MOLYKOTE®

DUPONT™

MOLYKOTE® Pastes for general lubrication, assembly & threaded connection applications

High-performance protection in harsh environments

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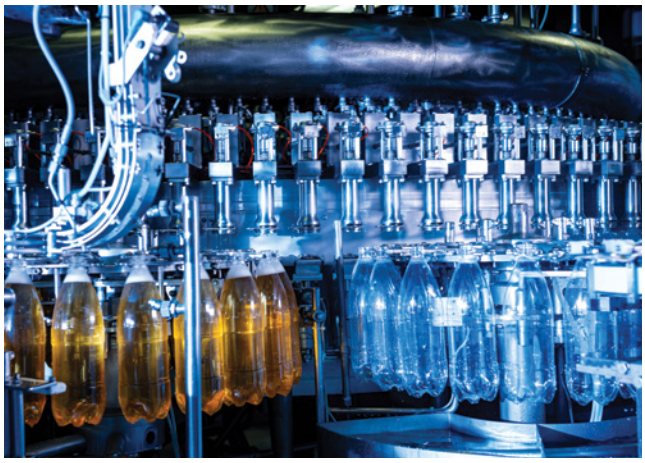
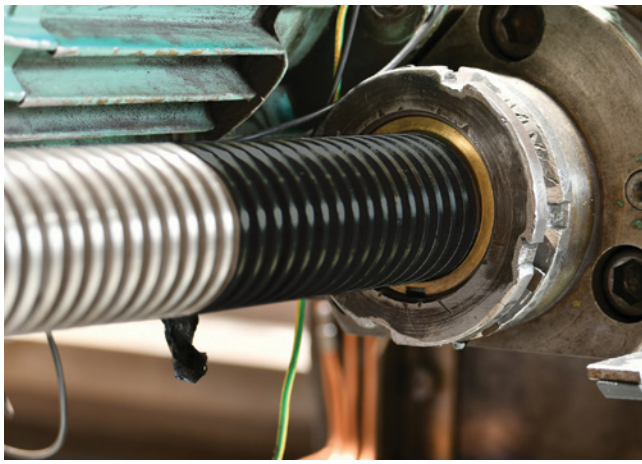
MOLYKOTE® Specialty Lubricants

Your partner for your toughest design & lubrication challenges

For more than 75 years – since 1948 – MOLYKOTE® has been a trusted partner, helping engineers and manufacturers meet some of the world's toughest design and lubrication challenges. Now, with the addition of DuPont's technologies and expertise, we are even better positioned to create solutions for emerging trends.

We continually invest in technology and product innovation to support customers' changing needs. Working side by side with our customers, MOLYKOTE® is forging the future of specialty lubrication with:

- A broad range of trusted, technology-driven specialty lubricant chemistries
- Application expertise and technical support from internationally recognized lubrication experts
- Lubrication solutions across six product families to enable long-term solutions across a wide variety of applications
- Innovative combination of tribology and material science for wet and dry lubrication

Introduction to pastes

Pastes are heavily loaded with solid lubricants dispersed in a base oil. Because of their high solids content, pastes are ideal for applications where metal-to-metal components experience friction under extreme conditions such as heavy loads, high temperatures, or dusty or moist environments. They can be used to lubricate threaded connections, assembly processes and slow-moving parts.

Using pastes in threaded connections enables convenient tightening, as well as repeated disassembly and reassembly with consistent coefficients of friction. In addition, pastes are well-suited for machine assembly – particularly for components that slide under high loads and boundary friction conditions, which can lead to seizure and galling. Furthermore, pastes are ideal for slow-moving metal pairs in rotating, sliding or oscillating operations, whether continuous or intermittent. They can separate metal surfaces effectively under high pressure and temperature to protect parts from wear and fretting corrosion, even in water-rich and dusty environments.

Pastes offer several benefits:

- Provide constant friction over time
- Provide consistent bolt tension in threaded connections (due to consistent coefficient of friction)
- Provide high load-carrying capacity
- Prevent stick-slip
- Prevent undesirable scale formation
- Ensure long lifetimes without stress corrosion cracking
- Facilitate maintenance by preventing seizure
- Protect mating surfaces, reducing the effects of oxide layer depletion (which lead to fretting, galling, seizing and shearing)
- Protect mating surfaces in extreme environments and reduce surface corrosion
- *Additional benefit of ultrahigh-purity paste*: Reduce hydrogen and solder embrittlement

MOLYKOTE® M-77 Paste is the perfect choice to lubricate brake shims.

MOLYKOTE® brand Specialty Lubricants can help your threaded connections perform well in service, from initial assembly through repeated disassemblies. MOLYKOTE® Pastes are specially formulated to withstand harsh conditions; to perform at a wide range of service temperatures; and to resist the effects of heavy loads, salt spray or other contaminants. Pastes are designed to be a long-term solution: High loadings of solid lubricants ensure solids will remain in place, even under extreme conditions such as high temperatures or heavy loads. MOLYKOTE® Pastes can be divided into three general categories: assembly pastes, general lubrication pastes and threaded connection pastes. Some pastes fit well into more than one category. The MOLYKOTE® technical support team can assist you in choosing the best paste for your specific application and technical requirements.

Surface preparation and paste application

All pastes are applied in the same manner, regardless of the intended end use. First, parts or threads need to be cleaned as thoroughly as possible, removing any excess oils or debris. Standard cleaning methods for degreasing work well for removing existing lubricants or oils; such contaminants can negatively impact the performance of the paste. Apply the paste properly over the contact surface, and do not mix the paste with any other oil or grease.

Pastes can be applied by brush, by applicator or even by hand; selected pastes also are available in a convenient spray can version. Cans or larger containers should be stirred thoroughly before use; spray cans need to be shaken thoroughly before spraying. Clogging of spray cans can be prevented by turning the can upside down after use and depressing the button briefly to clear the nozzle.

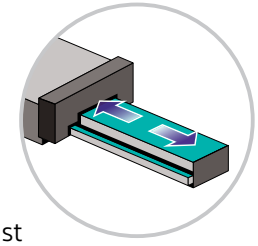
Surfaces should be coated thoroughly; any excess will be pushed out of the contact area, and solid lubricants will remain long after the carrier oil has worn away. When applying to threads, ensure all threads are covered evenly. For large fasteners (>M30), it is recommended to apply paste to both the fastener threads and the nut to ensure complete coverage.

Categories of MOLYKOTE® Pastes

MOLYKOTE® Pastes can be classified into three categories: general lubrication pastes, assembly pastes and thread pastes. Pages 6 through 11 of this brochure describe each paste category in detail, including real case studies that help illustrate the unique properties of each category of paste.

CATEGORY 1 OF 3

MOLYKOTE® General Lubrication Pastes (grease pastes)



General lubrication pastes, also known as grease pastes, consist of solid lubricants, base oil, thickener and additives. MOLYKOTE® General Lubrication Pastes contain a significant amount of solid lubricants, including molybdenum disulfide (MoS_2), graphite and white solids, which function both as thickeners and as protectors against wear. The base oils in grease pastes are either refined mineral oils or synthetic oils that act as carriers for the solid lubricants. Additionally, MOLYKOTE® Pastes for general lubrication are formulated with soaplike concentrations that maintain paste consistency, resulting in high resistance against drying and bleeding. Grease pastes offer excellent lubrication performance and high load-carrying capacity under boundary friction conditions.

Why choose MOLYKOTE® General Lubrication Pastes?

To achieve a hydrodynamic lubricating state, conventional lubricating oils and greases require a minimum viscosity of base oil and a minimum hydrodynamically effective speed. However, operational conditions such as excessively low speeds or intermittent operation may prevent hydrodynamic lubrication. In such scenarios, grease pastes that contain solid lubricants with “emergency-running” properties or “dry-running” properties can guarantee mating surface separation to mitigate potential issues under these service conditions.

MOLYKOTE® General Lubrication Pastes are designed for extreme tribological conditions including slow and oscillating movement, heavy loads, and high temperatures. They are superior to traditional oils and greases, which cannot form films capable of preventing part contact in these extreme conditions, resulting in wear or scuffing. Moreover, under harsh conditions such as water-rich or chemically aggressive environments, they also prevent wear, friction, galling, corrosion and fretting corrosion in machines.

At ambient temperatures, the carrier oil and solid lubricants deliver lubricity, whereas at very high temperatures, the carrier oil evaporates, bleeds or decomposes. As a result, the residual solid lubricants deliver efficient lubrication through a strong lubrication film that adheres to the metal surface.

In contrast to thread and assembly pastes, general lubrication pastes are used more generously on the contact area to offer long-lasting dynamic lubrication. In addition, MOLYKOTE® General Lubrication Pastes are suitable for centralized lubrication systems.

MOLYKOTE® has many general lubrication pastes to meet your application requirements, including MOLYKOTE® M-77 Paste for shim and back plates of disc brakes, MOLYKOTE® Cu-7439 Plus Paste V1 for pins in disc brakes, MOLYKOTE® E Paste for seat recliners, MOLYKOTE® P-1042 Adhesive Grease Paste and MOLYKOTE® TP-42 Paste for lathe chucks, MOLYKOTE® P-1900 FM Anti-Seize Paste with NSF H1 registration for food and beverage processes, and MOLYKOTE® P-40 (S) Paste for hinges and screws exposed to moisture or water.

Typical properties of MOLYKOTE® General Lubrication Pastes

Product	Penetration, mm/10	COF	COF at press fit	Prevents fretting corrosion?	High load-carrying capacity?	Provides corrosion resistance?	Service temperature as paste[2], °C	4-ball weld load, N	Color	Substrate compatibility	Water resistance	Base oil	Solid lubricants	Metal content?
MOLYKOTE® Cu-7439 Plus Paste V1	320 to 370	High	0.14	No	No	Yes	-30 to 300	3600	Copper	Steel	Excellent water resistance	Semi-synthetic oil	Copper	Contains metal
MOLYKOTE® DX (S) Paste	285 to 315	Medium	0.10	Yes	Yes	Yes	-25 to 125	4800	White	Steel	Good water resistance & water washout resistance	Mineral oil	White solids	Metal-free
MOLYKOTE® E Paste	265 to 295	Low to medium	0.08	N/D	Yes	Yes	-50 to 150	5500	Light yellowish	Steel, plastics	N/D	Synthetic oil	White solids	Metal-free
MOLYKOTE® HTP Paste	250 to 280	Medium	N/D	N/D	No	No	-20 to 120	2200	White	Steel	N/D	Mineral oil	White solids	Metal-free
MOLYKOTE® M-77 Paste	280 to 330	Low to medium	N/D	No	No	No	-45 to 230	2000	Black-gray	Plastic & elastomers	Good water resistance	Synthetic oil	MoS_2	Metal-free
MOLYKOTE® P-40 (S) Paste	310 to 350	Medium to high	0.09	Yes	Yes	Yes	-40 to 230	3000	Yellowish-brown	Steel	Excellent water resistance	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® P-1042 Adhesive Grease Paste	285 to 320	Medium to high	0.10	Yes	Yes	Yes	-25 to 120	9000	White	Steel	Excellent water resistance	Semi-synthetic oil	White solids	Metal free
MOLYKOTE® TP-42 Paste	265 to 300	Medium	0.09	Yes	Yes	Yes	-25 to 125	3000	Light beige	Steel	Excellent water resistance	Semi-synthetic oil	White solids	Metal free
MOLYKOTE® P-1500 (S) Paste	285 to 315	Medium	0.12	Yes	Yes	Yes	-50 to 160	4000	White	Steel	Good water resistance & water washout resistance	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® P-1900 FM Anti-Seize Paste[1]	290 to 340	Medium	0.10	No	No	No	-30 to 150	3200	White	Steel	Good water resistance	Mineral oil	White solids	Metal-free
MOLYKOTE® U Paste	280 to 340	Medium	0.10	No	Yes	No	-40 to 180	N/D	Grayish-black	Rubber	N/D	Synthetic oil	MoS_2	Metal-free
MOLYKOTE® U-N Paste	250 to 280	Medium	0.09	Yes	Yes	No	-40 to 150	3800	Black	Steel/rubber	N/D	Synthetic oil	MoS_2	Metal-free
MOLYKOTE® X Grease Paste	255 to 275	Low to medium	0.07	Yes	Yes	Yes	-30 to 135	3000	Black	Steel	Good water resistance	Mineral oil	MoS_2	Metal-free

Specification writers: These values are not intended for use in preparing specifications. Please contact your local MOLYKOTE® sales representative prior to writing specifications on these products.

[1]Also available as spray. | [2]Service temperature ranges describe the temperature window in which wet lubrication is provided. These ranges might vary from the technical data sheet (TDS) of the product, as the TDS is always linked to a specific application, whereas you may need just dry lubrication provided by the solid lubricant (e.g., anti-seize applications, such as high-temperature-exposed threads). | N/D: No data.

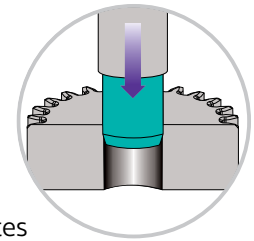
CASE STUDY: Lubrication of lathe chuck mechanisms

Featured product: MOLYKOTE® P-1042 Adhesive Grease Paste

Lathe chucks are used to safely clamp parts in turning machining processes. An internal mechanism enables centered clamping by simultaneously closing clamping jaws. Centrifugal forces during service counteract against the jaws until a part may become loose. MOLYKOTE® P-1042 Adhesive Grease Paste is designed to meet OEM requirements for a safe, constant level of clamping force. Careful selection of white solid lubricants enables a high level of clamping force and protection against fretting corrosion induced by vibrations. Due to its tackiness and excellent adhesion on metallic surfaces, this grease paste resists washout. It does not dissolve or severely harden in contact with typical machining fluids on the market. MOLYKOTE® P-1042 Adhesive Grease Paste effectively helps end users reduce costs by extending tool life and lengthening service intervals of lathe chucks.

CATEGORY 2 OF 3

MOLYKOTE® Assembly Pastes



MOLYKOTE® Pastes with solid lubricants are ideal for machine assembly in applications where sliding speeds are slow and components are subject to high loads. Under such conditions, pastes containing large amounts of solid lubricants – rather than standard greases – prove highly effective in protecting sliding surfaces.

Requirements for assembly pastes

Many moving parts are involved in mechanical assemblies; each part has distinct lubrication requirements, such as high load-carrying capacity, precise positioning, wear and/or friction reduction, and water and corrosion resistance. Such performance requirements are important to enable smooth installation and to minimize the downtime of large machines with sliding components under heavy loads, such as metal-processing machines.

Benefits of assembly pastes in various applications

For bearings and gears, MOLYKOTE® Pastes with extreme-pressure-resistance properties enable smooth press-fitting while improving assembly accuracy. Furthermore, pastes applied on gear-tooth surfaces shorten the initial break-in period, thus extending machine lifetime. When assembling low-speed sliding parts, pastes can prevent stick-slip during assembly and operation. A paste with correctly selected solid lubricants not only improves the efficiency of assembly, but it also reduces friction and wear by decreasing sliding resistance of parts that are in contact with each other.

Other common applications for MOLYKOTE® Assembly Pastes are screws and bolts, where pastes allow for proper tightening torque and prevent seizing. Assembly pastes with excellent water resistance are ideal for food machinery, components that are in contact with water-based cutting oil, and several outdoor applications such as offshore wind turbines.

CASE STUDY: Assembly of train wheels

Featured products: MOLYKOTE® G-Rapid Plus Paste & MOLYKOTE® G-N Plus Paste

MOLYKOTE® G-Rapid Plus Paste and MOLYKOTE® G-N Plus Paste are ideal for the assembly of train wheels on axles. They allow for the smooth mounting of the wheel on the hub and can eliminate unwanted noise associated with high-friction metal-on-metal contact. However, they also maintain an appropriate friction factor necessary to transduce the torques required during the acceleration and braking of the train. Lubricants play an important role in reducing the probability of failure and ensuring a safe journey for passengers and operators. Use of MOLYKOTE® G-Rapid Plus Paste or MOLYKOTE® G-N Plus Paste also can simplify disassembly processes during maintenance, helping reduce excess vibrations and friction on wheels and helping keep fretting corrosion and wear to an absolute minimum.

Typical properties of MOLYKOTE® Assembly Pastes

Product	Penetration, mm/10	COF at press fit	Prevents fretting corrosion?	High load-carrying capacity?	Service temperature (solid lubricants)[2], °C	4-ball weld load, N	Color	Substrate compatibility	Base oil	Solid lubricants	Metal content?
MOLYKOTE® D Paste[1]	250 to 280	0.10	Yes	Yes	-25 to 250	2600	Off-white	Steel	Mineral oil	White solids	Metal-free
MOLYKOTE® G Paste	310 to 360	0.10	Yes	Yes	-20 to 400	3140	Black	Steel	Mineral oil	MoS_2	Metal-free
MOLYKOTE® G-N Metal Assembly Paste[1]	260 to 310	0.08	Yes	Yes	-18 to 400	4900	Gray-black	Steel	Mineral oil	MoS_2, white solids	Metal-free
MOLYKOTE® G-N Paste	280 to 310	0.10	Yes	Yes	-20 to 400	4200	Black	Steel	Mineral oil	MoS_2, white solids	Metal-free
MOLYKOTE® G-N Plus Paste	280 to 310	0.08	Yes	Yes	-25 to 450	2800	Black	Steel	Mineral oil	MoS_2, white solids	Metal-free
MOLYKOTE® G-Rapid Plus Paste[1]	255 to 275	0.05	Yes	Yes	-35 to 450	5300	Black	Steel	Mineral oil	MoS_2, graphite, white solids	Metal-free
MOLYKOTE® G Rapid Spray	N/A	0.05	Yes	Yes	-35 to 400	3040	Gray-black	Steel	Mineral oil	MoS_2, graphite	Metal-free
MOLYKOTE® P-40 (S) Paste	310 to 350	0.09	Yes	Yes	-40 to 1200	3000	Yellowish-brown	Steel	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® P-74 Assembly Paste	280 to 310	0.12	Yes	Yes	-40 to 1500	4800	Grayish-black	Steel	Synthetic oil	Graphite, white solids	Metal-free
MOLYKOTE® P-1042 Adhesive Grease Paste	285 to 320	0.10	Yes	Yes	-25 to 500	9000	White	Steel	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® TP-42 Paste	265 to 300	0.09	Yes	Yes	-25 to 250	3000	Light beige	Steel	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® P-1500 (S) Paste	285 to 315	0.12	Yes	Yes	-50 to 160	4000	White	Steel	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® U Paste	280 to 340	0.10	Yes	Yes	-40 to 450	3800	Gray-black	Steel, rubber	Synthetic oil	MoS_2	Metal-free
MOLYKOTE® U-N Paste	250 to 280	0.09	Yes	Yes	-40 to 450	3800	Black	Steel, rubber	Synthetic oil	MoS_2	Metal-free
MOLYKOTE® X Grease Paste	255 to 275	0.07	Yes	Yes	-30 to 135	3000	Black	Steel	Mineral oil	MoS_2	Metal-free

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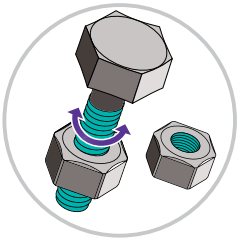
[1]Also available as spray. | [2]Service temperature ranges describe the temperature window in which dry lubrication is provided (e.g., additional anti-seize protection is present). These ranges might vary from the technical data sheet (TDS) of the product, as the TDS is always linked to a specific application, whereas you may need continuous wet lubrication (see MOLYKOTE® General Lubrication Pastes section on pages 6 and 7). | N/A: Not applicable.

CATEGORY 3 OF 3

MOLYKOTE® Thread Pastes



Bolted connections must maintain a proper amount of clamping force to guarantee safety and reliability. To achieve this requirement, proper tightening torque must be applied during assembly. The torque is dependent on the friction of two tribo-systems: the fastener thread and the head contact areas. In many cases, these friction factors are unknown parameters. However, it is important to estimate these friction factors, as incorrect clamping forces can cause damage to bolts, potentially compromising safety.

MOLYKOTE® Thread Pastes are designed to be applied to surfaces in contact with one another and provide a uniform coefficient of friction and reduced stick-slip during assembly. Thread pastes also help to protect against surface wear phenomena such as fretting, galling and seizing. The tribological working mechanism is based on carefully selected solid lubricants, which are dispersed in carrier oils or greases for easy application. In comparison to liquid lubricants, solids will stay in place once applied to separate friction surfaces, even under standstill conditions. Due to their adhesion and consistency, thread pastes also can be effective at sealing against corrosive substances. At elevated temperatures where organic materials decompose, these pastes can prevent seizure by maintaining surface separation, allowing for damage-free disassembly.

Description of friction coefficients and K-factors

The relation between clamping force F_{Mzul} and applied tightening torque M_A with respect to geometrical parameters and head and thread friction, can be calculated according to VDI 2230:

$$M_A = F_{Mzul} \cdot \left[0{,}16 \cdot P + 0{,}58 \cdot d_2 \cdot \mu_{Tmin} + \frac{D_{km}}{2} \cdot \mu_{Hmin}\right] \quad (1.1)$$

Where:

P = pitch of thread

d_2 = pitch diameter of bolt thread

D_{km} = effective diameter of the friction moment at the bolt head or nut bearing

μ_T = friction of the thread

μ_H = friction of the head bearing

While P, d_2 and D_{km} are geometrical parameters, the two friction coefficients μ_T and μ_H need to be determined experimentally. With given friction factors, design engineers easily can calculate tightening torque. Another simplified relationship between tightening torque, clamping force and bolt size is the so-called "K-factor":

$$k = \frac{M_A}{F_{Mzul} \cdot d} \quad (1.2)$$

The K-factor combines the two friction coefficients with several geometrical parameters and often is used by mechanics in field installations. While the nominal bolt diameter, d, is the only geometrical parameter, the equation enables a simple and quick calculation of the tightening torque. On the other hand, the equation suggests K-factors remain constant with size variation of the bolt, which is not necessarily the case. ISO 16047 further limits the validity of a K-factor of threaded connections with "same friction conditions, same nominal bolt diameter d and same geometry."

In addition to variation in geometrical parameters, factors influencing friction on threaded connections can include material combination, surface, type of lubricant, temperature, tightening speed and environment.

Please note that the values of μ_T, μ_H and K-factors in this brochure or any technical data sheet for MOLYKOTE® Thread Pastes only apply to the presented bolt size, material combination and surface preparation. While they may provide an initial indication for other geometries and material combinations, we recommend determining the friction factors for your specific bolt-nut combinations.

CASE STUDY: Lubrication of threaded connections in gas/steam turbines

Featured product: MOLYKOTE® P-3700 Anti-Seize Paste

Gas and steam turbines require regular maintenance to ensure reliable power generation, especially in today's advanced, rapidly evolving energy landscape. MOLYKOTE® P-3700 Anti-Seize Paste is an effective solution that provides controlled friction during assembly to support exact tensioning and enables safe disassembly of threaded connections, even after long-term exposure to high temperatures of up to 900°C[1]. This can reduce maintenance time, thus reducing turbine downtime. In recent years, it has been discovered that lubricated parts made from chromium-containing alloys, such as flanges, can form carcinogenic hexavalent chromium residues when exposed to elevated temperatures (>300°C). These Cr(VI) residues can impose serious occupational hazards to turbine operators and maintenance technicians. Turbine OEMs have acknowledged these hazards by issuing several safety warnings advising against the use of certain lubricants. MOLYKOTE® P-3700 Anti-Seize Paste helps suppress Cr(VI) residue formation, ensuring operator safety with its EHS-friendly profile while still enabling smooth maintenance of high-temperature turbines and turbochargers.

[1]Higher temperatures have not been tested.

Typical properties of MOLYKOTE® Thread Pastes

Product	Penetration, mm/10	K-factor	Anti-seize feature?	Corrosion resistance?	High-temperature resistance?	Service temperature (solid lubricants)[3], °C	4-ball weld load, N	Color	Substrate compatibility	Base oil	Solid lubricants	Metal content?
MOLYKOTE® 1000 Paste[2]	280 to 310	~0.16	Yes	Yes	Yes	-30 to 650	4800	Brown	Steel	Mineral oil	Copper, zinc, graphite	Contains metal
MOLYKOTE® 7439 Paste V1	260 to 310	~0.17 to 0.18	Yes	Yes	Yes	-20 to 650	2000	Copper	Steel	Semi-synthetic oil	Copper	Contains metal
MOLYKOTE® Cu-7439 Plus Paste V1	320 to 370	~0.17 to 0.18	Yes	Yes	Yes	-30 to 650	3600	Copper	Steel	Semi-synthetic oil	Copper	Contains metal
MOLYKOTE® G-Rapid Plus Paste[2]	255 to 275	~0.11	No	No	No	-35 to 450	5300	Black	Steel	Mineral oil	MoS_2, graphite, white solids	Metal-free
MOLYKOTE® HSC Plus Paste[2]	250 to 280	~0.16 to 0.17	Yes	Yes	Yes	-30 to 1100	4800	Copper	Steel	Mineral oil	Metallic	Contains metal
MOLYKOTE® P-37 Paste	280 to 310	~0.14 to 0.15	Yes	No	Yes	-30 to 1400	5500	Dark gray	High-temperature steel alloys	Mineral oil	Special solid lubricants	Metal-free
MOLYKOTE® P-3700 Anti-Seize Paste	280 to 320	~0.14	Yes	No	Yes	-30 to 900	3000	Dark gray	High-temperature steel alloys	Mineral oil	Special solid lubricants	Metal-free
MOLYKOTE® P-74 Assembly Paste	280 to 310	~0.14	Yes	Yes	Yes	-40 to 1500	4800	Grayish-black	Steel	Synthetic oil	Graphite	Metal-free
MOLYKOTE® P-1042 Adhesive Grease Paste	285 to 320	~0.16 to 0.17	No	Yes	No	-25 to 500	9000	White	Steel	Semi-synthetic oil	White solids	Metal-free
MOLYKOTE® P-1900 FM Anti-Seize Paste[2]	290 to 340	~0.14 to 0.15	No	No	No	-30 to 300	3200	White	Steel	Mineral oil	White solids	Metal-free

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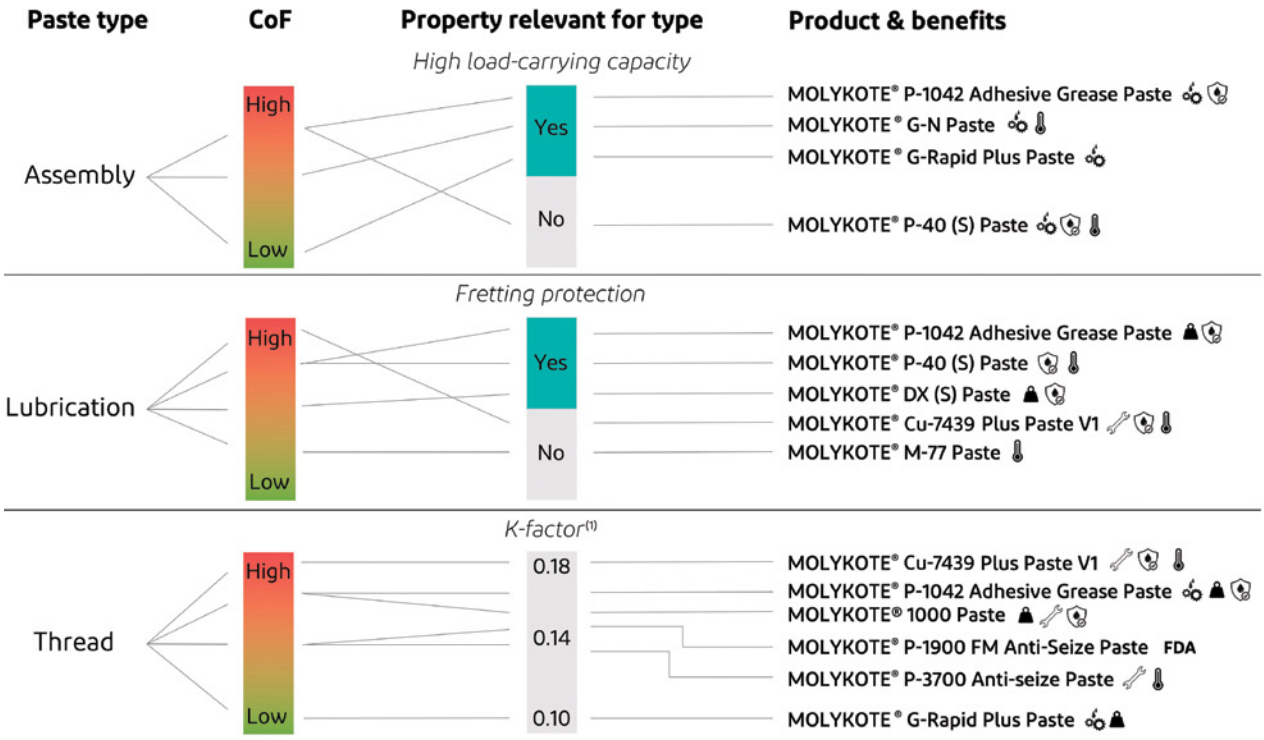
[2]Also available as spray. | [3]Service temperature ranges describe the temperature window in which dry lubrication is provided (e.g., additional anti-seize protection is present). These ranges might vary from the technical data sheet (TDS) of the product, as the TDS is always linked to a specific application, whereas you may need continuous wet lubrication (see MOLYKOTE® General Lubrication Pastes section on pages 6 and 7).


DUPONT
MOLYKOTE
E Paste
• Trusted by customers worldwide
• Backed by a heritage of innovation
• Proven performance
• Excellent value
• Complete line of lubricants and solutions
• Extensive local service and supply
Smart Lubrication™
P-1500 Paste
G-N Metal Assembly Paste
• Trusted by customers worldwide
• Backed by a heritage of innovation
• Proven performance
• Excellent value
• Complete line of lubricants and solutions
• Extensive local service and supply
MOLYKOTE® is Smart Lubrication™
molykote.com
P-1042 Adhesive Grease Paste
P-1900 FM Anti-Seize Paste
• Trusted by customers worldwide
• Backed by a heritage of innovation
• Proven performance
• Excellent value
P-3700 Anti-Seize Paste
G-Rapid Plus Paste

Quick selection guide for MOLYKOTE® Pastes

The following quick selection guide features only our most popular products; it does not include our entire paste offering. In many cases, this guide will help you to identify a suitable product. To identify the best solution for your specific wear and lubrication challenges, feel free to connect with our technical team by visiting **www.dupont.com/molykotecontact** or by scanning the QR code at right.

Contact us



(1)Linked to bolt geometry.

Benefits:

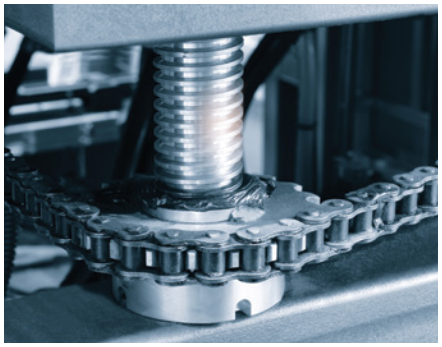
- *High load-carrying capacity*
- *Fretting protection*
- *Anti-seize*
- *Corrosion resistance*
- *High-temperature resistance*
- FDA *Meets FDA regulation 21 CFR 178.3570*

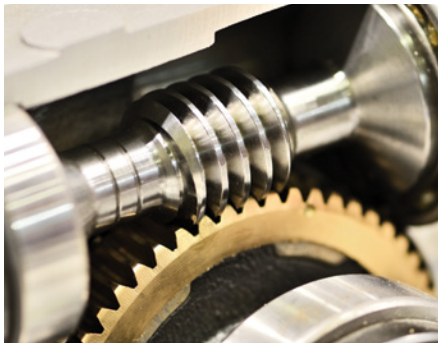
Solutions for a wide range of applications

MOLYKOTE® Pastes are valued by the world's leading engineers and manufacturers and are trusted for uses where endurance in broad service-temperature ranges is needed in a wide variety of applications where functionality, connectivity, safety and sustainability are critical. These diverse applications range from power generation and transportation (electrified vehicles, railway, etc.) to aerospace and industrial challenges.

Highlighted on pages 14 through 17 are examples of common applications for various MOLYKOTE® Pastes.

General lubrication





Conveyor chains

MOLYKOTE® G-N Metal Assembly Spray

MOLYKOTE® G-N Metal Assembly Paste

Long-term lubrication for reduced maintenance and increased run time

Worm gears

MOLYKOTE® E Paste (automotive mirror adjustment)

MOLYKOTE® P-1500 (S) Paste (automotive actuator, plastic worm assemblies)

Smooth operation over a wide service-temperature range during entire service lifetime

Automotive seating

MOLYKOTE® DX (S) Paste

MOLYKOTE® E Paste

Low noise and smooth seat adjustments over a wide service-temperature range

Bearings

MOLYKOTE® P-1900 FM Anti-Seize Paste

MOLYKOTE® U Paste

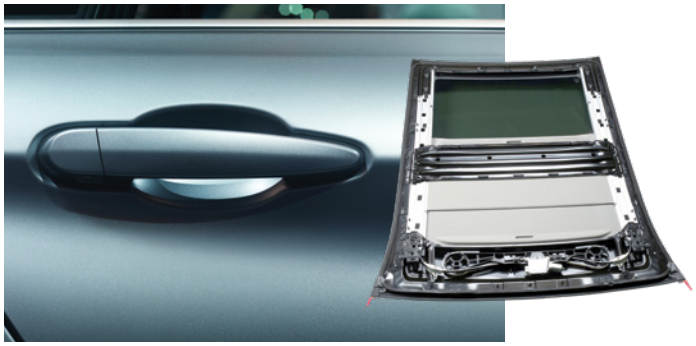
Reduced friction in bearings; extended lifetime at high temperatures and low rotational speeds; ideal for bearings in food and beverage applications due to NSF H1 certification (MOLYKOTE® P-1900 FM Anti-Seize Paste only)

Lathe chucks

MOLYKOTE® P-1042 Adhesive Grease Paste

MOLYKOTE® TP-42 Paste

Suitable clamping forces under high loads and low speeds; fretting corrosion prevention; excellent resistance to washout by machining fluids and repetitive centrifugal forces; superior resistance to modern machining fluids (MOLYKOTE® P-1042 Adhesive Grease Paste only)



Door locking systems & sunroof guides

MOLYKOTE® P-1500 (S) Paste (door locking systems)

MOLYKOTE® E Paste (sunroofs)

Smooth operation; long-lasting performance; resistance to moisture and extreme temperatures

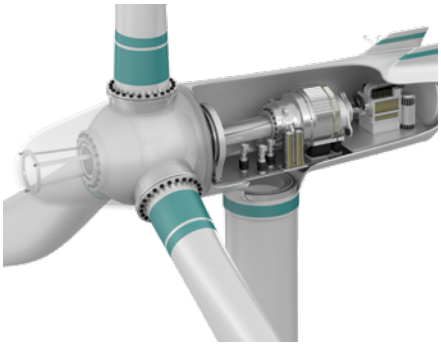
Springs in electrical contacts, appliance mechanisms & actuators

MOLYKOTE® DX (S) Paste

MOLYKOTE® E Paste

Reduced friction under loads while resisting vibration, moisture and corrosion to enable long appliance lifetime

Assembly



Blade assembly components & fasteners of wind turbines

MOLYKOTE® 1000 Paste

MOLYKOTE® G-Rapid Plus Paste

MOLYKOTE® P-74 Paste

Low friction during assembly; long-term lubrication; weathering and fretting resistance

Train wheel hub assembly

MOLYKOTE® G-Rapid Plus Paste

MOLYKOTE® G-N Plus Paste

Facilitation of press-fit assembly; friction reduction; stick-slip suppression; prevention of fretting corrosion

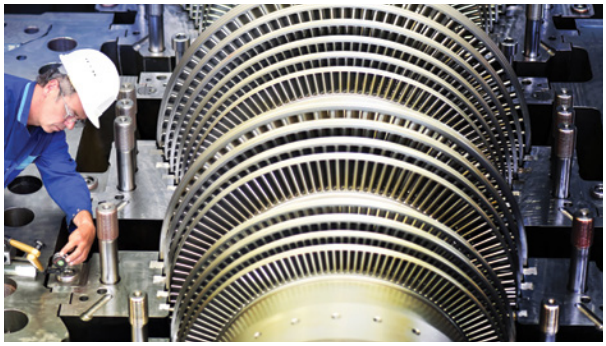
Automotive brake assembly

MOLYKOTE® Cu-7439 Paste V1

MOLYKOTE® TP-42 Paste

Reduced wear and tear on brake components; noise reduction; corrosion protection

Threaded connections



Threaded connections of gas/steam turbines

MOLYKOTE® P-3700 Anti-Seize Paste (high-temperature turbines)

MOLYKOTE® P-37 Paste (low-temperature turbines)

High purity; metal-free; excellent anti-seize properties, even after exposure to temperatures up to 900°C; controlled friction during assembly; support for precise tensioning; prevents formation of hexavalent chromium at high temperatures (MOLYKOTE® P-3700 Anti-Seize Paste only)

Broad range of applications for threaded fasteners

MOLYKOTE® 1000 Paste (oil & gas casing, outdoor equipment, ship maintenance)

MOLYKOTE® P-37 Paste (engine manifold, chemical plant connections/flanges)

MOLYKOTE® P-40 (S) Paste (oil & gas piping)

MOLYKOTE® HSC Plus Paste (engine cylinder head)

Consistent coefficient of friction over many disassemblies and reassemblies; thread protection; prevention of wear phenomena such as galling, fretting and seizing

The full MOLYKOTE® Pastes portfolio

This table spanning pages 18 and 19 shows selected properties of the entire portfolio of MOLYKOTE® Pastes. More details for each product are listed in our product-specific technical data sheets, which are available via the **molykote.com** Resource Center or by scanning the QR code at right.

Find a TDS

Typical properties of all MOLYKOTE® Pastes

Product	Spray version available?[1]	Penetration, mm*10^{-1}	Service temperature[2], °C	4-ball weld load, N	Color
MOLYKOTE® 1000 Paste	●	280 to 310	-30 to 650	4800	Brown
MOLYKOTE® 7439 Paste V1	○	260 to 310	-20 to 120 (solids up to 650)	2000	Copper
MOLYKOTE® Cu-7439 Plus Paste V1	○	320 to 370	-30 to 300 (solids up to 650)	3600	Copper
MOLYKOTE® D Paste	●	250 to 280	-25 to 250	2600	Off-white
MOLYKOTE® DX (S) Paste	○	285 to 315	-45 to 125	4800	White
MOLYKOTE® E Paste	○	265 to 295	-50 to 150	5500	Light yellowish
MOLYKOTE® G Paste	○	310 to 360	-20 to 400	3140	Black
MOLYKOTE® G Rapid Spray	●	N/A	-35 to 400	3040	Gray-black
MOLYKOTE® G-N Metal Assembly Paste	●	260 to 310	-18 to 400	4900	Gray-black
MOLYKOTE® G-N Paste	○	280 to 310	-20 to 400	4200	Black
MOLYKOTE® G-N Plus Paste	○	280 to 310	-25 to 450	2800	Black
MOLYKOTE® G-Rapid Plus Paste	●	255 to 275	-35 to 450	5300	Black
MOLYKOTE® HSC Plus Paste	●	250 to 280	-30 to 1100	4800	Copper
MOLYKOTE® HTP Paste	○	250 to 280	-20 to 1150 (as solid)	2200	White
MOLYKOTE® M-77 Paste	○	280 to 330	-45 to 230	2000	Black-gray
MOLYKOTE® P-1042 Adhesive Grease Paste	○	285 to 320	-25 to 120 (solids up to 500)	9000	White
MOLYKOTE® P-1500 (S) Paste	○	285 to 315	-50 to 160	4000	White
MOLYKOTE® P-1900 FM Anti-Seize Paste	●	290 to 340	-30 to 125 (solids up to 300)	3200	White
MOLYKOTE® P-37 Paste	○	280 to 310	-30 to 1400	5500	Dark gray
MOLYKOTE® P-3700 Anti-Seize Paste	○	280 to 320	-30 to 900	3000	Dark gray
MOLYKOTE® P-40 (S) Paste	○	310 to 350	-40 to 230 (solids up to 1200)	3000	Yellowish-brown
MOLYKOTE® P-74 Assembly Paste	○	280 to 310	-40 to 200 (solids up to 1500)	4800	Grayish-black
MOLYKOTE® TP-42 Paste	○	265 to 300	-25 to 250	3000	Light beige
MOLYKOTE® U Paste	○	280 to 340	-40 to 180 (solids up to 450)	3800	Gray-black
MOLYKOTE® U-N Paste	○	250 to 280	-40 to 150 (solids up to 450)	3800	Black
MOLYKOTE® X Grease Paste	○	255 to 275	-30 to 135	3000	Black

Specification writers: These values are not intended for use in preparing specifications. Please contact your local MOLYKOTE® sales representative prior to writing specifications on these products.

[1] ●: Yes, a spray version is available. ○: No spray version available. | [2]Service temperature ranges describe the temperature window in which dry lubrication is provided (e.g., additional anti-seize protection is present). These ranges might vary from the technical data sheet (TDS) of the product, as the TDS is always linked to a specific application, whereas you may need continuous wet lubrication (see MOLYKOTE® General Lubrication Pastes section on pages 6 and 7). | N/A: Not applicable.

Legend:

General lubrication paste

Assembly paste

Thread paste

	Substrate compatibility	Base oil	Solid lubricants	Metal content?	Paste category
	Steel	Mineral oil	Copper, zinc, graphite	Contains metal	
	Steel	Semi-synthetic oil	Copper	Contains metal	
	Steel	Semi-synthetic oil	Copper	Contains metal	
	Steel	Mineral oil	White solids	Metal-free	
	Steel	Mineral oil	White solids	Metal-free	
	Steel, plastics	Synthetic oil	White solids	Metal-free	
	Steel	Mineral oil	MoS_2	Metal-free	
	Steel	Mineral oil	MoS_2, graphite	Metal-free	
	Steel	Mineral oil	MoS_2, white solids	Metal-free	
	Steel	Mineral oil	MoS_2, white solids	Metal-free	
	Steel	Mineral oil	MoS_2, white solids	Metal-free	
	Steel	Mineral oil	MoS_2, graphite, white solids	Metal-free	
	Steel	Mineral oil	Metallic	Contains metal	
	Steel	Mineral oil	White solids	Metal-free	
	Plastics, elastomers	Synthetic oil	MoS_2	Metal-free	
	Steel	Semi-synthetic oil	White solids	Metal-free	
	Steel	Semi-synthetic oil	White solids	Metal-free	
	Steel	Mineral oil	White solids	Metal-free	
	High-temperature steel alloys	Mineral oil	Special solid lubricants	Metal-free	
	High-temperature steel alloys	Mineral oil	Special solid lubricants	Metal-free	
	Steel	Semi-synthetic oil	White solids	Metal-free	
	Steel	Synthetic oil	Graphite, white solids	Metal-free	
	Steel	Semi-synthetic oil	White solids	Metal-free	
	Steel, rubber	Synthetic oil	MoS_2	Metal-free	
	Steel, rubber	Synthetic oil	MoS_2	Metal-free	
	Steel	Mineral oil	MoS_2	Metal-free	

About MOLYKOTE® Specialty Lubricants

Since 1948, customers around the world have trusted the MOLYKOTE® brand for performance and expertise to help solve complex, technical design and lubrication challenges. Today, our greases, compounds, pastes, dispersions, oils and fluids, and anti-friction coatings support customers' innovation, performance and sustainability needs. To learn more about our extensive product and service offering, to utilize our interactive product selection tool, or to locate a distributor, visit **molykote.com**.

Contact us

MOLYKOTE® has Contact Centers around the globe. Find the phone number for the center nearest you at **www.dupont.com/molykotecontact**.

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MOLYKOTE®

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