

Pedal systems

Hydraulic components

Brake boosters/actuators

Drum brake components

Disc brake components

Safety solutions

Electrical parking brake

From the Pedal to the Pad

Molykote® Lubricants for Brake Applications



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Automotive
Solutions



Molykote® Brake Solutions— From the Pedal to the Pad

When it comes to providing safety, dependability, comfort and value in increasingly sophisticated automobile brake systems, designers and engineers around the world turn to Molykote® for lubrication solutions from Dow Corning.

For trouble-free performance under changing conditions, you can trust Molykote engineers to provide brake lubrication solutions early in your design process for smooth operation and to minimize costly, time-consuming changes. We can even customize products, eliminating the guesswork that can run up costs and delay production.

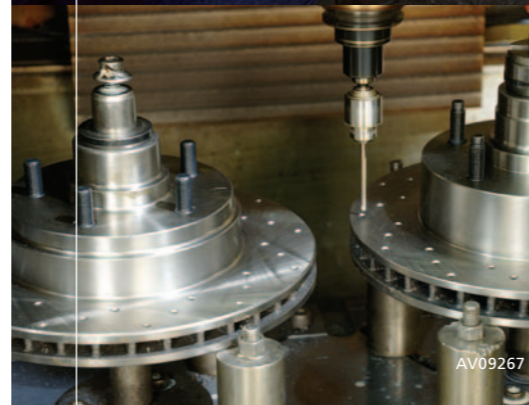
Every Molykote automotive product and service is backed by the Dow Corning commitment to provide the design and processing answers you need to ensure your customer's satisfaction.

Molykote state-of-the-art lubricants offer good lubricity, corrosion protection, noise reduction, dampening, sealing, and insulating properties. In addition, they are non-toxic, environmentally friendly, and fulfill all international regulatory requirements.

Designed to work under extremes of load, speed and temperature, as well as in exposure to water and dust, Molykote lubricants have excellent thermal stability, mechanical and oxidative resistance and offer good compatibility with elastomers commonly used in automotive brake systems, such as EPDM, neoprene, and others.

Our product range and engineer expertise make us the ideal partner for cooperation and development projects for modified or new products.

- **Tailored approach** – Dow Corning has global capabilities but can tailor a solution that can satisfy local needs.
- **Simple and exact** – We offer a wide selection of specialty lubricants for all applications to help you make the right choice the first time.
- **Environmentally friendly** – our selected range of lubricants and silicone-based products do not contain heavy metals, such as lead or chromium, nor antimony in order to comply with our customer's increasing requirements in terms of environmentally friendly products.
- **Total solution** – Specialty lubricants are the core portion of our brake solutions and Dow Corning also offers selected silicone compounds, sealants and testing services to complete the product and service range.



Pedal systems

Silicone- or polyolefin-based greases can satisfy lubrication requirements of new pedal joint designs that use polymeric composites of glass-fiber-reinforced thermoplastics. Silicone-based greases show very good dampening and anti-vibration properties due to excellent low temperature behavior and high viscosity capability.

Brake boosters

Greases are the best choice to provide good lubricity and sealing capability at low temperatures (as low as -40°C) and are compatible with a wide range of different plastics and rubbers, especially guide pin, sliding boot, reaction disc, plunger and vacuum seals.

Disc brake components

Brake calipers – The common types of automotive brake systems are based on the caliper disc brake. At the brake caliper, several areas need to be lubricated to provide trouble-free movement of the sliding parts and to avoid or reduce noises and vibration.

Brake caliper guide pin – In general, a solid-containing lubricant with a good lubricity and load carry capacity over a wide temperature range is needed. Silicone and PAG based greases are both suitable because of their low temperature and good rubber compatibility.

Brake pad shim – Greases and Pastes are appropriate for their good lubricity, wide temperature range, and good dampening capacity and vibration absorption that can eliminate noise and squeak.

Brake pad guiding spring – A “dry” anti-friction coating lubricant with insulating and corrosion preventing properties needs to be applied to the steel spring to provide the accurate lubrication of the brake pad in the caliper sliding guides and act as an insulating and anti-corrosion coating.

Brake pads

When brake components (pad/disc or lining/drum) are in sliding contact, velocity is converted into heat through friction, which can be controlled by solid lubricant powders to improve safety, comfort, and wear resistance.

Drum brake components

A important number of cars utilize a front-disc/rear-drum brake setup. Several areas also need to be lubricated in the drum brake in order to avoid and reduce noise and friction.

Adjusting screw – low friction pastes are applied to eliminate seizure at the adjusting screw.

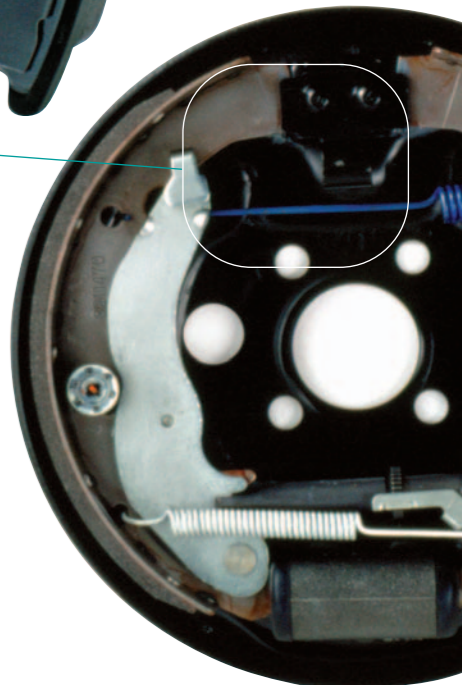
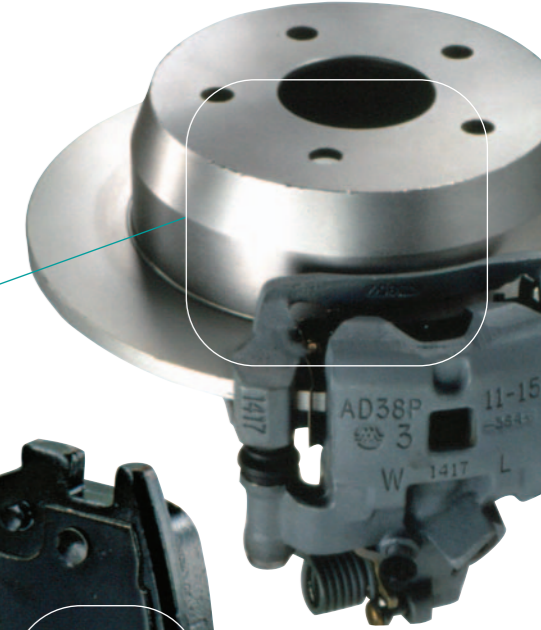
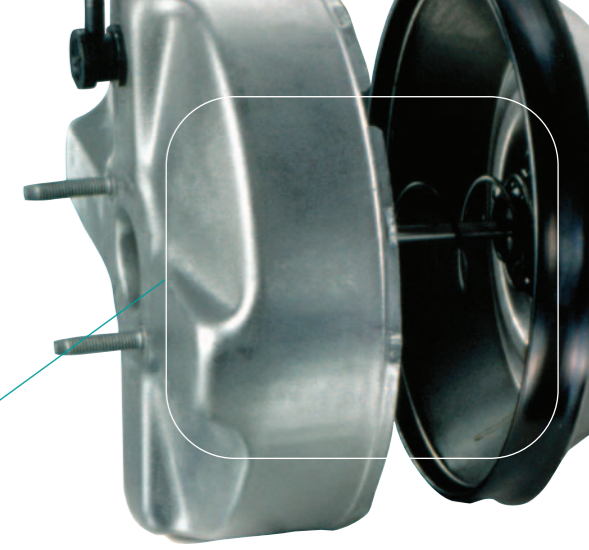
Brake cam – pastes are appropriate to reduce noise and corrosion.

Backing plate – Anti-friction coatings are used to reduce friction and noise against the backing plate.

Emerging Technologies

Molykote engineers are also working closely with OEMs to provide lubricant solutions to reduce friction and wear and fulfill the endurance requirements for next-generation braking systems such as electrical hand brakes and electromechanical braking systems.

Images: AV04651, AV04650, AV04652, AV04653



Molykote® Long-life Specialty Lubricants

Ordinary lubricants often cannot meet the increased technical demands of today's sophisticated brake systems. In many applications, specialty lubricants are required to perform under extreme conditions such as low and high temperatures, variable speeds and loads, and exposure to water and dust. Good compatibility with rubbers used in automotive brake systems is also essential.

The Molykote line of specialty lubricants for brake systems includes:

- **Greases** – thick or semi-fluid dispersions of a thickening agent in a lubricating liquid. High-performance greases are designed for dynamic metal-to-metal, metal-to-rubber, metal-to-plastic and plastic-to-plastic applications. Most greases are based on synthetic formulations that have excellent resistance to thermal degradation. Many are fortified with solid lubricant additive technology to provide effective lubrication under extreme load conditions. High-performance fluorinated greases are designed for extended service at higher temperatures and higher loads, and in harsh chemical environments.
- **Pastes** – high concentrations of solid lubricants dispersed in oil for convenient application. These lubricants have high concentrations of solid lubricants blended in various base oils. They are used where a high concentration of solid lubricant is required, such as initial run-in and areas exposed to high loads.
- **Friction control additives** – Dry lubricant powders (solid substances) that are applied between sliding surfaces to reduce friction and wear and to prevent

scoring. These lubricants are primarily used as additives for plastics and friction lining formulations to improve wear resistance and control friction. They offer good thermal stability and are resistant to wear.

- **Anti-friction coatings (AFC)** – paint-like products that contain submicron sized particles of solid lubricants instead of coloring pigment, dispersed through carefully selected resin blends and solvents. After curing, the coating forms a dry lubricating film that can help prevent corrosion and is aesthetically pleasing. Anti-friction coatings are ideal for applications involving dusty environments or for inaccessible areas containing parts that need long-term lubrication.

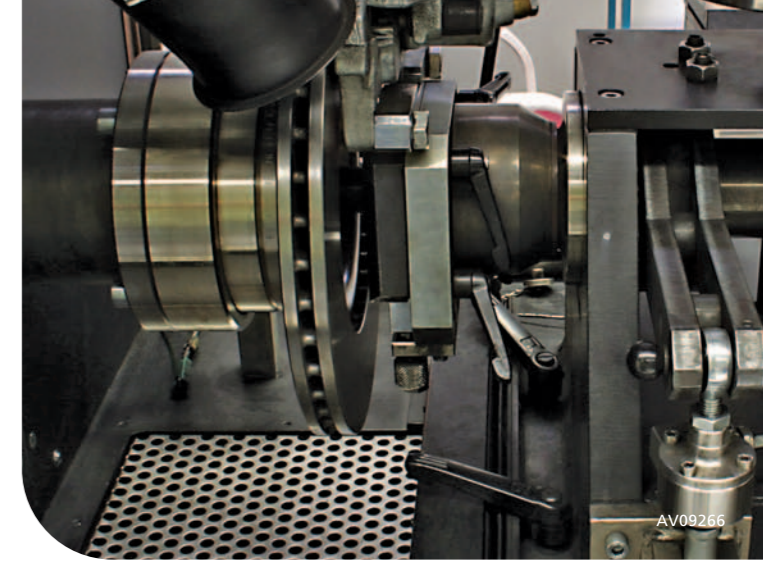
Specialty lubricants are the core portion of our brake solutions and Dow Corning also offers selected silicone compounds, sealants and testing services to complete the product and service range.

- **Silicone compounds** – additives for brakes and friction linings, designed for hot air vulcanisation. They feature high temperature stability, low temperature elasticity as well as a hydrophobic behavior. Silanes used for the surface treatment of fillers are also included into this product family.
- **Silicone adhesives/sealants** – one component adhesive/sealants which cure at room temperature when exposed to moisture in the air. These products are designed for applications which demand a strong but flexible bond, such as when bonding materials with differing thermal expansion rates.

Testing Capabilities

Dow Corning automotive centers in Germany, Japan and the United States feature a wide range of equipment for designing, testing and validating our lubricants and other materials specifically for brake applications.

To help you to select the right specialty lubricants for your application in the brake segment, we can perform the following tests:



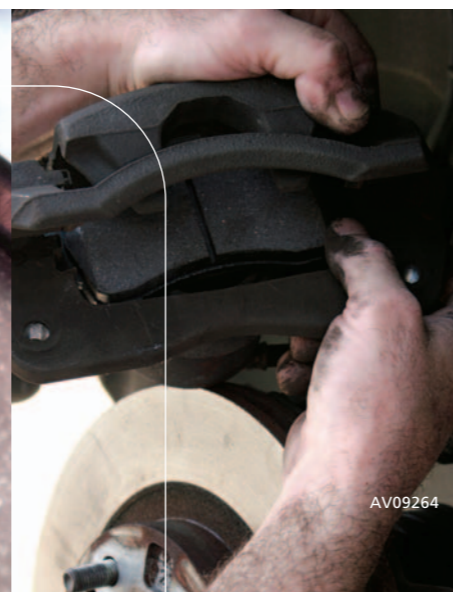
Mechanical/Dynamical Tests

Feature	Test	Grease	Paste	Powder	AFC
Lubricity/plastic compatibility	Ball Plate	X	X		X
Friction/wear	Brake – Krauss			X	
Lubricity/plastic compatibility	Cable	X			
Life time/high temperature	FE 9 bearing – FAG	X			
Corrosion	Emcor – SKF	X	X		
Life time/wear/load	LFW 1 – Oscillating and Rotating	X	X	X	X
Low temperature	Low temperature torque	X			
Lubricity/stick slip	Press fit	X	X		X
Life time/lubricity/wear	SRV	X	X	X	X
Load carry capacity/wear	VKA – Four Ball	X	X		
Water compatibility	Water Wash Out	X	X		

Chemical/Physical Tests

Feature	Test	Grease	Paste	Powder	AFC
Temperature stability	Dropping Point	X	X		
Low temperature usability	Flow Pressure	X	X		
IR spectra	Infrared analysis (IR)	X	X		
Oil Bleed and Evaporation	Oil Bleed and Evaporation	X	X		
Oxidation resistance	Norma Hoffmann	X	X		
Consistency	Penetration	X	X		
Viscosity	Rotational viscometer	X	X		
Corrosion	Salt spray	X	X		X
Thermal/oxidation stability	DSC	X	X	X	
Particle residue on sieve	Sieve analysis			X	
Tamped density/volume	Tamped density/volume			X	
Apparent volume	Apparent volume			X	
Moisture content	Moisture content			X	
Particle size	Particle size			X	

Check our website for up-to-date testing capabilities at www.dowcorning.com/automotive



Dow Corning: One Company, Many Automotive Solutions

As the global leader in silicon-based technology and with more than 60 years of experience as a leading automotive supplier, Dow Corning provides products, services and business solutions to meet your needs exactly. Whether you need to boost performance, lower costs, or increase customer satisfaction with your automotive systems, modules and components, we have experts who can help.

When you select Dow Corning as your business partner, you get fully integrated application and engineering support along with high-quality products and materials. From parts manufacturing to consulting to critical components' design, our experts can customize solutions that provide comfort, reliability and safety for vehicles today and for the future.

In addition to lubrication and sealing expertise, we have a wide variety of options involving electronics, coatings, elastomers and service solutions.



AV08564



AV09265

Product Recommendations

Brake segment

Sub-segment	Part	Function to be performed	Recommended Molykote® products	Product feature
Pedal system	Pivot of brake pedal	lubrication	YM-102	
	Bearing	lubrication	PG 21	Lubrication of pedal joints, good plastic compatibility
Hydraulic Components	Air compressor	sealing	Dow Corning® D 94-45M	High temperature silicone sealing
	Air compressor	lubrication	1292, 3452	Lubrication of compressor O-ring, guide pin compressor
	Master cylinder	lubrication	111 compound	Lubrication, assembly aid for O-ring and brake fluid reservoir
Brake boosters/actuators	Diaphragm rubber	lubrication	PG 54, 111, 822M	Lubrication of plastic cylinder/diaphragm
	Cup seal	lubrication	PG 54, 111, 822M	Lubrication at -40°C, good plastic compatibility
	Control piston	lubrication	PG 54, 111, 822M	Lubrication at -40°C, good plastic compatibility
	Reaction disc	lubrication	PG 54, 111, 822M	Lubrication at -40°C, good plastic compatibility
Drums Brake Components	Hand brake device	lubrication	G-n Paste, Cu-7439 plus, 44 M	
	Adjusting screw	lubrication	G-n paste	Lubrication, corrosion protection of screw
	Brake cam	lubrication	G-n paste, 44 M	Lubrication, corrosion protection of cam
Disc Brake Components	Backing plate	lubrication	7409, G-n Paste, 44 M	Lubrication, corrosion protection of backing plate
	ABS	lubrication	BG 20, HP-300	Lubrication of needle bearing
	Brake pad back plate	lubrication	Cu-7439 plus, D-708, M-77	Applied on edge of plate to reduce noise
	Back plate	corrosion protection	D-708	Anti-Friction Coating corrosion protection and lubrication
	Shim	NVH	PG 54, M-77	Lubrication to reduce squeak noise
	Caliper pin	lubrication	G-807, PG 54, 111	Lubrication of caliper pin (needs compatibility with rubbers)
	Caliper spring + slipper	lubrication	111	Lubrication at wide temperature range, high resistance to impurities
	Caliper spring + slipper	corrosion protection	D-708	Anti-Friction Coating corrosion protection and lubrication
	Brake pad	friction control and comfort	7365, 7375, D-3912, D-78, D-79, D-29, D-54, D-55	Friction additives
	Brake pad	vibration and compressibility	Silastic® WS 23-60	Silicone rubber for high and low temperatures

New technologies

Electrical parking brake	Spindle and gear	lubrication	EM-60L, YM-103, D-708	Lubrication at -40°C, good plastic compatibility
Brake by wire	Electrical actuator	lubrication	HP-300	Lubrication, durability

Recommended products are Molykote® brand and for all areas, unless otherwise noted.

How To Contact Us

Dow Corning has sales offices, manufacturing sites, as well as science and technology laboratories around the globe. For more information, visit www.dowcorning.com/automotive or www.molykote.com, or call one of our primary locations listed here.

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Global Presence. Local Support.

Dow Corning's global presence in the automotive market enables you to develop specifications centrally while providing consistent high-quality products and services locally. Through our global sales, application engineering, product development, and manufacturing and delivery capabilities, our quality is consistent around the globe. This also enables a more effective and efficient product customization process—no matter where you are located!



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