

Vacuum Dryer for High Purity Containment Vessels

- **Faster drying.**
- **Low temperature.**
- **Energy saving.**
- **Suitable for sensitive materials.**
- **Will remove high liquid concentrations.**
- **Achieves single digit ppm moisture levels.**
- **Real time indication of drying progress.**



Containers for many chemicals and nuclear materials have to be exceptionally clean and dry to prevent unwanted reactions. Cleaning processes often leave traces of water or solvent that are difficult to remove, particularly from crevices and construction joints. Traditional drying methods involve time consuming and costly oven drying at atmospheric pressure, which can also damage or distort the material being dried.

Rather than heating the whole vessel to boil off liquids, vacuum drying lowers the pressure inside the vessel so that liquids boil at room temperature, and are pumped away. Some heat is required to counteract the cooling effect of vaporisation and prevent liquids freezing on the vessel surface. However this is small and, depending on the vessels thermal mass and the rate of vaporisation, no external heat source may be needed.

In the past vacuum pumps have been a source of contamination themselves, requiring maintenance intensive traps to prevent hydrocarbons backstreaming into the vessel being dried. The traps also quickly became saturated with water or solvent vapours, reducing pumping efficiency. Current totally oil free pump designs eliminate the need for traps and reduce both complexity and drying times.

The system shown was built to meet the specific requirements of a customer. Tubes 4m long x 11mm diameter, with a welded plug at one end have to be dried to <10 ppm moisture.

In this case the tubes could contain up to 5ccs of demineralised water each, and have to be dried within a 10 minute process window at room temperature, without the application of heat. The system uses an oil-free scroll pump coupled to the tube through a manifold with an external o-ring seal. Optimum pumping speed was set to control the rate of vaporisation and achieve the shortest drying time, without causing the demineralised water to freeze. A capacitance manometer is fitted to the manifold as close as possible to the tube connection point, indicating when the pressure inside the tube falls below the vapour pressure of water, and is "dry". To ensure the moisture level is below 10 ppm a separate UHP sample line and moisture monitor is also fitted. Purging of the moisture sensor and venting of the dry tube is carried out via a built in gas purifier, which ensures the gas has <1 ppb moisture content.



Mechanical	
Package	Bench top case with casters and adjustable feet.
Size (enclosure)	W 950mm, D 555mm, H 1000mm
Mounting	Floor Standing
Weight	85 Kg
Power Supply	
Line Voltage	240 VAC or 110 VAC (factory set)
Line frequency	50 - 60 Hz
Consumption	Less than 1.5 kVA
Operating Conditions	
Operating temperature range	+15°C to +40°C
Storage temperature range	-10°C to +70°C
Warm up time to full accuracy	60 minutes (assumes stabilised at ambient)
Vacuum Pump	
Type	Dry Scroll
Ultimate Vacuum	0.01 mbar
Pumping Speed	35m ³ /hr
Vacuum Gauge	
Type	Capacitance
Accuracy	0.5% of reading
Display	Digital panel meter, 4.5 place.
Moisture Meter	
Type	Impedance
Accuracy	+/- 1ppm
Display	Digital panel meter
Gas Purifier	
Type	Ambient temperature, getter stabilised zeolite.
Maximum flow	50 slpm
Outlet moisture level	<1ppb



Chell Instruments Ltd
 Folgate House
 Folgate Road
 North Walsham
 Norfolk NR28 0AJ
 England

Tel.: +44 (0)1692 500555
 Fax: +44 (0)1692 500088

E-mail : sales@chell.co.uk

Web site : www.chell.co.uk