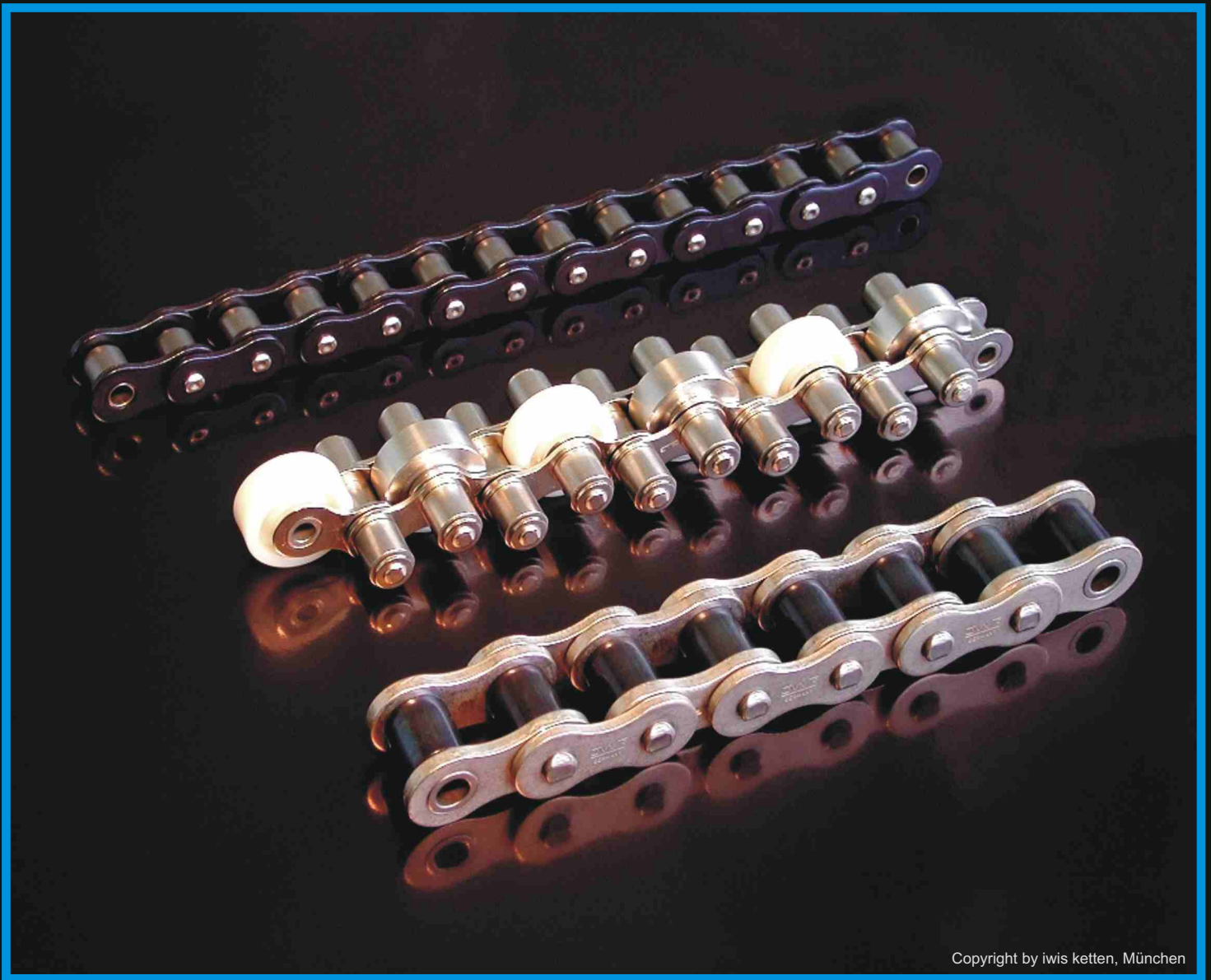


We have the solution...

...the future has a name



Special Lubricants for Chains



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TURMOFLUID® Series B

Use Lubricants which are
Successfully Applied by
the Industry.



The high efficiency of the **LUBCON** lubricants is proven by

- long service life
- good running properties
- high operational reliability





Chains are made up of links supported by plain bearings. Most of these small bearings operate at low speeds and are subject to oscillations. From experience it is known that full fluid film lubrication usually does not occur in such friction points.

Instead, they are difficult to access, speeds are moderate and lubrication often fails completely at the points of reversal. This is the reason why there is normally a mixed friction condition.

Friction and wear can be prevented by using special lubricants which form a reaction layer in the contact areas, a phenomenon which is often referred to as “**chemical lubrication**”.

An important criterion is the specific running-in wear which causes a certain geometrical modification of the contact elements and ensures that the roughness peaks of the contact surfaces are smoothed to the desired extent. As is well known, this running-in process leads to a significant decrease of the surface pressure, similar to plain hydrodynamic bearings.

Advantages:

- high-temperature resistance
- higher service life and longer maintenance intervals
- Replacement of many lubricants used in different points by one lubricant specified to the optimum
- reduction of stock keeping
- simple and cost-saving disposal
- minimization of manpower
- not liable to identification marking

The following lubricant recommendation is only a suggestion because of the manifold demands and different machines and therefore **LUBCON** offers you a free consultation and complete assistance before, during and after your purchase of **LUBCON lubricants**.

Should one or the other point of lubrication need a new product, our development department is, of course, always available to you.



This brochure only contains product information. For specific information please refer to our technical data and safety data sheets. The indications made represent the present state of development and knowledge of **LUBRICANT CONSULT GMBH**. Subject to change. The products are subject to severe controls of manufacture and comply in full with the specifications set forth by our company, but due to the multitude of different influencing factors, we cannot assume any warranty for the successful application in each individual case. Therefore, we recommend to perform field tests. We strictly refuse any liability.

TURMOFLUID® oils of the **B series** are light-coloured chain oils on a synthetic oil basis with thermally stable oxidation inhibitors and special EP additives which, owing to synergetic effects, ensure that the required reaction layer is formed in a wide temperature range.

The oil's excellent penetration properties ensure that it reaches all contact points.

TURMOFLUID® series B oils do not contain harmful heavy metals.

Due to the favourable viscosity temperature behaviour and the high viscosity index of 160, they can be used without problems in the specified service temperature range.

The oils do not resinify at high temperatures, and they do not leave solid residues, but only a small quantity of powder-like residues which have turned out to be of no negative effect in practical use.

TURMOFLUID® series B oils have a low tendency towards evaporation, even at increased temperatures. Their full lubricating effect ensures low friction, and thus also reduced power consumption in practical applications.

The chain lubricated with **TURMOFLUID® 40 BK** is free from encrustations even after operation at high temperatures and still has a bright surface, see **fig. 1**.

The chain lubricated with an unfavourable competing oil clearly leaves lubricant residues, see **fig. 2**.



Fig. 1:
Roller chain after operation
Lubrication with **TURMOFLUID® 40 BK**

The special oils of the **TURMOFLUID® B series** are suitable for the lubrication of chains subject to high temperatures, e. g. in dryers, painting systems and stenters. In the wood processing industry they are used in ContiRoll systems (roller bar chain and steel belt lubrication).

Determination of the Application Range by means of Mechanic-dynamical and Chemical Tests

SRV test: The good lubricity is verified in the SRV test subjecting the specimens to oscillating movements under the following test conditions:

- **Contact geometry: point - surface**
- **Test component: ball - disk, standard surface quality**
- **Sliding distance (= length of stroke): 1200 µm**
- **Load: 100 N, frequency: 50 Hz**
- **Running time: 2 hours at temperatures of +200 °C**

In this tests, **TURMOFLUID® 40 BK** showed an extremely low wear rate and a very low friction coefficient of $\mu = 0.11$ to 0.13 . **Diagram 1, p. 5** shows the friction curve as a function of the running time, **diagram 2** shows the friction surface profile graph. **Fig. 3** are photographs of the wear areas which prove that chain oil has a good lubricity and leads to extremely low wear (wear factor = 400, wear depth = 2.0 µm, wear scar diameter = 505 µm).

A competing oil used in the same test had the results of increased wear (wear factor = 1687, wear depth 5.5 µm, wear scar diameter = 625 µm), see the **diagrams 3 + 4 and fig. 4, p. 6**.



Fig. 2:
Roller chain after operation
Lubrication with an unfavourable competing oil

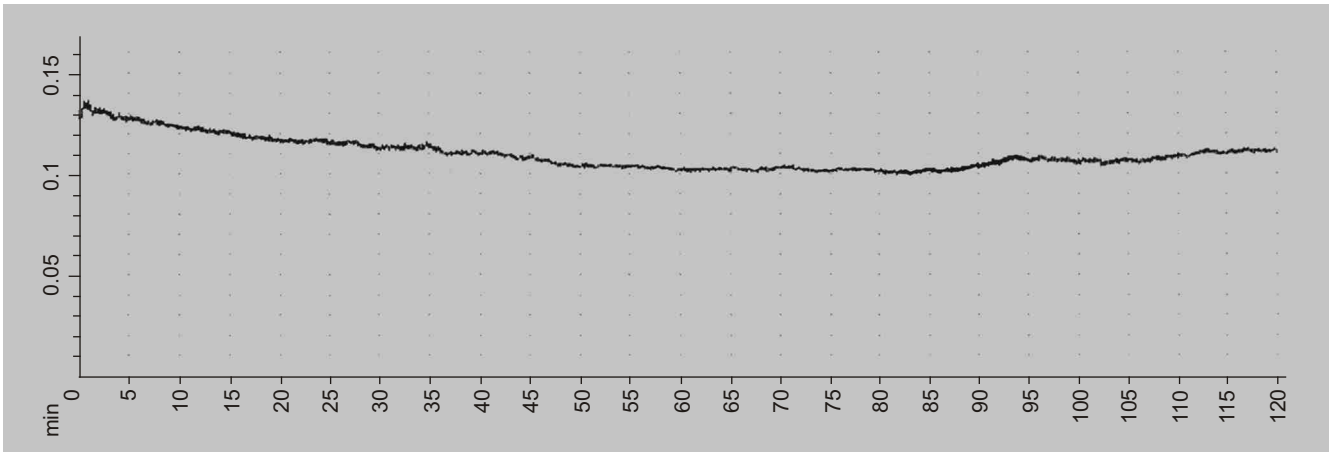


Diagram 1:
SRV test - Friction coefficient as a function of the running time
Lubrication with **TURMOFLUID® 40 BK**

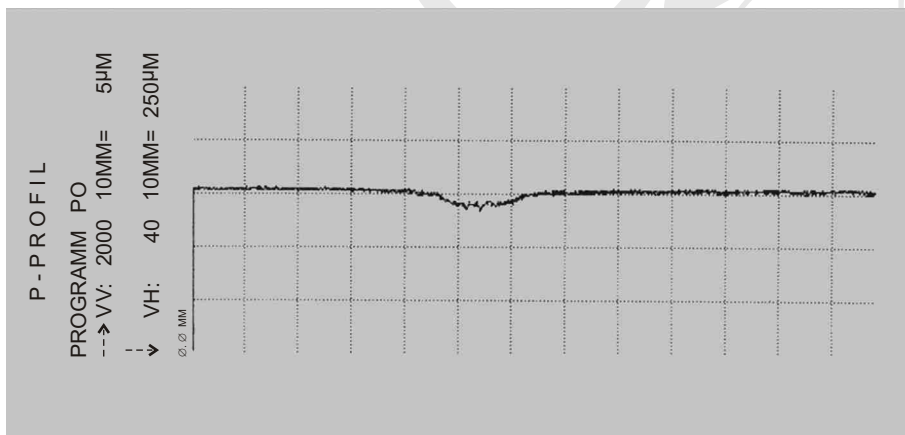


Diagram 2:
SRV test - Profile graph of the friction surface
Lubrication with **TURMOFLUID® 40 BK**

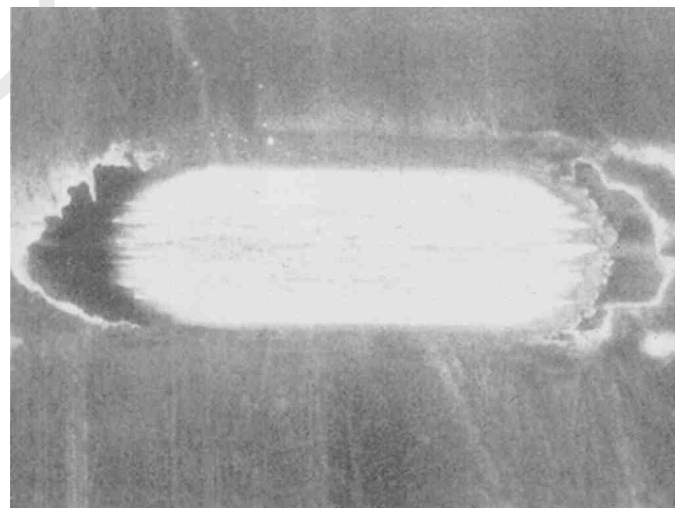
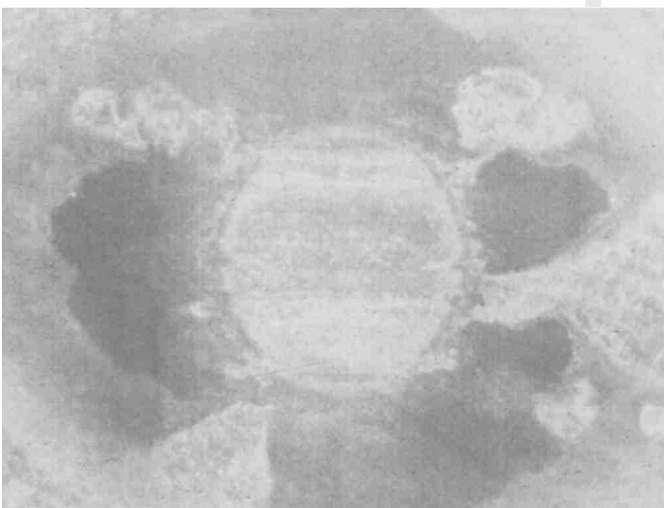


Fig. 3:
SRV test - Wear zones ball/disk
Lubrication with **TURMOFLUID® 40 BK**

Test Results with an Unfavourable Competing Product

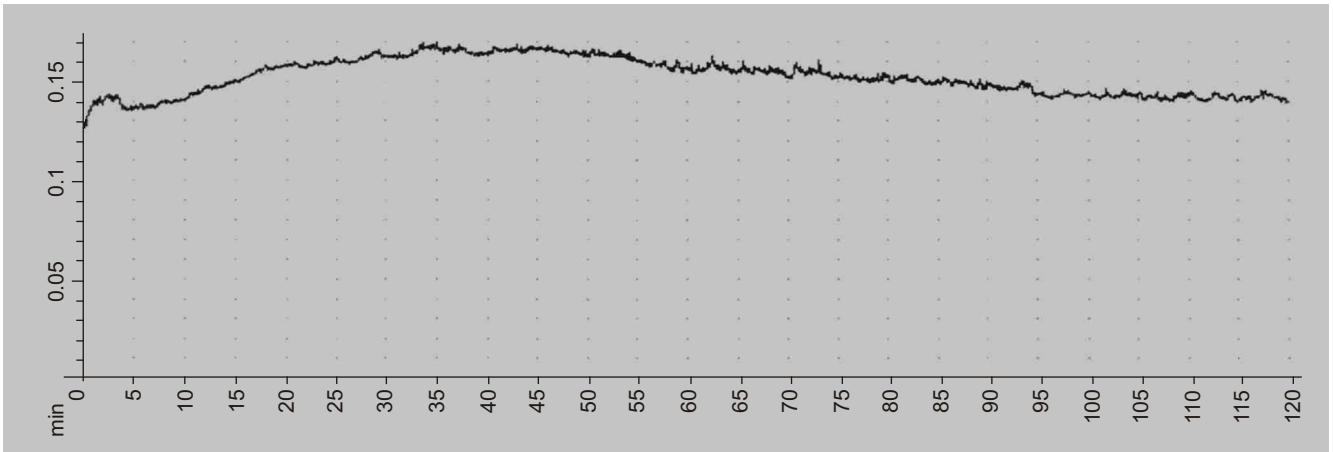


Diagram 3:
SRV test - Friction coefficient as a function of the running time
Lubrication with an unfavourable competing oil

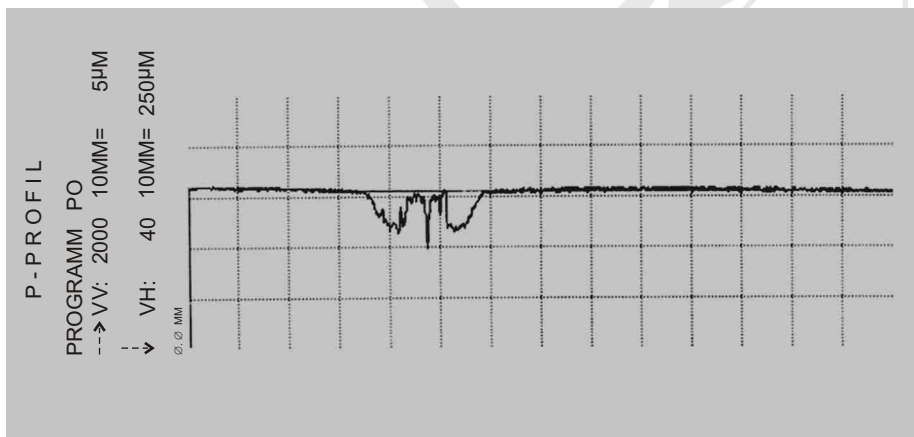


Diagram 4:
SRV test - Profile graph of the friction surface
Lubrication with an unfavourable competing oil

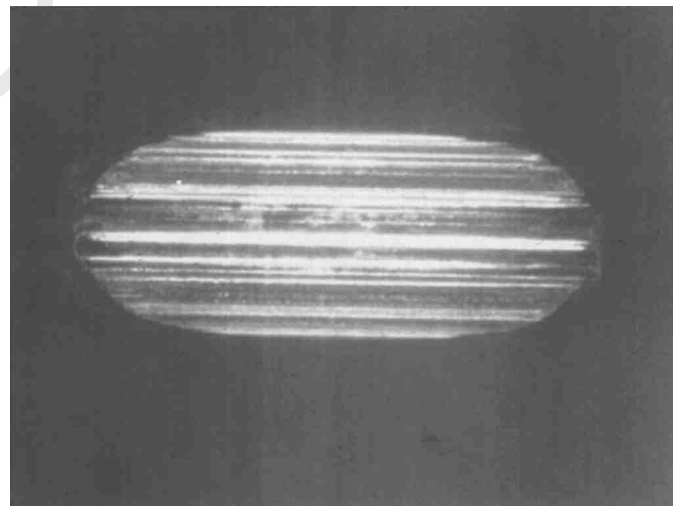
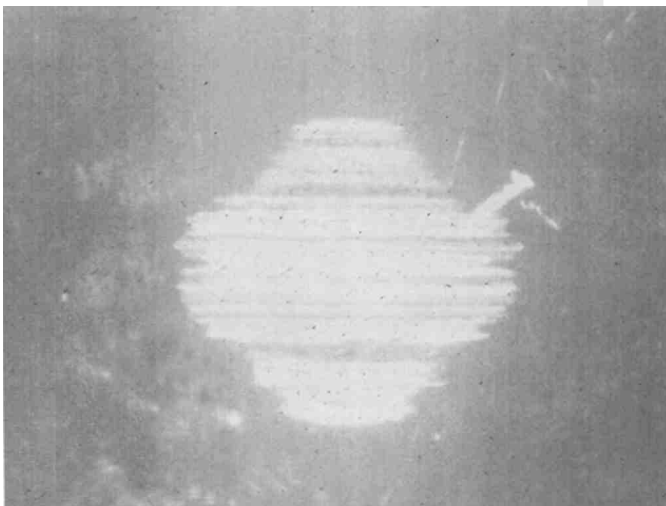


Fig. 4:
SRV test - Wear zones ball/disk
Lubrication with an unfavourable competing oil



Wear Test with Roller Chain 08B - 1 DIN 8187, A + S, Type 1603

The roller chains used in the wear test contains 32 links and operates on rollers with a gear ratio of $z_1 = z_2 = 17$.

The test conditions are as follows:

- Tension load $F = 2400 \text{ N}$
- Contact area pressure $p = 4800 \text{ N/mm}^2$
- Speed $n = 70 \text{ min}^{-1}$

The change in length obtained with **TURMOFLUID® 40 BK** during the test run is shown in **diagram 5, p. 8**, which also indicates the change in length when using a competing oil.

Comparing both curves, it is obvious that competing oils result in the same change in length in approximately half the time, i. e. much earlier.

TURMOFLUID® 40 BK ensures good wear protection, prevents premature change in length or, in other words, premature wear.

Formation of Residues and Residue - Dissolving Properties of TURMOFLUID® 40 BK

If ageing, usually under the presence of oxygen, leads to oil residues, it is important to prevent these residues from hardening. They should remain soft in order to guarantee a stable lubrication condition. The residues should be dissolved when adding fresh oil.

When stored in a heating cabinet (+250 °C), **TURMOFLUID® 40 BK** oil samples do not leave any hard residues but a white, powder-like substance, see **fig. 5 right, p. 8**.

The base oil of **TURMOFLUID® 40 BK** and the contained additives make the residues soft and give the product the capability of dissolving residues.

The unfavourable competing oil leaves hardening residues partly splintering pieces as hard as glass which, however, can be dissolved by using **TURMOFLUID® 40 BK**, see **fig. 5 left, p. 8**.

The best result is usually achieved by using **TURMOFLUID® 40 BK** as a lubricating oil for chains **and** to regenerate solid residues, especially if the operating temperatures are high and ageing is a problem due to the ingress of oxygen.

Evaporation Losses at Operating Temperatures

The **diagram 6, p. 8** shows the evaporation loss when using different chain oils: **TURMOFLUID® 40 BK** and two competing oils.

The low evaporation loss of **TURMOFLUID® 40 BK** and of the competing oil no. 1 suggest that lubricant losses are low, relubrication cycles are long, and environmental pollution due to evaporating oil is low.

The low evaporation rate also ensures that the oil is always present in the critical contact points.

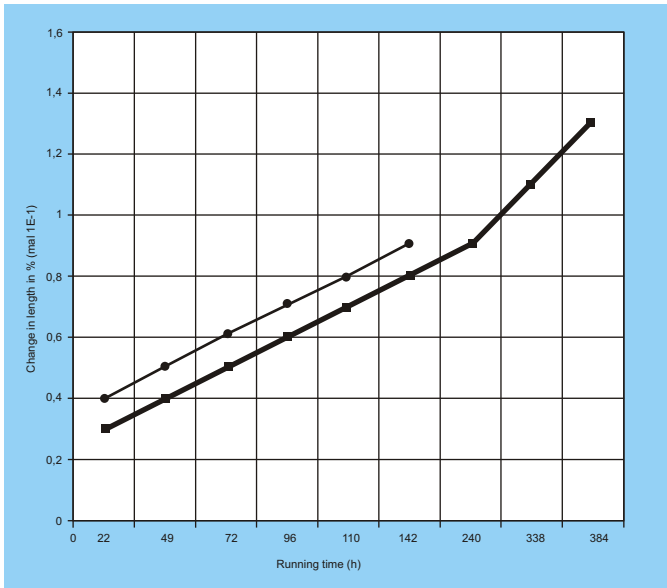


Diagram 5:
Results of wear tests with roller chains 08B - 1 DIN 8187, A + S, type 1603 with different chain oils

TURMOFLUID® 40 BK
 Competing product



Fig. 5:
Residues after storage at +250 °C, right: TURMOFLUID® 40 BK, left: an unfavourable competing oil

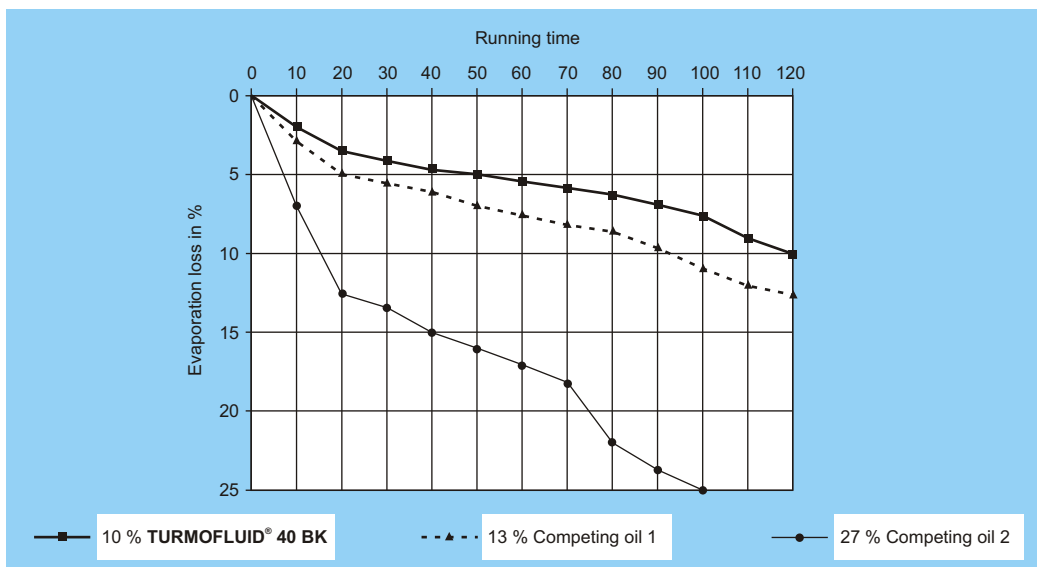


Diagram 6:
Evaporation losses of different chain oils at +200 °C



■ Universal Oil for Thin-film Lubrication

TURMOFLUID® ED 13

- fully synthetic
- Colour: clear/transparent
- Service temperature range: -45 °C up to +150 °C
- silicone free, no resinification, thin-bodied
- high creeping behaviour, good spreading behaviour
- high-pressure resistant, prevents squealing noises
- displaces water, does not consolidate dust
- good corrosion protection

An universal oil for all repair works. Rust-in or tight hinges or guides are released and work smoothly.

Suitable for the lubrication of machines, machine parts and dust loaded chains in the measuring and control technique, in the construction of machines and tools as well as in the foodstuff and plastic industry.

■ Adhesive Lubricating Oil for High Temperatures

TURMOFLUID® 300 OM

- fully synthetic
- Colour: green/transparent
- Service temperature range: -5 °C up to +240 °C
- good creeping behaviour, stays supple in the cold
- excellent adhesive properties
- silencing, high load carrying capacity
- reducing wear, excellent corrosion protection

Spray for the lubrication of open drives and wire ropes, chains, guideways, gearwheels, sliding points and control cams, when a good adhesion is required.

■ Adhesive Lubricant

GRIZZLYGREASE® No. 1

- Colour: darkbrown
- Service temperature range: -30 °C up to +150 °C
- heat resistant, extremely adhesive
- good wear protection

Suitable for a vast range of applications at high temperatures combined with extreme loads.

To be used for ball and roller bearings as well as for sliding bearings, liners and open gear drives.

■ H1-Foodstuff Oil

TURMOFLUID® LMI 300

- fully synthetic
- Colour: colourless/transparent
- Service temperature range: -10 °C up to +220 °C
- good creeping behaviour, stays supple in the cold
- adhesive, excellent lubricating film load capacity
- silencing, high load carrying capacity
- no resinification, no acid and sticking formation

Adhesive spray for chains and outdoor cables, oil-tight couplings (curved teeth), non-contaminating, therefore suitable for open drives and residue-free high-temperature lubrication.

Physiologically recognised as safe, inodorous and tasteless lubricating and release agent which meets the requirements of § 5 of the German food act (LMBG) and the FDA 21 CFR 178.3570. As NSF registered H1-product its contact with foodstuff is admissible and therefore it will be used in all areas of the foodstuff, beverage and cosmetic industry as well as dental techniques.

■ H1-Foodstuff Oil

TURMO®SYNTHOIL 75 TF

- fully synthetic
- Colour: lightbeige/opac
- Service temperature range: -15 °C up to +180 °C
- silicone free, reducing friction
- excellent wetting properties
- low evaporation loss, no resinification
- low up-take of current, good wear protection

Physiologically recognised as safe, inodorous and tasteless lubricating and release agent which meets the requirements of § 5 of the German food act (LMBG) and the FDA 21 CFR 178.3570. As NSF registered H1-product its contact with foodstuff is admissible and therefore it will be used in all areas of the pharma, foodstuff and beverage industry.

■ Lubricating Oil for the Foil Industry

TURMOFILM®OIL 220

- fully synthetic
- Colour: yellowish-brown/transparent
- Service temperature range: -10 °C up to +250 °C
- thermally stable, low evaporation loss, does not polymerise
- extremely adhesive, few powder-like residues
- low moment of friction, resistant to oxidation

For oil lubricated, thermally loaded chains in foil stretching machines exposed to high temperatures. Due to the synergetic effect of the additives, far superior to all chain oils known hitherto.

■ Chain Lubricant for the Insulating Industry

TURMOFLUID® HF 150 plus

- fully synthetic
- Colour: brownish/transparent
- Service temperature range: -20 °C up to +280 °C
- low evaporation loss and up-take of current
- low moment of friction, high load carrying capacity
- free of environmental loaded heavy metals

Special chain lubricant for oil lubricated, thermally loaded chains in drying plants, lacquer plants and stenter frames.

Wood industry: Conti roll plants, rolling rod chains and steel belt lubrication.

■ Chain/Belt Lubrication in the Chip Board Industry

TURMOWOOD®OIL 1

- fully synthetic
 - Colour: yellowish/transparent
 - Service temperature range: -30 °C up to >+250 °C
 - good viscosity-temperature behaviour, silicone free
 - low evaporation loss, high load carrying capacity
 - does not polymerize, resistant to oxidation, good wear protection
- Suitable for the lubrication of all driving and conveyor chains as well as for the lubrication of belts and rolling rods in Conti double belt presses.

■ Lubricating Oil for Bending Rods, Bolts and Rolling Rods

TURMOWOOD®OIL 2

- fully synthetic
 - Colour: blue/transparent
 - Service temperature range: -30 °C up to +250 °C
 - excellent creeping behaviour, low moment of friction
 - low up-take of current, non-polymerizing (non-toxic)
 - high cleaning effect, resistant to ageing and oxidation
- Applicable for all driving chains and conveyor chains. Proved of excellent results in the lubrication of bending rods in Conti double belt presses. Exempt from sulphur compounds.



Technical Data

TURMOFLUID® series B - Survey of Types - Product Description

Technical Data	TURMOFLUID® serie				
	15 B	20 B	40 B	40 BK	60 B
Colour Appearance	yellowish/transparent	yellowish/transparent	yellowish/transparent	brownish/transparent	yellowish/transparent
Density +20 °C DIN 51751 (g/ml)	0.975	0.975	0.915	0.915	1.003
Base oil viscosity (mm ² /s) DIN 51562 +40 °C/+100 °C	~ 60/ ~ 11	~ 110/ ~ 14	~ 270/ ~ 32	~ 265/ ~ 32	~ 618/ ~ 70
Viscosity index (VI _E) ISO 2909	140	133	160	160	191
Flash point (°C) DIN 51758	+280	+290	+280	+280	+265
Pour point (°C) DIN 51597	-45	-35	-35	-35	-30
Service temperature range (°C)	-30 ... +250	-20 ... +250	-20 ... +250	-20 ... +250	-10 ... +260
Evaporation loss DIN 51581 +250 °C (% by wt.)	8	4	2	< 2	2
VKA* welding load DIN 51350 Pt. 2 (N)	2000/2200	2000/2200	2800/3200	3000/3200	2800/3200
AWM** pressure DIN 51350 (N)	20000	20000	20000	20000	20000
FZG test A 8.3/+90 °C DIN 51354 Bl. 2 Scuffing load stage	--	--	12	> 12	12
Special FZG test A 16.6/+140 °C Scuffing load stage	--	--	12	> 12	12
SRV test: Temperature: +200 °C Time: 10 min. Load: 500 N	low friction coefficient constant friction curve no friction peaks				

* VKA value:

Four-ball-apparatus - Test of boundary friction conditions under high pressure. Four balls from a ball bearing are arranged like a pyramid. The lower three balls are fixed in a chuck below the oil or grease to be tested. The upper ball rotates under load. The load under which the balls weld, or the wear scars on the balls, are measured as a function of the test duration.

** AWM value:

Almen-Wieland testing apparatus - Machine to test the boundary friction coefficient in the high-pressure range. A small rotating shaft is subject to load exerted by two bearing halves pressed onto the shaft; it rotates in a sump of the oil or grease to be tested. The load at which the test elements weld is usually measured.



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