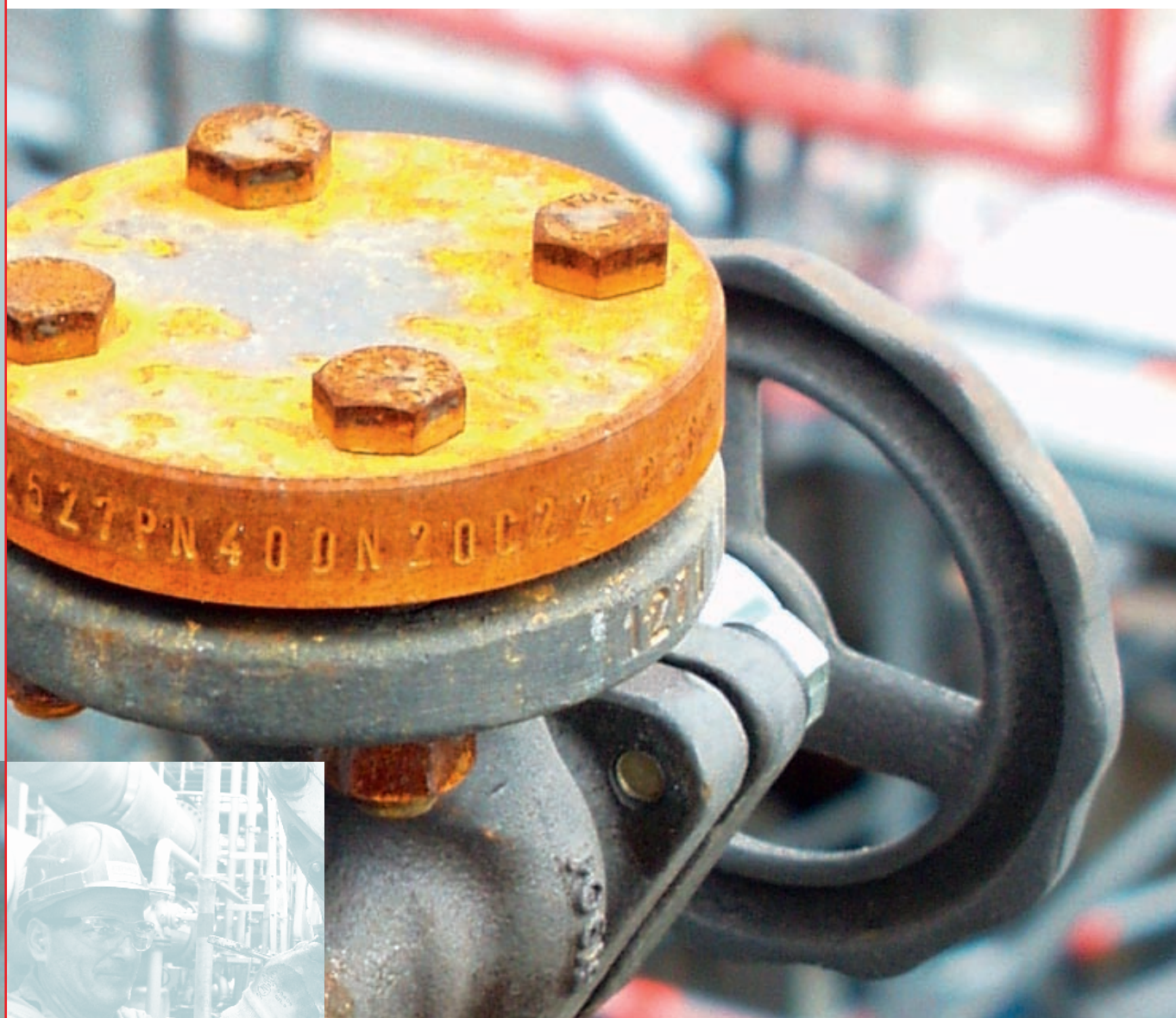




OKS Speciality Lubricants

***Examples of use for
screw lubrication***

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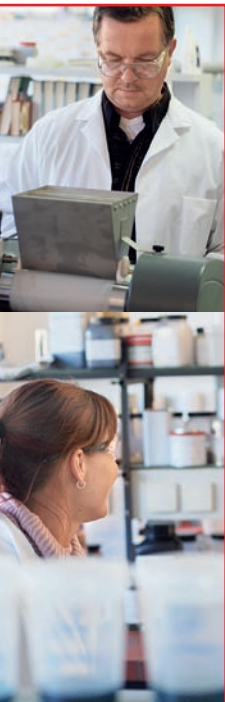
***INNOVATIVE PRODUCTS FOR
MAINTENANCE, REPAIR AND OPERATION***

Speciality Lubricants
Maintenance Products

30 YEARS OF TRIBOLOGICAL EXPERTISE

AVAILABLE WORLDWIDE

OKS – your professional partner for chemotechnical special products



The OKS brand stands for high-performance products for reducing friction, wear and corrosion. Our products are used in all the areas of production and maintenance technology in which the performance limits of classic lubricants are exceeded.

Quality – Made in Germany

The continued success of OKS for more than 30 years is decisively characterised by the high quality and reliability of our products, as well as the fast implementation of customer requirements through innovative solutions.

The products developed by OKS engineers and technicians are produced under strict quality requirements in Munich, Germany, our company's headquarters. From here just-in-time sales are carried out worldwide, supported by the modern logistics centre in nearby Maisach.

The high OKS quality standard is proven by our certification by the TÜV SÜD Management Service GmbH in the fields of quality (ISO 9001: 2008), environment (ISO 14001: 2004) and work protection (OHSAS 18001: 2007).

A company of the Freudenberg Group

Since 2003 OKS Spezialschmierstoffe GmbH has been part of the international Freudenberg Group, with headquarters in Weinheim, Germany. We utilize the comprehensive know-how and the innovative power of the Freudenberg Chemical Specialties (FCS) division for the further development of new products and markets to ensure the continued dynamic growth of our company in the future.

OKS – Partner to Trade

Our speciality lubricants and chemotechnical maintenance products are sold exclusively via the technical and mineral oil trades. The consistent strategy of "sales only via trade", the smooth processing of orders and our comprehensive technical service make us one of the preferred partners for demanding customers the worldwide.

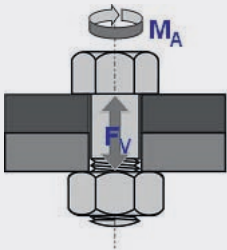


Screw lubrication ensures reliability and cost advantages

Function of a screw

Screws are used to fasten components and machine elements that can be loosened again.

A screwed connection is based on the conversion of a defined tightening torque (M_A) via the screw head to the nut or inner thread into a pre-tensioning force (clamping force F_V) in the screw shaft with which the parts to be connected are compressed. The clamping force generates the frictional adhesion of the screw in the thread. Only if the clamping force is sufficiently large, is the screwed connection of the component secure.



The frictional resistances in the thread and under the screw head impair the conversion of the tightening torque (M_A) to the pre-tensioning force (F_V). Therefore only approx. 10 % of the tightening torque is actually converted into the pre-tensioning of the screw. The corresponding coefficient of friction of the screwed connection depends in particular on the material and the surface of the thread and the screw. The size of the screws does not have any influence.

Use of lubricants in screw lubrication

In industrial mounting it is of particular importance to achieve a defined clamping force. Through the use of special screw lubricants the required coefficient of friction of the screwed connection can be "set" correspondingly, thus ensuring a secure connection.

Dismantling of a screwed connection should be possible without any problems in reality. However, this is usually not the case, because screws may corrode into a "permanent lock" in particular at long periods of use and aggressive conditions of use. The use of special lubricants prevents corrosion and seizing of the screwed connection and notably reduces the time required and the costs involved to loosen these connections, for example during the inspection of supply lines, fittings and machines.

Choosing the right screw lubricant thus not only ensures the reliability of a screwed connection, but also facilitates dismantling later on – including corresponding cost advantages.

OKS lubricants for screw lubrication

The reliability of a screwed connection and its trouble-free dismantling place high requirements on the lubricants, such as pastes, oils or anti-friction lacquer, used to this purpose. In addition to an optimum coefficient of friction and excellent corrosion protection, properties such as water and chemical resistance, suitability for food processing technology, compatibility to plastic, environmental compatibility, work safety and user friendliness have to be fulfilled.

Experts from a wide range of different disciplines work in our laboratories with state-of-the-art systems and test equipment in order to develop lubricants that fulfil these requirements optimally.

Use our specialists' know-how.
Put us to the test.





Over 150 high-performance products
from one supplier

www.oks-germany.com



- ❑ **Pastes** for easy assembly and dismantling
- ❑ **Oils** with high-performance additives for reliable lubrication
- ❑ **Greases** for long-term lubrication under critical operation conditions
- ❑ **Dry lubricants** – the alternative for special application cases
- ❑ **Corrosion protection** for reliable preservation during storage and shipping
- ❑ **Maintenance products** for ongoing service
- ❑ **Cleaners** for thorough removal of soiling and lubricant residues

For your company's individual lubrication requirements please contact OKS.

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Freudenberg Group

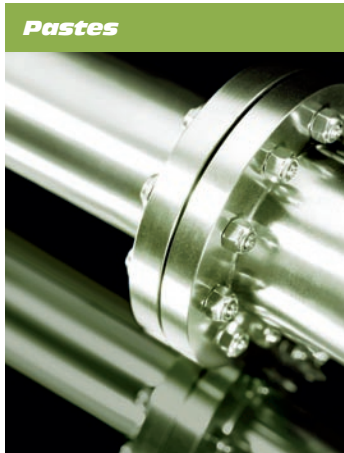
CONSULTING AND SALES

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For a world in motion

Lubrication of screws in the chemical industry

High-temperature paste, high purity



Advantages and benefits

- Prevents seizing and binding of screw threaded connections
- Separates up to 1400°C
- Does not react with metal surfaces
- Prevents material changes
- Suitable for V2A and V4A steels
- Low content of metal and alloys
- Free of sulphides, chlorides and fluorides

Everywhere in the chemical industry screws are used to connect different components. Thus, for example, approx. 130,000 screws varying between sizes M5 and M130 had to be loosened and checked at pipings, instrumentation and process control devices, valves, fittings, tanks and containers, heat exchangers during the routine shutdown of the OMV refinery in Schwechat, Vienna in Autumn 2005. To enable time and cost savings in the process "smooth" assembly of the screw threaded connections has to be ensured. For the screw paste this means that a constant coefficient of sliding friction has to be ensured in order to ensure the optimal ratio of tightening torque and attainable pre-tension even at the most varied screw dimensions and materials. In the case of screws made of high-alloy steels, cold welding must furthermore be avoided reliably.



Non-destructive dismantling of the screw threaded connection for service work or during the next shutdown is just as important. In the aggressive environment of a refinery the good protection of the paste against corrosion is decisive in this respect. However, the prevention of burning-together and of binding of the screw threaded connection at high temperatures is also very important.

Lubrication of screws in the chemical industry

Example of use: High-temperature paste, high purity

During the plant revision of the OMV refinery in Schwechat in Autumn 2005 OKS 217 was generally used as a screw paste for assembly lubrication at all the screw threaded

connections in order to prevent seizing, burning-together and corrosion. The overall requirement in the context of the shutdown activities amounted to approx. 2.5 t.



Product description

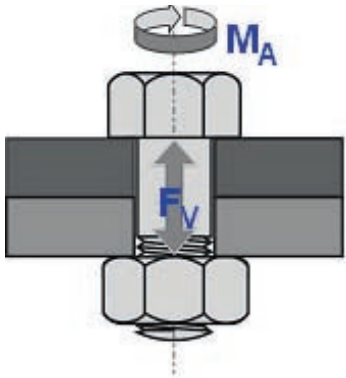
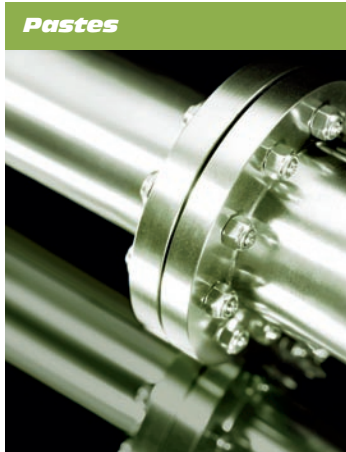
OKS 217 based on a semi-synthetic oil with a mixture of various solid lubricants as well as additives, e.g. for corrosion protection. The special combination of solid lubricants does not react with metal surfaces. In addition to the extremely low contents of metals and metal alloys, OKS 217 only contains traces of sulphur, chlorine and fluorine. Lead compounds, sulphides, chlorides or fluorides are not contained at all.

Further OKS products for the chemical industry

OKS 1110	For lubricating fittings, seals, plastic parts, etc. in operation or during assembly
OKS 611	For rust removal, lubrication
OKS 641	For rust removal, cleaning, protection and lubrication
OKS 701	For lubricating measuring instruments
OKS 2611	For cleaning the lubrication points before use of the lubricants
OKS 2621	For cleaning electrical contacts and switches
OKS 2801	For ensuring imperviousness of lines under pressure

Lubrication of screw connections

White Allround Paste, metal-free



Consistent coefficients of sliding friction in order to achieve a defined pre-tension are imperative for fault-free mounting of a screwed connection. Screws base on the principle of transferring a tightening torque [M_A in Nm] into a pre-tension force [F_V in N] in the screw shank with which the connecting parts are pressed together (clamping force). In this case the transfer is effected by means of the screw thread between the head and the nut of the screw. Frictional resistances in the screw thread [μ_G] and at the screw head [μ_K] as a rule reduce the transfer of the tightening torque [M_A] into the pre-tension [F_V]. However, they also make a fastening thread, such as at a thread, self-locking. Weldings of the thread surface, so-called cold welding, can result time and again when screws are mounted, in particular at high-alloy steels (austenitic materials), so that a defined pre-tension can no longer be achieved or is prevented.

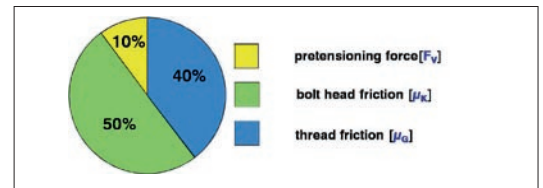
Problems also occur time and again when screw threaded connections are dismantled, for example through burning together at high operating temperatures ($>200^\circ\text{C}$).

Product description

OKS 250 is a white, metal-free high-temperature screw paste that was developed specially for special-steel screws. OKS 250 does not contain any sulphurous additives and solid lubricants such as MoS_2 that can influence the screw material negatively under extreme conditions of use. The white solid lubricants separate the thread surfaces reliably during mounting, thus preventing

Advantages and benefits

- Optimum ratio of tightening torque to achievable pre-tension
- Separates reliably
- Excellent corrosion protection
- Metal-free (no graphite, no MoS_2)
- Resistant to cold and hot water
- Suitable for stainless-steel connection
- NSF H2 registered (Reg.-No. 131379)



In the process oxidation of the surface arises and layers of scale are formed that can result in a thread being blocked. At normal temperatures corrosion, caused by the capillary property in the thread that lets moisture ingress, can make it impossible to open a screw without destroying it.

cold welding. The consistent coefficient of sliding friction ensures optimal transfer of the tightening torque into the pre-tension. The smooth consistency of the paste allows it to be applied evenly and thinly to the thread. Thanks to its excellent corrosion protection OKS 250 makes it possible to dismantle a screw without destroying it — also after a long period of use and under extreme conditions.

Lubrication of screw connections

Example of use: White Allround Paste, metal-free

A German manufacturer of locomotives uses OKS 250 when mounting all screws at the locomotives. As a universal paste OKS 250 is suitable for all common screw materials. Thus only a single paste has to be used in mounting instead of various special pastes. In addition to simplifying procurement, errors caused by confusing pastes are also avoided.

Great value is also placed on being able to unscrew a connection even after longer use under aggressive conditions. With its metal-free solid lubricants OKS 250 reliably prevents tribo-corrosion in the thread. The contained corrosion protection additives protect the lubricating point reliably against corrosion for a long period. Even after subjection to high-temperature stress, the solid lubricants allow the connection to be dismantled without destruction.



picture 1



An example is the mounting of the braking sand reservoir (picture 1) for the locomotives. This is mounted in front of the front bogey of the locomotive and is thus subjected to rain, snow, cold and heat. OKS 250 is applied with a brush to the four large fastening screws of the sand reservoir before mounting (picture 2).



picture 2

Further OKS products for screw connections

OKS 2610/2611	to clean screws
OKS 214, OKS 217, OKS 240/241, OKS 255/251	further screw pastes
OKS 1300/1301, OKS 1700, OKS 1750 and OKS 1765	for pre-coating of screws (for reliable processing).
OKS 600/601, OKS 610/611, OKS 621, OKS 640/641	for non-destructive dismantling of rusted screw connections



Our catalogue "Speciality Lubricants for industrial applications" is available for downloading under www.oks-germany.com