OKS®

OKS Dry lubricants

Bonded coatings and sliding films

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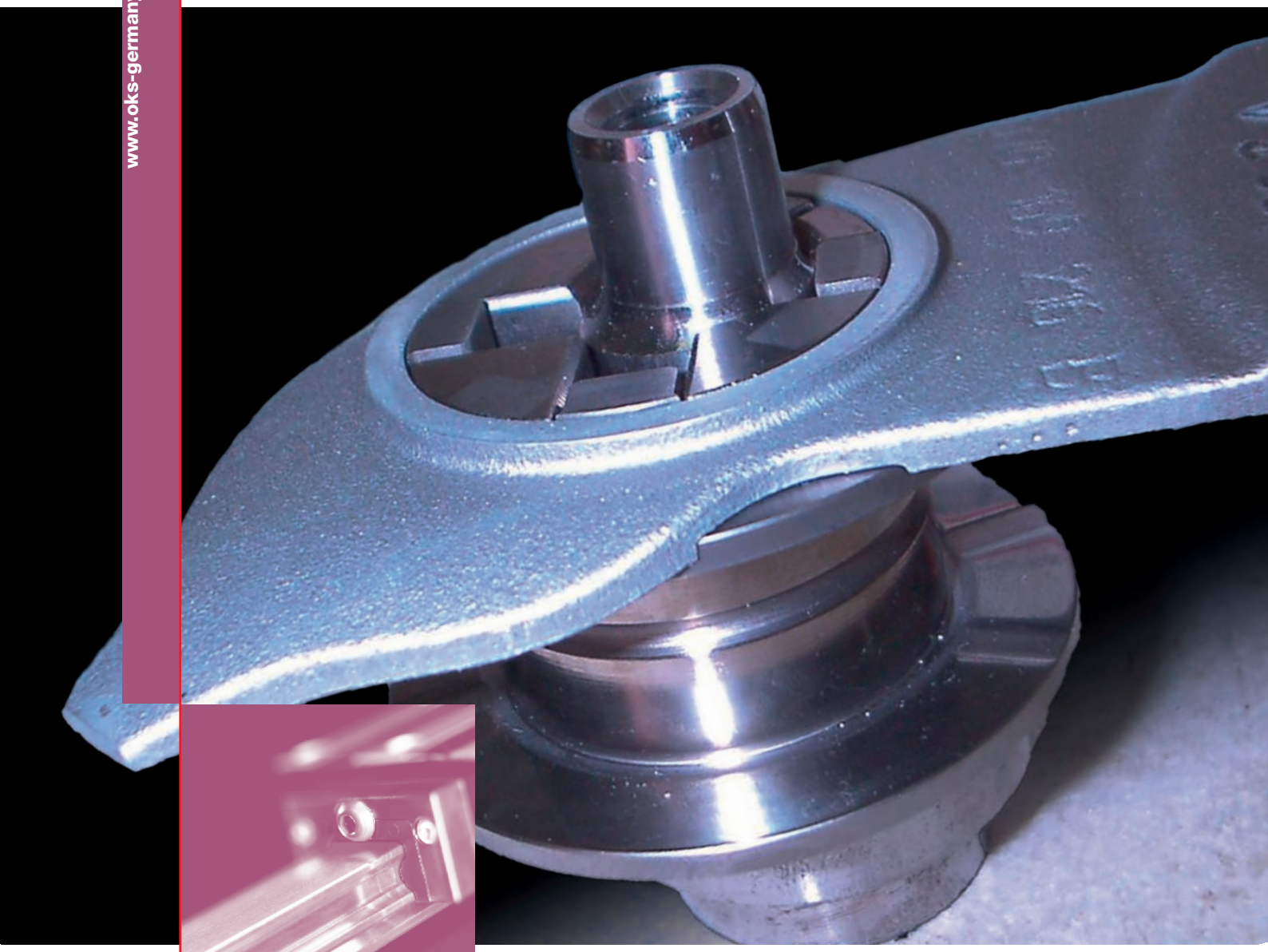

INNOVATIVE PRODUCTS FOR INDUSTRIAL PRECOATING

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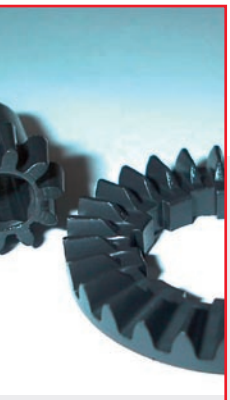


Dry lubricants — the alternative for special application cases

Dry lubricants are used wherever the usage of conventional lubricants such as greases, oils or pastes is not possible or is not desirable. As high-performance lubricants they avoid surface damage. They ensure reliable and maintenance-free continuous lubrication of machine elements subjected to high stress. In addition they allow easy mounting of screw threaded connections.

Dry lubricants can be classified into:

- Powdery solid lubricants
- Ceraceous sliding films
- Solid-content bonded coatings

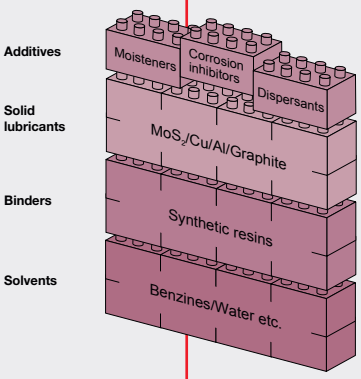
Solid lubricants (such as MoS_2, graphite or PTFE) are substances that, thanks to their structure and properties, are able to form separating films between surfaces, alone or in combination with other lubricants.

Structure of bonded coatings and sliding films

Bonded coatings are suspensions of **solid lubricants** – very small-sized particles contained in an inorganic or organic **binder**. Sliding films, on the other hand, are based on **waxes** as the separating substance.

The choice of binder (usually resins) determines the operating temperature, the surface binding, hardness and abrasion resistance of a bonded coating layer, its chemical stability as well as the application procedure to be used.

To enable distribution of the bonded coating/sliding film a **solvent** that evaporates during the drying time is added. It dissolves the binder in the bonded coating or respectively the wax in a sliding film. The share of the solvent influences the coating, the viscosity as well as the suitability of the bonded coating/sliding film for specific application methods. Depending on the type of binder, both aromatic and aliphatic hydrocarbons as well as water are used as the solvent.



Comparison: Dry lubricants — Standard Lubricants		
Purpose	**Bonded coating**	**Oil, grease, paste**
Vacuum	Very good	Almost impossible
Low temperature	Good	Unfavourable, viscosity-specific
High temperature	Very good	Not suitable due to evaporation losses
Low speed	Low influence	Bad
High speed	Limited	Good, hydrodynamic
Combustibility	None in cured film	Often high
Ionising radiation	Good tolerance	Bad tolerance
Environmental risk	Very low	Difficult disposal
Soiling	Low	Creep processes
Relubrication	Not possible	Possible

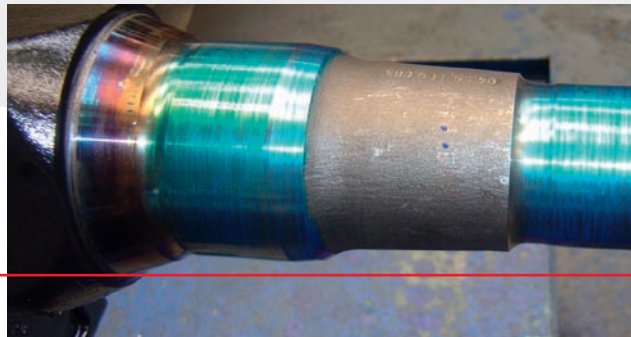
Solid lubricant	MoS_2	Graphite	PTFE
Colour	Black	Black	Transparent/white
Operating temp. [°C]	–180 to +450	–35 to +600	–180 to +260
Adhesion on metal	+	–	–
Electr. conductivity	– –	+	– –
Chemical stability	–	+	+
Advantages	▪ High load-bearing capacity ▪ Low coefficient of friction ▪ Prevents stick-slip effects	▪ Synergetic effects with MoS_2	▪ Non-stick properties ▪ Synergetic effects with MoS_2
Corrosion protection properties	Moderate	Moderate	Good

Mode of action of bonded coatings and sliding films

Bonded coatings prevent direct contact of material surfaces in the micro range with surface roughnesses from 5 to 10 µm. The rich supply of solid lubricants in bonded coatings furthermore reduces the risk of initial damage to the material surfaces in tribocontact.

In addition, bonded coatings ensure a working parting film between the coated surfaces from the very beginning of the movement at machine parts that reach only low speeds under high loads or execute oscillating movements.

The enclosed product overview will help you when selecting a suitable dry lubricant for your individual application.



Effectiveness and possible applications of bonded coatings and sliding films

Coating with a sliding film, on the other hand, has the purpose of achieving a consistent coefficient of sliding friction for reliable mounting of screw threaded connections. In addition, bonded coatings / sliding films can also be used as corrosion protection, anti-creak and anti-stick coating. Careful selection of suitable solid lubricants, binders and additives allow the development and manufacturing of tailor-made bonded coatings/sliding films for a wide range of industrial applications. Thus, for example, OKS also develops low-solvent and water-dilutable bonded coatings and sliding films in order to fulfil the increasing demands in the field of environment and labour protection.

Processing of bonded coatings and sliding films

OKS bonded coatings/sliding films are suitable for a wide variety of materials such as metals, plastics and elastomers. A decisive factor for the high durability of a bonded coating/sliding film coating is the preparatory treatment of the surfaces and the selection of the application technique. An OKS bonded coating/sliding film is durable under observance of the preparatory treatment and coating instructions.

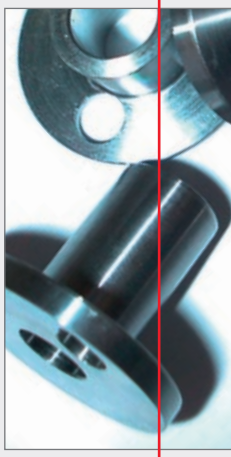
Coating is carried out after thorough degreasing of the metal surfaces either through immersion, spraying or painting. The dry hard-grip layer is between 10 and 20 µm thick. It has good adhesion, resists high pressure loads, is resistant to soiling and is characterised by high chemical stability and temperature compatibility up to a maximum of 600 °C, depending on the product.

The use of drum and centrifugal systems is advisable for the mass coating of small parts, such as screws, with a sliding film.

Processing of bonded coatings			
	Immersion and centrifugation	**Spraying**	**Painting**
Advantages	▪ Rapid and inexpensive coating of small parts ▪ Low consumption ▪ No emissions due to closed system	▪ Smooth even surface (in particular at automatic application) ▪ Thickness of the film coating can be set through viscosity and numbers of spray passes	▪ Simple handling ▪ For workshop and mounting ▪ Coating of low volumes of parts
Disadvantages	▪ Uneven surfaces ▪ Sticking together of the parts ▪ No partial coating ▪ Expensive machines	▪ Extraction equipment required ▪ Material loss through overspraying ▪ High amount of work	▪ Uneven layer

Examples of use

Fitting parts, fastening elements, seals, anchors, springs, positive-locking connections, pivoting bearings, threaded spindles, slideways, friction bearings, sliding disks, chain parts, rocker levers, bearing bolts, metal profiles, metal forming, rivets, screws, nuts, switch cams, clamping sleeves, retaining pawls, chipboard screws, hinges, metal fittings, lock parts, shafts, gearwheels. Bonded coatings are increasingly being used in the commodity goods sector.



Advantages of bonded coating lubrication (depending on type)

- Dry long lasting lubrication without oil and grease
- Full lubrication effect even after long standstill periods
- Extreme pressure resistance
- Not sensitive to dust, soiling, moisture and chemical influences
- Allows very low friction values with constant coefficients of friction
- High temperature resistance within a broad temperature range
- No evaporation losses and excellent adhesive strength
- Use in vacuum possible
- Chemical-physically stable and radiation resistant
- Effectiveness also at low sliding speeds
- Run-in aid for motor and gear components
- Creates emergency running properties
- Long-term corrosion protection
- Replacement for environmentally hazardous coatings
- Highly economical

Lorry axle with bonded coating

Please contact our Technical Service Team for any further inquiry.

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Over 150 high-performance products from one supplier

OKS – Quality made in Germany

The OKS brand stands for high-performance products for reducing friction, wear and corrosion. The success of OKS, which has continued uninterrupted for over 35 years, is decisively shaped by the high quality and reliability of our products developed and produced by experience experts at our headquarters in Maisach near Munich with modern testing systems and equipment.

OKS – your professional partner

Out high tribologic expertise, our comprehensive technical service, smooth availability and our innovative solutions for specific lubricant requirements make us a preferred partner to demanding customers all over the world.

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OKS BONDED COATINGS

Drying / Base	Product	Designation	Technical Data	Colour, Solid Lubricant	Characterisation	Examples of use
thermosetting / solvent	**OKS 500**	MoS_2 Bonded Coating, thermosetting	Operating temperature: –70 °C to +250 °C Press-fit test: μ = 0.09, no chatter Optimal coating thickness: 7 to 15 µm	• black • MoS_2, graphite	• Dry lubrication for temporary operation and long downtimes, in dusty environments and at low speeds • Run-in lubricant in combination with oil or grease lubrication • Creates emergency-running properties	• Slide rails, joints, guides, pivoting bearings and similar components under high surface pressures and predetermined sliding paths
thermosetting / solvent	**OKS 589**	MoS_2 PTFE Bonded Coating, thermosetting	Operating temperature: –70 °C to +250 °C Press-fit test: μ = 0.07, no chatter Thread friction (M10/8.8): μ = 0.08 Optimal coating thickness: 10 to 20 µm	• matt black • MoS_2, graphite, PTFE	• Dry lubrication of sliding surfaces under heavy loads, low speeds and corrosive influences • Fully effective even after long standstills • No adhesion of dust and dirt	• Increased protection against wear of otherwise not accessible slide areas
air-drying / solvent	**OKS 510** **OKS 511**	MoS_2 Bonded Coating, fast-drying	Operating temperature: –180 °C to +450 °C Press-fit test: μ = 0.07, no stick-slip Optimal coating thickness: 10 to 15 µm	• grey-black • MoS_2, graphite	• Dry lubrication for temporary operation or long downtimes, industry environments and at low sliding speeds • Run-in lubricant in combination with oils or greases • Creates emergency-running properties • Dries at room temperature	• Friction bearings, toothing and other sliding pairs with oscillating movements • For coating punching tools
air-drying / solvent	**OKS 570** **OKS 571**	PTFE Bonded Coating	Operating temperature: –180 °C to +260 °C Press-fit test: μ = 0.07 Thread friction (M10/8.8): μ = 0.10 Optimal coating thickness: 5 to 20 µm	• whitish • PTFE	• Dry lubrication of sliding surfaces of different materials at low pressures, low speeds and in dusty environments • Colourless, no-soiling sliding and parting film • Prevents tribocorrosion • Dries at room temperature	• For packaging machines, slide surfaces in the plastics and textile industry • Anti-stick coating of seals or sealing surfaces of all kinds
air-drying / water	**OKS 530**	MoS_2 Bonded Coating, water-based, air-drying	Operating temperature: –35 °C to +450 °C Press-fit test: μ = 0.10, no chatter Thread friction (M10/8.8): μ = 0.05	• black • MoS_2, graphite	• Can be sprayed onto hot surfaces • Use in a broad temperature range • Dries at room temperature • Spent sliding film can be topped up • Can be diluted with water in ratio of up to 1:5	• Lubrication of heavily loaded chains when oil and grease lubrication is no longer possible
air-drying / water	**OKS 536**	Graphite Bonded Coating, water-based, air-drying	Operating temperature: –35 °C to +600 °C Press-fit test: μ = 0.12, no chatter	• black • graphite	• Lubrication of heavily loaded chains when oil and grease lubrication is no longer possible • Can be sprayed onto hot surfaces • Dries at room temperature • Spent sliding film can be topped up • Can be diluted with water in ratio of up to 1:5	• For example, in annealing, stoving and baking ovens for aluminium tube manufacturing, in painting systems or in baking lines
air-drying / water	**OKS 575**	PTFE Water Bonded Coating	Operating temperature: –180 °C to +150 °C/+250 °C Thread friction (M10/8.8): not applicable Optimal coating thickness: 5 to 10 µm	• whitish • PTFE	• For sliding surfaces made of different materials at low pressures, low speeds and in dusty environments • Dries at room temperature • Can be diluted with water • Prevents tribocorrosion	• For packing machines • Rollers and chutes in the transport range • Non-stick coating • Separating film for casting resin applications

OKS SLIDING FILMS AND SOLID LUBRICANTS

Drying / Base	Product	Designation	Technical Data	Colour, Solid Lubricant	Characterisation	Examples of use
air-drying / solvent	**OKS 1300** **OKS 1301**	Sliding Film, colourless	Operating temperature: –60 °C to +100 °C Thread friction (M10/8.8): μ = 0.08 – 0.10	• colourless	• Thread coating • Sliding film for plastic, wood and metal • Dry sliding film fast to handling with UV indicator • Prevents seizing • For all screw materials • Broad range of uses, in particular for precoating small and mass-produced parts	• For assembly of axial face seals or dry lubrication in textile or paper-processing machines
air-drying / water	**OKS 1710**	Sliding Film for Screws, water-based concentrate	Operating temperature: > +60 °C Thread friction (M10/8.8): μ = 0.08 – 0.14 (depending on concentration and surface)	• milky-white	• Thread coating for controlled assembly • Dry sliding film fast to handling, verifiable with UV indicator • Can be diluted with water in a ratio of up to 1:5 • Controlled friction coefficients • Economic precoating	• Coating of threads with galvanized surfaces and high-alloy steel threads
air-drying / water	**OKS 1750**	Sliding Film for Wood Screws, water-based concentrate	Operating temperature: > +70 °C Thread friction (M10/8.8): μ = 0.08 – 0.14 (depending on concentration and surface)	• yellowish	• Dry film fast to handling • Verifiable with UV indicator • Can be diluted with water in a ratio of up to 1:5 • Controlled friction coefficients	• Coating of threads with galvanized surfaces, e.g. screws for flakeboards
air-drying / water	**OKS 1765**	Sliding Film for Thread-Cutting Screws, water-based concentrate	Operating temperature: > +70 °C Thread friction (M10/8.8): μ = 0.06 – 0.15 (depending on concentration and surface)	• milky-white	• Dry film fast to handling • Verifiable with UV indicator • No cold welding • Can be diluted with water in a ratio of up to 1:5 • Controlled friction coefficients	• Coating of thread-cutting screws made of aluminium alloys, high-alloy steels, galvanised and austenitic steels
	OKS 100	MoS_2 Powder, high degree of purity	Operating temperature: –185 °C to +450 °C (up to +1,100 °C in vacuum, up to +1,300 °C in inert gas) Particle size: 4.0 – 15.0 µm, max. 48.0 µm	• grey-black • MoS_2	• To improve the sliding properties of machine elements • Run-in lubricant in combination with oil or grease lubrication • Difficult moulding processes in metal working • For integration in plastics, seals and packings	• Apparates and precision machinery, e.g. under the influence of oxygen, in vacuum or radioactive radiation • Tools or workpieces in cold- and thermoforming
	OKS 110 **OKS 111***	MoS_2 Powder, microsize	Operating temperature: –185 °C to +450 °C (up to +1,100 °C in vacuum, up to +1,300 °C in inert gas) Particle size: 2.5 – 5.0 µm, max. 15.0 µm	• grey-black • MoS_2 • wax (*only aerosol)	• Run-in lubricant in combination with oils or greases • Prevents friction and wear, even at high pressures • Good adhesion, even at extremely precisionmachined surfaces • For difficult moulding processes • For pressing in bearings	• Machine parts, apparates and precision machinery • For incorporation in plastics, sealings, packages, sintered metals