

SYNTHESO® D/EP-Öle

Synthetic high-performance gear oils



Description:

SYNTHESO D/EP oils are synthetic high-performance gear oils on a polyglycol basis. They have a very high scuffing load capacity and provide reliable protection against wear. In addition, they have passed the FZG-L-42 scuffing load test for hypoid gear oils. SYNTHESO D/EP oils are especially resistant to ageing and have a good viscosity-temperature relation.

Application:

SYNTHESO D/EP oils are used for the lubrication of steel/steel gear systems. They are especially suitable for extreme requirements in terms of wear protection and scuffing load capacity, e.g. in bevel, spur and worm gears subject to shock loads, and in hypoid gears. SYNTHESO D/EP oils are frequently used in high-speed worm gears and gears with a long center distance. In addition, they are used in rolling bearings and gear couplings. Owing to their special polyglycol base oils, they reduce the friction coefficient. When carefully selecting a suitable viscosity grade, it is possible to increase efficiency, decrease temperatures and ensure long-term lubrication.

Application notes:

SYNTHESO D/EP oils are suitable for immersion, immersion circulation, and injection lubrication. In case of automatic lubrication systems it is important to observe the manufacturer's instructions on maximum viscosity levels.

SYNTHESO D/EP oils are **not miscible** with mineral oils and synthetic hydrocarbons. We recommend cleaning the lubrication points prior to conversion, and rinsing gears or closed lubrication systems with the SYNTHESO D/EP oil that will be used for lubrication.

SYNTHESO D/EP oils are neutral towards ferrous materials and almost all non-ferrous metals.

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

Depending on the temperature and exposure time, synthetic lubricants on a polyglycol base may have an impact on the functional capacity of rubber-elastic sealing materials. Seals made of NBR materials (acrylonitrile-butadiene-rubber) can be used at permanent temperatures up to 100 °C (corresponds to the temperature limit of SYNTHESO D/EP oils).

It has to be taken into account that different elastomer qualities produced by one manufacturer or different manufacturers may show a different behaviour.

Paints may be attacked by synthetic lubricants. When applying SYNTHESO D/EP oils we recommend the use of two-component paints (reactive 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. **We recommend testing the suitability of design materials in contact with the selected lubricants, especially for series application.**

Viscosity selection for rolling bearings and gears:

- Rolling bearings

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

SYNTHESO D/EP oils

- Synthetic high-performance gear oils
- Excellent scuffing load capacity
- Excellent wear protection
- Reduce friction

For determining the existing viscosity, refer to the enclosed viscosity-temperature diagram indicating the differing viscosity-temperature behaviour of SYNTHESO D/EP oils as compared to mineral oils.

- Gears

The manufacturer's instructions take priority in all cases. The correct viscosity can also be selected in accordance with the enclosed worksheet "SYNTHESO D/EP oils – Selection of oil viscosity for gears".

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:

20 kg canister
180 kg drum

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Service temperature range*:

Immersion lubrication:

SYNTHESO D/EP 68 150:
approx. – 35 °C to 100 °C

SYNTHESO D/EP 220 460:
approx. – 30 °C to 100 °C

SYNTHESO D/EP 680 und 1000:
approx. – 20 °C to 100 °C

Product data:

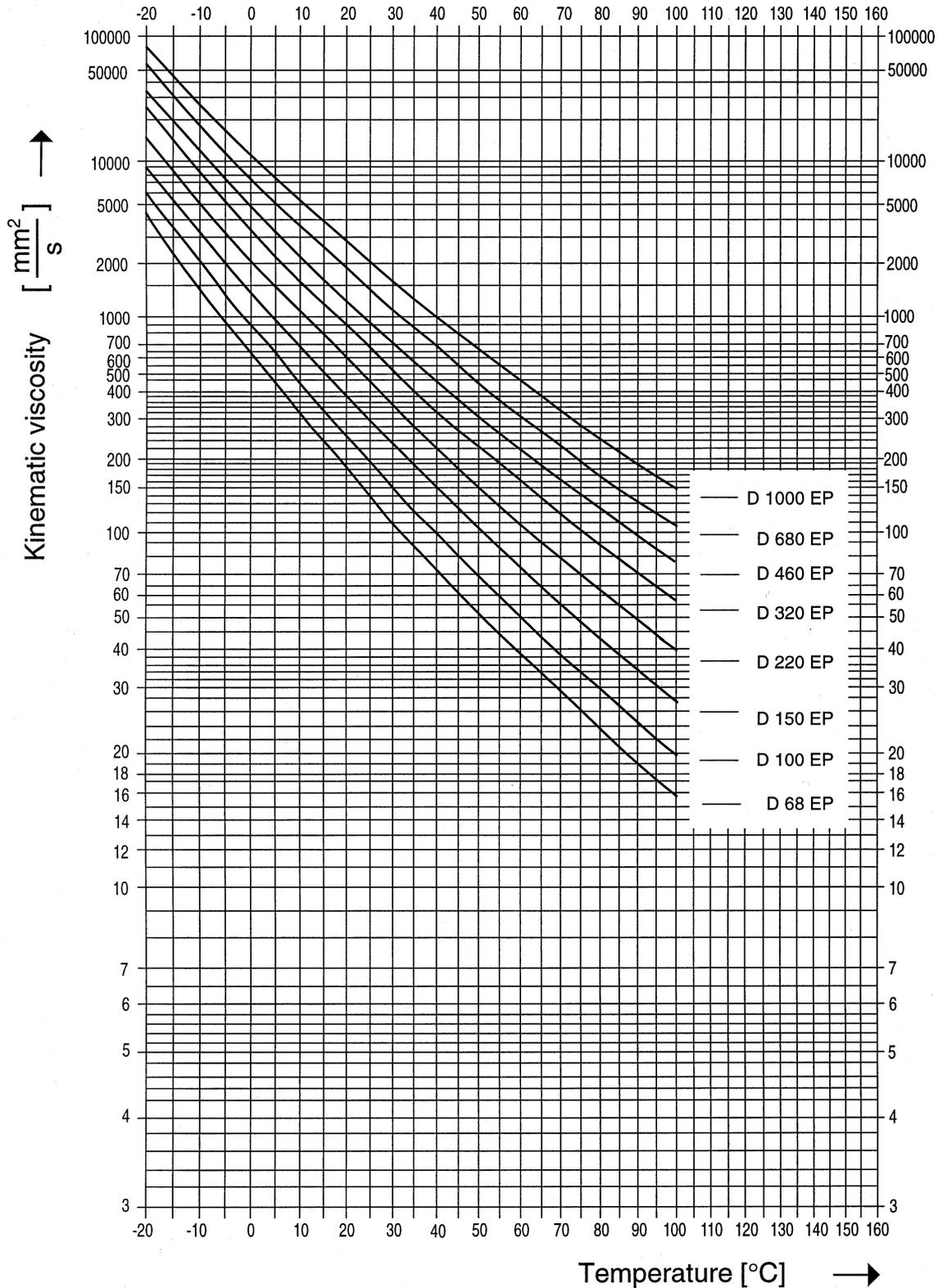
	SYNTHESO D 68 EP	SYNTHESO D 100 EP	SYNTHESO D 150 EP	SYNTHESO D 220 EP	SYNTHESO D 320 EP	SYNTHESO D 460 EP	SYNTHESO D 680 EP	SYNTHESO D 1000 EP
ISO VG DIN 51 519	–	100	150	220	320	460	680	1000
Density, DIN 51 757, (g/ml), at 20 °C, approx.	1.04	1.04	1.05	1.05	1.05	1.05	1.05	1.05
Kinematic viscosity, DIN 51 562, at 40 °C, mm ² /s, approx. at 100 °C, mm ² /s, approx.	80 15.5	100 20.5	150 29	220 38	320 60	460 75	680 120	1000 170
Viscosity index, DIN ISO 2909, approx.	> 180	> 210	> 210	> 210	> 230	> 230	> 250	> 270
Flash point, DIN ISO 2592, °C	> 200	> 200	> 200	> 200	> 200	> 200	> 200	> 200
Pour point, DIN ISO 3016, °C	< – 40	< – 40	< – 40	< – 35	< – 30	< – 30	< – 25	< – 20

* 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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Safety Data Sheet

<p>1.1 Product name: SYNTHESO D a) 68 EP, b) 100 EP, c) 150 EP, d) 220 EP, e) 320 EP, f) 460 EP, g) 680 EP, h) 1000 EP</p> <p>Code-No.: a) 012 060, b) 012 062, c) 012 058, d) 012 056, e) 012 125, f) 012 068, g) 012 083, h) 012 089 16.11.2000</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): Polyalkylene glycol 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. Do not store together with food 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: 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</p>

<p>9. Physical and chemical properties Form: liquid Colour: light yellow Odour: characteristic Pour point: a), b), c) < - 40, d) < - 35, e), f) < - 30, g) < - 25, h) < - 20, °C, DIN ISO 3016 Flash point: > 200 °C, DIN ISO 2592 Ignition temperature: not applicable Lower explosion limit: not applicable Upper explosion limit: not applicable Vapour pressure-first Density, approx.: not applicable a), b) 1.04, c), d), e), f), g), h) 1.05, g/cm³, 20 °C, DIN 51 757 Water solubility: partly soluble pH value: not applicable Kinematic viscosity, approx.: a) 80, b) 100, c) 155, d) 220, e) 320, f) 460, g) 680, h) 1000, mm²/s, 40 °C, DIN 51 562 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: Prolonged skin contact may cause skin irritation and/or dermatitis</p>
<p>12. Ecological information Information on elimination (persistence and degradability): The product has not been tested Behaviour in environmental compartments: Ecological injuries are not known or expected under normal use Ecotoxic effects: The product has not been tested 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 incineration 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 / ADNR: 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 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

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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 51 509 Pt 1, “Selection of lubricants for toothed gears”. All information in this worksheet applies only to SYNTHESO D/EP 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 each 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 of the SYNTHESO D/EP 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.

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/mm²]

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

F_t = Nominal peripheral force [N]

b = Tooth width [mm]

d_1 = Diameter of reference circle [mm]

U = Gear ratio = Z_2/Z_1 ^{*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:	$F_t = 3000 \text{ N}$
Tooth width:	$b = 25 \text{ mm}$
Diameter of reference circle:	$d_1 = 230 \text{ mm}$
Gear ratio:	$U = 2.5$
$Z_H^2 \cdot Z_e^2$:	≈ 3
K_A :	1
Peripheral speed:	4 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 SYNTHESO D 150 EP in accordance with the diagram on page 4.

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

The required Klüber viscosity index for a spur 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 conveyer

- Drive: Electric motor
- Output moment: $T_2 = 300 \text{ Nm}$
- Worm speed: $n_1 = 350 \text{ min}^{-1}$
- Center distance: $a = 0.063 \text{ m}$
- Application factor: $K_A = 1$
- Force-speed factor: $K_S/v = 3427.9 \frac{\text{N} \cdot \text{min}}{\text{m}^2}$
- Klüber viscosity index acc. to table 2: KVZ = 8
- Expected oil sump temperature: $\approx 85 \text{ }^\circ\text{C}$

For this application SYNTHESO D 460 EP was selected in accordance with the diagram on page 4.

