Vapour Pump Fluids

Edwards supplies a range of fluids of different vapour pressures and physical properties. From this range, you can choose the optimum fluid for your applications.

In general, the more volatile fluids are used with vapour booster pumps and for vapour diffusion pumps used on industrial processes (for example, decorative coating and vacuum furnaces) where high gas loads are encountered and high critical backing pressure is advantageous. The less volatile fluids are used for processes or experiments requiring more exacting high vacuum conditions. The least volatile fluids are used for clean or ultra high vacuum applications (mass spectrometry, electron probe apparatus, surface studies, and so forth). Fluid selection depends also on the particular physical and chemical characteristics of the fluids (apart from vapour pressure).

Edwards has a long history of co-operation with various fluid manufacturers in the development of new pumping fluids and is well placed to advise in cases of uncertainty.

AP201 Vapour Booster Pump Fluid

Apiezon® AP201 is a hydrocarbon fluid prepared by molecular distillation and protected against oxidation by a thermally stable additive of matched vapour pressure. It has an auto ignition temperature of 305 °C.

It exhibits a fair degree of resistance to chemical degradation (so that high throughputs of air and water vapour can be pumped without damage to the fluid) and it can withstand limited accidental admission of atmospheric air at operating temperature. The fluid has low viscosity which permits easy filling and draining. It does not attack synthetic rubbers used for seals and gaskets in vacuum systems. It is non-irritant, non-toxic and environmentally non-polluting.

Ordering Information

Product Description	Order No.
AP201 vapour booster pump fluid	
4 litres	H02601054
20 litres	H02601052
200 litres	H02601050

Edwards L9 Diffusion Pump Fluid

Edwards L9 fluid has been developed for use in Diffstak and diffusion pumps. It is a naphthalene based synthetic material which is ideal for use in applications where silicones (which form insulating films) cannot be tolerated.

L9 fluid is rugged, has a very good vacuum performance and gives an ultimate pressure of typically 5×10^{-9} mbar (at 20 °C).

In addition, the fluid is chemically stable and is resistant to acids, alkalis, halogens and oxides of nitrogen. It does not react with common engineering metals or elastomers. It is immiscible to the common solvents alcohol, acetone and trichlorotrifluoroethane. The toxicity level of L9 is very low.

Safety note: When changing to this fluid the pump should be cleaned using a proprietary fluid. The pump should then be rinsed in acetone and dried prior to re-charging.

Ordering Information

Product Description	Order No.
Edwards L9 fluid 1 litre	H11501015

Silicone DC702, DC704EU and DC705 Diffusion Pump Fluids

These synthetic fluids are organo-silicon oxide polymers and have exceptional chemical stability both at high temperature and when in contact with most gases and vapours. They provide a range of general purpose fluids for ultimate vacuum from about 10^{-5} to 10^{-9} mbar, and are particularly useful in industrial processing applications due to their exceptional ruggedness. High throughputs of air, water vapour and corrosive gases can be pumped without fluid degradation. The fluids can withstand repeated admission of atmospheric air while at operating temperature and are widely used in valveless quick-cycle pumping processes. They have low toxicity and good resistance to gamma radiation.

Fluid breakdown products (due to bombardment and so on) tend to be electrically insulating and so we do not recommend these fluids for physical electronic applications such as mass spectrometers and surface analysis systems. The fluids are indifferent lubricants. Their decomposition is catalysed by traces of alkali metals (for example, caesium) and their use should be avoided where possible.

Ordering Information

Product Description	Order No.	
	Europe	N. America
Silicone 702		
500 ml	H02400007	H02400007
1 US gal	N/A	H02400008
5 kg (4673 ml)	H02400038	N/A
Silicone 704EU		
500 ml	H11201040	H02400043
1 US gal	N/A	H02400011
5 kg (4673 ml)	H11201041	N/A
Silicone 705		
500 ml	H02400027	H02400027

Santovac® 5 Diffusion Pump Fluid

This synthetic fluid is a polyphenyl ether developed from fluids originally produced as lubricants for space vehicles. It has exceptionally low vapour pressure, exceptional thermal stability and a tendency to wet surfaces less readily and "creep" to a lesser extent than is common with most fluids. The fluid is employed for the cleanest high vacuum and ultra high vacuum applications down to less than 10^{-9} mbar (for example, electron microscopes, mass spectrometers and surface physics studies) where its excellent high vacuum performance and low tendency to migrate into the pump system particularly recommend it. The fluid is chemically stable, non-corrosive, safe and non-toxic at normal operating temperatures. Fluid breakdown products (due to bombardment and so forth) tend to be electrically conducting. Lubricating qualities are good and the fluid finds application to lubricate mechanisms in vacuum systems.

Ordering Information

Product Description	Order No.	
	Europe	N. America
Santovac® 5 fluid		
100 ml	H11401001	H02300045
500 ml	H11401002	H02300046

Vapour Pump Fluid Selection Chart

	Apiezon®	Silicone			Santovac® 5	L9
	AP201	702	704EU	705		
Mass Spectrometers					•	•
Electron Microscopes					•	•
Thin Film Sputtering					•	
Surface Studies					•	
UHV Systems				•	•	
Leak Detection					•	
TV Tubes		•	•			
Power Valves					•	•
Spaces Studies					•	
Furnaces	•					
Radioactive					•	
Vapour Booster	•					
Metallisation		•	•			
Typical ultimate vacuum achievable at 20 °C (mbar)	6.5×10^{-5}	6.5×10^{-6}	6.5×10^{-8}	1.3×10^{-9}	1.3×10^{-9}	5×10^{-9}
Vapour pressure (mbar) at 20 °C	5×10^{-6}	6.5×10^{-7}	1.3×10^{-8}	2.6×10^{-10}	2.6×10^{-10}	7.8×10^{-10}
at 100 °C	2.4×10^{-2}	1.3×10^{-3}	2.6×10^{-4}	1.3×10^{-5}	6.5×10^{-6}	2.6×10^{-5}
at 150 °C	6.5×10^{-1}	$< 10^{-1}$	1.3×10^{-2}	$< 10^{-3}$	4×10^{-4}	2.3×10^{-3}
Boiling temperature at 1.3 mbar (°C) (approximate)	160	185	223	254	295	251
Molecular weight (average)	310	530	484	546	446	407
Viscosity cSt at 20 °C	34	55	47	240	2400	71.3
100 °C	5.0	4.9	4.3	7.9	12	5.6
150 °C	2.7	2.4	2.2	3.3	4.5	1.2
Pour point (°C) (approximate)	-30	< -20	< -20	-10	+5	-5
Flash point (°C)	196	193	221	243	288	241
Fire point (°C) (approximate)	204	275	275	275	350	281
Auto ignition point (°C) (approximate)	305	500	500	500	590	370
Specific heat (cal/g/°C)	0.46	0.42	0.41	0.42	–	0.46
Latent heat (cal/g)	69	40.9	52.7	51.6	49.2	42
Specific gravity at 25 °C	0.862	1.07	1.07	1.09	1.195	0.901
Coefficient of expansion per deg C	0.0007 (10 – 30 °C)	0.0008 (25 – 50 °C)	0.0008 (25 – 50 °C)	0.0006 (25 – 50 °C)	0.0008 (25 – 50 °C)	0.00042 (25 – 50 °C)
Refractive index at room temperature	1.476	1.516	1.557	1.579	1.6306 (25 °C)	1.5154 (25 °C)
Energetic Particle Bombardment	conducting polymers formed	insulating polymers formed			conducting polymers formed	
Thermal Stability	poor	very good			excellent	good
Oxidation Resistance	Poor to fair	excellent			very good	good
Chemical Resistance	poor	very good but decomposed by alkali metal			good	very good
Radiation Resistance	fair	good			very good	fair

• Recommended for this application