

Description

The Klübersynth EG 4 oils are fully synthetic high-performance gear oils conforming to the demands of CLP and AGMA. They are also mineral oil miscible.

In addition to their excellent anti-corrosion and anti-wear properties, these oils are very resistant to ageing and oxidation and offer exceptional service at low temperatures. They also show a low tendency to foam. In the FZG test (A10/16,6R/90) a scuffing load capacity of GL 4 was achieved.

Fields of application

The Klübersynth EG 4 oils are particularly suitable for lubricating friction points subject to high loads over a wide temperature range. The oils can be used to lubricate spur, bevel and worm gears.

Klübersynth EG 4 oils are stable under shear stress and offer excellent demulsifying properties. The oils react on the whole neutrally to common seal materials such as NBR or FPM and lacquers. Care should nevertheless be taken, as elastomers from different manufacturers can behave differently. Therefore the data given in the „compatibility with elastomers“ section should be used for reference purposes only. For this reason a compatibility test should always be carried out with the elastomers which are actually used.

Application notes

The oils can be applied using the immersion, immersion circulation and injection methods. Total loss lubrication is possible with drip-feed, brush or oil feeder application. It is possible to apply the oils automatically, but attention should be paid to the maximum processable

viscosity value in the manufacturer's instructions.

Viscosity selection for rolling bearings and gears

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

The gear manufacturer's instructions always take priority when determining the oil viscosity for gears.

If instructions are not available from the gear manufacturer then the viscosity can be determined from the „Klübersynth EG 4 oils – Selection of oil viscosity for gears“ worksheet.

Operating temperature range

Operating temperature values are reference values which have been established according to the lubricant structure, desired application and application engineering.

- Gear and chain lubrication by immersion:
Klübersynth EG 4-150 /...220
from approx. -35 °C to 140 °C
Klübersynth EG 4-320 /...460
from approx. -30 °C to 140 °C
Klübersynth EG 4-680
from approx. -25 °C to 140 °C
Klübersynth EG 4-1000
from approx. -15 °C to 120 °C

Storage

The minimum shelf life is approx. 36 months when stored carefully in a dry place and in closed original containers.

Klübersynth EG 4 oils

- Synthetic high-performance gear oils
- Scuffing load capacity conforms to API GL 4
- Miscible with mineral oil
- Excellent corrosion protection
- Ageing resistance

Package sizes

19 l canister
208 l drum

Klübersynth® EG 4 oils

Synthetic high-performance gear oils

Product characteristics

	Klübersynth EG 4-150	Klübersynth EG 4-220	Klübersynth EG 4-320	Klübersynth EG 4-460	Klübersynth EG 4-680	Klübersynth EG 4-1000
ISO VG DIN 51 519	150	220	320	460	680	1000
AGMA no.	4 EP	5 EP	6 EP	7 EP	8 EP	8 A EP
Density (g/ml) at 20 °C, approx. DIN 51 757	0,87	0,88	0,88	0,88	0,89	0,89
Kinematic viscosity (mm²/s), approx. DIN 51562	40 °C	150	220	320	460	680
	100 °C	18	24	30	38	50
Viscosity index DIN ISO 2909	≥ 130	≥ 130	≥ 130	≥ 130	≥ 130	≥ 130
Flash point (°C) DIN ISO 2592	> 200	> 200	> 200	> 200	> 200	> 200
Pour point (°C) DIN ISO 3016	≤ -40	≤ -35	≤ -30	≤ -35	≤ -25	≤ -15

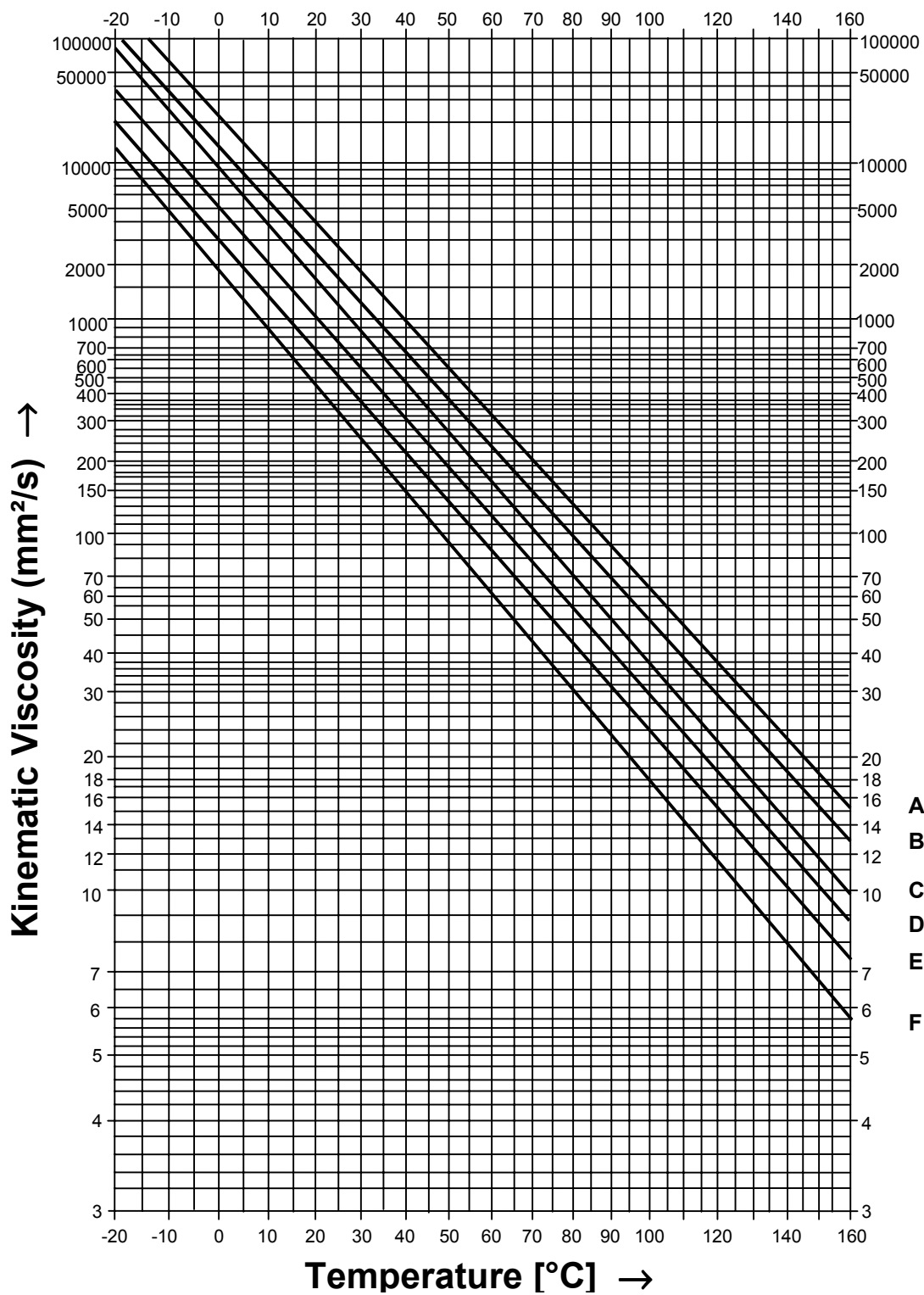
Compatibility with elastomers

Klübersynth EG 4-...	150	220	320	460	680	1000
with 72 NBR 902 at 100 °C / 168 h						
change in volume %	< 3	< 3	< 3	< 4	< 4	---
change in hardness (Shore A) approx.	< 2	< 2	< 2	< 2	± 1	---
with 75 FKM 585 at 150 °C / 168 h						
change in volume %	< 2	< 2	< 2	< 2	< 2	< 5
change in hardness (Shore A) approx.	< 3	< 5	≤ 6	< 5	≤ 6	< 4

Klübersynth® EG 4 oils

Synthetic high-performance gear oils

Temperature - Viscosity - Diagram



A) Klübersynth EG 4-1000
B) Klübersynth EG 4-680
C) Klübersynth EG 4-460

D) Klübersynth EG 4-320
E) Klübersynth EG 4-220
F) Klübersynth EG 4-150

Klübersynth® EG 4 Oils

Safety Data Sheet

1.1 Product name: Klübersynth EG 4- a) 150, b) 220, c) 320, d) 460, e) 680, f) 1000 Art.-No.: a) 012220, b) 012221, c) 012222, d) 012223, e) 012224, f) 012225	9. Physical and chemical properties 9.1 Form liquid Colour yellow (ISO VG 1000 - brown) Odour characteristic 9.2 Pour point see product data Flash point see product data 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: see product data Water solubility: insoluble pH-value: not applicable Kinematic viscosity: see product data 9.3 Further information: None
1.2 Klüber Lubrication München KG Geisenhausenerstraße 7 D-81379 München Telephone: ++49 - 89 - 78 76-0 telephone exchange Telefax: ++49 - 89 - 78 76-333 Emergency telephone no.: ++49 - 89 - 7876-0	
2. Composition / information on ingredients Chemical characterization: (preparation) Synthetic hydrocarbon oil, ester oil Additional information: No hazardous ingredients.	
3. Hazards identification No particular hazards known.	
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.	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
5. Fire - fighting measures Suitable extinguishing media: Water spray, foam, dry powder, carbon dioxide (CO ₂) 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.	11. Toxicological information The toxicological data has been taken from products of similar composition. Acute toxicity: LD50/oral/rat = > 2g/kg (literature data) Chronic toxicity: None Human experience: Prolonged skin contact may cause skin irritation and/or dermatitis
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.	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.
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. Do not store together with food Further information on storage conditions: Store at room temperature in the original container.	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.
8. Exposure controls / personal protection 8.1 Additional advice on system design: Not applicable 8.2 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: Avoid prolonged and/or repeated contact with skin. Clean skin thoroughly after work; apply skin cream. Remove soiled or soaked clothing immediately. Do not inhale aerosol.	14. Transport information 14.1 GGVS / GGVE: not applicable 14.2 ADN / ADNR: not applicable 14.3 IMDG-Code: not applicable 14.4 ICAO / IATA-DGR: not applicable 14.5 Further information: Not classified as dangerous in the meaning of transport regulations.
	15. Regulatory information 15.1 Labelling according to EU-guidelines The product does not require a hazard warning label in accordance with EC-directives / German regulations on dangerous substances. 15.2 Nationals regulations
	16. Other information Issue-department of Safety Data Sheet: Chemical Documentation, Tel.: ++49 - 89 - 78 76-564

The information provided in this Safety Data Sheet is correct to the best of our knowledge. Information and belief at the data of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid if the material is used in combination with any other materials or if is specified in the text.



Klüber Lubrication, member of the Freudenberg group

Klübersynth EG 4 Oils

Synthetic high performance gear oils

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 51 509 Pt 1, „Selection of lubricants for toothed gears“. All information in this worksheet applies only to Klübersynth EG 4 oils. The differing viscosity-temperature and viscosity pressure behaviour of these synthetic oils as compared to mineral oils has been taken into account.

The correct viscosity must be selected independently for any 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 required viscosity grade to the Klübersynth EG 4 oils for a gear stage is determined by means of the required Klüber viscosity index and the oil's expected operating temperature using the diagram of the last page.

Klübersynth EG 4 Oils: 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
$\leq 0,02$	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]

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

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

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: $Z_H^2 \cdot Z_\epsilon^2 \approx 3$

^{*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:	$F_t = 3000 \text{ N}$
Tooth width:	$b = 25 \text{ mm}$
Diameter of reference circle:	$d_1 = 230 \text{ mm}$
Gear ratio:	$U = 2,5$
$Z_H^2 \cdot Z_\epsilon^2$:	≈ 3
K_A :	1
Peripheral speed:	$v = 4 \text{ m/s}$
Expected oil sump temperature:	$\approx 90 \text{ }^\circ\text{C}$
Rolling pressure acc. to Stribeck:	$K_S = 2,2 \text{ MPA}$
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

For this application we selected Klübersynth EG 4-220 in accordance with the diagram on page 4.

Klübersynth EG 4 Oils: 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 $K_S/v \left[\frac{\text{N} \cdot \text{min}}{\text{m}^2} \right]$	Klüber viscosity index KVZ
≤ 60	5
> 60 to 400	6
> 400 to 1800	7
> 1800 to 6000	8
> 6000	9

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

T_2 = Output moment [Nm]

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

a = Center 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 moment:	$T_2 = 300 \text{ Nm}$
Worm speed:	$n_1 = 500 \text{ min}^{-1}$
Center distance:	$a = 0.08 \text{ m}$
Application factor:	$K_A = 1$
Force-speed factor:	$K_S/v = 1171.9 \frac{\text{N} \cdot \text{min}}{\text{m}^2}$
Klüber viscosity index acc. to table 2:	KVZ = 7
Expected oil sump temperature:	$\approx 85 \text{ }^\circ\text{C}$

For this application Klübersynth EG 4-680 was selected in accordance with the diagram on page 4.

