

Klüberoil® 4 UH 1-32 N ... 1500 N oils

Synthetic lubricating oils for the food-processing and pharmaceutical industries



Description

Klüberoil 4 UH 1-32...1500 N oils are lubricants for the food processing and pharmaceutical industry. They meet the requirements of the German law governing food products and associated ancillaries (LMBG, sec. 5, para 1, sentence 1) and the US requirements set forth in the "Guidelines of sec. 21 CFR 178.3570 of FDA regulations" and are in line with the requirements of NSF H1 registration. Klüberoil 4 UH 1-68...1500 N oils meet the CLP requirements. When tested on the FZG gear test rig according to DIN 51 354, part 2, A/8,3/90, the oils showed a scuffing load of > 12 and a specific loss of weight of < 0.2 mg/kWh.

Especially formulated for use in the food-processing and pharmaceutical industries, these lubricating oils exhibit good antiwear and EP properties as well as excellent low-temperature characteristics.

The corrosion protection properties of these oils are very good as is their ageing and oxidation stability. They also have a high resistance to shear and do not foam.

Application

Klüberoil 4 UH 1 oils are used for the lubrication of friction points in food-processing and pharmaceutical machinery. They are especially suitable for the lubrication of spur, bevel and worm gears, bearings, spindles and joints, as well as of lift, drive and conveyor chains at low temperatures.

Application notes

When used in gears, Klüberoil 4 UH 1 oils may be applied by immersion, immersion circulation or injection. Drip-feed lubrication (e.g. for chains) and application by brush or oil can is also possible.

Klüberoil 4 UH 1 oils are miscible with mineral oils and polyalphaolefin oils. However, we recommend cleaning the oil circulation system or flushing it with the new oil prior to using Klüberoil 4 UH 1 for the first time. Especially with a view to the H1 requirements in the food-processing industry, any mixing of Klüberoil 4 UH 1 oils with non-food-grade lubricants should be avoided.

For permanent temperatures at the seal edge up to 100 °C, NBR seals (acrylonitrile-butadiene rubber) may be used. For higher temperatures, it is safer to use FKM seals (fluorinated rubber) instead. It should be noted that elastomers from one or several manufacturers can behave differently. Therefore the data given in the "compatibility with elastomers" table should be used for reference purposes only. A compatibility test should always be carried out with the elastomers which are actually used.

Viscosity selection for rolling bearings and gears

To select the correct oil viscosity, observe the bearing manufacturer's instructions or refer to worksheet 3 from the Society of Tribology (GfT).

For determining the correct viscosity for gears, the manufacturer's instructions take priority.

Only in cases where there are no gear manufacturer's instructions, the viscosity can be selected in accordance with the enclosed worksheet "Klüberoil 4 UH 1 oils – selection of oil viscosity for gears".

For immersion lubrication of gears and chains:

- ISO VG 32 to 320
approx. - 25 °C to approx. 120 °C
- ISO VG 460 to 1500
approx. - 20 °C to approx. 120 °C

Klüberoil 4 UH 1 32 N...1500 N

- Synthetic oils for the food-processing and pharmaceutical industries
- Compliance with NSF H1 requirements
- Wide operating temperature range
- Excellent ageing and oxidation stability
- Good wear protection
- High scuffing load capacity
- Good corrosion protection
- Neutral towards seals and paints
- The higher viscosity variants fulfill CLP requirements

When used for loss lubrication, the lubricant may be exposed to higher temperatures, depending on the relubrication intervals. We will be pleased to provide samples for testing.

Service temperature range:

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

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Minimum shelf life

The minimum shelf life is approx. 24 months if the product is stored in the original closed container in a dry place.

Pack sizes

400 ml spray can (ISO VG 1500)
20 l canister
200 l drum

Product data:

Klüberoil 4 UH 1- ...	32 N	46 N	68 N	100 N	150 N	220 N	320 N	460 N	680 N	1500 N
ISO VG DIN 51 519	32	46	68	100	150	220	320	460	680	1500
Density, DIN 51 757, at 20 °C, g/ml, approx.	0.84	0.84	0.84	0.85	0.85	0.85	0.85	0.86	0.86	0.89
Kinematic viscosity, DIN 51 562 T01 at 40 °C, mm ² /s, approx. at 100 °C, mm ² /s, approx.	32 6	46 8	68 11	100 14	150 19	220 26	320 35	460 47	680 65	1500 125
Viscosity index, DIN ISO 2909, approx.	140	140	140	140	150	150	150	150	150	180
Flash point, DIN ISO 2592, °C	> 220	> 220	> 220	> 220	> 220	> 220	> 220	> 220	> 220	> 220
Pour point, DIN ISO 3016, °C, approx.	- 30	- 30	- 30	- 30	- 30	- 30	- 25	- 25	- 25	- 25

Compatibility with elastomers:

Klüberoil 4 UH 1- ...	32 N	46 N	68 N	100 N	150 N	220 N	320 N	460 N	680 N	1500 N
towards 72 NBR 902, at 100 °C / 168 h change in volume, %, approx. change in hardness (Shore A), approx.	+ 1 0	- -	+ 1 0	- -	- -	+ 2 0	- -	+ 2 - 1	- -	- -
towards 75 FKM 585, at 150 °C / 168 h change in volume, %, approx. change in hardness (Shore A) approx.	+ 1 - 1	- -	+ 1 - 1	- -	- -	+ 1 - 1	- -	+ 1 - 1	- -	- -

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Safety Data Sheet

<p>1.1 Product name: Klüberoil 4 UH 1 a) -32 N; b) -46 N; c) -68 N; d) -100 N; e) -150 N; f) -220 N; g) -320 N; h) -460 N; i) -680 N; j) -1500 N Code-No.: a) 029 037; b) 029 038; c) 029 039; d) 029 040; e) 029 041; f) 029 042; g) 029 034; h) 029 043; i) 029 044; j) 029 045 23.10.2000</p>
<p>1.2 Klüber Lubrication München KG Emergency telephone no.: Geisenhausenerstraße 7 ++49 - 89 7876 - 0 D-81379 München Tel. ++49 - 89 78 76 - 0 telephone exchange Fax: ++49 - 89 78 76 - 333</p>
<p>2. Composition / information on ingredients Chemical characterization (preparation): Synthetic hydrocarbon oil, ester oil</p>
<p>3. Hazards identification No particular hazards known</p>
<p>4. First aid measures After inhalation: Not applicable After contact with skin: Wash off with soap and plenty of water After contact with eyes: Rinse with plenty of water After ingestion: Do not induce vomiting. Obtain medical attention Advice to doctor: Treat symptomatically. If swallowed or in the event of vomiting, risk of product entering the lungs</p>
<p>5. Fire-fighting measures Suitable extinguishing media: Water spray, foam, dry powder, carbon dioxide (CO₂) Unsuitable extinguishing media: High volume water jet Special Hazards: In case of fire the following can be released: Carbon monoxide, hydrocarbons Special protective equipment for firefighters: Standard procedure for chemical fires Additional information: Water mist may be used to cool closed containers. In the event of fire and/or explosion do not breathe fumes</p>
<p>6. Accidental release measures Personal precautions: Risk of slipping due to leakage/spillage of product Environmental precautions: Do not flush into surface water or sanitary sewer system Methods for cleaning up / taking up: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Dispose of absorbed material in accordance with the regulations Additional information: None</p>
<p>7. Handling and storage Advice on safe handling: Avoid formation of aerosol Advice on protection against fire and explosion: No special precautions required Requirements on storage rooms and vessels: No special storage conditions required Incompatible materials: Incompatible with oxidizing agents Further information on storage conditions: Store at room temperature in the original container</p>
<p>8. Exposure controls / personal protection Additional advice on system design: Not applicable Ingredients and specific control parameters: None Respiratory protection: No special protective equipment required Hand protection: No special protective equipment required Eye protection: No special protective equipment required Body protection: No special protective equipment required Other protection measures: No special protective equipment required General protection and hygiene measures: Clean skin thoroughly after work; apply skin cream. Do not inhale aerosol</p>

<p>9. Physical and chemical properties Form liquid Colour colourless Odour characteristic Pour point a) - f) ≤ - 30 °C; g) - j) ≤ - 25 °C; DIN ISO 3016 Flash point > 220 °C, DIN ISO 2592 Flammability not applicable Ignition temperature not applicable Autoflammability not applicable Lower explosion limit not applicable Upper explosion limit not applicable Vapour pressure-first not applicable Density, approx. a) - c) 0.84; d) - g) 0.85; h) - i) 0.86; j) 0.89; 20 °C, DIN 51 757 Water solubility insoluble pH value not applicable Kinematic viscosity, approx. a) 32; b) 46; c) 68; d) 100; e) 150; f) 220; g) 320; h) 460; i) 680; j) 1500; DIN 51 562, mm²/s, 40 °C Further information none</p>
<p>10. Stability and reactivity Conditions to avoid: Do not heat above flash point Materials to avoid: Strong oxidizing agents Hazardous decomposition products: None under normal use Additional information: None</p>
<p>11. Toxicological information The toxicological data has been taken from products of similar composition Acute toxicity: LD₅₀/oral/rat = > 2 g/kg (literature data) Chronic toxicity: None Human experience: Health injuries are not known or expected under normal use</p>
<p>12. Ecological information Information on elimination (persistence and degradability): Product is insoluble in water. May be separated out mechanically in purification plants Behaviour in environmental compartments: Ecological injuries are not known or expected under normal use Ecotoxic effects: Aquatic toxicity is unlikely due to low solubility Additional information: Should not be released into the environment</p>
<p>13. Advice on Disposal Disposal: Dispose of in accordance with your local, state and federal regulations as used oil for reconditioning Dispose of contaminated packaging and recommended cleaning: Offer rinsed packaging material to local recycling facilities</p>
<p>14. Transport information GGVS / GGVE: not applicable ADN / ADN: not applicable IMDG-Code: not applicable ICAO / IATA-DGR: not applicable Further information: Not classified as dangerous in the meaning of transport regulations</p>
<p>15. Regulatory information Labelling according to EU-guidelines: The product does not require a hazard warning label in accordance with EC-directives/German regulations on dangerous substances National regulations</p>
<p>16. Other information Classification as USDA H1 Issue-department of Safety Data Sheet: Chemical Documentation, Tel.: ++49 - 89 7876 - 564</p>

The data in this product information is based on our general experience and knowledge at the time of printing 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 tests with the selected product. We recommend contacting our Technical Consulting Staff to discuss your specific application. If required and possible we will be pleased to provide a sample for testing. Klüber products are continually improved. Therefore, Klüber Lubrication reserves the right to change all the technical data in this product information at any time without notice.



Klüber Lubrication München KG, a member of the Freudenberg group

Klüberoil® 4 UH 1-32 N ... 1500 N oils

Synthetic lubricating oils for the food-processing and pharmaceutical industries

Selection of oil viscosity for gears

Worksheet: selection of oil viscosity for gears

The manufacturer's instructions on oil viscosity take priority in any case. If the viscosity is not calculated e.g. on the basis of the EHD theory, it can be selected in accordance with this worksheet. Selection is based on DIN 51509, pt. 1 "Selection of lubricants for toothed gears". All information in this worksheet applies only to Klüberoil 4 UH 1 – 32 N ... 1500 N oils. The differing viscosity-temperature behaviour of these synthetic oils as compared to mineral oils has been taken into account.

The correct viscosity must be selected independently for every gear stage, and a compromise is required for multi-stage gears. The selection of the correct viscosity in accordance with this worksheet is based on the oil's expected operation temperature, i.e. the oil sump temperature or the temperature of the injected oil. This temperature is calculated by determining the gear's thermal economy, taking into account the produced losses, or, in the case of gears already installed, by measuring the temperature. It might be required to select a lower viscosity to ensure lubricant supply during a cold start and at low ambient temperatures. In the individual case it is necessary to check the viscosity at the existing starting temperature (especially in the case of oil circulation lubrication), or to test the components at the expected starting temperature (especially in the case of immersion lubrication).

The viscosity grade of the Klüberoil 4 UH 1 – 32 N ... 1500 N oils required for a gear stage is determined by means of the Klüber viscosity index and the expected oil operating temperature using the diagram of the last page.

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Synthetic lubricating oils for the food-processing and pharmaceutical industries
Selection of oil viscosity for gears

Determination of the Klüber viscosity index for a spur gear stage:

The required Klüber viscosity index for a spur gear stage is calculated using the force-speed factor in accordance with table 1.

Table 1:

Force-speed factor K_S/v $\left[\frac{\text{MPa} \cdot \text{s}}{\text{m}} \right]$	Klüber viscosity index KVZ
≤ 0.02	1
> 0.02 to 0.08	2
> 0.08 to 0.3	3
> 0.3 to 0.8	4
> 0.8 to 1.8	5
> 1.8 to 3.5	6
> 3.5 to 7.0	7
> 7.0	8

v	=	Peripheral speed at the reference circle [m/s]
K_S	=	Rolling pressure acc. to Stribeck [N/mm ² , MPa]
K_S	=	$\frac{F_t}{b \cdot d_1} \cdot \frac{U+1}{U} \cdot Z_H^2 \cdot Z_e^2 \cdot K_A$ [N/mm ² , MPa]
F_t	=	Nominal peripheral force [N]
b	=	Tooth width [mm]
d_1	=	Diameter of reference circle [mm]
U	=	Gear ratio = Z_2/Z_1 ; $Z_2 > Z_1$
Z_H	=	Distribution factor ^{*1}
Z_e	=	Contact ratio ^{*1}
K_A	=	Application factor ^{*2}

^{*1} Note: Determination of Z_H and Z_e according to DIN 3990, pt. 2. For a rough calculation: $Z_H^2 \cdot Z_e^2 \approx 3$

^{*2} Note: Guide values for K_A are listed in DIN 3990, pt. 6.

Example 1: Single-stage spur gear driving a fan

Drive:	Electric motor
Nominal peripheral force:	$F_t = 3000$ N
Tooth width:	$b = 25$ mm
Diameter of reference circle:	$d_1 = 230$ mm
Gear ratio:	$U = 2.5$
$Z_H^2 \cdot Z_e^2$:	≈ 3
K_A :	1
Peripheral speed:	$v = 4$ m/s
Rolling pressure acc. to Stribeck:	$K_S = 2.2$ MPa
Force-speed factor:	$K_S/v = 0.55 \frac{\text{MPa} \cdot \text{s}}{\text{m}}$
Acc. to table 1, Klüber viscosity index:	KVZ = 4
Expected oil sump temperature:	≈ 90 °C

For this application we selected Klüberoil 4 UH 1 – 220 N in accordance with the diagram on page 4.

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Selection of oil viscosity for gears

Determination of the Klüber viscosity index for a worm gear stage

The required Klüber viscosity index for a worm gear stage is calculated in accordance with table 2.

Table 2:

Force-speed factor K_S/v $\left[\frac{N \cdot \text{min}}{m^2} \right]$	Klüber viscosity index
≤ 60	5
> 60 to 400	6
> 400 to 1800	7
> 1800 to 6000	8
> 6000	9

$$\text{Force-speed factor } K_S/v = \frac{T_2}{n_1 \cdot a^3} \cdot K_A \left[\frac{N \cdot \text{min}}{m^2} \right]$$

T_2 = Output torque [Nm]

n_1 = Worm speed [min^{-1}]

a = Centre distance [m]

K_A = Application factor

Note: Guide values for K_A are listed in DIN 3990, pt. 6.

Example 2: Worm gear stage of a gear motor driving a circular conveyor

Drive: Electric motor

Output torque: $T_2 = 300 \text{ Nm}$

Worm speed: $n_1 = 500 \text{ min}^{-1}$

Centre distance: $a = 0.08 \text{ m}$

Application factor: $K_A = 1$

Force-speed factor $K_S/v = K_S / v = 1171.9 \frac{N \cdot \text{min}}{m^2}$

Klüber viscosity index acc. to table 2: KVZ = 7

Expected oil sump temperature: $\approx 85 \text{ }^\circ\text{C}$

For this application Klüberoil 4 UH 1 – 460 N was selected in accordance with the diagram on page 4.

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 Selection of oil viscosity for gears

Viscosity selection diagram

