ROBUST FREEZE DRYER PUMP

Model
CRVpro 8

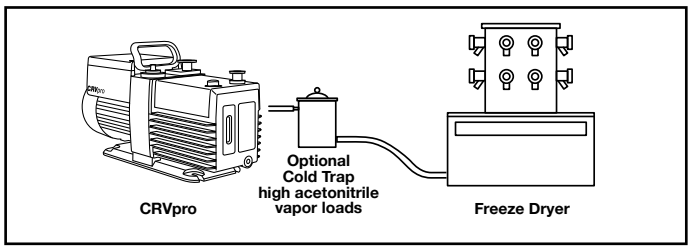
Specifications & Ordering - p. 52-53

- **Cool running to extend oil life**
- **Internal surface protection to resist corrosion**
- **Large oil capacity to dilute contaminants**

CRVpro direct-drive rotary vane pumps are built for reliability to provide stable operation and long product lifespan with proper maintenance. The pumps are cool running due to enhanced air flow leading to pump running 10°C cooler than standard direct drive vane pumps. The lower temperature leads to reduced chemical activity within the pump and slows down rates of oil consumption.

Inside surface of the oil case has a PTFE coating and the outer surface of the pumping module has a black oxide coating. Both coatings act to slow metal corrosion to extend service interval. Larger the oil capacity the more the dilution of chemical vapors that sublime from freeze dryer's condenser into the pump oil. This minimizes the rates of oil breakdown and reduce chemical attacks within the pump.

For high acetonitrile vapor loads, add a cold trap operating at -75 °C or colder. See p. 70 for exhaust filter options.



ACIDIC/ORGANIC VAPOR FREEZE DRYING

Model
8917A-80

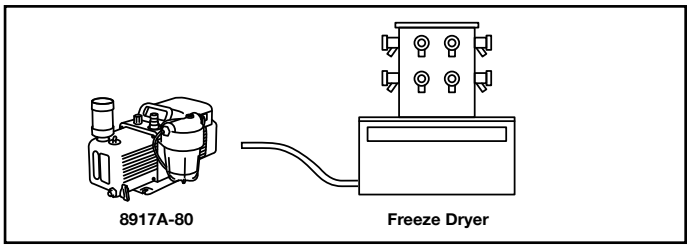
Specifications & Ordering - p. 51

- **Holds up to harsh chemicals used in proteomics and combinatorial chemistry**
- **System includes continuous acid neutralization and oil filtration**
- **Compact, quiet direct drive pump**

The Welch freeze dryer vacuum system is effective for freeze drying or concentrating by freeze dryer of samples including harsh chemicals such as TFA, acetonitrile, HBr and others. These chemicals quickly attack the vacuum pump oil of unprotected vacuum pumps. The 8917A-80 system includes a powerful 173 l/min. (143 l/min@50Hz) vacuum pump that is protected by an integral oil filtration system.

The oil filtration system neutralizes acids and removes solid reaction products from the oil. The system also has a large oil capacity of 1.3 liters that dilutes contaminants that mix with the pump oil during freeze drying runs.

The system includes Welch Gold Vacuum Pump Oil (see p. 72) which has excellent resistance to chemical attack.



Application Note | Freeze Dryers

Vacuum pump oil can be quickly compromised by the vapors from a freeze dryer. Once oil is chemically damaged, lubrication properties diminish and the vacuum pump quickly requires repair.

Organic solvents, acids, and other sublimated vapors often pass through the freeze dryer collector too rapidly to be effectively condensed. In general, better protection of your vacuum pump can be accomplished by

1. Using a low temperature cascade-refrigeration collectors.
2. Ensuring that your freeze dryer is operating vacuum tight. Too high a flow – augmented by system leakage – prevents the collector from operating efficiently.

Harmful vapor pass through is common in many freeze dryer systems. To maintain your lyophilizing process, select a vacuum pump designed to cope with harmful vapor ingress. See MODEL SELECTOR for the pump recommendations.

HIGH ORGANIC VAPOR LOADS

Model 8960

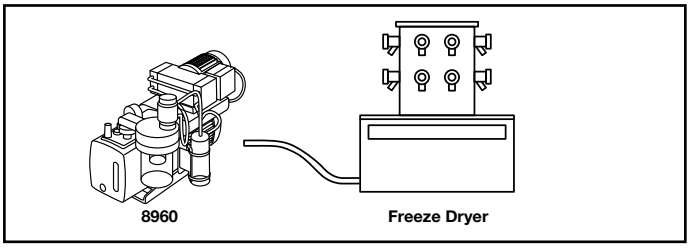
Model 8965/8970

Specifications & Ordering - p. 51

- **Degassing solvents trapped in oil case**
- **Laboratory Applications with chemical and corrossiove gases/vapors**

Eliminate the harmful vapors that destroy your pump in the most demanding vacuum applications. The Chemvac Combination Pump draws a deep, high-flow vacuum – suitable for freeze dry applications – with a powerful Rotary Vane Pump.

Harmful ingested fumes that would compromise the primary pump's oil are promptly degassed by Chemvac's secondary vacuum – a corrosion resistant PTFE diaphragm pump. This pumping system maintains high performance of the primary rotary vane pump, reducing maintenance and extending component life.



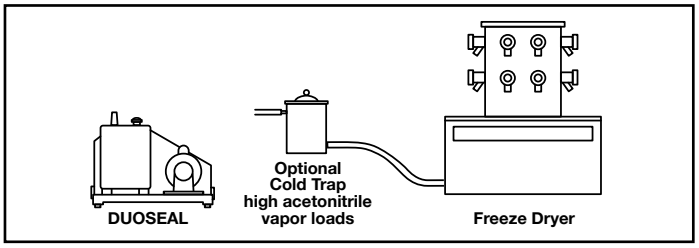
RUGGED PUMP FOR CORROSIVE VAPORS

Model 1402N

Specifications & Ordering - p. 56

- **Lower rotational speed for less wear and longer life**
- **Vital parts are corrosion resistant**
- **Large oil reservoir dilutes contaminants**

ChemStar® belt driven vacuum pumps are the most rugged Welch vacuum pumps for freeze drying applications. The design of these pumps makes them more tolerant of chemical contamination. The large 2.1 liters oil capacity dilutes contaminants. Lower belt drive RPM lowers operating temperature, thus reducing chemical activity. Lower RPM also results in less wear and longer operating life. Vital pump parts are corrosion resistant. The pump includes Welch Gold Oil which has excellent resistance to chemical attack.



Application Note | Freeze Dryers

Drug discovery labs are using freeze dryers for the final drying step when samples isolated by HPLC and LC include heat sensitive proteins and peptides. These samples are typically dissolved in a water, acetonitrile, and 0.1% TFA solution. Acetonitrile and TFA and its by-products will cause rapid breakdown of pump oil, changing its viscosity and leading to pump failure – sometimes after only a few runs.

There is often no way to prevent the ingestion of harsh chemicals into the pump. Three steps to minimize ingestion of harsh chemicals are:

1. Clean the freeze dryer's condenser after each freeze drying run to prevent sublimation of the frozen chemicals into the pump.
2. Size the pump to the freeze dryer. Pumping speed that is too high will shorten residence time in the condenser, reducing its trapping efficiency.
3. Spread the drying of multiple samples over time to evenly distribute the vapor load on the condenser.

CAUTION: For high acetonitrile vapor loads, add a cold trap operating at -75 °C or use a cascade system freeze dryer wih collector operating at -75˚C or colder.

Model Selector | Freeze Dryers

Freeze Dryer Size (volume)	Economy	Acidic/Organic Vapors	High Organic Vapors	Highly Corrosive Vapors
< 4 L	CRVpro 6	8917A-80	8960	1402N-01
4 to 12 L	CRVpro 8	8917A-80/8917C-80	8965	1402N-01
12 to 25 L	CRVpro 16	1376N-01	8970	1376N-01