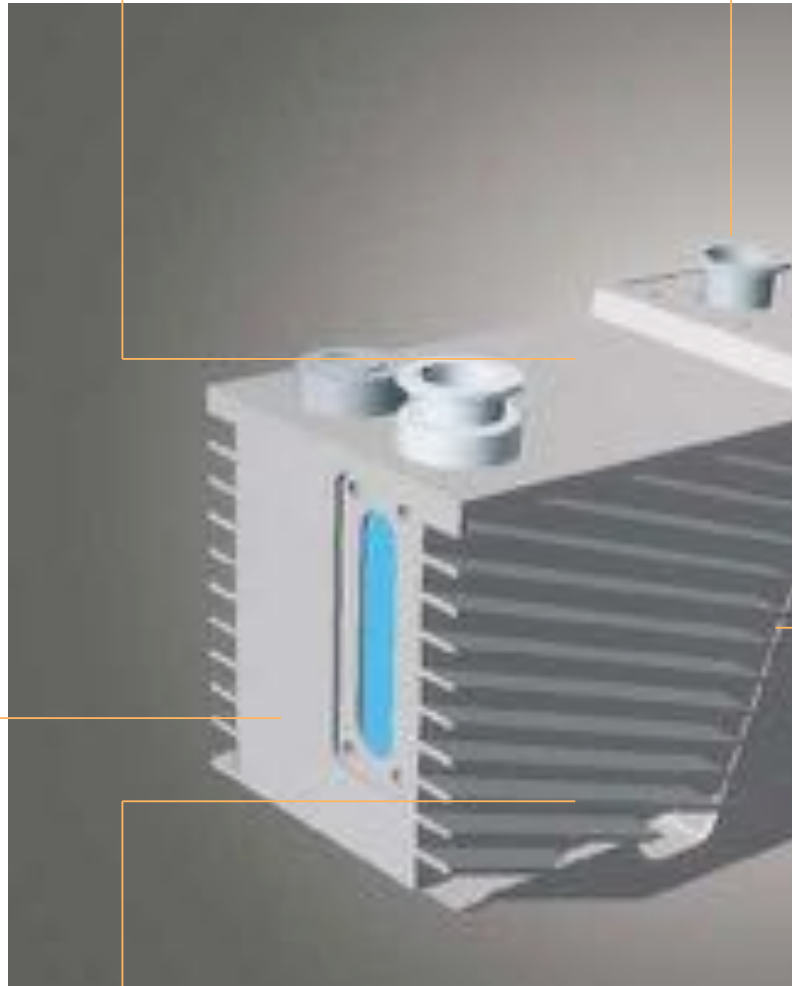
### Forced Oil Circulation

The dedicated oil circulation gear pump ensures efficient and reliable lubrication of the pump from atmospheric pressure throughout the entire vacuum operating range.



### Dual Stage Pump

The two stage design allows low  $10^{-3}$  mbar operation, low operating temperature, minimal backstreaming at low pressure, good pumping efficiency and gas ballast in the high  $10^{-3}$  mbar region.



### The new HS 452 and HS 652

In 2004 Varian introduced the first rotary vane pumps with truly "smart" capabilities, HS 452 and HS 652 rotary vane pumps, employing

an innovative frequency inverter technology that delivers optimal and consistent performance while encompassing the worldwide range of voltage and frequency conditions.



### Built-in Oil Shield

This feature minimizes the oil mist at the pump exhaust. Apart from drastically reducing the oil consumption over long periods of operation, this results in a reduction of air pollution limiting the impact on the environment.



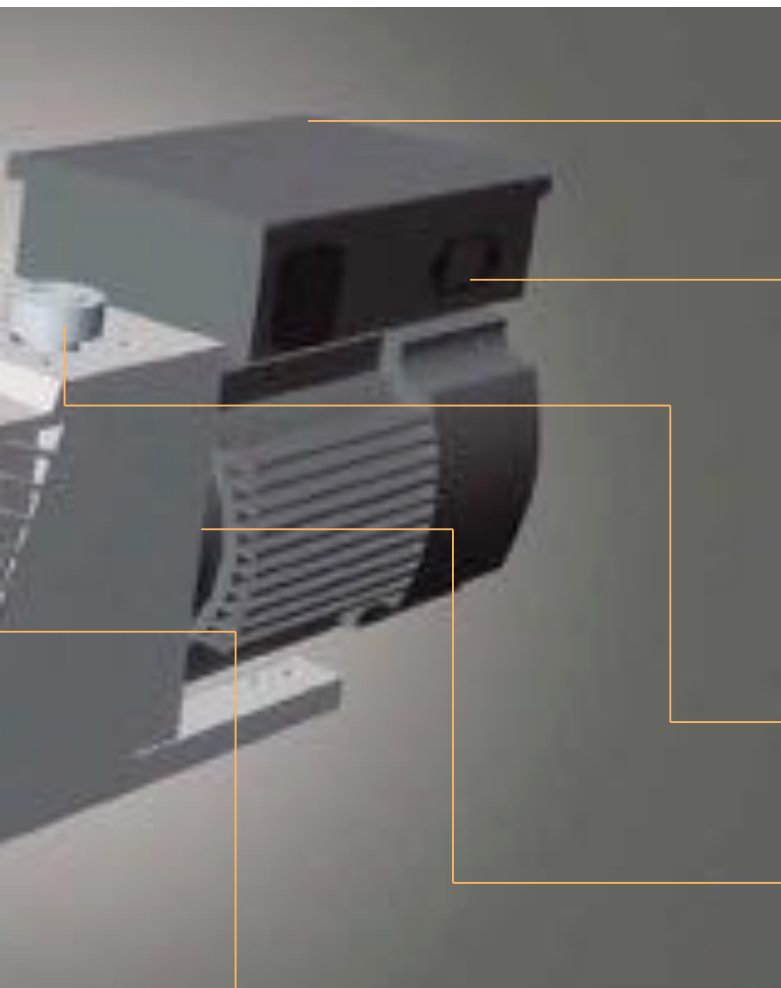
## Anti-suckback Valve and Vent Device

This valve isolates the pump should it stop or be idle. It prevents inadequate venting and oil contamination of the vacuum system when the pump is switched off.



## World-wide Motors

Pump motors, available as 1-phase or 3-phase, are suitable for all voltages and frequencies world-wide. Operational voltages are easily selectable, allowing greater flexibility, easy planning and inventory reduction.



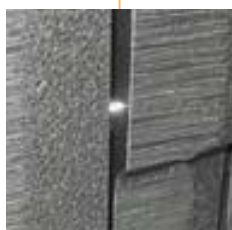
## Socket Type IEC320

permits use of standard power cables, eliminating the need to open box and wire the motor.



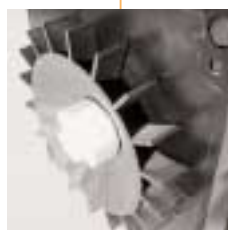
## Gas Ballast Valve

The opening of this valve injects air into the second stage of the pump. This action increases the temperature of the module which facilitates the outgassing and clean up of water vapor or other condensibles from the pump fluid.



## Alignment Pins on Pump Module

The pump module components are assembled and positioned by built-in alignment pins. These speed up and facilitate pump assembling and maintenance.



## Forced Air Ventilation

The cooling fan between the motor and the pump reduces the pump operating temperature, lowers the oil vapor partial pressure, minimizes oil backstreaming and vacuum system contamination.

## Rotary Vane Pumps Typical Applications



- **Analytical Instruments**

Dual Stage Rotary Vane Pumps are practically the only primary vacuum pumps used on GC-MS, LC-MS, ICP-MS, and MALDI-TOF Instruments.

GC-MS typically uses our smallest pump, the DS102; the pump is needed to rough the system and back the high vacuum Turbo or Diffusion pump.

LC-MS and ICP-MS use a medium capacity pump on the sample injection/system interface, typically a DS402 or a DS602, and a smaller pump to back the system Turbo pumps.

MALDI-TOF depending on system size, uses the DS102 to the DS602 as roughing or interface pumps.

### **Mass Spectrometry**

The new HS 452 and HS 652 address all the requirements of LC-MS and ICP-MS applications:

- Large pumping capacity
- Consistent worldwide performance
- Single phase
- Universal voltage and frequency compatibility
- Low power requirements
- Remote control and diagnostic
- Adjustable performance



### **Electron Microscopes**

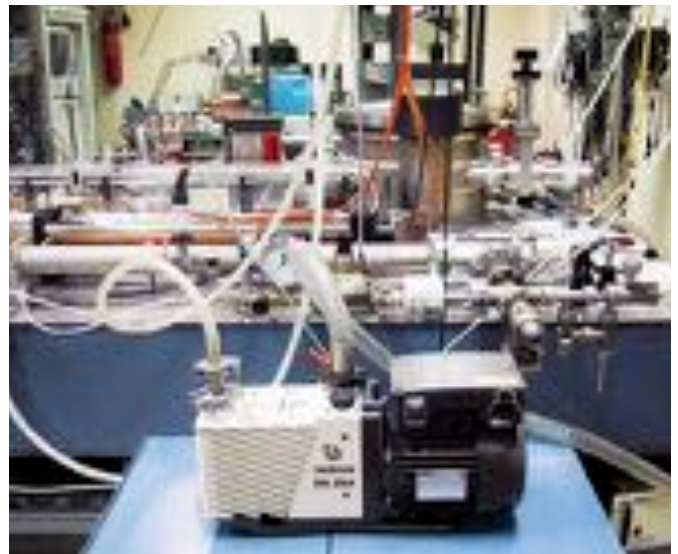
Small pumps, typically the DS202 and the DS302, are still used in competition with dry pumps to rough the system and the high vacuum Turbo or Diffusion pump.

- **Leak Detection**

Pumps in the DS102, DS202 and DS302 range are typically used to back the Helium Mass Spectrometer Turbo or Diffusion pump.

The roughing pump is usually bigger, typically up to the DS402/DS602, and can still be installed on the Leak Detector itself, while bigger pumps can be used to pump down high throughput Leak Detection systems.





- **Industrial Vacuum Processes**

Vacuum coatings, Metallurgy Vacuum Furnaces, Lamps and TV Tube manufacture, Sterilizers, Freeze Dryers, Glove Boxes, High Speed Centrifuges, and Flywheels (for energy storage) represent the main Industrial applications for Dual Stage Rotary Vane pumps. In the first four fields of application the Rotary Pumps are used as roughing and backing pumps for High Vacuum Turbo or Diffusion pumps, while in the others the Rotary Pumps are typically the only vacuum pumps on the system.

- **High Energy Physics and Research Laboratories**

In these applications the Rotary Vane pumps are mainly used in combination with Turbo pumps. The combination is typically used to rough and pump High Vacuum experimental chambers or to start Ion Pumps in ultra high vacuum systems.

# Pump Models

			DS 42	DS 102	DS 202
Free air displacement	60 Hz	l/min (cfm)	45,5 (1.6)	114 (4)	192 (6.8)
	50 Hz	l/min (m³/h)	38 (2.3)	95 (5.7)	160 (9.6)
Pumping speed*	60 Hz	(cfm)	1.2	3.5	5.8
	50 Hz	(m³/h)	1.8	5	8.3
Ultimate partial pressure* (mbar)			10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>
Ultimate total pressure* (mbar)			4 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>
Ultimate total pressure with gas ballast* (mbar)			2 x 10 <sup>-2</sup>	2 x 10 <sup>-2</sup>	2 x 10 <sup>-2</sup>
Water vapor tolerance (mbar)			15	15	15
Water vapor capacity (g/h)			60	60	100
Oil capacity min/max (l)			0.6	0.2/0.5	0.2/0.6
Motor rating 1 ph	60 Hz	(kW)	0.4	0.55	0.55
	50 Hz	(kW)	0.4	0.45	0.45
Motor rating 3 ph	60 Hz	(kW)			
	50 Hz	(kW)			
Nominal rotation speed	60 Hz	(rpm)	3480	1800	1800
	50 Hz	(rpm)	2280	1500	1500
Weight kg (lbs)			11 (24)	22 (48)	25 (55)
Inlet flange			16KF DN	25KF DN	25KF DN
Exhaust flange			16KF DN	25KF DN	25KF DN

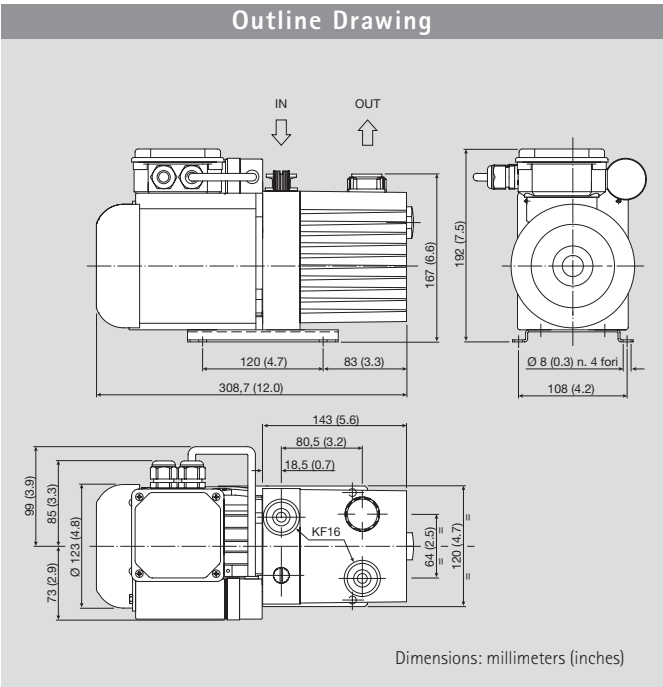
\* According to PNEUROP 6602



# Dual Stage Rotary Vane Pumps

DS 302	DS 402	DS 602	HS 452	HS 652
285 (10) 237 (14.2)	410 (14.5) 342 (20.5)	605 (21.4) 504 (30.2)	456 (16.1) 456 (27.3)	672 (23,8) 672 (40,3)
8.2 11.6	12.3 17.4	17.6 25	15.4 22	22.4 32
10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>
2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>
2 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>
20	30	30	30	30
160	350	550	350	550
0.25/0.6	0.5/1	0.5/1	0.5/1	0.5/1
0.55 0.45	0.90 0.75	0.90 0.75		
	0.90 0.75	0.90 0.75	0.50	0.50
1800 1500	1800 1500	1800 1500	2000	2000
25 (55)	35 (77)	35 (77)	33 (73)	33 (73)
25KF DN	25KF DN	25KF DN	25KF DN	25KF DN
25KF DN	25KF DN	25KF DN	25KF DN	25KF DN



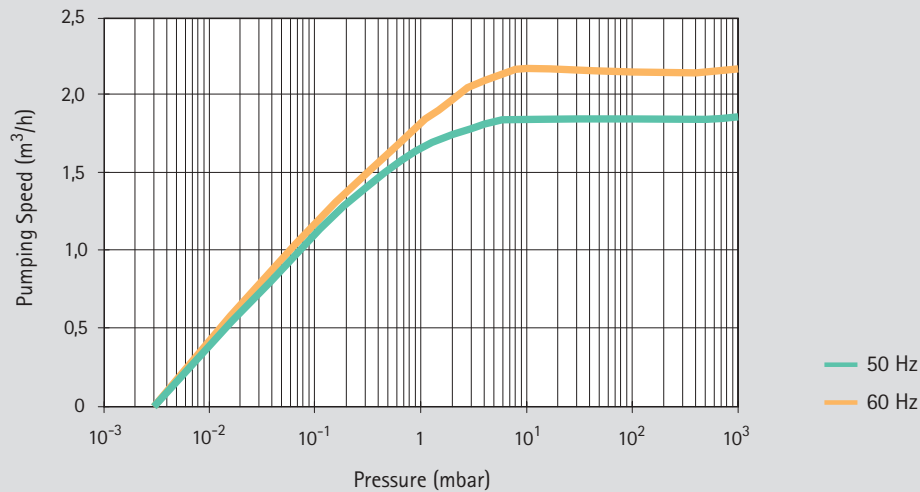


Technical Specifications		
Free air displacement	60 Hz: 45,5 l/min (1.6 cfm)	50 Hz: 38 l/min (2.3 m³/h)
Pumping speed*	60 Hz: 1.2 cfm	50 Hz: 1.8 m³/h
Ultimate partial pressure*	10 <sup>-4</sup> mbar	
Ultimate total pressure*	4 x 10 <sup>-3</sup> mbar	
Ultimate total pressure with gas ballast*	2 x 10 <sup>-2</sup> mbar	
Water vapor tolerance	15 mbar	
Water vapor capacity	60 g/h	
Oil capacity min/max	0.6 l	
Motor rating 1ph	60 Hz: 0.4 kW	50 Hz: 0.4 kW
Nominal rotation speed	60 Hz: 3480 rpm	50 Hz: 2280 rpm
Weight kg (lbs)	11 (24)	
Inlet flange	16KF DN	
Exhaust flange	16KF DN	

\*According to PNEUROP 6602

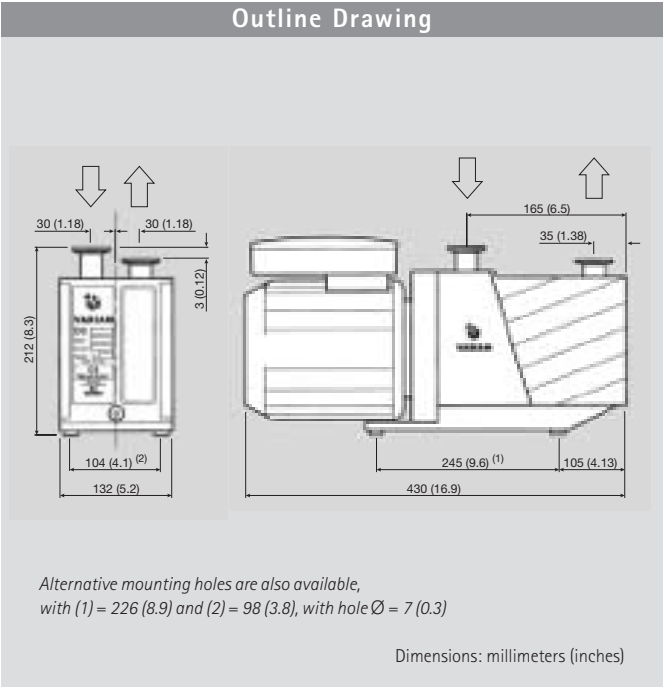


Pump Speed Curve



Ordering Information

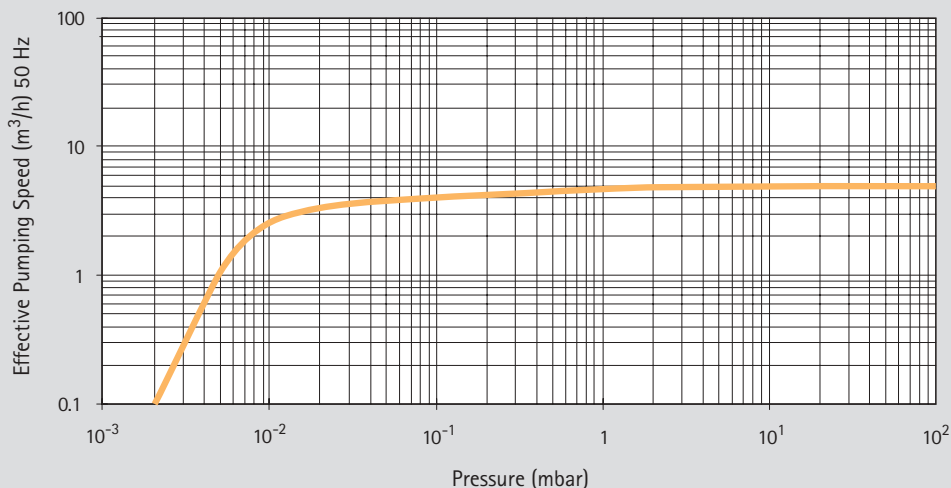
Dual Stage Rotary Vane Pump		Oil and Accessories	
	Part Number		Part Number
DS 42 100-110V	9499308	Rotary vane fluid, GP31 type, 0.5 liter	9499305
DS 42 220-240V	9499309	Oil mist eliminator KF16	9499388
		Oil mist eliminator 3/4 G	9499387
		DS 42 filter cartridge (pkg. of 2)	9499386
		Oil drain extension	9499375
		NW 16 centering ring Viton	KC16AV
		NW 16 aluminum clamp	KQ16AWP



Technical Specifications		
Free air displacement	60 Hz: 114 l/min (4 cfm)	50 Hz: 95 l/min (5.7 m³/h)
Pumping speed*	60 Hz: 3.5 cfm	50 Hz: 5 m³/h
Ultimate partial pressure*	10 <sup>-4</sup> mbar	
Ultimate total pressure*	2 x 10 <sup>-3</sup> mbar	
Ultimate total pressure with gas ballast*	2 x 10 <sup>-2</sup> mbar	
Water vapor tolerance	15 mbar	
Water vapor capacity	60 g/h	
Oil capacity min/max	0.2/0.5 l	
Motor rating 1ph	60 Hz: 0.55 kW	50 Hz: 0.45 kW
Nominal rotation speed	60 Hz: 1800 rpm	50 Hz: 1500 rpm
Weight kg (lbs)	22 (48)	
Inlet flange	25KF DN	
Exhaust flange	25KF DN	

\*According to PNEUROP 6602

Pump Speed Curve



## Ordering Information

**Dual Stage Rotary Vane Pump** **Part Number**

DS 102 with 1 phase worldwide motor\* 9499315

\* 1 phase motors (100-120 / 200-240) V  $\pm 10\%$ , 50/60 Hz.

All motors comply with CE and UL/CSA standards.

**Minor Maintenance Kit** **Part Number**Contains all the valves, O-rings and seals  
to refurbish the pump to vacuum integrity 9499370**Major Maintenance Kit** **Part Number**

Includes all the items of the minor kit plus the vanes 9499380

**Oil and Accessories** **Part Number**

Rotary vane fluid, GP type, 1 liter 9499390

Rotary vane fluid, GP type, 1 liter (USA)\* K7516301

Rotary vane fluid, GP type, 2 liters 9499391

Rotary vane fluid, GP type, 1 gallon (USA) K7516302

Oil mist eliminator 9499395

Oil mist replacement cartridge (pkg. of 2) 9499394

NW 25 oil exhaust filter 9499392

NW 25 oil exhaust replacement cartridge 9499342

Oil return kit 9499376

Oil drain extension 9499375

European plug power cable 2 meters 1 ph 9499396

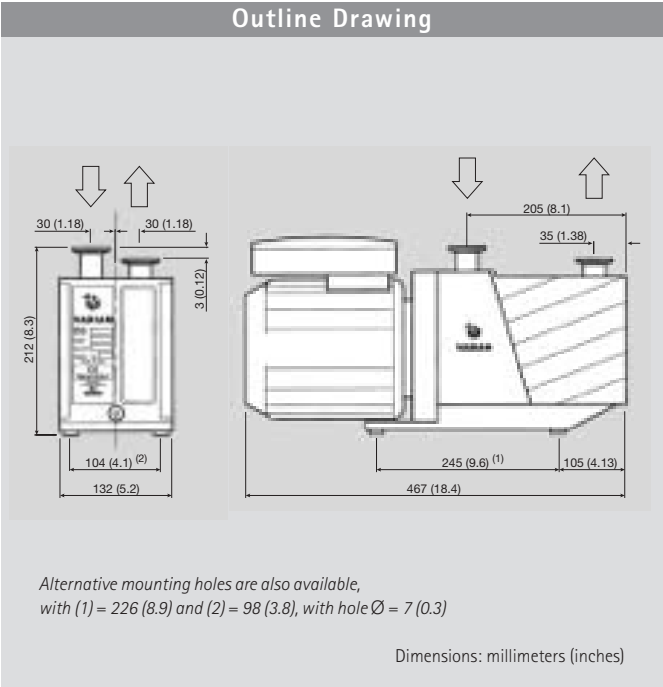
USA plug power cable 2 meters 1 ph 9499397

UK plug power cable 2 meters 1 ph 9499398

NW 25 centering ring Viton KC25AV

NW 25 aluminum clamp KQ25AWP

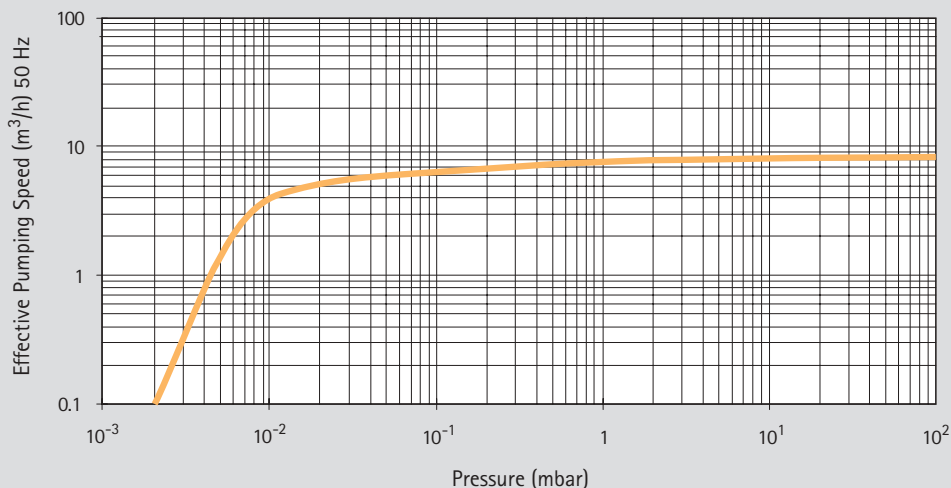
\* When these pumps are used in Leak Detectors applications, we recommend the use of Rotary Vane Fluid (Elite-Z mechanical), P/N 695409005 as it features a lower vapor pressure.



Technical Specifications		
Free air displacement	60 Hz: 192 l/min (6.8 cfm)	50 Hz: 160 l/min (9.6 m³/h)
Pumping speed*	60 Hz: 5.8 cfm	50 Hz: 8.3 m³/h
Ultimate partial pressure*	10 <sup>-4</sup> mbar	
Ultimate total pressure*	2 x 10 <sup>-3</sup> mbar	
Ultimate total pressure with gas ballast*	2 x 10 <sup>-2</sup> mbar	
Water vapor tolerance	15 mbar	
Water vapor capacity	100 g/h	
Oil capacity min/max	0.25/0.6 l	
Motor rating 1ph	60 Hz: 0.55 kW	50 Hz: 0.45 kW
Nominal rotation speed	60 Hz: 1800 rpm	50 Hz: 1500 rpm
Weight kg (lbs)	25 (55)	
Inlet flange	25KF DN	
Exhaust flange	25KF DN	

\*According to PNEUROP 6602

Pump Speed Curve



## Ordering Information

Dual Stage Rotary Vane Pump	Part Number
DS 202 with 1 phase worldwide motor*	9499320
* 1 phase motors (100-120 / 200-240) V $\pm$ 10%, 50/60 Hz. All motors comply with CE and UL/CSA standards.	

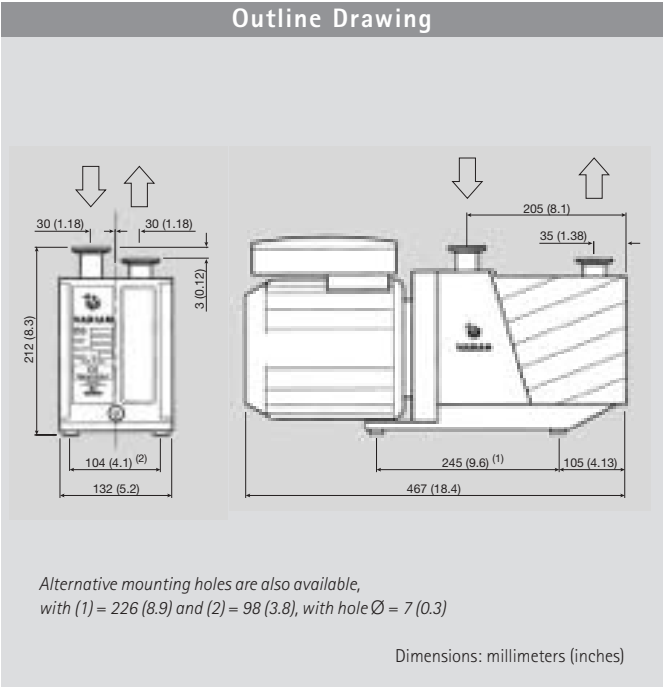
Minor Maintenance Kit	Part Number
Contains all the valves, O-rings and seals to refurbish the pump to vacuum integrity	9499370

Major Maintenance Kit	Part Number
Includes all the items of the minor kit plus the vanes	9499381

Oil and Accessories	Part Number
Rotary vane fluid, GP type, 1 liter	9499390
Rotary vane fluid, GP type, 1 liter (USA)*	K7516301
Rotary vane fluid, GP type, 2 liters	9499391
Rotary vane fluid, GP type, 1 gallon (USA)	K7516302
Oil mist eliminator	9499395
Oil mist replacement cartridge (pkg. of 2)	9499394
NW 25 oil exhaust filter	9499392
NW 25 oil exhaust replacement cartridge	9499342
Oil return kit	9499376
Oil drain extension	9499375
European plug power cable 2 meters 1 ph	9499396
USA plug power cable 2 meters 1 ph	9499397
UK plug power cable 2 meters 1 ph	9499398
NW 25 centering ring Viton	KC25AV
NW 25 aluminum clamp	KQ25AWP

\* When these pumps are used in Leak Detectors applications, we recommend the use of Rotary Vane Fluid (Elite-Z mechanical), P/N 695409005 as it features a lower vapor pressure.

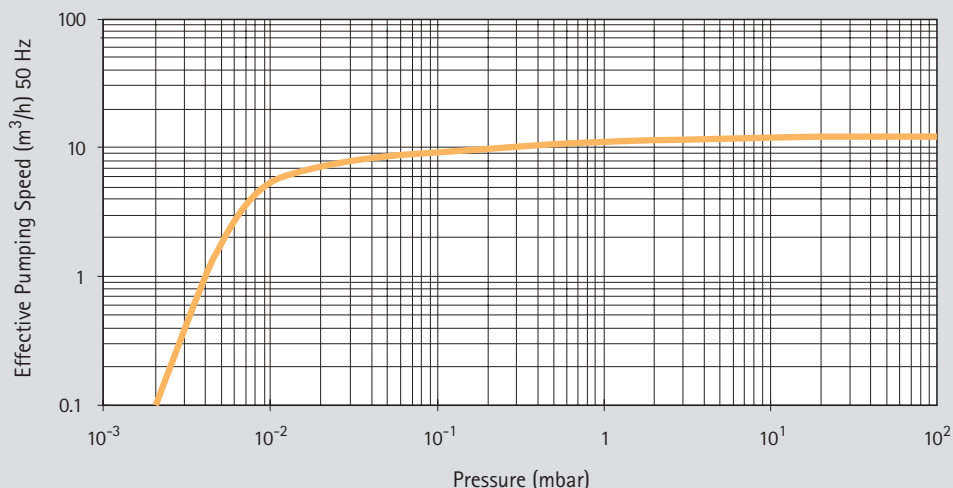




Technical Specifications		
Free air displacement	60 Hz: 285 l/min (10 cfm)	50 Hz: 237 l/min (14.2 m³/h)
Pumping speed*	60 Hz: 8.2 cfm	50 Hz: 11.6 m³/h
Ultimate partial pressure*	10 <sup>-4</sup> mbar	
Ultimate total pressure*	2 x 10 <sup>-3</sup> mbar	
Ultimate total pressure with gas ballast*	2 x 10 <sup>-2</sup> mbar	
Water vapor tolerance	20 mbar	
Water vapor capacity	160 g/h	
Oil capacity min/max	0.25/0.6 l	
Motor rating 1ph	60 Hz: 0.55 kW	50 Hz: 0.45 kW
Nominal rotation speed	60 Hz: 1800 rpm	50 Hz: 1500 rpm
Weight kg (lbs)	25 (55)	
Inlet flange	25KF DN	
Exhaust flange	25KF DN	

\*According to PNEUROP 6602

Pump Speed Curve



### Ordering Information

#### Dual Stage Rotary Vane Pump Part Number

DS 302 with 1 phase worldwide motor\* 9499325

\* 1 phase motors (100-120 / 200-240) V  $\pm$  10%, 50/60 Hz.

All motors comply with CE and UL/CSA standards.

#### Minor Maintenance Kit Part Number

Contains all the valves, O-rings and seals  
to refurbish the pump to vacuum integrity 9499370

#### Major Maintenance Kit Part Number

Includes all the items of the minor kit plus the vanes 9499381

#### Oil and Accessories Part Number

Rotary vane fluid, GP type, 1 liter 9499390

Rotary vane fluid, GP type, 1 liter (USA)\* K7516301

Rotary vane fluid, GP type, 2 liters 9499391

Rotary vane fluid, GP type, 1 gallon (USA) K7516302

Oil mist eliminator 9499395

Oil mist replacement cartridge (pkg. of 2) 9499394

NW 25 oil exhaust filter 9499392

NW 25 oil exhaust replacement cartridge 9499342

Oil return kit 9499376

Oil drain extension 9499375

European plug power cable 2 meters 1 ph 9499396

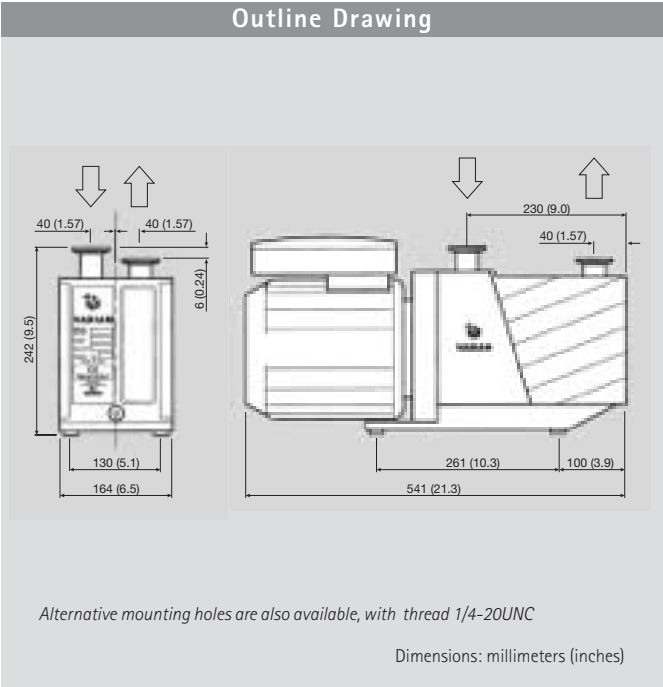
USA plug power cable 2 meters 1 ph 9499397

UK plug power cable 2 meters 1 ph 9499398

NW 25 centering ring Viton KC25AV

NW 25 aluminum clamp KQ25AWP

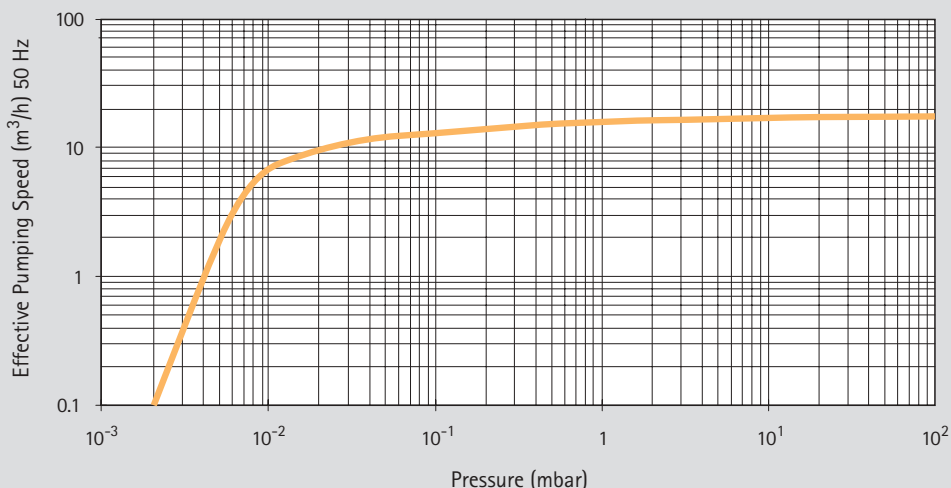
\* When these pumps are used in Leak Detectors applications, we recommend the use of Rotary Vane Fluid (Elite-Z mechanical), P/N 695409005 as it features a lower vapor pressure.



Technical Specifications		
Free air displacement	60 Hz: 410 l/min (14.5 cfm)	50 Hz: 342 l/min (20.5 m³/h)
Pumping speed*	60 Hz: 12.3 cfm	50 Hz: 17.4 m³/h
Ultimate partial pressure*	10 <sup>-4</sup> mbar	
Ultimate total pressure*	2 x 10 <sup>-3</sup> mbar	
Ultimate total pressure with gas ballast*	1 x 10 <sup>-2</sup> mbar	
Water vapor tolerance	30 mbar	
Water vapor capacity	350 g/h	
Oil capacity min/max	0.5/1 l	
Motor rating 1ph	60 Hz: 0.90 kW	50 Hz: 0.75 kW
Motor rating 3ph	60 Hz: 0.90 kW	50 Hz: 0.75 kW
Nominal rotation speed	60 Hz: 1800 rpm	50 Hz: 1500 rpm
Weight kg (lbs)	35 (77)	
Inlet flange	25KF DN	
Exhaust flange	25KF DN	

\*According to PNEUROP 6602

Pump Speed Curve



## Ordering Information

Dual Stage Rotary Vane Pump	Part Number
DS 402 with 1 phase worldwide motor*	9499330
DS 402 with 3 phase worldwide motor**	9499331

\* 1 phase motors (100-120 / 200-240) V  $\pm$ 10%, 50/60 Hz.

\*\* 3 phase motors (200-220 / 380-415) V  $\pm$ 10% at 50 Hz or (200-230 / 460) V  $\pm$ 10% at 60 Hz.

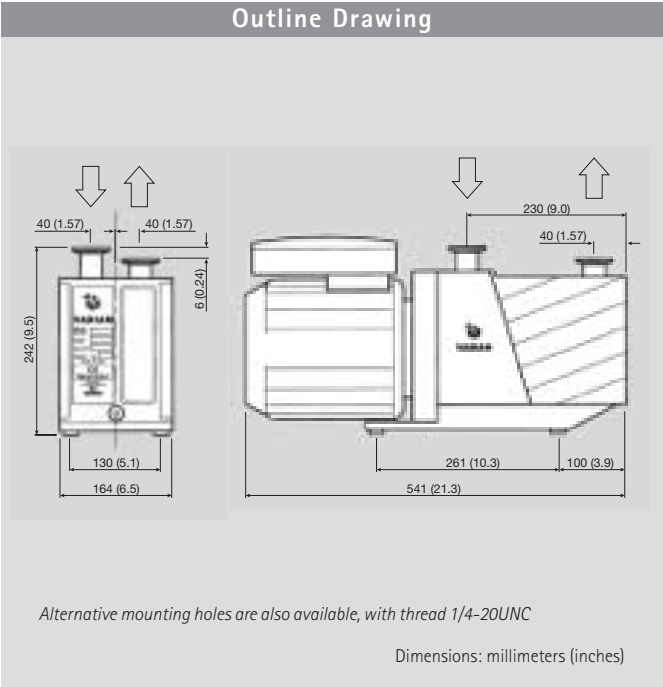
All motors comply with CE and UL/CSA standards.

Minor Maintenance Kit	Part Number
Contains all the valves, O-rings and seals to refurbish the pump to vacuum integrity	9499371

Major Maintenance Kit	Part Number
Includes all the items of the minor kit plus the vanes	9499382

Oil and Accessories	Part Number
Rotary vane fluid, GP type, 1 liter	9499390
Rotary vane fluid, GP type, 1 liter (USA)*	K7516301
Rotary vane fluid, GP type, 2 liters	9499391
Rotary vane fluid, GP type, 1 gallon (USA)	K7516302
Oil mist eliminator	9499395
Oil mist replacement cartridge (pkg. of 2)	9499394
NW 25 oil exhaust filter	9499392
NW 25 oil exhaust replacement cartridge	9499342
Oil return kit	9499376
Oil drain extension	9499375
European plug power cable 2 meters 1 ph	9499396
USA plug power cable 2 meters 1 ph	9499397
UK plug power cable 2 meters 1 ph	9499398
NW 25 centering ring Viton	KC25AV
NW 25 aluminum clamp	KQ25AWP

\* When these pumps are used in Leak Detectors applications, we recommend the use of Rotary Vane Fluid (Elite-Z mechanical), P/N 695409005 as it features a lower vapor pressure.

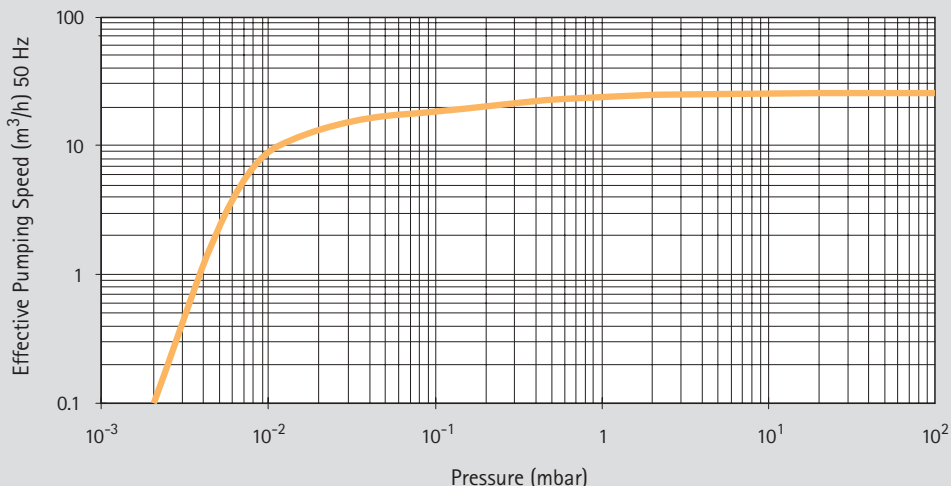


Technical Specifications		
Free air displacement	60 Hz: 605 l/min (21.4 cfm)	50 Hz: 504 l/min (30.2 m³/h)
Pumping speed*	60 Hz: 17.6 cfm	50 Hz: 25 m³/h
Ultimate partial pressure*	10 <sup>-4</sup> mbar	
Ultimate total pressure*	2 x 10 <sup>-3</sup> mbar	
Ultimate total pressure with gas ballast*	1 x 10 <sup>-2</sup> mbar	
Water vapor tolerance	30 mbar	
Water vapor capacity	550 g/h	
Oil capacity min/max	0.5/1 l	
Motor rating 1ph	60 Hz: 0.90 kW	50 Hz: 0.75 kW
Motor rating 3ph	60 Hz: 0.90 kW	50 Hz: 0.75 kW
Nominal rotation speed	60 Hz: 1800 rpm	50 Hz: 1500 rpm
Weight kg (lbs)	35 (77)	
Inlet flange	25KF DN	
Exhaust flange	25KF DN	

\*According to PNEUROP 6602



Pump Speed Curve



## Ordering Information

Dual Stage Rotary Vane Pump	Part Number
DS 602 with 1 phase worldwide motor*	9499335
DS 602 with 3 phase worldwide motor**	9499336

\* 1 phase motors (100-120 / 200-240) V  $\pm$  10%, 50/60 Hz.

\*\* 3 phase motors (200-220 / 380-415) V  $\pm$  10% at 50 Hz or (200-230 / 460) V  $\pm$  10% at 60 Hz.

All motors comply with CE and UL/CSA standards.

Minor Maintenance Kit	Part Number
Contains all the valves, O-rings and seals to refurbish the pump to vacuum integrity	9499371

Major Maintenance Kit	Part Number
Includes all the items of the minor kit plus the vanes	9499382

Oil and Accessories	Part Number
Rotary vane fluid, GP type, 1 liter	9499390
Rotary vane fluid, GP type, 1 liter (USA)*	K7516301
Rotary vane fluid, GP type, 2 liters	9499391
Rotary vane fluid, GP type, 1 gallon (USA)	K7516302
Oil mist eliminator	9499395
Oil mist replacement cartridge (pkg. of 2)	9499394
NW 25 oil exhaust filter	9499392
NW 25 oil exhaust replacement cartridge	9499342
Oil return kit	9499376
Oil drain extension	9499375
European plug power cable 2 meters 1 ph	9499396
USA plug power cable 2 meters 1 ph	9499397
UK plug power cable 2 meters 1 ph	9499398
NW 25 centering ring Viton	KC25AV
NW 25 aluminum clamp	KQ25AWP

\* When these pumps are used in Leak Detectors applications, we recommend the use of Rotary Vane Fluid (Elite-Z mechanical), P/N 695409005 as it features a lower vapor pressure.

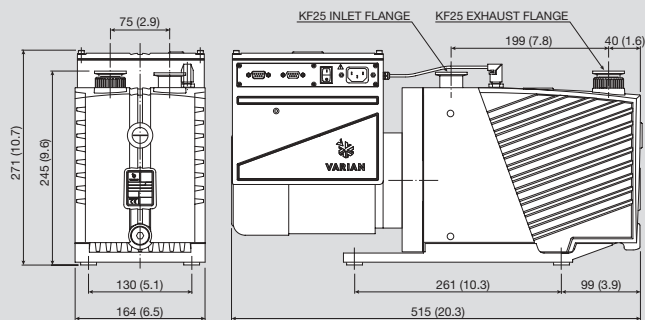
# HS 452



## The first rotary vane pumps with truly “smart” capabilities.

- Varian's HS452 and HS652 pumps employ an innovative frequency inverter technology that delivers optimal and consistent performance while encompassing the worldwide range of voltage and frequency conditions.
- Operating with low power requirements, the microprocessor controlled frequency inverter, combined with a 3-phase motor, is an efficient driving unit capable of delivering the high starting torque required of a dual-stage oil pump.
- HS452 and HS652 technology solves the common problems inherent in traditional single-phase motors. Smart Pumps start with inrush current about 7 times lower than that of equivalent traditional pumps.

Outline Drawing



Dimensions: millimeters (inches)

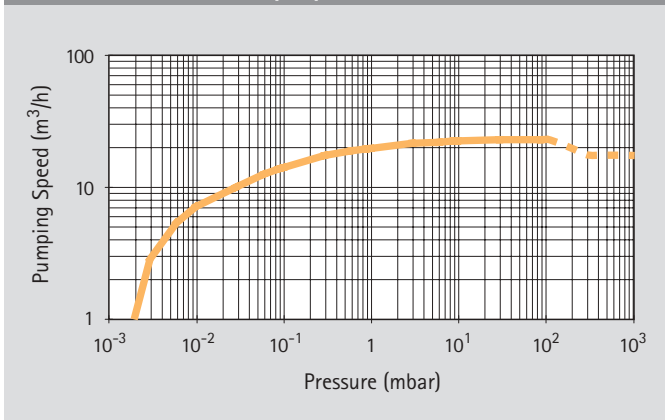
- Unlike traditional pumps, Smart Pump's software driven startup procedure recognizes faulty pumps within seconds, and so avoids uncontrolled load conditions. The result is very easy pump integration.
- The 3-phase inverter output is constant and independent of single-phase input frequencies and voltages. Motor efficiency and power factors remain optimal and as a result motor and pump working temperatures remain low and constant worldwide.
- Smart Pumps can be remotely driven via discrete I/O or RS232/RS485 interfaces. Varian's T-plus Navigator Software facilitates communication making it very easy to drive the pump. Pump performance can be tailored by setting the rotational speed for specific applications. The software monitors and logs pump parameters making it possible to perform pump and system diagnostics.

## Technical Specifications

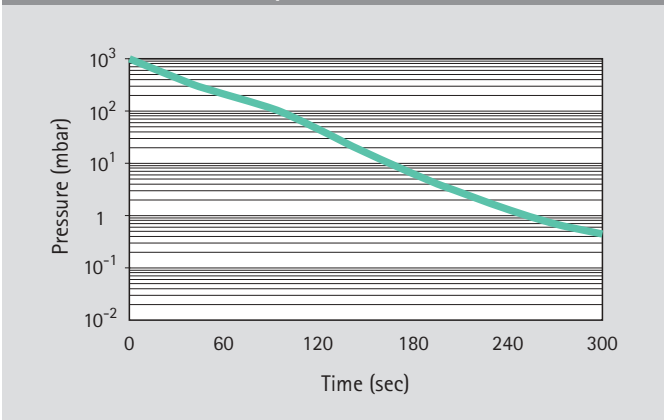
Free air displacement	27 m <sup>3</sup> /h (19 cfm)
Pumping speed*	22 m <sup>3</sup> /h (15.4 cfm)
Ultimate total pressure	2 x 10 <sup>-3</sup> mbar
Ultimate total pressure with gas ballast	1 x 10 <sup>-2</sup> mbar
Operating Voltage	100-120/200-240 V ±10%, 50/60 Hz
Inverter maximum output power	780 W
Nominal rotational speed	2000 rpm
Weight kg (lbs)	33 (73)

\* According to PNEUROP 6602

Pump Speed Curve



Pump Down Curve



Ordering Information

Pump	Part Number
HS452 Smart Pump 1 phase worldwide motor	9499360
IP44 accessory connector Kit	9499367

Accessories	Part Number
NW25 oil exhaust filter	9499392
Oil return kit	9499376
Oil drain extension	9499375
Rotary vane fluid, GP type, 1 liter	9499390
Rotary vane fluid, GP type, 2 liter	9499391
European plug power cable 2 meters 1 ph	9499396
USA plug power cable 2 meters 1 ph	9499397
UK plug power cable 2 meters 1 ph	9499398
Minor maintenance kit	9499371
Major maintenance kit	9499382

Application Note

Steady state high gas load applications exploit the major benefits of the smart technologies. When operated at pressures lower than the auto-tuning pressure, the HS452 and HS652 outperform the equivalent traditional DS402 and DS602 pumps by 10% at 60 Hz and by 30% at 50 Hz. The Smart Pumps can run below auto-tuning pressure at their full speed of 2000 rpm. As shown in the pumping speed

curve at top right, the HS452 has an auto-tuning pressure of 100 mbar while the HS652 has an auto-tuning pressure of 40 mbar. Despite the lower power requirements of 780 W max, the Smart Pumps deliver good performance in the roughing phase. Fast cycling or inrush applications need to be evaluated on a case by case basis with our application engineers.

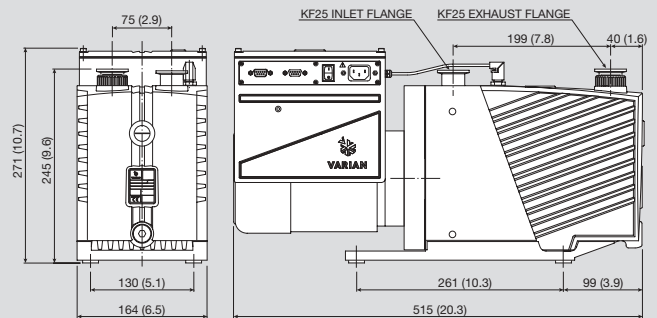
## HS 652



### The first rotary vane pumps with truly "smart" capabilities.

- Varian's HS452 and HS652 pumps employ an innovative frequency inverter technology that delivers optimal and consistent performance while encompassing the worldwide range of voltage and frequency conditions.
- Operating with low power requirements, the microprocessor controlled frequency inverter, combined with a 3-phase motor, is an efficient driving unit capable of delivering the high starting torque required of a dual-stage oil pump.
- HS452 and HS652 technology solves the common problems inherent in traditional single-phase motors. Smart Pumps start with inrush current about 7 times lower than that of equivalent traditional pumps.

### Outline Drawing



Dimensions: millimeters (inches)

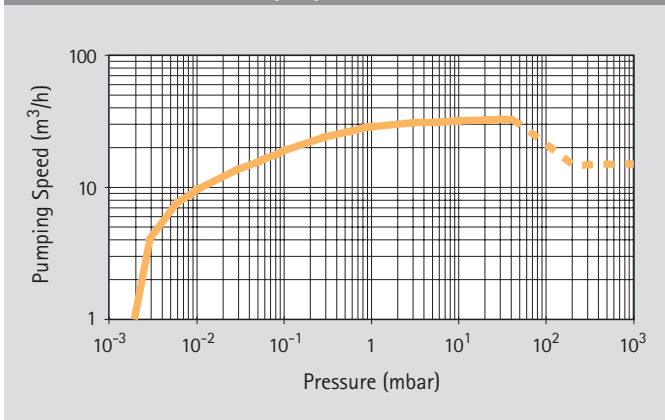
- Unlike traditional pumps, Smart Pump's software driven startup procedure recognizes faulty pumps within seconds, and so avoids uncontrolled load conditions. The result is very easy pump integration.
- The 3-phase inverter output is constant and independent of single-phase input frequencies and voltages. Motor efficiency and power factors remain optimal and as a result motor and pump working temperatures remain low and constant worldwide.
- Smart Pumps can be remotely driven via discrete I/O or RS232/RS485 interfaces. Varian's T-plus Navigator Software facilitates communication making it very easy to drive the pump. Pump performance can be tailored by setting the rotational speed for specific applications. The software monitors and logs pump parameters making it possible to perform pump and system diagnostics.

### Technical Specifications

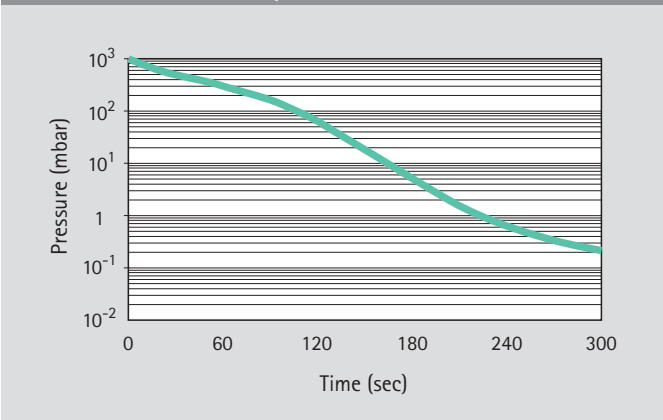
Free air displacement	39 m <sup>3</sup> /h (27.5 cfm)
Pumping speed*	32 m <sup>3</sup> /h (22.4 cfm)
Ultimate total pressure	2 x 10 <sup>-3</sup> mbar
Ultimate total pressure with gas ballast	1 x 10 <sup>-2</sup> mbar
Operating Voltage	100-120/200-240 V ±10%, 50/60 Hz
Inverter maximum output power	780 W
Nominal rotational speed	2000 rpm
Weight kg (lbs)	33 (73)

\* According to PNEUROP 6602

Pump Speed Curve



Pump Down Curve



Ordering Information

Pump	Part Number
HS652 Smart Pump 1 phase worldwide motor	9499365
IP44 accessory connector Kit	9499367

Accessories	Part Number
NW25 oil exhaust filter	9499392
Oil return kit	9499376
Oil drain extension	9499375
Rotary vane fluid, GP type, 1 liter	9499390
Rotary vane fluid, GP type, 2 liter	9499391
European plug power cable 2 meters 1 ph	9499396
USA plug power cable 2 meters 1 ph	9499397
UK plug power cable 2 meters 1 ph	9499398
Minor maintenance kit	9499371
Major maintenance kit	9499382

Application Note

Steady state high gas load applications exploit the major benefits of the smart technologies. When operated at pressures lower than the auto-tuning pressure, the HS452 and HS652 outperform the equivalent traditional DS402 and DS602 pumps by 10% at 60 Hz and by 30% at 50 Hz. The Smart Pumps can run below auto-tuning pressure at their full speed of 2000 rpm. As shown in the pumping speed

curve at top right, the HS452 has an auto-tuning pressure of 100 mbar while the HS652 has an auto-tuning pressure of 40 mbar. Despite the lower power requirements of 780 W max, the Smart Pumps deliver good performance in the roughing phase. Fast cycling or inrush applications need to be evaluated on a case by case basis with our application engineers.



# Innovative Frequency Inverter Technology

Varian's HS452 and HS652 rotary vane pumps employ an innovative frequency inverter technology that delivers optimal and consistent performance throughout the worldwide range of voltage and frequency conditions. Operating with low power requirements, the microprocessor-controlled frequency inverter, combined with a 3-phase motor, is an efficient driving unit capable of delivering the high starting torque required for a dual-stage oil pump.



**I/O and RS232/RS485 Communication**  
Adjustable pumping speed from 45 to 68 Hz permits easy integration and reduces noise levels. Pump performance can be tailored to specific applications to reduce system costs.



**Universal Input Voltage**  
Truly universal single-phase voltage and frequency provide worldwide compatibility and constant performance at different input frequencies.



**Remote Diagnostics**  
Remote monitoring and control of oil consumption, power and current reduces maintenance costs, improves uptime and offers higher reliability.



**Reduced Power Requirements**  
Inverter technology reduces the power required compared to traditional single phase motors. Circuit-breakers are no longer required, resulting in reduced system costs.



**Higher Nominal Rotational Speed (2000 rpm)**  
The pump is ideally suited for steady and high gas-load applications.

## Rotary Vane Pumps Accessories

### Exhaust Filters – Oil Mist Eliminator

The exhaust filters (below, left) and the oil mist eliminator (right), retain the oil vapors which would otherwise be expelled into the atmosphere during pumpdown and gas ballast operation.

Some models feature an oil return line to allow condensed oil or fluid to return to the pump reservoir.



NW25 oil exhaust filter (left) PN 9499392  
Oil mist eliminator DS 102 - DS 602 (right) PN 9499395

### Foreline Roughing Traps

Varian's new traps are designed to prevent the backstreaming of mechanical pump fluids. Copper and stainless steel gauze inserts are designed to reduce oil backstreaming. Molecular sieve inserts are available for applications where it is desirable to increase water vapor pumping speed while eliminating backstreaming above the trap.



Foreline/Roughing Traps: please call Varian for ordering information

For any further details on our rotary vane pump accessories, please contact Varian Vacuum Technologies.

