KLÜBER LUBRICATION

your global specialist

Detailed information

BARRIERTA® & Co. PFPE Lubricants for extreme conditions.

Tribological solutions for bearings and guideways

Content

page

Klüber Innovation

It was in the late sixties that Klüber Lubrication developed the first high-temperature lubricants based on perfluorinated polyether oils (PFPE) – the BARRIERTA® brand. BARRIERTA® lubricants are far superior to conventional lubricants in terms of longevity and thermal resistance. Consequently, they have enabled engineers to come up with completely new designs.

As the world's only specialty lubricant manufacturer to obtain its exclusive PFPE oils from an associated manufacturer, Klüber Lubrication has been a pioneer in the marketing of this new type of lubricant. Today, BARRIERTA® type lubricants are indispensable in engineering fields as varied as automotive construction and aerospace technology.

Through constant innovation, rigid quality control and the development of tailor-made specialty products, Klüber Lubrication offers the widest range of PFPE products for a broad spectrum of applications in the form of BARRIERTA®, Klüberalfa® and Klübertemp®.

PFPE-based lubricants constitute only a small sector of Klüber's product range. Klüber Lubrication offers more than 2500 lubricants of different composition to suit almost any tribological task.

A series of complicated multi-stage manufacturing and cleaning processes is required to turn PFPE oils into lubricating greases.

PFPE – High-performance lubricants for extreme conditions

Today, smaller machines are expected to deliver higher output with reduced maintenance and at lower cost – a real challenge for all branches of the machine building sector. As a consequence, bearings and guideways are forced to operate under higher temperatures, at higher speeds and for a longer time while being exposed to varying environmental influences.

The tribological stresses acting on friction points are becoming ever more extreme. If long lifetimes are to be attained while combating high or strongly fluctuating temperatures, the influence of various media, or very low pressure, PFPE lubricants are the types offering the required chemical stability.

With such lubricants, new designs are possible also under extreme conditions, leading to shorter development times and lower operating costs due to less need for maintenance.

But not all PFPE oils are the same. This brochure is intended to give you an overview of which products are particularly suitable for certain operating conditions, and provide orientation for product selection. Products are grouped according to application: whether you are facing extreme temperatures, strong influence by media or extreme physical stresses, Klüber has a product for you.

Benefits offered by PFPE greases from Klüber at a glance

Long service life

- **at high temperatures – up to 300 °C and above**
- **at strongly fluctuating temperatures**
- **under the influence of aggressive chemicals**

Improved component performance

- **due to excellent compatibility with seals**
- **due to excellent compatibility with plastic materials**
- **due to low evaporation losses**

Safer applications

- **due to non-toxic substances**
- **due to non-flammable products**

Extreme temperatures

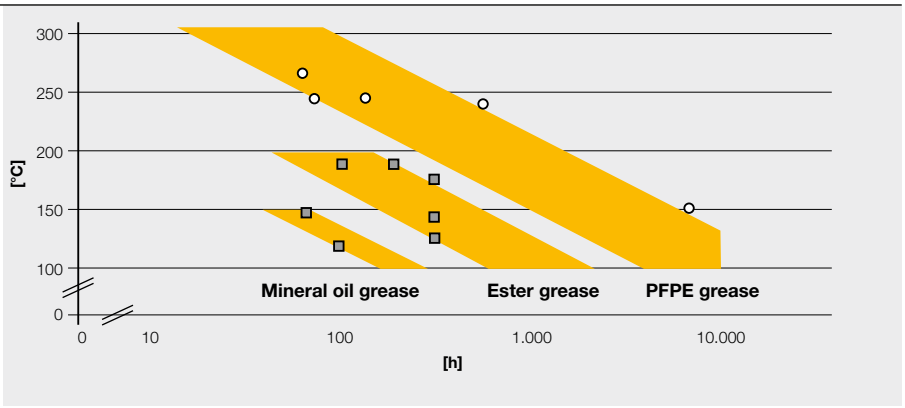
Maximum operating temperatures

At temperatures rising above 200 °C, long-term lubrication with conventional greases is no longer effective. Lubricant decomposition and evaporation lead to ever shorter relubrication cycles and give rise to premature bearing failure.
In many cases, the use of PFPE greases begins to make sense at permanent temperatures of approx. 160 °C.

The longer service life offered by these greases more than makes up for the higher product costs. Conventional greases, like those based on mineral oil, are normally not recommended for operating temperatures above 150 °C, and 200 °C is the end of the line for ester greases.
With PFPE greases, on the other hand, even temperatures of up to 300 °C and higher can be managed.

Expected service life* of PFPE greases compared with other types

Typical grease life values of PFPE and other grease types, based on typical L10 results obtained on FAG-FE9 and SKF-R0F test rigs



** as defined in GFT worksheet 3*

BARRIERTA® L 55 greases

The leading lubricant choice for temperatures up to 260 °C. These greases contain thermally treated base oils with a high evaporation resistance and are made using refined manufacturing techniques. Consequently, they enable long component life and reduce the frequency of premature failure. This is a grease concept that has proven successful in practice for many decades.

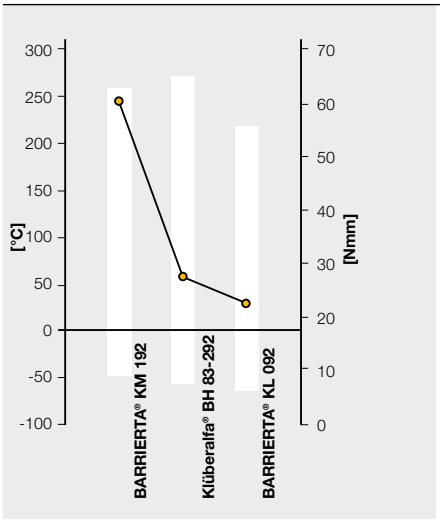
Klüberalfa® HPX 93-1202

A product offering top-performance at operating temperatures up to 300 °C due to its highly viscous PFPE base oil, which is made exclusively for Klüber Lubrication. This lubricant has the lowest evaporation rate of all PFPE greases we know.

BARRIERTA® L 55/2 attains a life of more than 10,000 hours in paint lines under optimum conditions.

Huge differences in temperature

Bearings and guideways that are normally exposed to high temperatures may have to function at normal or even very low temperatures as well. “Cold starts” may be necessary even if the operating temperature is 180 °C or more. Klüber Lubrication meets this additional challenge by using highly refined production techniques for its products. The PFPE greases made in this way have an extremely wide service temperature range.



Service temperature ranges and measured low temperature starting torques*

Service temperature range

Low temperature starting torque acc. to IP 186 at – 40 °C [Nmm]

* The values given are not subject to regular review. Fixed product data cannot be derived from these data.

Heated calenders and broad-drawing rollers are found in many production plants.

BARRIERTA® K greases

These are the greases of choice when low starting torques are required at low temperatures, without affecting operation at high temperatures. With these greases, low-power drives are not overtaxed at cold temperatures, and noise and wear are kept to a minimum. BARRIERTA® K greases are resistant to fuel and solvent vapors and compatible with most sealing materials. For these reasons, these greases are recommended for use in the automotive industry.

Klüberalfa® BH 83-292

These high-performance lubricants offer the widest service temperature range of all, as determined according to DIN 51825. Long service intervals can therefore be attained in broad-drawing rollers, e.g. in the paper or textile industries. These rollers are often subject to high thermal loads, but they must also start reliably at lower temperatures.

Is this cold and hot enough for you? If not, talk to us. We will be pleased to develop a solution to suit your specific requirements.

Strong influence by media

Aggressive chemicals

If direct contact between lubricant and aggressive chemicals or fumes cannot be reliably prevented for design reasons, the lubricant must be extremely resistant. And when it comes to chemical resistance, there is simply no alternative to Klüber's PFPE greases.

Sensitive materials

EPDM or Viton seals? This is important to know when choosing a lubricant. However, with PFPE greases from Klüber there won't be a problem. If you are using perfluorinated FFKM elastomers, however, there might be cross-reactions between the seal material and the lubricant. As a rule, material compatibility should always be checked prior to series application. To be sure, ask Klüber!

PFPE greases made by Klüber can help precision components operate without problems. They permanently minimize stick-slip and remain compatible with all kinds of material pairings even when exposed to UV radiation, X-rays, or chemicals.

Klüberalfa® YVI 93-152

This inert grease withstands strong acidic and alkaline solutions, solvents and gasoline without undergoing any measurable change. This makes it hard for foreign substances to penetrate the lubricant barrier, effectively shielding the friction point from aggressive influences.

BARRIERTA® I greases

These are the first-choice greases when long service life without negative effects on materials is desired. Their almost universal compatibility with plastics and seal materials is a decisive argument for use.

Food-grade lubricants

Lubricants that are to be used in the food-processing industry must meet special requirements. If incidental contact with the food product cannot be avoided for technical reasons, the lubricants used must be physiologically safe, neutral in taste and odor and should, ideally, be internationally approved. BARRIERTA® greases fulfill all these requirements.

BARRIERTA® L 55 greases are used by leading food-product manufacturers.

BARRIERTA® L 55 greases

These white special greases have proven successful in bearings and guideways that are subject to thermal stress such as in automatic baking or cooking ovens. They meet the requirements for food-grade lubricants (Guidelines of sec. 21 CFR 178.3570 of FDA regulations) and are registered as NSF H1. For this reason, they can be regarded as integral elements of any quality assurance or process control system.

Extreme physical stresses

High speeds/centrifugal forces

Rising bearing speeds and torques at high temperatures are typical of the challenging operating conditions under which lubricants in heavy-duty electric motors, and many other types of equipment, must perform today. And in bearings with a rotating outer ring, the higher centrifugal forces bring about even tougher requirements.

Lubricants with innovative combinations of PFPE base oils and thickeners have a very high speed tolerance and can therefore contribute to attaining the desired component performance.

Component test rigs made by Klüber provide predictions of grease life in rolling bearings at high speeds and under defined axial and radial loads.

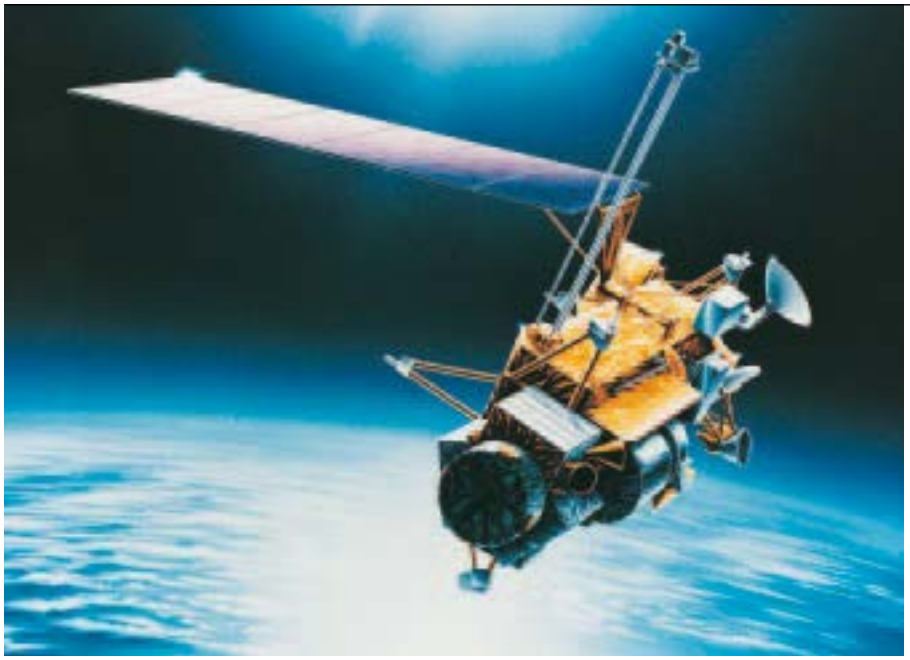
Klüberalfa® BF 83-102

This high-speed grease was specifically designed for the lifetime lubrication of fast rotating bearings. In endurance tests at 160 °C permanent temperature, a speed factor* of over 1,000,000 was attained, which is unheard of for PFPE greases in deep-groove ball bearings.

** for a definition of speed factor, see page 15*

Vacuum resistance

In certain applications, such as in outer space, clean room production sites, or CVD processes, a lubricating grease must do double duty by meeting the general application requirements and by performing reliably in high to ultra-high vacuum. If evaporation losses are too high, an elevated risk of starved lubrication and quality defects caused by condensate on manufactured parts will be the consequence.
Highly vacuum-resistant lubricants made by Klüber also offer support in sensitive manufacturing processes.
For more information on lubricants for clean-room production, please see our brochure on specialty lubricants for clean rooms.



In satellites, components are required to function reliably under extreme vacuum and enormous temperature differences. PFPE have been used by the aerospace industry for a long time.

Klüberalfa® HX 83-302

This specialty grease is used for the lubrication of linear motion guides in a high vacuum under clean-room conditions. It ensures constantly low friction over a wide temperature range. This facilitates precise actuation movements and reduces the formation of wear-induced contaminants.

Recommendations for the use of PFPE greases

Initial lubrication and cleaning

PFPE lubricants adhere best to completely degreased, metallically bright surfaces. We therefore recommend thorough cleaning of the friction points prior to initial lubrication so as to remove any organic residues or anticorrosive oil.
In contrast, PFPE-compatible anticorrosive products such as **Klüberalfa® XZ 3-2** do not need to be removed. We recommend cleaning in two steps.

First step: Clean surfaces in your cleaning section or mechanically using white spirit, then dry.

Second step: Treat surface with PFPE-compatible cleaning fluid – like **Klüberalfa® XZ 3-1** – and dry using hot air or oil-free compressed air.

PFPE greases cannot absorb conventional anti-corrosive oils (shown yellow). This impairs adhesion in the bearing.

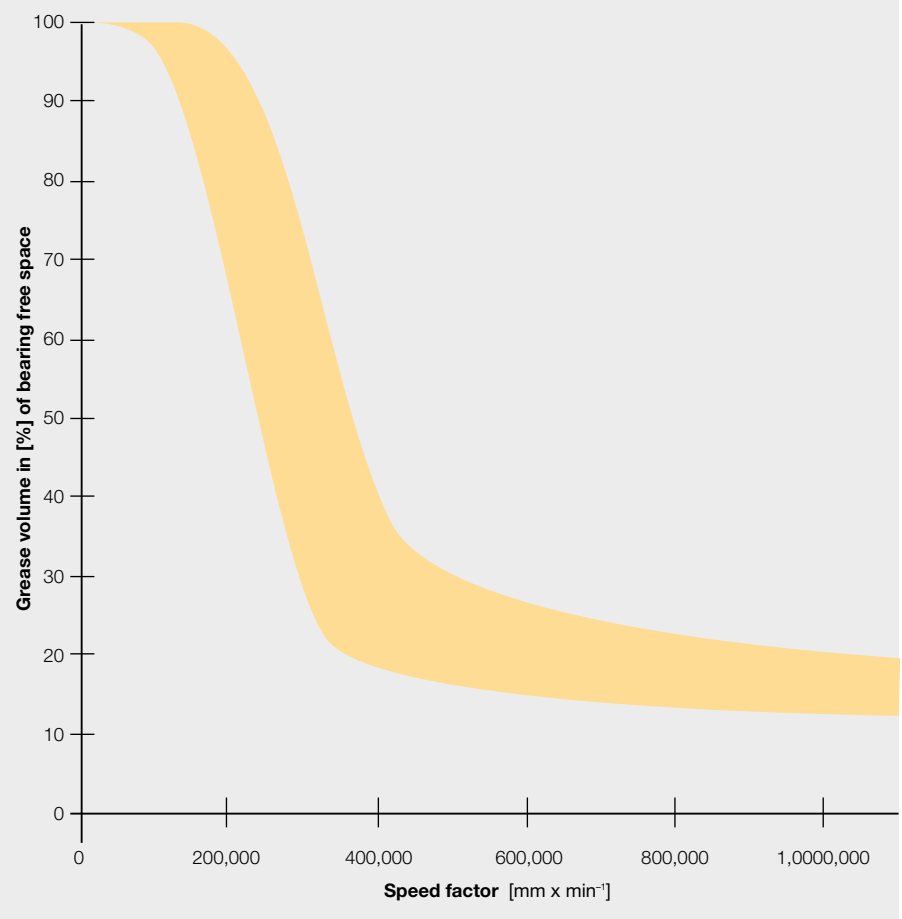
Grease volume

The question of ideal grease volume depends on the bearing type, operating conditions and manufacturer's recommendations. As a rule, slow moving systems require a larger filling volume in proportion to the bearing free space than fast moving ones. However, at very low speeds the free space should not always be filled to the limit. During running-in, the rising temperature may cause grease leakage in unsealed bearings. Besides the speed factor, bearing design, environmental influences, mounting position and seals should be taken into account for the determination of the grease volume.

Miscibility with other greases

PFPE greases can normally be mixed with one another. However, if different thickeners or additives come together, their performance in the component may suffer. For this reason, a grease should be added to another only upon consultation of your lubrication specialist at Klüber or the machine manufacturer.

Other lubricant types are not miscible with PFPE greases at any ratio. Therefore, friction points should be thoroughly cleaned before a lubricant change, as described above, so as to attain optimum lubricity.



Typical filling volumes in proportion to speed factors

Product overview

When selecting PFPE lubricants for rolling or plain bearings, three criteria are of particular importance to achieve optimum component performance. The following product overviews with symbols will facilitate your orientation.

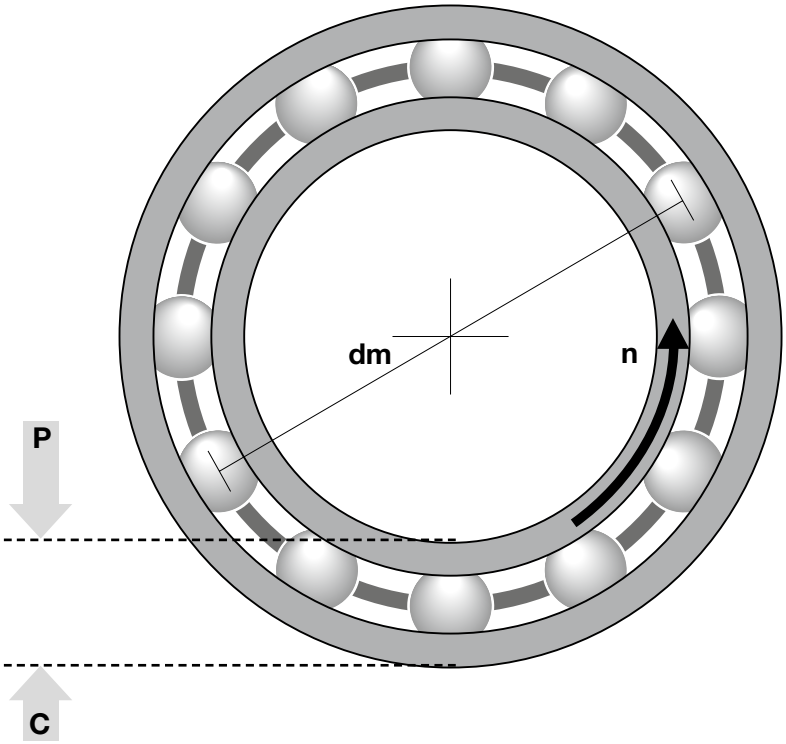
Key load data of rolling bearings

P dynamic load

C load bearing capacity

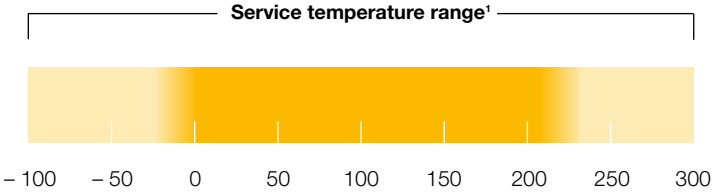
n rpm

dm mean bearing diameter



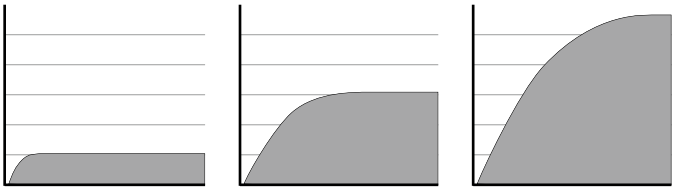
1. Actual bearing temperature T

This temperature determines the thermal load the component and the lubricant must withstand. The temperature bar indicates the recommended service temperature range for each product.



¹ Service temperature
Service temperatures are guide values which depend on the lubricant's composition, the intended use and the application method. Lubricants change their consistency, apparent dynamic viscosity or viscosity depending on the mechano-dynamical loads, time, pressure and temperature. These changes in product characteristics may affect the function of a component.

² Speed factor
Speed factors are guide values which depend on the type and size of the rolling bearing and the local operating conditions, which is why they have to be confirmed in tests carried out by the user in each individual case.



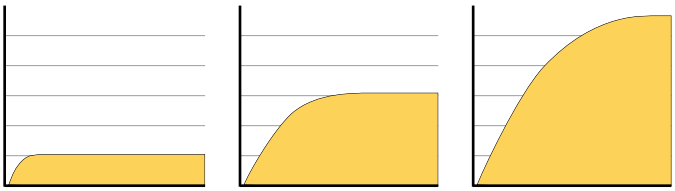
Load-carrying capacity C/P

High:	< 10
Medium:	10–20
Low:	> 20

2. Load ratio C/P

The **C/P** value describes the ratio of basic dynamic load rating **C** in [N] of the bearing and the actual equivalent dynamic load **P** in [N] in the operating point.

C/P values below 10 are considered high loads. A grease with a high load-bearing capacity has a highly viscous base oil and additives which help to avoid premature failure due to wear.



Speed factor [n x dm]

Fast:	> 600,000
Medium:	400,00–600,000
Slow:	≤ 300,000

3. Speed factor^2 [n x dm]

The speed factor is made up of the rpm in the operating point **n** in [min^{-1}] and the mean bearing diameter **dm** in [mm].

Lubricants which are suitable for high rpm are dynamically light, which prevents the lubricant film from rupturing at high speeds.

You will find a detailed description of all parameters influencing the extended service life calculation in our brochure on lubricants for rolling bearings.

The lubricants listed in the following overview are an extract from Klüber's product range. They are of consistency class NLGI 2, unless stated otherwise. Comprehensive information on each product can be found in the product information leaflets, which Klüber Lubrication will be pleased to provide on request.

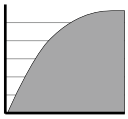
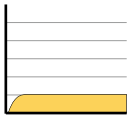
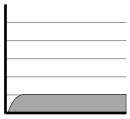
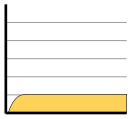
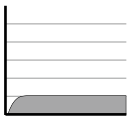
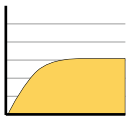
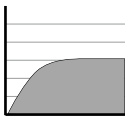
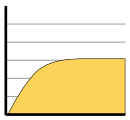
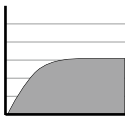
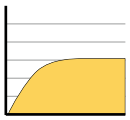
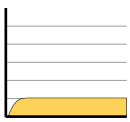
BARRIERTA®

BARRIERTA® is the leading European brand of PFPE lubricants. In many sectors of industry, BARRIERTA® is synonymous with long service life, reduced maintenance and constant quality.

Products	Kinematic viscosity [mm²/s], approx. at 40 °C	100 °C	Service temperature range [°C] – 100 – 50 0 50 100 150 200 250 300
BARRIERTA® L 55/2	400	40	
BARRIERTA® L 25 DL	90	10	
BARRIERTA® KL 092	90	25	
BARRIERTA® KM 192	190	34	
BARRIERTA® I MI 202	200	22	
BARRIERTA® I S 402	420	40	
BARRIERTA® I FLUIDS	100 200 425	12 22 43	depending on viscosity

Most **BARRIERTA®** products are based on PFPE raw materials that are exclusively produced for Klüber. They are made to close tolerances, following tried and tested formulations and using perfected techniques.

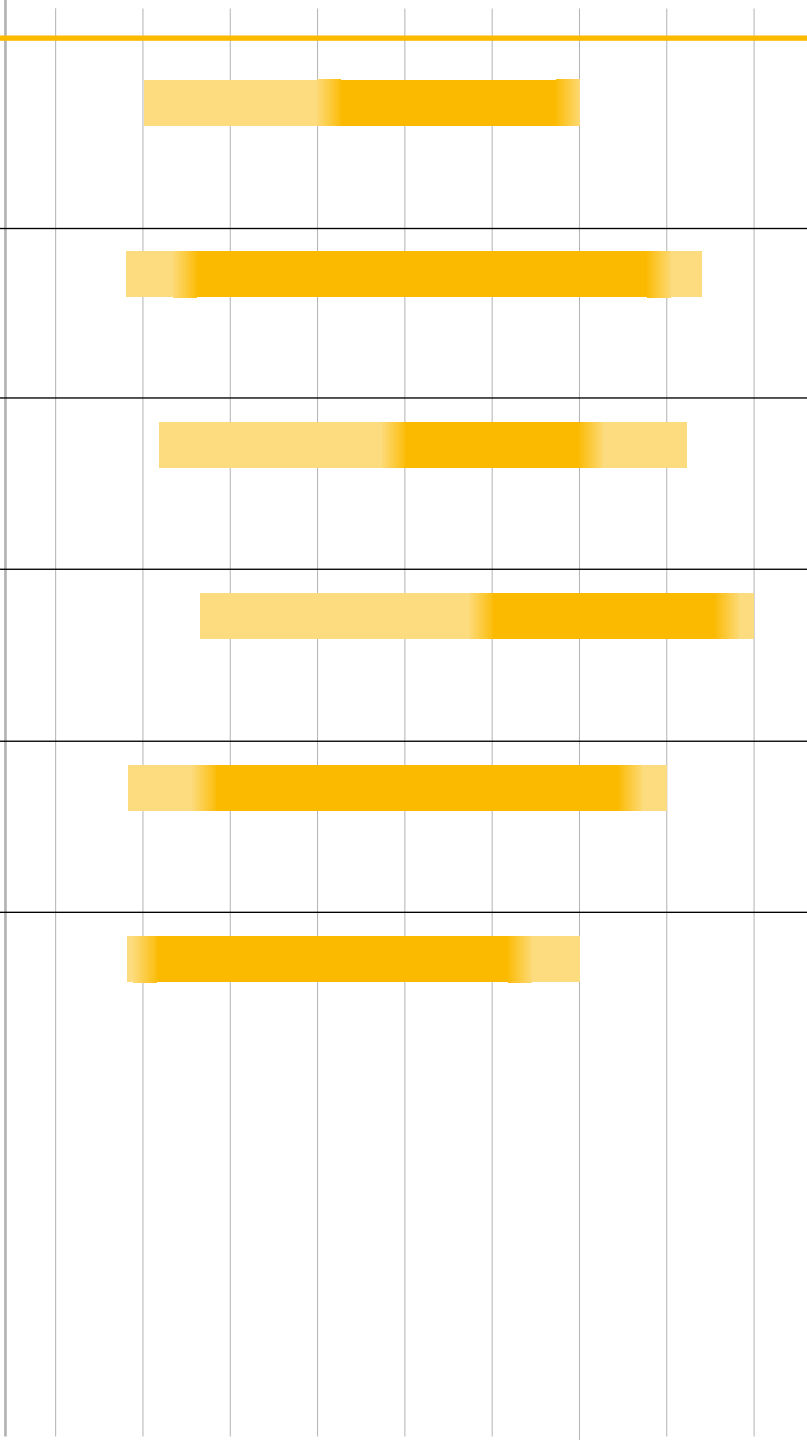
Thanks to their wide spectrum of applications and their availability, BARRIERTA® products are the first choice for lubrication experts worldwide.

Load-carrying capacity	Speed factor	Application
		**ALL INDUSTRIES** – the leading long-term grease for rolling bearings and guides subject to high temperatures. Excellent stability and corrosion protection. Approved and recommended by many manufacturers. Tested and listed as NSF H1 for use in the food-processing industry. Available in four NLGI grades from 0 to 3 and ten packaging sizes to meet individual requirements.
		**PRECISION ENGINEERING, OPTOELECTRONICS** – special grease for the long-term lubrication of plastic/plastic sliding contact surface combinations. Supports precision control of moving plastic parts, e.g. in camera lenses, without affecting the material.
		**AUTOMOTIVE ENGINEERING, PRECISION ENGINEERING** – Dynamically light high-temperature grease with extraordinary low-temperature properties. Takes load off low-power drives due to low starting and running torques.
		**ALL INDUSTRIES** – High-temperature grease with wide service temperature range and excellent corrosion protection properties. Long service life even when exposed to extreme operating temperature variations proven in practice.
		**PRECISION ENGINEERING, CLEAN ROOM** – Vacuum-resistant lubricating grease with excellent chemical stability and good corrosion protection. The high oil content ensures smooth running and supports precise actuations in precision components.
		**TEXTILE INDUSTRY, FOIL PROCESSING** – High-temperature grease with excellent long-term properties, smooth running of bearings, even those with rotating outer ring, and in components lubricated for life. Available in many viscosity grades to meet individual requirements.
		LIQUID-LUBRICATED FRICTION POINTS – High-performance lubricating fluids for oil-lubricated rolling and plain bearings with excellent chemical resistance, low vapor pressures and compatibility with plastics and elastomers.

Klüberalfa®

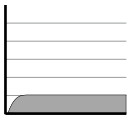
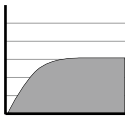
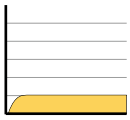
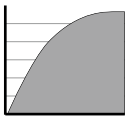
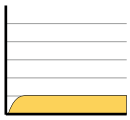
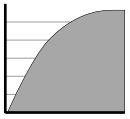
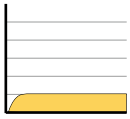
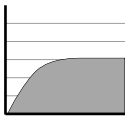
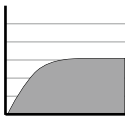
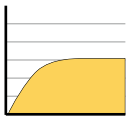
Klüberalfa® lubricants have been optimized to suit the requirements of lifetime lubrication in certain niche applications.

Products	Kinematic viscosity [mm²/s], approx. at 40 °C	100 °C	Service temperature range [°C]
Klüberalfa® BF 83-102	110	26	
Klüberalfa® BH 83-292	290	85	
Klüberalfa® BHR 53-402	420	40	
Klüberalfa® HPX 93-1202	1200	100	
Klüberalfa® HX 83-302	300	80	
Klüberalfa® YVI 93-152	150	40	



Innovative formulations and manufacturing techniques impart product characteristics that enable the lubricants to act as problem-solvers in highly specialized applications.

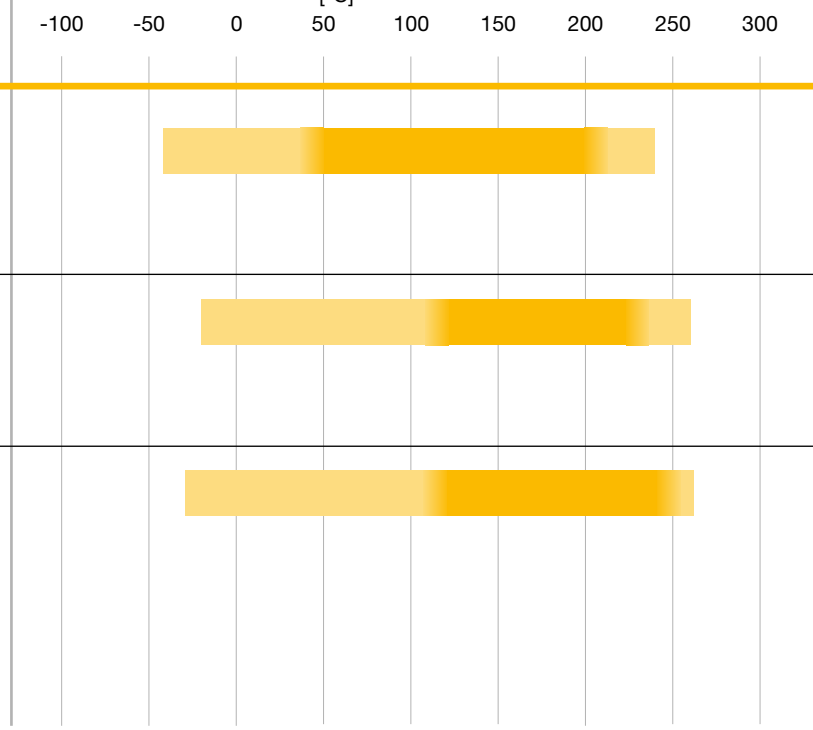
Klüberalfa® products are used where many other PFPE lubricants fail to attain the required lifetimes or component performance.

Load-carrying capacity	Speed factor	Application
		**HIGH-SPEED BEARINGS, e.g. IN TURBINE DRIVES** – tolerates high permanent temperatures and speeds. Speed factors of > 10^6 achieved in test rigs.
		**BEARINGS WITH ROTATING OUTER RING, e.g. IN BROAD-DRAWING ROLLERS** – reduced starting torques even at low temperatures. Long service life even at medium speeds.
		**LOW-SPEED BEARINGS IN CONVEYORS, e.g. IN PAINTSHOPS** – removable by means of aqueous detergents to avoid problems with paint. Excellent corrosion protection. No PTFE used in manufacture.
		**LOW-SPEED BEARINGS SUBJECT TO HIGH TEMPERATURES, e.g. KILN BEARINGS AND GUIDES** – high-temperature grease containing a highly viscous base oil for permanent temperatures up to 300 °C. No PTFE used in manufacture.
		**FRICTION POINTS UNDER VACUUM, e.g. CVD** – ensures consistently low friction torques over a wide temperature range and yields high kappa values in rolling bearing calculations.
		**BEARINGS AND SEALS SUBJECT TO MEDIA, e.g. IN SENSORS** – inert grease with excellent vacuum resistance over a wide temperature range. No emission of VOC or CHC compounds.

Klübertemp®

Klübertemp® greases were developed for the initial and permanent lubrication of lube points requiring a lot of maintenance. Besides long service lives, they offer good relubrication behavior and constant product quality.

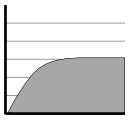
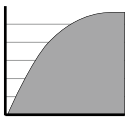
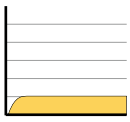
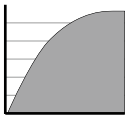
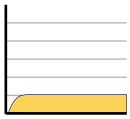
Products	Kinematic viscosity [mm²/s], approx. at 40 °C	100 °C	Service temperature range [°C]
Klübertemp® HM 83-271	280	40	
Klübertemp® HB 53-391	400	40	
Klübertemp® HM 83-402	420	40	



The application range of PFPE greases made by Klüber is far from being limited to bearings. Their unique features support component functions in valves, plug-in contacts, seals, pistons and gears.

We will be pleased to provide further information on the entire range of applications for PFPE lubricants made Klüber. Contact us.

Klübertemp® greases greases are available worldwide in application-specific pack sizes and are listed in the lubrication charts of leading manufacturers.

Load-carrying capacity	Speed factor	Application
		**RELUBRICATED BALL AND ROLLER BEARINGS, e.g. IN CALENDERS, CORRUGATING MACHINES** – lubricating grease of NLGI grade 1–2 with excellent corrosion protection.
		**RELUBRICATED ROLLER BEARINGS, e.g. IN CONTI-ROLL PRESSES** – good corrosion and wear protection, high load-bearing capacity.
		**RELUBRICATED BALL AND ROLLER BEARINGS, e.g. IN CORRUGATORS, SHEET EXTRUDERS** – long service life even at very high permanent temperatures.

User-specific containers

Expensive manufacturing processes and stringent performance requirements call for the right lubricant supplied in tailor-made containers. This ensures safe, economical and reproducible application during production and for maintenance purposes.

Our Klüber Packaging and Labeling Service implements the most varied packaging concepts, including seam-sealed plastic bags, spray cans or special cartridges, and provides suitable labeling.

What do you have to do?
Simply talk to us. We will be pleased to provide consulting on specific lubrication solutions, various packages, purchasing volumes and delivery times.

You can contact us worldwide. Please find our contact data in the back of this brochure.

Customer-specific packages with customized labeling offers a number of advantages:

- ❑ **Containers fitting automatic lubricant dispensing systems**
- ❑ **Economical lubricant consumption**
- ❑ **Easy application for maintenance purposes**
- ❑ **No confusion of different products**
- ❑ **Better application control of approved lubricants in the field**

Customized pack sizes and types offer a number of advantages

Would you like

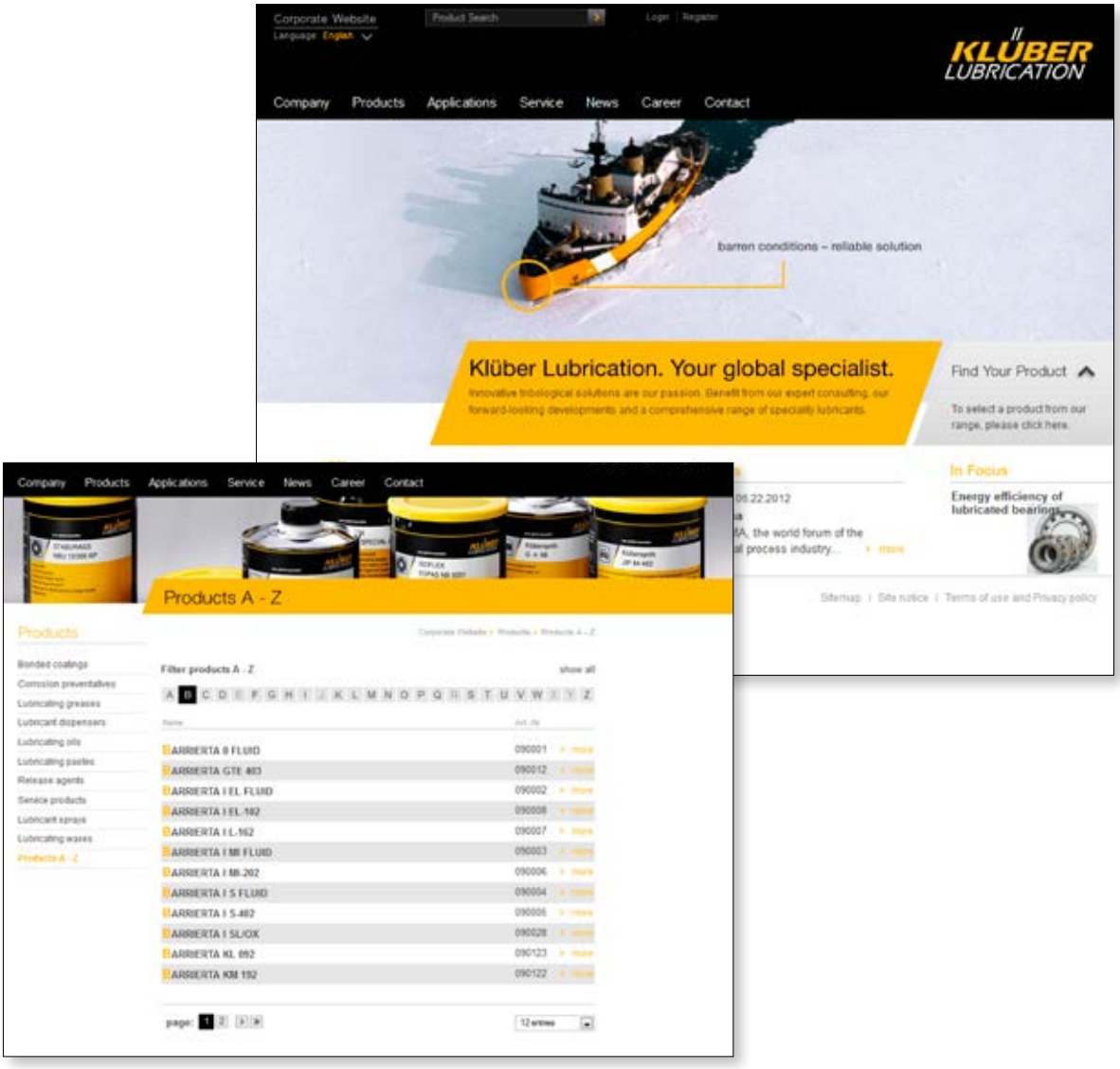
more detailed information on our product range?

Do you need

Material Safety Data Sheets on any of the above products?

You can order

using the form overleaf or our website www.klueber.com.



KLÜBER LUBRICATION

Questionnaire Rolling Bearings

If your selection criteria are not included in this questionnaire we will be pleased to find a tailor-made solution for you. This questionnaire helps us identify your specific requirements.
Please complete, copy and send it to one of the addresses overleaf. We will provide a recommendation as soon as possible.

Sender:

Company _____

_____

Name _____

Function _____

Street _____

Place _____

Phone _____

Fax _____

E-mail _____

1. Application

_____
Machine/Equipment:

_____
Manufacturer:

2. Bearing details

_____
Type of bearing:*

_____
Designation/suffix

Mounting pos.:* ❑ Vertical
❑ Horizontal
❑ Tilted

_____
Seal: ***(Type)****

_____
Material

❑ Rubbing ❑ Non-rubbing

3. Operating conditions*

n = _____ min^{-1}

_____
Equivalent dynamic bearing load rating, P[N]

❑ Rotating inner ring
❑ Rotating outer ring
❑ Oscillating
❑ Intermittent
❑ Vibrating
Frequency _____ [Hz]
Path _____ [° or mm]
or speed-time diagram in sketch form

❑ Shock load [N] _____
or speed-time diagram in sketch form

Temperature, °C	estimated		measured	
	min.	max.	min.	max.
Bearing temperature				
Ambient temperature				

AMBIENT INFLUENCES:
Type, concentration, temperature, pressure)
❑ Liquid _____
❑ Vapour _____
❑ Gas _____
❑ Dust _____
❑ Other media _____
❑ Daily service time _____ [h]
❑ Miscellaneous _____

4. Additional lubricant requirements

❑ Low-noise operation
❑ High degree of purity
❑ Very low friction torque
❑ Customer specification
❑ Compliance with lubricant chart (encl.)

Food-grade registration:
❑ NSF H1**
Others: _____
_____

5. Lubrication details

_____
Lubricant currently used:

Type of lubrication:
❑ Lifetime lubrication [h]
Actual _____
Desired _____
❑ Lubrication interval [h]:
Actual _____
Desired _____
❑ Relubrication quantity [g/h]
Actual _____
Desired _____
❑ Manual ❑ Automatic

_____
Lubricating equipment

_____
Lubricant lines
(dimensions, pressure, material, type of distributor)

_____
Lubrication interval [g/h]

_____
Desired improvement

_____
Annual lubricant consumption

Miscellaneous _____
_____
_____

* ***Minimum information required for consulting***
** ***National Sanitation Foundation***

Request for Information

Sender:

Company _____

_____

Name _____

Function _____

Address _____

_____

Phone _____

Fax _____

E-mail _____

I am interested in more information **on Klüber Lubrication lubricants.**

Please send the following documents**:**

- ❑ **Rolling bearing lubricants**
- ❑ **Lubricants for vacuum technology**
- ❑ **Lubricants for clean room production**
- ❑ **Lubricants for the food-processing and pharmaceutical industries**

❑ **Please contact me for an** appointment**.**

For more information please visit us at www.klueber.com.

Please fill in and return to Klüber Lubrication

The data in this document is based on our general experience and knowledge at the time of publication and is intended to give information of possible applications to a reader with technical experience. It constitutes neither an assurance of product properties nor does it release the user from the obligation of performing preliminary field tests with the product selected for a specific application. All data are guide values which depend on the lubricant's composition, the intended use and the application method. The technical values of lubricants change depending on the mechanical, dynamical, chemical and thermal loads, time and pressure. These changes may affect the function of a component. We recommend contacting us to discuss your specific application. If possible we will be pleased to provide a sample for testing on request. Products from Klüber Lubrication products are continually improved. Therefore, Klüber Lubrication reserves the right to change all the technical data in this document at any time without notice.

Klüber Lubrication München KG
Geisenhausenerstraße 7
81379 München
Germany

Local first-instance court Munich, Germany
Certificate of registration 46624

www.klueber.com

Klüber Lubrication – your global specialist

Innovative tribological solutions are our passion. Through personal contact and consultation, we help our customers to be successful worldwide, in all industries and markets. With our ambitious technical concepts and experienced, competent staff we have been fulfilling increasingly demanding requirements by manufacturing efficient high-performance lubricants for more than 80 years.

Freudenberg

A company of the Freudenberg Group