Product information

Klübersynth GH 6 oils

Synthetic gear and high temperature oils

Benefits for your application

- **The oils meet the requirements according to DIN 51 517 – 03, CLP. Corresponding gears can be switched to Klübersynth GH 6 oils without prior consultation with the gear manufacturer provided the general application notes are observed.**
- **As of ISO VG 220 the scuffing load stage API GL 5 is achieved. Gears are sufficiently protected against scuffing even under high peak loads.**
- **Much longer service life than mineral oils due to the excellent ageing and oxidation resistance of the base oil; thus maintenance intervals can be extended and in certain cases even lifetime lubrication is possible**
- **Owing to the wide service temperature range a single viscosity grade can cover both low and high temperatures in many applications**
- **The optimum friction behaviour of the polyglycol base oil reduces power losses and improves efficiency**
- **The good wear protection of both gears and rolling bearings ensures that the service life calculated for the lubricated components is achieved**
- **The excellent viscosity-temperature behaviour supports the formation of a sufficient lubricating film even at elevated and high temperatures**
- **Seals made of 72 NBR 902, 75 FKM 585 and 75 FKM 170055 are resistant to Klübersynth GH 6 oils. Leakage and contamination are prevented.**
- **Approved by Flender, SEW Eurodrive, Getriebebau Nord, Stöber Antriebstechnik, Lenze, ZAE Antriebstechnik, Bonfiglioli, Rossi Motoriduttori, Motovario, Moventas, etc.**

Description

Klübersynth GH 6 oils are gear oils on a polyglycol basis. They have a high scuffing load capacity and micro-pitting resistance.

These oils have also proved their good wear protection in rolling bearings on the FAG FE 8 test rig for gear oils.

Klübersynth GH 6 oils stand out for their excellent ageing and oxidation resistance, good viscosity-temperature behaviour and very good thermal stability.

Application

Klübersynth GH 6 oils were especially developed for the lubrication of worm gears with steel/bronze pairings.

The polyglycol base oils and special additives reduce the friction coefficient and provide low wear values, which is a clear advantage in these applications.

Klübersynth GH 6 oils achieve a particularly low wear intensity according to DIN 3996 (calculation of load capacity of worm gears).

Klübersynth GH 6 oils are also used for the lubrication of bevel and spur gears, rolling and plain bearings as well as all types of denture couplings, especially when exposed to high temperatures.

Klübersynth GH 6 oils can also be used for the lubrication of lifting, drive and transport chains.

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Application notes

Klübersynth GH 6 oils can be applied by immersion, immersion/circulation and injection.

Klübersynth GH 6 oils are **not** miscible with mineral oils and synthetic hydrocarbons.

We recommend cleaning the lubrication points or rinsing gears with the Klübersynth GH 6 oil which will be used after conversion.

Klübersynth GH 6 oils are neutral towards ferrous metals and almost all nonferrous metals.

There may be increased wear when the contact surfaces of design elements made of aluminium or aluminium alloys are exposed to dynamic loads. If necessary, preliminary tests should be carried out.

For permanent temperatures up to 80 °C seals made of 72 NBR 902 may be used. For higher temperatures, we recommend to use seals made of 75 FKM 585 or 75 FKM 170055.

It should be noted that elastomers from one or several manufacturers can behave differently; therefore tests should be performed.

When applying Klübersynth GH 6 oils we recommend the use of two-component paints (reaction paints) for interior coating.

Oil gauge glasses should preferably be made of natural glass or polyamide materials. Other transparent plastics, e.g. Plexiglas, have a tendency to crack under stress.

The suitability of materials used in contact with Klübersynth GH 6 oils should be tested, especially prior to series application.

Viscosity selection

When determining the oil viscosity for gears, the manufacturer's instructions take priority. In cases where there are no gear manufacturer's instructions, the viscosity can be selected in accordance with the enclosed worksheet "Klübersynth GH 6 oils – selection of oil viscosity for gears".

To determine the correct oil viscosity for bearings, please observe the bearing manufacturer's instructions.

For determining the actual viscosity, please refer to the enclosed viscosity-temperature diagram indicating the differing viscosity-temperature behavior of Klübersynth GH 6 oils as compared to mineral oils.

Minimum shelf life

The minimum shelf life is approx. 36 months if the product is stored in its unopened original container in a dry, frost-free place.

Pack sizes

20 l canister
200 l drum

Material Safety Data Sheets

Material safety data sheets can be downloaded or requested via our website www.klueber.com. You may also obtain them through your contact person at Klüber Lubrication.

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Product data

Klübersynth GH 6- …	32	46	80	100	150	220	320	460	680	1000	1500
ISO VG DIN 51 519	32	46	–	100	150	220	320	460	680	1000	1500
Density, DIN 51 757, at 15 °C, [kg/m³], approx.	984	1035	1040	1043	1050	1060	1067	1074	1075	1075	1080
Kinematic viscosity, DIN 51 561 at 20 °C, [mm^2/s], approx. at 40 °C, [mm^2/s], approx. at 100 °C, [mm^2/s], approx.	 88 32 6,5	 113 46 9	 205 80 15	 270 100 20	 400 150 29	 630 220 40	 880 320 54	 1240 460 71	 1900 680 110	 3000 1000 167	 4300 1500 231
Viscosity index, DIN ISO 2909	≥ 150	≥ 190	≥ 190	≥ 190	≥ 210	≥ 220	≥ 220	≥ 220	≥ 220	≥250	≥ 250
Flash point COC, DIN ISO 2592, [°C]	≥ 220	≥ 250	≥ 250	≥ 250	≥ 250	≥ 250	≥ 250	≥ 250	≥ 250	≥250	≥ 250
Pour point, DIN ISO 3016, [°C]	≤ -45	≤ -40	≤ -40	≤ -35	≤ -35	≤ -35	≤ -30	≤ -25	≤ -25	≤-25	≤ -10
Lower service temperature range*, [°C]	-45	-40		-35			-30	-25			-10
Upper service temperature range*, [°C]	160										
Corrosion protection on steel, DIN ISO 7120	0 – A										
Ageing characteristics, ASTM D 2893, increase in viscosity, [%]	≤ 6										
FZG gear test rig, A/8.3/90, DIN 51354-2, scuffing load stage	≥ 14										
API scuffing load capacity						API GL 5					
Rolling bearing test rig FE 8, D 7,5/80-80, DIN 51 819-3, wear of rolling elements, [mg] wear of cage [mg]	≤ 30 ≤ 200										

* 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.

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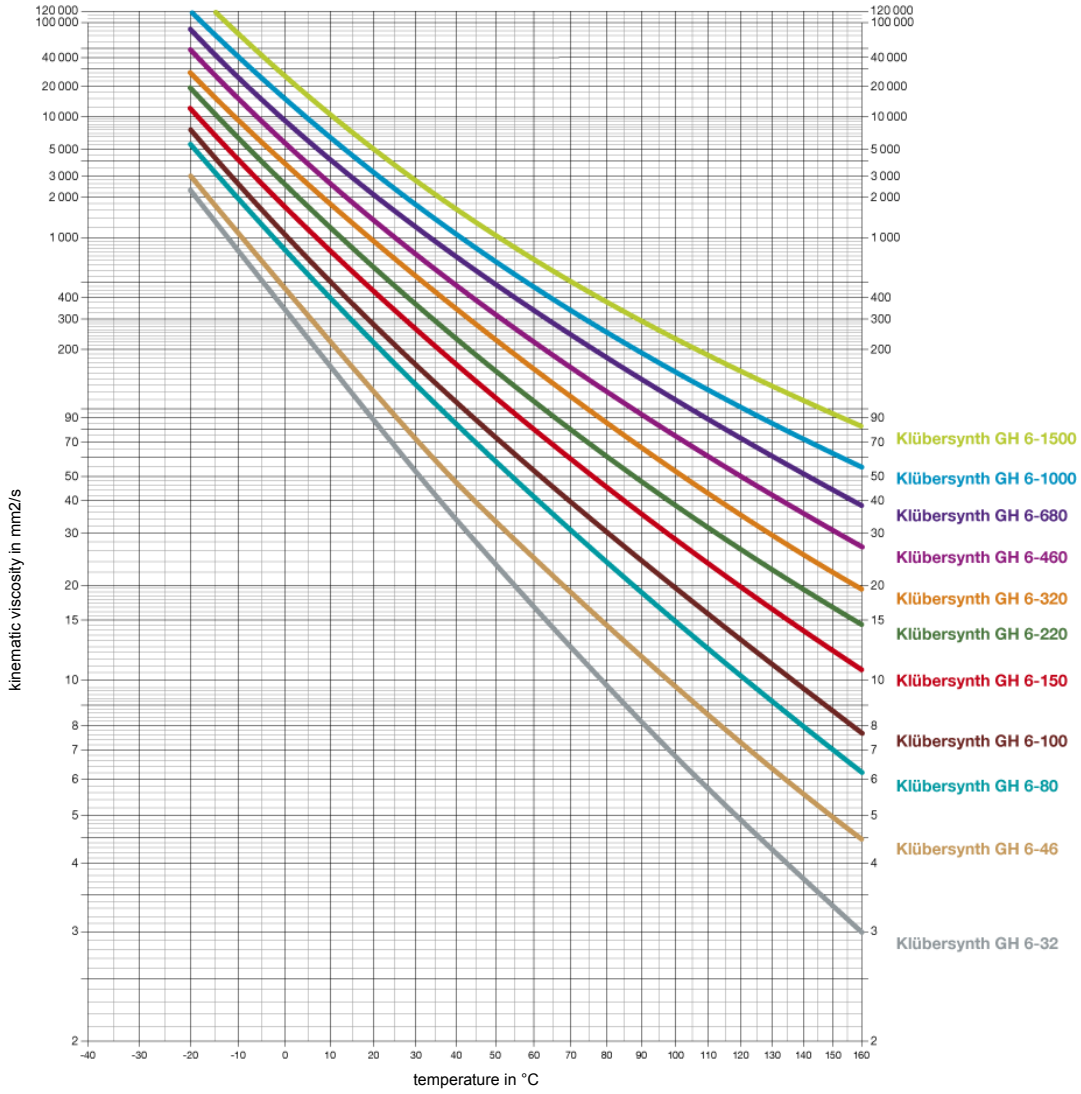
Viscosity-temperature diagram



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Klüber Lubrication München KG, Geisenhausenerstraße 7, 81379 München, Germany, phone +49 89 7876-0, fax +49 89 7876-333.

Klübersynth® GH 6 oils

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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 Klübersynth GH 6 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 Klübersynth GH 6 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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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 $K_S/v \left[\frac{MPa \cdot s}{m}\right]$	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/mm², MPa]

$$K_S = \frac{F_t}{b \cdot d_1} \cdot \frac{U+1}{U} \cdot Z_H^2 \cdot Z_\varepsilon^2 \cdot K_A \left[N/mm^2, MPa\right]$$

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_ε = Contact ratio [*1]
K_A = Application factor [*2]

[*1] Note: Determination of Z_H and Z_ε according to DIN 3990, pt. 2. For a rough calculation: $Z_H^2 \cdot Z_\varepsilon^2 \approx 3$

[*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
$Z_H^2 \cdot Z_\varepsilon^2$:	≈ 3
K_A:	1
Peripheral speed:	v = 4 m/s
Rolling pressure acc. to Stribeck:	K_S = 2.2 MPa
Force-speed factor:	$K_S/v = 0.55 \frac{MPa \cdot s}{m}$
Acc. to table 1, Klüber viscosity index:	KVZ = 4
Expected oil sump temperature:	≈ 90 °C

For this application we selected Klübersynth GH 6-150 in accordance with the diagram on page 4.

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

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

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 Nm
Worm speed:	n_1 = 350 min^{-1}
Centre distance:	a = 0.063 m
Application factor:	K_A = 1
Force-speed factor	$K_S / v = 3427{,}9 \frac{N \cdot min}{m^2}$
Klüber viscosity index acc. to table 2:	KVZ = 8
Expected oil sump temperature:	≈ 85 °C

For this application Klübersynth GH 6-460 was selected in accordance with the diagram on page 4.

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Viscosity selection diagram