

F16 Mechanical Pump Oils

Selection of Oils for Mechanical Rough Pumps

Whenever selecting mechanical pump fluids for use in mass spectrometers, it is important to select the fluid with the lowest vapor pressure. The vapor pressure of the oil is important because it determines the ultimate vacuum the pump can achieve. Lower vapor pressures will allow the user to minimize backstreaming, significantly reduce pumpdown time and maximize vacuum. The major mineral based oils used for rough pumps in mass spectrometers include Inland 19, Invoil® 20, Inland 33 and Inland 45. Any of these pump fluids can be used in all BOC Edwards, Alcatel, Welch and other mechanical rough pumps.

Vapor Pressure (torr)	Inland 19	Invoil 20	Inland 33	Inland 45	Inland TW	Fomblin YO6/6
	3×10^{-5}	3×10^{-6}	1×10^{-6}	1×10^{-7}	1×10^{-6}	3×10^{-6}

The selection of a specific grade of pump oil utilized depends on the users needs including the mass range of the mass spectrometer, the system cleanliness required, the sensitivity required and the cost the user is willing to pay.

Inland 19 is the basic mineral oil used in most mass spectrometer vacuum pumps. It has been engineered for use with all mechanical vacuum pumps, providing for minimal backstreaming.

Invoil 20 is a better grade of mineral oil for use in mechanical rough pumps. It has been distilled to remove the majority of the light fractions present in the base oil. These light fractions represent

weak links in oil and tend to provide a source of attack for reactive gases. In addition they can easily migrate into the vacuum system to increase mass spec background. Invoil 20 will provide for better pumping efficiency, lower vacuum and longer vacuum pump life in comparison to Inland 19 or similar oils.

Inland 33 is manufactured to enhance the oxidation resistance of the fluid providing outstanding chemical stability. The process also provides a clear oil base virtually free of impurities.

Inland 45 is the newest and best grade of oil for mechanical vacuum pumps for mass spectrometers. It is a highly refined and distilled pump oil which will provide for optimum vacuum levels and minimal mass spectrometer background. It is recommended for mass spectrometers such as high resolution instruments which require the cleanest system, highest vacuum levels and optimum pumping efficiency. This oil is now recommended for the Agilent mass spectrometer systems.

Inland TW mechanical pump fluid is specifically recommended for applications where exposure to reactive or corrosive gases is prevalent, such as electrospray and particle beam.

Fomblin PFPE oils are non-flammable chemically inert fluids for use in areas where there are high levels of oxygen or where serious corrosion is a problem. This oil is identical to Krytox. Several manufacturers recommend this pump fluid for uses such as in the Agilent Particle Beam mass spectrometer.

Product	Vapor Pressure @25°C (Torr)	Boiling Point @.01 Torr (°C)	Viscosity (CST)		Pour Point (°C)	Flash Point (°C)	Fire Point (°C)	Density @25°C (gm/cc)	Reclaimable
			@40°C	@100°C					
Inland 19	3×10^{-5}	112	51	8.1	-15	213	244	0.86	No
Invoil 20	3×10^{-6}	127	58	8.5	-10	224	259	0.86	Yes
Invoil 21	3×10^{-5}	112	54	8.1	-15	213	244	0.86	No
Inland 45	1×10^{-6}	133	49	6.9	-59	268	288	0.83	Yes
Inland 77	1×10^{-4}	138	90	9.9	-9	257	291	0.87	No
Inland TW	$<1 \times 10^{-6}$	158	56	8.9	-12	243	270	0.86	Yes
Inland HVTW	$<1 \times 10^{-6}$	161	105.9	12.9	-12	249	277	0.86	Yes
Fomblin Y06/6	6×10^{-6}	>250	22	4	-45	None	None	1.88	Yes
Fomblin Y14/6	3×10^{-6}	>250	47	7.5	-40	None	None	1.89	Yes
Fomblin Y16/6	3×10^{-6}	>250	54	8.6	-45	None	None	1.89	Yes
Fomblin Y25/6	1×10^{-6}	>250	72.4	10	-35	None	None	1.89	Yes
Inland FF-10	1×10^{-4}	----	28.8	4.5	----	199	221	0.85	No
Inland 33	$<1 \times 10^{-6}$	166	67	9.3	-10	247	275	0.86	Yes