



Scroll Pumps v. Diaphragm Pumps - Factors to Consider When Selecting a Dry Backing Pump



Solution Note

- Introduction
- Clean, predictable performance
- Lower vibration
- Lower noise
- Long service life between maintenance activities
- Conclusion

Introduction

High vacuum pumps, such as turbo molecular pumps, are increasingly used in conjunction with dry backing pump technology. For years, diaphragm pumps have been used as dry pumping alternatives to oil-sealed mechanical pumps. These pumps offered the advantage of eliminating the risks of oil contamination in the vacuum system and avoided the requirements associated with pump oil disposal after use. However, diaphragm pumps were susceptible to lower reliability, excess noise and worse vibration characteristics than oil-sealed mechanical pumps. They also typically have a higher ultimate pressure than oil-sealed mechanical pumps causing the turbo molecular pumps to run at elevated current, power and temperature levels in most applications.

Pumps based on scroll technology have become the dry pump technology of choice for backing turbo molecular high vacuum pumps. There are several factors that make scroll technology the superior dry pump choice, including clean, predictable performance, lower vibration and noise, and long service life. These factors will be explored below.



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Scroll Pumps offer clean and predictable performance

Current scroll technology and tip seal design are factors that work together to provide low base pressure, and a gradual increase in base pressure over the service life. The advantages for the end user are significant. The base pressure attainable with scroll technology is typically lower than that of a diaphragm pump. In addition, the failure mode for diaphragm pumps typically involves a rupture of the diaphragm, creating a sudden, often unpredictable and catastrophic loss of vacuum. Scroll pumps, on the other hand, typically experience a very gradual increase in base pressure over time. They are not subject to the sudden loss of pumping capability. This gradual increase in base pressure allows maintenance to be done before the vacuum becomes unacceptable and cuts unscheduled downtime. A typical scroll pump like the Agilent IDP3 will achieve a base pressure of 250 mTorr or lower while a comparable diaphragm pump will achieve a base pressure of only 1 Torr or lower. In this way the IDP3 allows for better ultimate vacuum and lower operating conditions for current, power and temperature for turbo molecular pumps at equivalent gas loads.

Scroll pumps operate with lower vibration

Current scroll technology is much lower in vibration when compared to typical diaphragm pumps. The scroll technology is based on smooth orbital operation, while diaphragm pumping involves abrupt cycling of the diaphragm's cylinder during the pumping stroke. With scroll technology the vacuum pump cycle of gas compression and discharge occurs with minimal pulsation and very low vibration. Depending on application, vibration can have some adverse effects, and may lead to the use of additional components such as vibration isolators. The dry pump of choice in a wide variety of applications where vibration is a factor is based on scroll technology.

Scroll pumps operate with lower noise

The scroll pump, based on smooth orbital operation is lower in noise when compared to typical diaphragm pumps. This makes it the ideal choice for laboratory equipment across a wide variety of applications, especially those where the pump is used in close proximity to people.

Scroll Pump technology offer long service life between maintenance activities

Many applications require the backing pump to run in continuous operation, and scroll pumps have proven long-life in performing this type of application. In most high vacuum backing applications, manufacturers recommend performing preventive maintenance on the scroll pump approximately once per year. With the pump tip seal designed for a gradual increase in base pressure, this simple maintenance activity can be scheduled as appropriate. On single stage scroll pumps this tip seal replacement can be completed in less than 30 minutes compared to several hours for diaphragm replacement.



Typical diaphragm pump rebuild kit



IDP-3 Tip Seal Kit

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Scroll pumps are ideal for a wide range of laboratory applications. Agilent Vacuum Products can provide the complete vacuum solution; including vacuum pump accessories like purge kits, vibration dampening kits, inlet filters and exhaust mufflers and silencer kits as well as a full line of complementary products including other vacuum pumps, valves and gauges. In addition, Agilent Vacuum Products is a world leader that offers technical expertise to help optimize your vacuum system.

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IDP-3



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