



VACUUM OILS & GREASES

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Vacuum Greases and Sealants

DOW-CORNING SILICONE HIGH VACUUM GREASE

Silicone High Vacuum Grease is sealant which is ideally suited for all high vacuum applications. The grease is of uniform, soft consistency and can be used over a wide range of temperatures. Important features of

this high vacuum grease include good sealing ability, excellent resistance to water, chemicals, high and low temperatures, and low volatility. This grease can be used in applications operating down to 10^{-8} mbar.

SPECIFICATIONS	DC HIGH VACUUM GREASE
Vapor pressure at 25°C	1.10^{-8} mbar
Color	light grey/translucent
Temperature range	-40 to 200°C
Evaporation after 24h at 200°C	< 2%
Packaging	50 g



High Vacuum Grease

PFPE INERT HIGH VACUUM GREASES

Inert High Vacuum Grease is a combination of an extremely low vapor pressure perfluoroalkylpolyether oil and a fluorocarbon resin thickener. These homogenous, white, buttery greases are designed for use in high vacuum environments operative where exposure to corrosive gases is probable. Inert High Vacuum Grease is not degraded or dissolved by most solvents, acids, bases, or other highly reactive chemicals, and can be cleaned from surfaces by dissolving the oil portion with solvent.

geminYe VAC 3

VAC 3 is particularly suitable for use as a lubricant of mechanical parts operating at high vacuum and in contact with aggressive chemicals or oxygen. Y VAC 3 is used in lubricating “for life” applications; its lubricating properties make it suitable for parts for long periods of time, and at very high operating temperatures (from -20°C to 200°C) and is used in the manufacturing, aeronautical, and electromechanical industries.

RT 15

RT 15 is suitable for lubricating mechanical parts requiring boundary (extreme pressure) lubricating properties. Shell four ball EP test show that RT 15's welding point is 800 kg. Its operation temperature range is from -20°C to 200°C. Its properties make it suitable in lubrication "for life" applications.



Fomblin RT 15

KRYTOX LVP

Krytox LVP high vacuum grease is used as a sealant or lubricant in vacuum systems. Chemically inert and offering superior lubrication properties, Krytox LVP grease combines the extremely low vapor pressure of Krytox fluorinated oil, which is based on the most stable type of perfluoroalkylpolyether available, with a fluorocarbon thickener. Thus, Krytox LVP grease will not explode, ignite, decompose, react to form gummy or solid deposits, or act as fuel for fires. It retains its lubricating ability at temperature extremes ranging from -15 to 300°C and offers complete oxidation resistance. All these features add up to lower wear and longer life for equipment and components -so important when access for component repair or replacement is difficult or impossible.



Krytox

SPECIFICATIONS	UNITS	geminYe Y VAC 3	RT 15	KRYTOX LVP
Vapor pressure at 25°C	mbar	1.10 ⁻⁹	1.10 ⁻⁹	1.10 ⁻¹³
Penetration (worked, 25°C)	mm/10	250	295	265-295
Temperature range	°C	-20/+200	-30/+150	-15/+300
Density	g/ml	1.92	1.92	1.94
Viscosity	cSt	1500 at 20°C	1300 at 20°C	740 at 40°C
Packaging	-	100 g	100 g	57 g

BRAYCOTE VACUUM GREASES

The Braycote line of high vacuum greases has been developed to cover a wide range of temperature and chemical environments. The Braycote greases are perhaps best known for their high chemical inertness which derives from their basically completely fluorinated chemistry, both in terms of the "base liquid", which is very similar to a diffusion pump fluid, and the solids phase, which is a micro-colloid of tiny polytetrafluoroethylene (PTFE) "dispersion" particles.

BRAYCOTE 600 EF

This grease is designed to operate in the presence of fuels, oxidizers, and in applications of deep space vacuum. It is used in gears, ball and roller bearings, electrical contacts, and O-rings. This grease is highly recommended for applications where temperature extremes and/or low vacuums are routine, such as cryogenic coolers, laser optical systems, or hostile chemical environments. Perfluorinated greases, such as Castrol Braycote® 600 EF exhibit excellent shelf life due to their intrinsic inertness.

CASTROL MICROCOTE 096, 196, AND 296

These greases are smooth off-white colored perfluoropolyether greases in NLGI grades 0, 1, and 2 respectively. Each Castrol Microcote product uses a proprietary base fluid thickened with a special polytetrafluoroethylene (PTFE) gelling agent with an average particle size of 0.8 µm. These products are specially formulated to provide

wear protection in most load and speed conditions under high or extreme vacuum conditions. These products offer excellent lubricity, thermal stability, low volatility, good shear stability, low acute toxicity, and contain no Sodium or other alkali metal containing ingredients. These greases are nonflammable and chemically inert.

SPECIFICATIONS	UNITS	BRAYCOTE 600 EF	MICROCOTE 096	MICROCOTE 196	MICROCOTE 296
Vapor pressure at 60°C	mbar	7.10 ⁻¹²		6.10 ⁻¹²	
Vapor pressure at 100°C	mbar	6.10 ⁻¹⁰		3.5.10 ⁻¹⁰	
Vapor pressure at 150°C	mbar	4.10 ⁻⁸		9.4.10 ⁻⁷	
Penetration (worked, 60 stroke at 20°C)	mm/10	288	376	328	272
Temperature range	°C	-80/+200	-50/+204	-50/+204	-50/+204
Oil separation (22 hrs, 204°C)	% wt	11.83*	8.9	11.7	6.4
Low temperature torque at -73°C starting running	N.m	0.14 0.06	0.04 0.02	0.06 0.04	0.14 0.05
Packaging	-	10 g / 57 g	57 g	57 g	57 g

* Oil separation: worked 30 hrs, 204°C

APIEZON GREASES

All stopcocks and moveable joints in a vacuum system must be satisfactorily lubricated while remaining leak proof. The ideal lubricant for this purpose would have a low vapor pressure and be stable, chemically inert, non-toxic, and easily applied/removed. Apiezon greases have these qualities. A wide range of greases are available for various applications.

AP 100 is a high vacuum grease with a softening point at 30°C. A blend of very low vapor pressure hydrocarbons and polytetrafluoroethylene (PTFE) lubricant. PTFE is virtually insoluble in all solvents.

AP 101 is based on a heavy duty lubricating grease gelled with Lithium stearate (a silicone earth), and PTFE, and can be used over a wide range of temperatures (-40°C to 180°C).

APIEZON AP 100 AND AP01 ANTI-SEIZE GREASES

AP 100 and AP 101 are specifically designed to prevent ground glass or polished glass joints in laboratory apparatus from seizing together, particularly in systems containing solvents. For these applications type AP greases have been found to be superior to silicones and petroleum jellies. As a result, AP greases are ideal lubricants for general laboratory use. Packed in tubes for ease of application, AP greases can be removed by wiping with a soft cloth or washing in an aqueous glassware detergent.



Apiezon AP 101

APIEZON H

Apiezon H will withstand temperatures up to 250°C without melting. In fact, it stiffens at temperatures above 40°C. It is of a rubbery nature and intended for lubricating glass taps and general purposes where a high melting point grease must be used.

APIEZON L

Apiezon L is a petrolatum hydrocarbon grease containing no additives. It has excellent vapor pressure capabilities, and is recommended for high vacuum use. It is widely used in gas-liquid chromatography, and may be used on all ground joints in a vacuum system where it is essential to have a grease with good lubricating properties and a low vapor pressure. It melts at 47°C and should not be used where temperatures at joints are likely to be above 30°C.

APIEZON M

Apiezon M is a general purpose grease for use in systems requiring a lubricant of moderate vapor pressure. It is used whenever a good lubricant is required and is recommended for vacuum use and general O-ring use throughout the laboratory. Grease M is not intended for use with joints that may exceed 30°C.



Apiezon M

APIEZON T

Apiezon T can be used over a wider temperature range. It contains a gelling agent which, though not truly soluble in organic solvents, is readily dispersed by them; it is therefore easily cleaned from metal and glass surfaces by solvent action.



Apiezon N

APIEZON N

Apiezon N can contain a high molecular weight polymeric additive that allows it to form a rubbery, cushioning effect between mating surfaces. The physical nature of this product makes it a popular grease for high vacuum use as well as general purpose laboratory use. It is not recommended for use above 30°C. Vapor pressure is estimated to be $8 \cdot 10^{-10}$ mbar at 20°C.

When it comes to low temperature applications, nothing comes close in performance to Apiezon N Grease. The product retains most of its important properties all the way down to -269°C/4°K. This lubricant solution to those low temperature challenges can also be cycled from these low temperatures up to room temperature and then back down without showing visible signs of cracking. And in addition, this grease is completely free of any silicones or halogens.

Typical static applications:

- Sensor mount within certain low temperature scientific instruments
- Thermal coupling medium within cryostats
- Use in just about any cryogenic experiments

SPECIFICATIONS	UNITS	AP 100	AP 101	H	L	M	T	N
Vapor pressure at 20°C	mbar	$8 \cdot 10^{-10}$	$5 \cdot 10^{-6}$	$2 \cdot 10^{-9}$	$7 \cdot 10^{-11}$	$2 \cdot 10^{-9}$	$4.6 \cdot 10^{-9}$	$8 \cdot 10^{-10}$
Melting point	°C	47	> 150	Does not melt	47	44	125	43
Average molecular weight	-	-	-	1000	1300	950	-	1300
Specific gravity at 20°C	g/ml	1.042	0.981	0.918	0.896	0.894	0.912	0.911
Packaging	-	50 g	50 g	25 g	25 g/50 g	25 g/100 g	25 g	25 g

APIEZON WAXES AND SEALING COMPOUNDS



Wax W100

Apiezon waxes are designed for sealing joints of a permanent nature. Three grades of wax are available, all similar, but with differing degrees of hardness and softening points. Wax W is used in most applications, but a softer wax is used where it would simplify application or where there may be vibration problems.

WAX W

Wax W is a general purpose wax with the highest melting point of the three Apiezon waxes. Wax W softens between 80°C and 90°C and is suitable for sealing joints that may become warm during operation. Wax W should be heated to about 100°C for ease of application.

WAX W100

Softer than Wax W, Wax W100 softens between 50 and 60°C. It is used where a wax seal is needed, but there is possibility of a joint cracking due to vibration. Wax 100 should not be used above temperatures of 50°C.

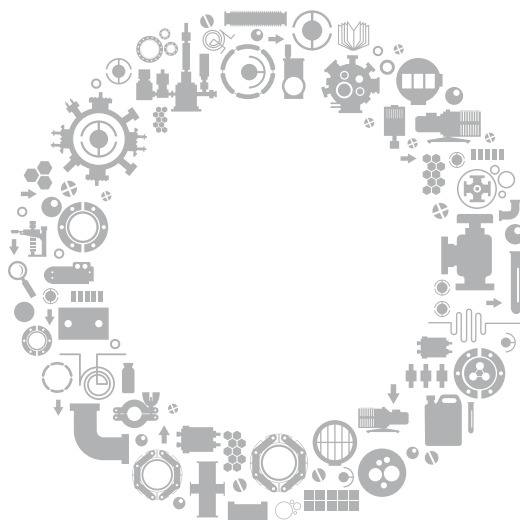
WAX W40

Wax W40, the softest wax, is designed for use where it is required so have the sealing medium flow into or around a joint, but at the same time the temperature of the joint must be kept as low as possible. Occasions for use of such wax arise where the glass of the apparatus may crack if heated. Wax W40 is designed to flow at temperatures of 50-60°C; it cannot be used for apparatus likely to heat above 30°C.

APIEZON Q COMPOUND

Is a putty-like substance used to seal joints and fill holes and gaps on the rotary side of a high vacuum system. It is suitable for sealing the edges of flat, underground joint in test equipment where parts of the system must be blanked off temporarily. A further example is the sealing of glass jars to metal plates to produce temporary vacuum enclosures.

SPECIFICATIONS	UNITS	WAX W	WAX W100	WAX W40	Q COMPOUND
Physical properties					
Approximate softening point	°C	80 to 90	50 to 60	40 to 50	45
Vapour pressure at 20°C	mbar	4.10^{-9}	$4.5.10^{-9}$	6.10^{-8}	1.10^{-4}
Temperature for application	°C	130	110	90	Ambient
Temperature range	°C	-10 to 75	-10 to 45	-10 to 35	-10 to 30
Water permeability at 25°C	$\text{g.cm}^{-1}.\text{hr}^{-1}.\text{mbar}^{-1}$	$1.4.10^{-8}$	$1.6.10^{-8}$	$1.6.10^{-8}$	N/A
Thermal/Electrical properties					
Thermal conductivity	$\text{W.m}^{-1}.\text{°C}^{-1}$	0.189	0.170	0.177	N/A
Specific heat at 25°C	J.g^{-1}	1.8	2.7	2.9	N/A
Volume resistivity	$\Omega.\text{cm}^{-1}$	$6.31.10^{15}$	$1.64.10^{15}$	$5.06.10^{15}$	N/A
Packaging	-	1 kg	250 g	250 g	1 kg



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