

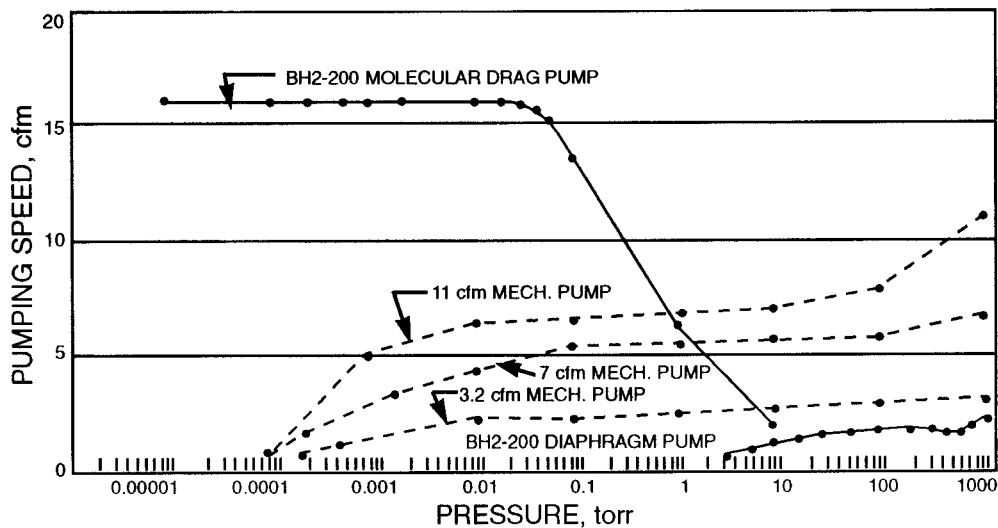
TECHNICAL NOTE DRI-2 OIL - FREE VACUUM PUMP PACKAGES

These oil-free vacuum pump packages combine a field proven molecular drag pump with heavy duty diaphragm pumps to provide clean, reliable pumping from atmosphere to the 10⁻⁶ torr range. Several unique features influence their application to specific vacuum requirements.

PUMPING SPEED - 16 cfm

All DRI-2 pump packages have a maximum pumping speed of 16 cfm. A unique feature of these packages is that they achieve maximum pumping speed at low pressure, which is just the opposite of oil sealed rotary mechanical pumps where maximum pumping speed is at atmospheric pressure. Figure 1 compares the pumping speed of the Model BH2-200 package with three common oil sealed rotary mechanical pumps.

**FIGURE 1. PUMPING SPEED COMPARARISON
HOVAC BH2-200 VS MECHANICAL PUMPS**



At pressures below 0.01 torr, the inlet speed of the DRI-2 pump packages is 16 cfm, which is the rated speed of the molecular drag pump. Above 10 torr the molecular drag pump does not contribute significantly to the over all pumping speed of the pump package. The high pressure pumping speed of these packages is dependent on the speed of the diaphragm pump. For this reason, the packages are sized in terms of the volume they can pump effectivity, rather than on the basis of pumping speed alone.

The model BH2-200 package is effective in pumping volumes up to 250 liters. The model BH2-60 is usually applied to systems up to 100 liters in volume. Pumpdown times will be significantly extended if these volumes are exceeded for the respective pump package. In general, DRI-2 packages pump slower than oil sealed rotary mechanical pumps at pressures above 10 torr. But, DRI-2 packages will achieve a significantly lower ultimate pressure than rotary mechanical pumps, without introducing oil contamination.

ULTIMATE PRESSURE

DRI-2 pump packages can produce pressures at least two decades lower than oil sealed rotary pumps because their maximum pumping speed is achieved at pressures below 0.01 torr. At these pressures, rotary mechanical pumps rapidly lose effective pumping speed.

These pump packages reduce the pressure quickly to the mid 10⁻⁴ torr range, and can produce ultimate vacuum levels into the 10⁻⁵ torr range if the system volume is small. While DRI-2 packages do maintain a pumping speed of 16 cfm into the 10⁻⁶ torr range, it should be kept in mind that 16 cfm corresponds to 7.5 liters/sec. If rapid pumpdown to the 10⁻⁵ torr range or lower is desired, then a separate high vacuum pump is required.

OIL-FREE

There is no measurable hydrocarbon contamination from these pump packages. However, we cannot say DRI-2 pumping packages are totally hydrocarbon free, since there is a lubricant on the bearings of the molecular drag pump on the low vacuum side of the pump. On the high vacuum side everything your vacuum system sees in a DRIVAC DRI-2 pump package is stainless steel, aluminum, viton or teflon.

OPEN FRAME CONSTRUCTION

DRIVAC DRI-2 pumps are mounted on an open frame for five good reasons:

1. Cool Operation- Diaphragm life is directly related to operation temperature. Diaphragm pump manufacturers advise against enclosing their pumps.
2. Quiet Operation- Drivac DRI-2 pump packages use high quality, quiet diaphragm pumps. They do vibrate a little and putting them in a case would only create noise. DRIVAC pumps are quit and we want to keep them quiet.
3. Modular Design- Every major component can be remotely mounted. The controls can be rack mounted, the drag pump directly mounted to the vacuum chamber or the diaphragm pump floor mounted. Open frame construction facilitates this modular concept.
4. Weight- DRIVAC DRI-2 pump packages are portable. The open frame design minimizes weight.
5. There is nothing to hide- Every component is top quality, manifolding is stainless steel and the construction is neat.

FULLY AUTOMATED PRESSURE CONTROLLED OPERATION

The DRIVAC Vacuum Monitor Circuit regulates the operation of the molecular drag pump, preventing operation of this pump at high pressures and eliminating time consuming forced starts.

WHEN SHOULD YOU USE A HOVAC DRI-2 PUMP PACKAGES?

1. Obviously, if your vacuum process cannot tolerate oil contamination you could benefit with a DRI-2 pump package.
2. If you are using a clean high vacuum pump, such as a cryopump, turbo pump or ion pump, a DRI-2 series pump package could enhance the operation of your pumping system. Aside from the obvious advantage of clean rough pumping, DRI-2 pumps offer other advantages. - When used to pump out cryopumps after regeneration, DRI-2 pump packages eliminate the possibility of oil contamination of the charcoal, especially if the cryopump is roughed excessively (below 50 mtorr). As backing pumps for turbo pumps, DRI-2 packages eliminate the need for venting of the turbo pump if power is interrupted or shut off. There is no oil to backstream into the turbo pump. and the DRI-2 roughing manifold valve closes, keeping your manifold under vacuum. Also, because of the potential for backing pressures in the 10 torr range, the useful pumping speed range of the turbo pump is extended. Starting of ion pumps is assisted by the reduce3ed pressures attainable during rough pumping with DRI-2 packages.
3. DRI-2 pumps are effective replacements for oil sealed rotary pumps on RGA sampling manifolds.

How is the proper DRI-2 pump package size specified? Primarily by the chamber volume. These pumps are not applicable to big box coaters, but bell jar systems are well suited to the DRI-2 pump packages. The volume of a 24"D x 30"h bell jar is about 220 liters and a Model BH2-200 is the pump to use. Figure 2 illustrates the pumpdown for this size chamber. Figure 3 shows the pumpdown performance for the model BH2-60 on a 30 liter vessel, about the volume of a 12"D x 18"H bell jar.

The basic rules are: Model BH2-60, Volume \leq 100 liters; Model BH2-200, Volume, \leq 250 liters.

FIGURE 2 BH2-200 PUMPDOWN PERFORMANCE
220 LITER CHAMBER

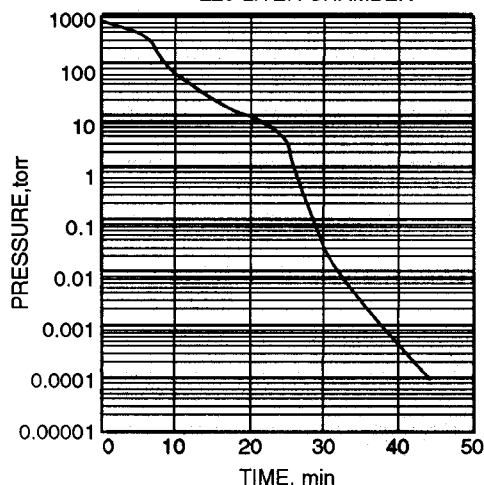


FIGURE 3 BH2-60 PUMPDOWN PERFORMANCE
30 LITER CHAMBER

