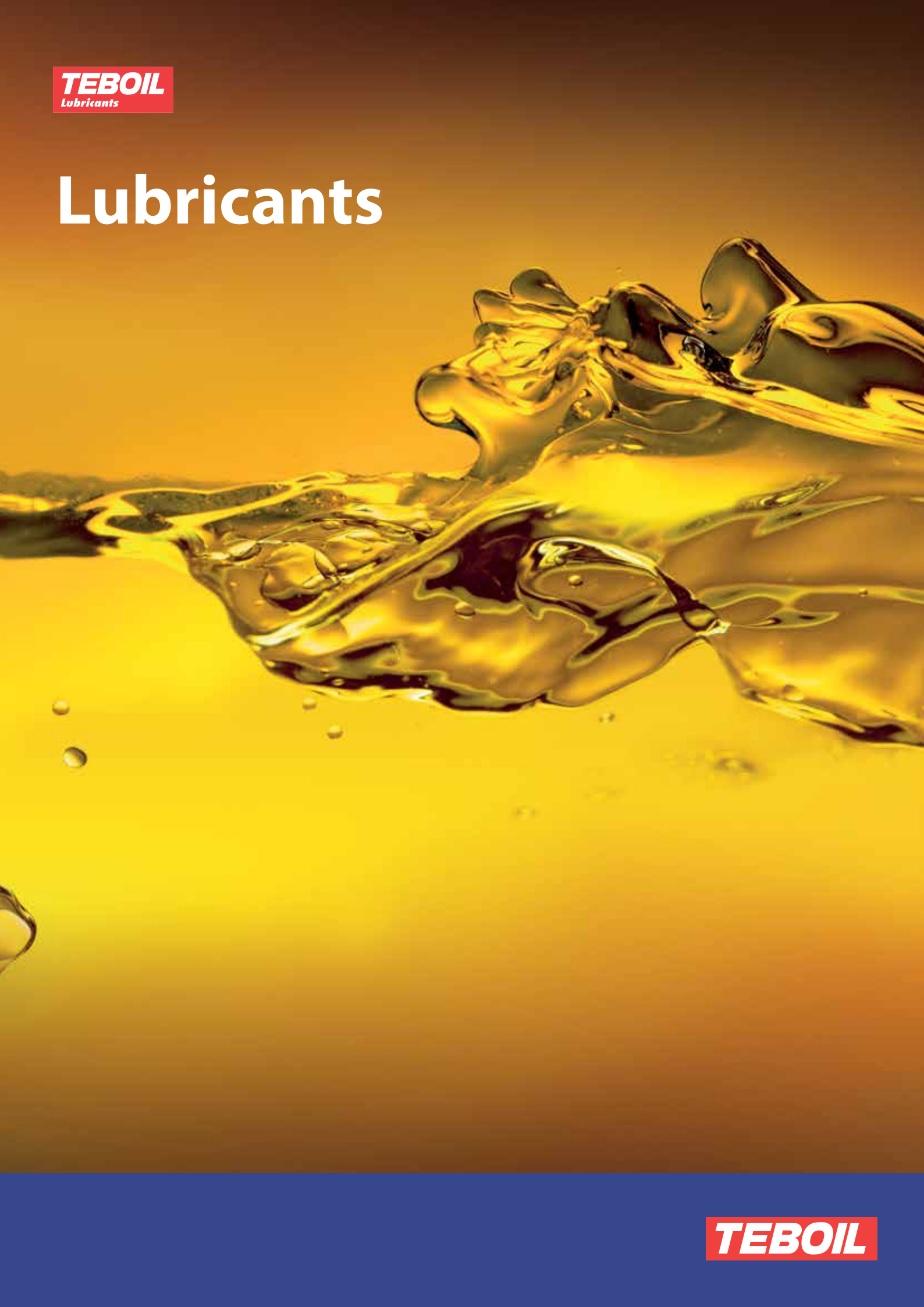
TEBOIL Lubricants

Lubricants



TEBOIL

Lubricant supplier of excellent versatility

Finnish oil expertise

Teboil lubricants proudly hold a strong and established position on the Finnish market. Development of the company's own trademark commenced over 50 years ago. From the very beginning, the objective has been manufacture of products designed especially for the Finnish environment.

Today, Teboil dominates nearly one-third of the total Finnish lubricant market.

Continuing development

Quick technical development along with vehicle and machinery manufacturers' changing recommendations are setting continuously new challenges for lubricants. We are engaged in continuous research and development in co-operation with our clients, additive, vehicle, and machinery manufacturers for the purpose of developing new, improved and better-performing lubricants. Our northern climate requires special requirements to lubricants, especially in the winter period. The objective of Teboil lubricants' development is to introduce to the market high-performance lubricants especially suitable for the Finnish environment.

Teboil's lubricant production facilities are located in Hamina. The lubricant production and laboratory activities have been granted the SFS-EN ISO 9001:2008 quality certification and SFS-EN ISO 14001:2004 environment certification, as well as OHSAS 18001:2003 occupational health and safety certification.

Automotive lubricants

Teboil has a wide selection of lubricants to meet any lubrication demands of both light and heavy vehicles. Teboil actively introduces new lubricants, which increases the clients' possibilities to select the best product for their needs. The latest top oils in our range include, for example, diesel engine oil Super XLD-3 10W-40 which is designed for commercial vehicles, especially for Scania Euro 6 motors, characterised by extremely low emissions and equipped with exhaust gas purification systems based on the newest technologies.

Industrial lubricants

Teboil is a reliable and innovative partner for industrial corporations. Diverse production programme, possibility to develop tailored products and optimized lubricating management programme OVHO will assist industrial clients in rationalisation of their lubricating needs. Teboil's co-operation with German special lubricants manufacturer Rhenus Lub will provide improved competence to serve the needs of industrial corporations.

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Basics about lubricants

Density and specific gravity

Density of a substance is its weight divided by volume [kg/m^3]. Specific gravity is the relation between the weight of a material volume and corresponding weight of a similar water volume. Density and specific gravity are variables depending on temperature.

Viscosity

Viscosity is a temperature-dependant variable that measures flowing characteristics of a liquid. There are several viscosity units. Lubricating oils are generally measured with kinematic viscosity, the unit of which is Stoke [St] in the SI system [m^2/s] or more functional centiStoke [cSt] in the SI system [mm^2/s]. When the kinematic viscosity is multiplied by oil density in the measuring temperature, the result is dynamic viscosity, the unit of which is Poisi [P]. In the SI system, the unit of dynamic viscosity is Pascal-second, [Pas] [Ns/m^2].

Viscosity index

Viscosity index, abbreviated VI, describes the dependence of oil viscosity on temperature change. The greater the VI value, the less the oil's viscosity changes as the temperature varies.

Flash point

When oil is heated, vapours are generated that can be ignited briefly with open flame. The temperature at which ignition of vapours occurs is called the flash point.

Pour point

The pour point is defined as the lowest temperature at which the oil has not yet lost its ability to flow at the tilt of the test tube in which it is chilled. The pour point reflects the moment of an abrupt increase of viscosity as a result of a decrease in temperature or paraffin crystallization together with the increase of viscosity, to such an extent that the oil becomes solid.

Neutralisation value

Lubricants contain acid and/or alkaline substances emanating from base oil, additives or oxidation due to use. These substances are analysed in laboratory as Total Basic Number (TBN) or Total Acid Number (TAN). Neutralisation value indicates the amount of alkaline or acid substance that is needed to neutralise the oil. Neutralisation value is indicated as [mg KOH/g] (milligrams of potassium hydroxide per oil gram).

Base oil types

Mineral oils

Mineral oils are made of crude oil with the help of complicated refining processes. High-quality mineral oil is a very reliable raw material for lubricants boasting overall balanced properties: it is gentle to gasket materials and characterized by good solubility of additives and their general efficiency. Under normal running temperatures and conditions, the lubricating properties of mineral oils are perfectly sufficient, and choosing the suitable viscosity can help to control lubrication. However, it is difficult (if not impossible) to produce a top-quality mineral oil performing excellently under cold conditions and ensuring sufficient lubrication efficiency under higher operating temperatures as well.

Synthetic oils

Synthetic base oils allow better characteristics as compared to mineral oils for the lubricants. Synthetic base oils are refined to a greater extent than mineral oils. The hydrocarbon compounds of the resulting lubricants are of more equal quality and size as compared to mineral oils. However, synthetic oil in itself does not guarantee quality; to ensure good quality, the components must be selected very carefully and their ratios optimized. This is why "similar" synthetic oils may vary significantly in price. The following properties can be achieved with synthetic oils:

- Excellent low-temperature performance, such as easy cold starting and good lubrication.
- Excellent high-temperature performance, such as easy corrosion resistance, low vaporization rate and low oil consumption.

Synthetic base oils available at the most favourable price are hydrocracked/hydrogen cracked (so-called EHVI, XHVI and VHVI oils). These base oils have been produced from crude oil with the help of time-consuming distillation processes and are characterised by more even distribution of hydrocarbon compounds as compared to ordinary mineral oils, which also leads to more balanced properties. Polyalphaolyfine (PAO) is a synthetic base oil used extensively in transmission and engine oils, for example. The production process of PAO is especially time-consuming and complicated, but the resulting hydrocarbon compounds are exactly as desired.
Synthetic esters are usually applied as additives to other base oils. Synthetic esters are very expensive and characterised by excellent cold resistance, which allows using them for further improvement of lubricants' cold-resistance properties.

Biodegradable oils

Biodegradable oils are usually made from synthetic esters or vegetable oils. Oils produced based on synthetic esters have excellent cold resistance characteristics and high viscosity index. Mixing of biodegradable oils with regular mineral oils is not recommended. When blending biodegradable oils of different producers, it must be known which base oils they contain. Oils that contain synthetic esters are suitable for blending, but vegetable oil-based oils should not be blended or mixed with oils made of synthetic esters. Additional information on biodegradable oils is available in the technical documentation.

Additives

All of the properties that modern machines and equipment require from their lubricants cannot be achieved by mere base oils. Because of this, special substances must be added, in order to improve the properties of high-performance base oils. It must be remembered, however, that even the best additives cannot turn low-quality base oils into high-quality lubricants.

The most important additives are:

Oxidation inhibitors. Oxidation is a chain reaction accelerated both by former oxidation products and impurities in lubricating oils. Oxidation inhibitors will stop the oxidation reaction and block the catalytic effect of metallic surfaces.

Detergent and dispersant additives
These additives serve to keep the engine parts clean and bind any impurities detaching from the engine.

Corrosion inhibitors form an anti-corrosion film on metallic surfaces.

Anti-wear additives form a chemical film preventing metal-to-metal contact on the lubricated surfaces. Anti-wear additives are important in places where the loads are high and the speeds are low.

Extreme pressure additives (EP additives) – together with metallic surfaces, form a chemical film that will effectively prevent shearing. The purpose of EP additives is to increase the load-bearing capacity of lubricating oil. Transmission oils typically contain significant amounts of EP additives.

Antifoaming additives stop the oil from foaming by decreasing the surface tension, thereby helping the air bubbles to break more easily.

Pour point depressants prevent wax crystals forming in oil as a result of temperature drop from joining each other, thereby ensuring that the crystallised wax does not stop the oil from flowing.

VI (viscosity index) improvers are macromolecular polymers soluble in lubricating oil that prevent the oil from thinning when temperature rises. VI improvers are crucial in oils operating under greatly varying temperature conditions.

Storing and handling of lubricants

Transport containers must be stored so as to prevent ingress of impurities and water. Barrels, for example, are best stored on their side or upside down. This way, water is prevented from accumulating on top of the barrel and cannot penetrate under the plug because of any temperature and pressure fluctuations. If stored appropriately, lubricating oil retains its quality for years.
Soluble oils, such as coolants for mechanical treatment of metals should be transported and stored at temperatures above 0°C. It is also recommended that lubricating greases be stored at temperatures above 0°C.
When transporting and storing oils, it is necessary to adhere to the environmental protection principles and instructions/regulations by officials.

Disposal of waste oil

Used oil is problem waste that should be delivered to problem waste facility for proper treatment.
Used barrels that are in good condition can usually be re-used, provided that they are adequately cleaned and prepared. Barrel repair facilities accept barrels containing oil residues. Any barrels that cannot be repaired and do not contain hazardous substance residues should be delivered to a scrapping facility.
Local government officials offer advice on matters concerning treatment of oil residues.

Performance classifications

SAE viscosity grades

Viscosity of engine oils is expressed in SAE (Society of Automotive Engineers) grades. In the SAE grading, engine oils have been divided in the following classes: 0W, 5W, 10W, 15W, 20W, 25W, 20, 30, 40, 50, and 60. A viscosity limit value at 100 °C has been specified for oils that have been graded with a numerical code only, according to the chart provided.

The letter W in connection with the grading number indicates that the oil is suitable for low temperatures. Oils of these classes are graded with a pumping limit temperature and viscosity in cold circumstances, in addition to the minimum viscosity at 100 °C, according to the chart provided. Most of the engine oils on sale today are multi-grade oils, i.e. they fulfil the viscosity requirements of their grading at both low and high temperatures.

A maximum viscosity at nominal temperature has been specified for each SAE grade (see the chart). Viscosity measurement is based on Cold Crank Simulator (CCS) testing. Pumping limit temperature describes the lowest temperature at which the engine's oil pump is capable of transferring the oil in the lubricating system. It can be considered as the lowest safe temperature for cold starting.

The HTHS value in the chart is abbreviated from High Temperature High Shear Rate. This is the test that measures the stability of oil's viscosity in extremely hot conditions.

SAE class	CCS viscosity cP/°C	Pumping limit temperature, °C	Viscosity CSt/100 °C		HTHS cP***
			min	max	
0 W	6.200/–35	–40	3.8	–	
5 W	6.600/–30	–35	3.8	–	
10 W	7.000/–25	–30	4.1	–	
15 W	7.000/–20	–25	5.6	–	
20 W	9.500/–15	–20	5.6	–	
25 W	13.000/–10	–15	9.3	–	
20			5.6	< 9.3	2.6
30			9.3	< 12.5	2.9
40			12.5	< 16.3	2.9*
40			12.5	< 16.3	3.7**
50			16.3	< 21.9	3.7
60			21.9	< 26.1	3.7

*) Viscosity classes SAE 0W-40, 5W-40 and 10W-40.
**) Viscosity classes SAE 15W-40, 20W-40, 25W-40 and 40.
***) Minimum viscosity at 150°C in HTHS test.

API service rating

API service rating of engine oils has been established and is being developed in co-operation between API (American Petroleum Institute), ASTM (American Society for Testing and Materials), and SAE. It determines the limit values for several different parameters (e.g. piston cleanness, piston rings abrasion, etc.) using a variety of test engines.

The API service rating of engine oils is divided into two categories:

1) Petrol engine oil categories: SE, SF, SG, SH, SJ, SL, SM and SN.

2) Diesel engine oil categories: CC, CD, CE, CF, CG, CH, CI and CJ.

Petrol engine oils

SC, SD and **SE** are old classifications that may be encountered in older vehicles.

SF Typical requirement for the petrol engines of vehicles manufactured from 1981 to 1988.

SG This class requires somewhat better cleanness, deposit prevention, service life and anti-wear properties as compared to earlier classes. Quality requirement of most engine manufacturers since 1989.

SH A class introduced in 1993. The same as SG by tests and limits, but the testing methods are more demanding.

SJ A class introduced in 1996, which was developed in order to satisfy the more stringent emissions and performance requirements established for engines.

SL A class introduced in 2001, developed to satisfy the following requirements: better fuel economy, improved protection for catalysers and other emission-reducing components, and extended service life of oil. New tests and test limits are significantly more demanding as compared to the class SJ.

SM The newest class introduced in 2005, designed to provide improved anti-wear protection for engine, retention of cold resistance properties over the service life and better oxidation resistance as compared to the class SL.

SN 2010 introduced classification, designed to provide improved high temperature deposit protection for pistons, more stringent sludge control, and seal compatibility.

Diesel engine oils

CB, CC and **CD** are old classifications that may be encountered in older vehicles.

CE A class introduced in 1985, typical for supercharged diesel engines operating under heavy loads.

CF Introduced in 1994, for pre-chamber diesel engines.

CF-4 Introduced in 1990, an improved oil class that replaced the CE class.

CF-2 Basically the same as CF-4, but for two-stroke cycle diesel engines.

CG-4 A class introduced in 1995, meets the requirements established for American heavy-duty diesel engines.

CH-4 A class for heavy-duty equipment, for engines designed to meet 1998 emission standards and intended to run on sulphur-free or low-sulphur diesel fuel.

CI-4 A class introduced in 2002, for low-emission engines designed to meet the 2004 exhaust emissions standards. Intended especially for engines with exhaust gas recirculation (EGR).

CJ-4 A class introduced in 2006 and complying with requirements of some (mainly American) low-emission diesel engines introduced since 2007 and used for road transport purposes. Intended especially for engines running on low-sulphur fuel and possibly equipped with novel exhaust gas post-processing systems.

Performance classifications

Engine oils

ACEA classification

The European Automobile Manufacturers' Association, ACEA, has developed a classification for engine oils that is better suited for the modern vehicles and operating conditions typical for Europe. The ACEA classification divides engine oils into three categories according to the type of engine: petrol engine oils (A), light vehicle diesel engine oils (B), and heavy-duty diesel engine oils (E). In 2004, the A and B classes were merged into single A/B class. Additionally, the new class C was introduced, which is intended for light vehicle petrol and diesel engines equipped with various exhaust gas recirculation and purification systems. C class oils are so-called Low SAPS oils that contain less sulphur, phosphor, and sulphate ash as compared to conventional engine oils.

Light vehicle petrol and diesel engine oils

A1/B1 So-called fuel economy oils (low friction, low viscosity) intended for petrol and diesel engines of light vehicles. Use of A1/B1 oils is not allowed in some engines. Consult the vehicle's owner manual if in doubt.

A2/B2 is intended for normal use and normal drain intervals. This classification is mainly encountered in older vehicles. May be replaced with A3/B3 class oils.

A3/B3 Oils intended for petrol and diesel engines of light vehicles for which engine manufacturers have specified longer drain intervals.

A3/B4 Otherwise similar to A3/B3 class, but with consideration of additional requirements to direct injection diesel engines. Also suitable for applications described under A3/B3.

A5/B5 Low-friction and low-viscosity oils for extended drain intervals. These oils may be unsuitable for use in some engines. Consult the vehicle's owner manual if in doubt.

C1, 2, 3 are **4** so-called Low SAPS oils, where sulphur, phosphor and metal-based additives have mainly been replaced with additives according to newer technology. Owing to their Low SAPS characteristics, these oils have no detrimental effect on the functioning of exhaust gas systems of modern environmental-friendly engines. Thin C1 and C2 energy-saving oils should only be used in engines for which they have been approved.

C1 Thin so-called fuel economy oils that comply with especially demanding Low SAPS limits.

C2 Thin so-called fuel economy oils that comply with demanding Low SAPS limits.

C3 Low SAPS oils that comply with demanding Low SAPS limits. The same Low SAPS level as in C2, but less demanding fuel economy requirements.

C4 Low SAPS oils that comply with especially demanding Low SAPS limits. Almost the same Low SAPS level as in C1, but fuel economy requirements as in C3.

In addition to the general **API** and **ACEA** classifications, many engine manufacturers develop their own classifications. Such light vehicle manufacturers as Audi, BMW, Ford, GM, Mercedes-Benz, Opel, Saab and Volkswagen require that oils complying with their own classifications should be used. As a rule, engine manufacturers, in developing their own classifications, use the API and ACEA classifications as a basis. In addition to this, oils are required to pass the tests established by the manufacturers, both in laboratory conditions and with engines.

Heavy-duty diesel engine oils

E2 Oils designed for heavy-duty diesel engines with mostly regular oil drain intervals.

E4 Special oil for extended drain intervals, mostly for Euro 3 engines by Mercedes-Benz and MAN.

E5 Most engine manufacturers require use of E5 oils in their Euro 3 engines if extended oil drain intervals are required. Officially, the class E5 has been cancelled and replaced with E7.

E6 Low SAPS oil for heavy-duty engines (see. ACEA C1-C4) and extended oil drain intervals. Intended especially for European-type diesel engines with novel exhaust gas post-processing systems.

E7 Especially high-performance diesel engine oil for engines complying with Euro 3 and 4 emission requirements, with extended oil drain intervals. Also suitable for older machines.

E9 Top class heavy-duty diesel engine oil. Improved performance as compared to E7, suitable for many engines equipped with novel exhaust gas treatment systems. Also suitable for use in vehicles where ACEA E7 or E5 is required.

2-stroke engine oil classifications

2-stroke engine oil classifications

The performance level of a 2-stroke engine oil is determined by API service rating, which is based on laboratory and engine tests. The 2-stroke oils are divided into four different API rating categories as follows:

API designation	Primary purpose
API-TA	For 2-stroke engines of mopeds, lawnmowers and other similar machines.
API-TB	For engines of small-power engine motorbikes and jet skis.
API-TC	For two-stroke engines used onshore in demanding conditions. Use is also allowed if API-TA or API-TB oil is required.
API-TD	Specifically for 2-stroke outboard engines.

NOTE: API-TC and API-TD ratings are mutually exclusive, i.e. one cannot be replaced with the other.

JASO

Japanese manufacturers' classification, with particular attention to reduced smoke generation of oils. JASO requirement levels are SA, FB , FC and FD (the latter being the most stringent).

NMMA

Outboard engine manufacturers' special classification for 2-stroke outboard engine oils. In this classification, special attention has been paid to maintaining the cleanliness of the engine. Outboard engine manufacturers' recommendations most often require use of TC-W3 oils.

Transmission and gear oils

SAE viscosity grades

SAE grades for transmission and gear oils are 70W, 75W, 80W, 85W, 80, 85, 90, 110, 140, 190 and 250. The letter W indicates that the oil viscosity is determined under low temperatures. The viscosity must remain below 150,000 centipoise at temperatures given in the chart provided and is additionally required to fulfil certain minimum requirements at 100 °C.
Viscosity levels for other SAE grades have been determined at 100 °C.

SAE class of transmission and gear oils:

SAE class	Maximum temperature corresponding to a viscosity of 150,000 cP	Viscosity at cSt 100 °C Min/Max
70 W	-55	4.1 / -
75W	-40	4.1 / -
80W	-26	7.0 / -
85W	-12	11.0 / -
80		7.0 / <11.0
85		11.0 / <13.5
90		13.5 / <18.5
110		18.5 / <24.0
140		24.0 / <32.5
190		32.5 / <41.0
250		41.0 / -

API service rating

GL-1 Transmission oil without extreme pressure (EP) additives. Used in transmissions where surface pressures and speeds are low.
GL-4 Oils with a fair amount of EP additives, used in most cars with manual transmissions.
GL-5 Oils with a great amount of EP additives for heavy-duty applications. Used in most modern vehicles and construction machinery equipped with hypoid gears where high speeds, high temperatures and shock-like peak loads are present.

NOTE: Always use the recommended API GL class.

Vehicles equipped with limited slip differential usually require oils containing special additives in order to ensure smooth operation of the unit. Gear oils with such additives are generally marked with LS or Limited Slip (e.g. Teboil Hypoid LS).

In addition to regular properties of transmission oils, automatic transmission fluids (ATF) must operate as power transmission media and be capable of fulfilling the requirements set to friction properties by different materials.

NOTE: The API classification does not include automatic transmission oils, because the transmission manufacturers have established their own requirements for the oils to be used. The requirements of different transmission manufacturers differ by friction characteristics. Most of automatic transmissions can be lubricated with Dexron II or Dexron III type oils, but if the transmission manufacturers specify their own requirements as to the oil that must be used, they should be adhered to, in order to ensure proper functioning of the transmission.

Lubrication grease is a lubricant that is formed when liquid lubricating oil is made solid or semi-solid with the help of special thickening agents. Additionally, solid or liquid additives may be used for improvement of the grease properties.

Lubrication grease = Oil (80–90 %) + Thickening agent + Additives

Thickening agents

- Metal soaps, e.g. lithium (70 % of all manufactured soaps), calcium, aluminium, and sodium.
- Complex soaps of previously mentioned metals, the most common of which is lithium complex.
- Inorganic thickening agents, such as bentonite clay and silica gel, for example.
- Synthetic thickening agents, such as polyurea and PTFE, for example.

Base oil

In lubrication greases, as in lubricating oils, both synthetic and mineral-based oils are used. Base oil together with the thickening agent determine the rheological characteristics of the lubrication grease. (Rheology = study of the flow of matter.)

Additives

In greases, as in lubricating oils, additives are used for improvement of the properties. In addition to liquids, solid lubricants (such as molybdenum sulphide (MoS_2) and graphite) are sometimes added to grease.

Properties and analyzing

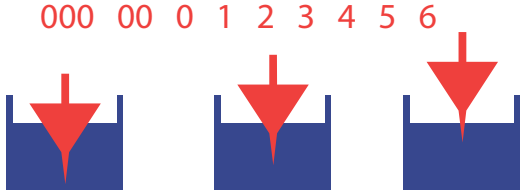
Hardness

The hardness, or penetration, of greases is determined according to NLGI (National Lubricating Grease Institute) ratings. The penetration is measured with special equipment, where a cone is allowed to sink for five (5) seconds into grease at a temperature of +25°C. The penetration depth is measured and announced in 1/10 mm. Usually, a point is made whether it is "whisked" or "non-whisked" penetration. The differences in these values indicate how well the grease can bear mechanical load.

On the basis of penetration, greases are divided into NLGI categories, which vary from 000 to 6. The greater the number indicating the category, the harder is the grease.

NLGI hardness ratings

NLGI number	Penetration (1/10 mm)
000	450-475
00	400-430
0	355-385
1	310-340
2	265-295
3	220-250
4	175-205
5	130-160
6	85-115



Dropping point

The temperature at which oil begins to separate from thickening agent.

Lubricating properties

The lubricating properties of a grease and its load-bearing capability are equally dependent on the thickness of the base oil and the thickening agent's behaviour in boundary lubrication situations.

Anti-wear and EP properties are measured by the following known tests, for example:

- SKF bearing tests, e.g. SKF R2F (includes, for example, determination of the grease's highest allowed operating temperature)
- Timken EP test
- Four-ball test
- Almen EP test

Pumping limit

High pumping limit is an essential property for central lubrication systems, especially in cold climate. The grease is required to withstand loads caused by central lubrication without separation of the oil and thickening agent from each other. Safematic has developed a grease pumping test by which the lowest operating temperature of each grease is determined. SKF (Safematic) updates and publishes a catalogue regarding greases tested.

Corrosion resistance

For example, SKF Emcor test, where the grease's ability to prevent bearing wear surfaces from rusting in the presence of water.

Water resistance

The Water Wash Out Test establishes how well the grease remains on the lubrication target in the presence of flowing water.
The result is the percentage of washed-out grease.

Lubrication greases

Lubricants' ability to be mixed with various thickeners

	Lithium	Lithium complex	Calcium	Calcium complex	Bentonite Microgel	Sodium
Lithium	Possible	Possible	Possible	Impossible	Impossible	Impossible
Lithium complex	Possible	Possible	Possible	Possible	Impossible	Impossible
Calcium	Possible	Possible	Possible	Impossible	Possible	Impossible
Calcium complex	Impossible	Possible	Impossible	Possible	Impossible	Impossible
Bentonite Microgel	Impossible	Impossible	Possible	Impossible	Possible	Impossible
Sodium	Impossible	Impossible	Impossible	Impossible	Impossible	Possible

This is an approximate lubricant mixing chart.
For additional information on mixing of greases, contact our technical counselling. (Tel. 020 4700 916)

ISO 3448 viscosity classification

ISO 3448 classification is used in hydraulic and industrial oils. The classification (grading) consists of 18 viscosity categories. The numerical value (2-1500) describes the kinematic viscosity of oil at 40°C in centistokes mm^2/s (cSt). The lowest allowed variation limit of viscosity is ±10% of the nominal value of each grade.

Teboil's hydraulic and lubricating oils are designed to meet the requirements of the latest technology. Our product development is based on the most recent data on lubricating technology. The names of Teboil's hydraulic and lubricating oils include a number that indicates the product's ISO VG viscosity grade. Where the number indicating the ISO VG viscosity grade has been printed bold in the charts of this brochure, it is a part of the product name. For example: Teboil Hydraulic Oil 15.

ISO VG class	Average viscosity in mm^2 at40 °C, variation limits ± 10%
ISO VG 2	2,2
ISO VG 3	3,2
ISO VG 5	4,6
ISO VG 7	6,8
ISO VG 10	10
ISO VG 15	15
ISO VG 22	22
ISO VG 32	32
ISO VG 46	46
ISO VG 68	68
ISO VG 100	100
ISO VG 150	150
ISO VG 220	220
ISO VG 320	320
ISO VG 460	460
ISO VG 680	680
ISO VG 1000	1000
ISO VG 1500	1500

Required properties

- Correct viscosity
  – sufficiently thin at start-up temperature
  – sufficiently thick at operating temperature in order to ensure lubrication
- Stable viscosity
- Anti-wear properties
- Anti-corrosion properties
- Good water separation
- Non-foaming, good deaeration
- Oxidation resistance properties
- Gasket-friendliness

Classifications

Besides the main classification of hydraulic oils, there are other classifications:

- DIN 51524 parts 2 (HLP) and 3 (HVLP)
- SS 155 434

DIN 51524 Part 2 (HLP) applies to hydraulic oils with additives designed for modern high-pressure hydraulic systems with insignificant temperature fluctuations. The most typical examples of such systems are industrial hydraulic systems operating indoors.

DIN 51524 Part 3 (HVLP) applies to hydraulic oils with additives for modern high-pressure hydraulic systems operating at varying temperature conditions. The oil's viscosity index must be 140 or higher. The most typical examples of such systems are hydraulic systems in mobile equipment.

SS 155 434 is a Swedish standard for high viscosity index hydraulic oils, which covers the cold resistance properties better than the DIN standard. The standard has been discussed above under SMR classification.

Cleanliness, applications and storing

Cleanliness of the hydraulic fluid is vital for the hydraulic system. According to manufacturers, over 70% of the equipment damages are caused by impurities. Hydraulic system should always be filled by pumping, not by pouring. This way, possible impurities that have accumulated on top of the container are kept out of the system. The filling should be carried out through a filter, as the cleanliness of oil in the container is rarely adequate for demanding equipment.

Transport containers must be stored so as to prevent ingress of impurities and water. Barrels, for example, are best stored on their side or upside down. This way, water is prevented from accumulating on top of the barrel and cannot penetrate under the plug because of any temperature and pressure fluctuations. Storage instructions apply to all lubricants.

Choosing the right oil

The most important criterion in the selection of hydraulic oils is correct viscosity.

Start-up viscosity:

The highest allowed start-up viscosity depends on pump type. Pump manufacturers define the following guidelines for different types:

Piston pumps	200–800 mm^2/s
Vane pumps	500–1000 mm^2/s
Gear pumps	800–1600 mm^2/s

Optimum viscosity:

In order to prevent cavitation and ensure minimal flow resistance, the oil's viscosity must be as low as possible, but at the same time high enough to ensure pump lubrication.

Minimum viscosity:

Viscosity at its minimum is so low that the films between surfaces reduce critically and metal begins to scrub against metal, thus increasing wear and tear.

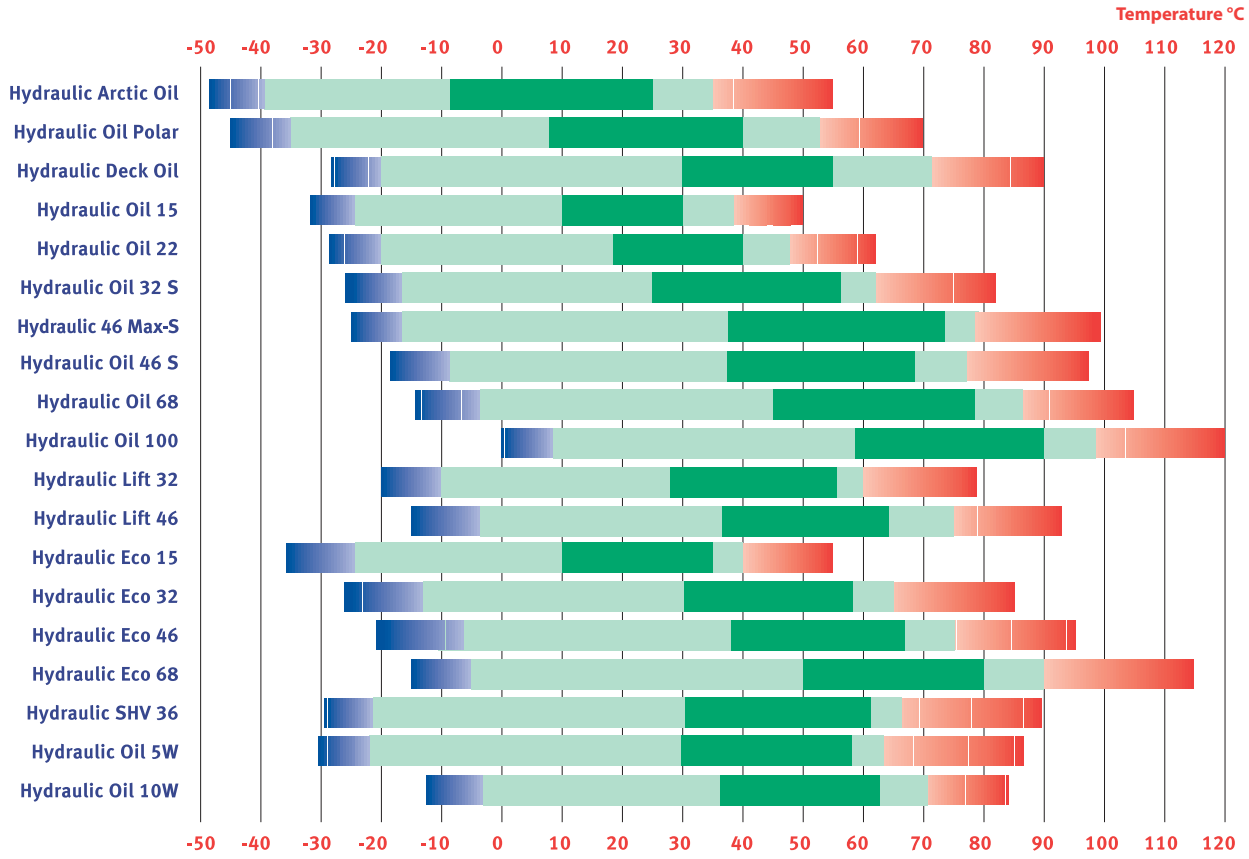
Since oil viscosity depends on temperature, the operating temperature ranges of hydraulic oils are presented in charts. Limit value viscosities are established in accordance with the pump manufacturers' specifications and are thus only guidelines. (More specific instructions are available in the equipment manufacturers' manuals).

Engine oil is generally not recommended for use in hydraulic equipment, since as compared to special hydraulic oils:

- it has poor water separation and deaeration properties;
- mono-grade engine oils have a narrow operating temperature range and most multi-grade engine oils contain viscosity index improvement additives that do not withstand hydraulic use.

Nevertheless, as an exception, some equipment manufacturers recommend use of mono-grade engine oils in their hydraulics systems. There are special hydraulic oils for this purpose marked similarly to engine oils (Teboil Hydraulic Oil 5W and 10W), but, unlike traditional engine oils, they have different performance characteristics within a wide temperature range and low shearing.

Operating temperature range of hydraulic oils produced by Teboil



Minimum starting temperature	Viscosity of 500 to 1,600 mm^2/s: pump can be started carefully without load
Optimum operating temperature	Viscosity of 16 to 50 mm^2/s:
Maximum operating temperature	Viscosity of 10 to 16 mm^2/s: pump can only be used temporarily and for a short time

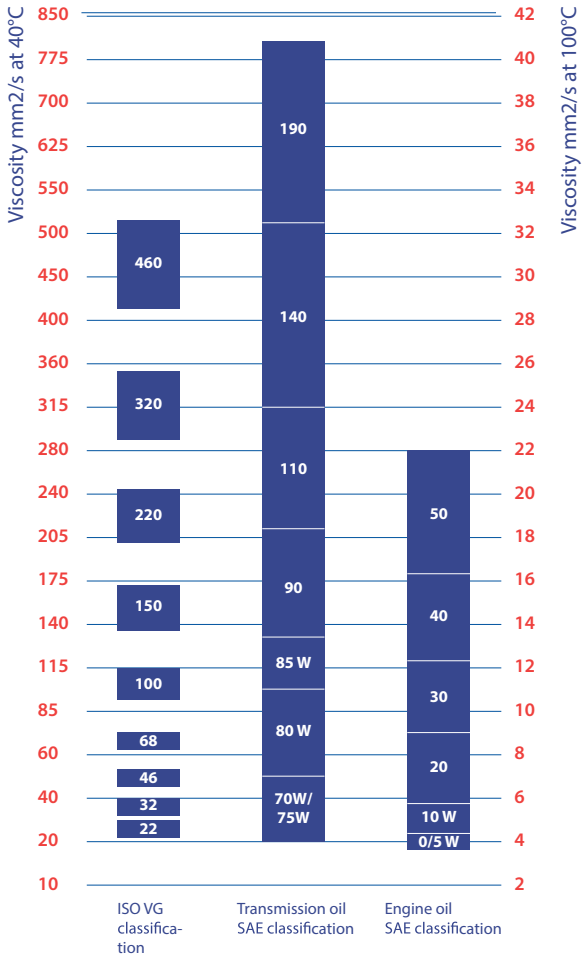
Note: These values are guidelines only; for more specific instructions, see the manufacturers' manuals.

Charts

Viscosity value comparison diagram

mm²/s (cSt)	°E	SUS	R.I.	mm²/s (cSt)	°E	SUS	R.I.
2	1.12	32.6	30.4	130	17.2	603	528
4	1.31	39.2	35.3	140	18.5	649	568
6	1.48	45.6	40.6	150	19.8	695	609
8	1.65	52.1	46.1	160	21.1	742	650
10	1.83	58.9	51.9	170	22.4	788	690
12	2.02	66.0	58.0	180	23.8	834	731
14	2.22	73.6	64.5	190	25.1	881	771
16	2.34	81.3	71.2	200	26.4	927	812
18	2.65	89.4	78.1	220	29.0	1020	893
20	2.88	97.8	85.2	240	31.7	1112	974
24	3.3	115	100	260	34.3	1205	1056
28	3.8	133	116	280	37.0	1298	1137
32	4.3	150	131	300	39.6	1390	1218
36	4.8	168	147	340	44.9	1576	1380
40	5.4	186	164	380	50.2	1761	1543
44	5.9	204	180	420	55.4	1947	1705
48	6.4	223	196	460	60.7	2132	1868
52	6.9	241	212	500	66.0	2317	2030
56	7.4	260	228	540	71.3	2503	2192
60	8.0	278	244	580	76.6	2688	2355
65	8.6	301	265	620	81.8	2874	2517
70	9.3	324	285	660	87.1	3059	2680
75	9.9	348	305	700	92.4	3245	2842
80	10.6	371	325	750	99.0	3476	3045
85	11.2	394	345	800	105.6	3708	3248
90	11.9	417	366	850	112.2	3940	3451
95	12.6	440	386	900	118.8	4172	3654
100	13.2	464	406	950	125.4	4403	3857
110	14.5	510	447	1000	132.0	4635	4060
120	15.8	556	487				

Viscosity classification



mm²/s = kinematic viscosity (= centistokes cSt)
°E = Engler's degree
SUS = Saybold Universal Seconds
R.I. = Redwood seconds

NOTE: Viscosities must always be compared and measured in the same temperature.

Viscosity-temperature diagram

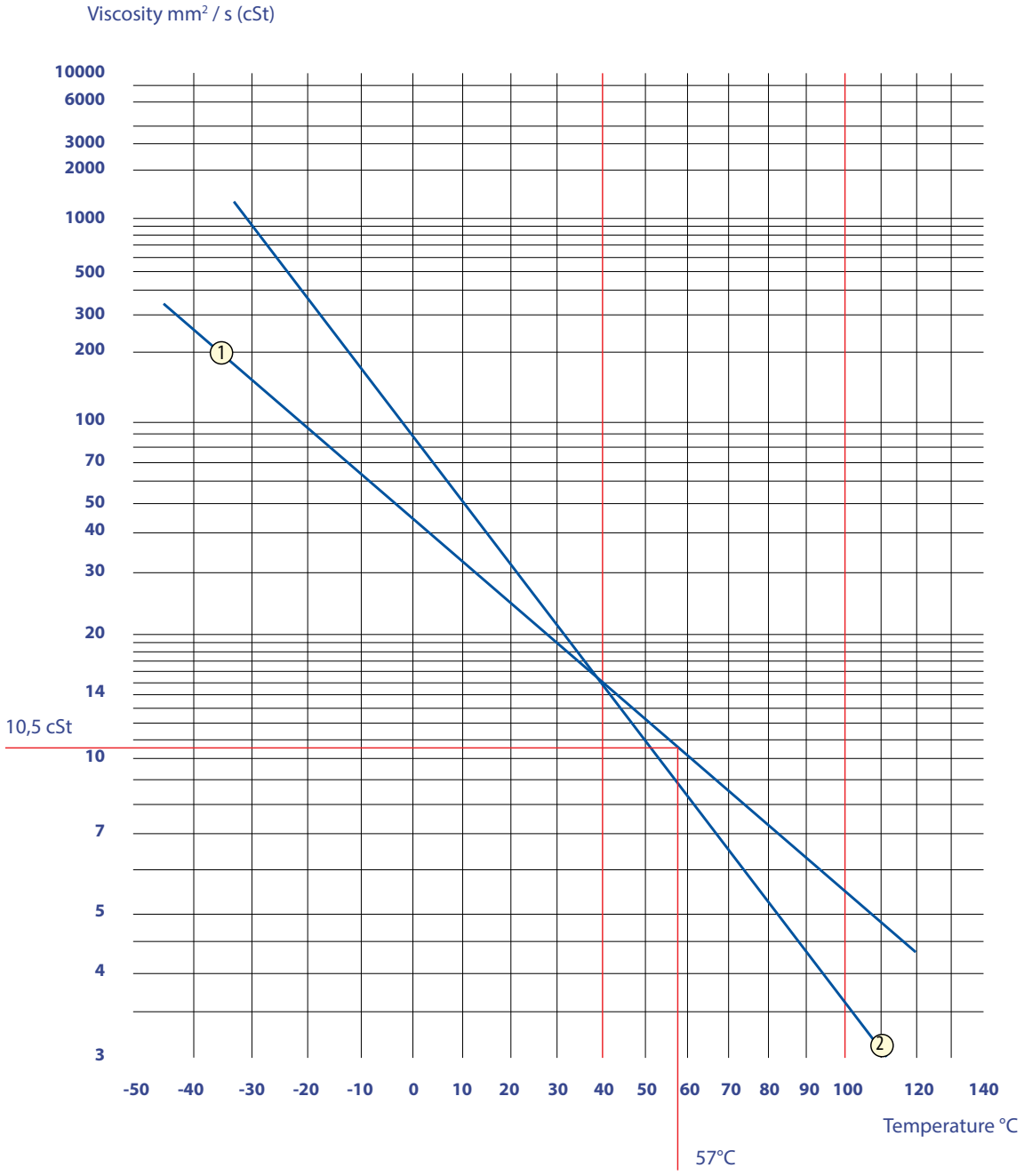
How to use the diagram:

Viscosity of oil at different temperatures can be determined with the help of this diagram. The viscosities of oil at two different temperatures are marked in the diagram. The line crossing the points describes the change of viscosity according to the temperature. Viscosity of the oil at any temperature can thus be estimated. Generally, viscosity diagrams use 40ºC and 100ºC, which can also be found in the technical charts of this brochure.

Example of using the diagram

Hydraulic Arctic Oil (1):

- viscosity at 40°C 15 cSt
- viscosity at 100°C 5.5 cSt
- the graph shows that viscosity at 57°C is 10.5 cSt



Exemplary graphs:

(1) Teboil Hydraulic Arctic Oil, viscosity index 375
(2) Teboil Hydraulic Oil 15, viscosity index 125

Automotive lubricants

Engine oils for cars and vans

Teboil Diamond Carat

- Viscosity
  SAE 0W-30
- Specifications
  API SL/CF, ACEA A5/B5

Teboil Diamond Carat 0W-30 is a fully synthetic, low viscosity, fuel economy ACEA A5/B5 engine oil for year-round use. Diamond Carat 0W-30 provides possibilities for the so-called Longlife service intervals of many vehicle manufacturers. Not suitable for all vehicles – check the vehicle's owner manual.

Teboil Diamond Carat III

- Viscosity
  SAE 5W-30
- Specifications
  ACEA C3; VW 504.00, 507.00;BMW LL-04;
  MB 229.31, 229.51
  Quality level: ACEA A3/B4, C2

Teboil Diamond Carat III 5W-30 is a fully synthetic engine oil especially intended for the vehicles manufactured by the VAG concern with VW specifications 504.00 or 507.00. Diamond Carat III can be used primarily as replacement oil in case of the following specifications: VW 503.00, 506.00 or 506.01. The oil is also suitable for use in engines of other manufacturers, provided that the classification matches.

Teboil Diamond Plus

- Viscosity
  SAE 0W-40
- Specifications
  API SN, SM/CF; ACEA C3; BMW LL-04; MB 229.31;
  VW 502.00, 505.00
  Quality level: ACEA A3/B4, Dexos 2

Teboil Diamond Plus 0W-40 is a fully synthetic engine oil designed for most demanding use in car and van petrol and diesel engines. It retains its properties even in case of extended oil change intervals and is suitable for many modern engines equipped with particle filters and catalysers. Owing to its SAE 0W-40 viscosity class, Diamond Plus 0W-40 ensures immediate oil flow even in Arctic weather conditions and reliable lubrication at extremely high temperatures or under heavy load.

Teboil Diamond

- Viscosity
  SAE 5W-40
- Specifications
  API SN, SM/CF; ACEA C3; BMW LL-04; MB 229.31;
  Porsche; VW 502.00. 505.00
  Quality level: ACEA A3/B4; Dexos 2

Teboil Diamond 5W-40 is a fully synthetic engine oil designed for demanding all-year-round use in car and van petrol and diesel engines. It retains its properties even in case of extended oil change intervals and is suitable for many modern engines equipped with particle filters and catalysers. Due to its low pour point and optimal viscosity-temperature properties, Diamond 5W-40 provides excellent wear protection to your engine under any conditions.

Teboil Diamond FS

- Viscosity
  SAE 5W-30
- Specifications
  API SL/CF; ACEA A1/B1, A5/B5;
  Ford WSS-M2C-913-A, -B, -C, -D,
  Renault RN 0700

Teboil Diamond FS 5W-30 is fully synthetic engine oil, it is intended for extended oil change intervals and is fuel-economical. It has been developed especially for Ford manufactured engines, but is also suitable for many other engines, requiring ACEA A1/B1 or A5/B5 type of engine oil.

Teboil Diamond Diesel

- Viscosity
  SAE 5W-40
- Specifications
  API SN, SM/CF; ACEA C3; BMW LL-04;
  MB 229.31, 229.51;
  VW 505.00, 505.01, Ford M2C917-A
  Quality level: ACEA A3/B4; Dexos 2

Teboil Diamond Diesel 5W-40 is Multi-Synthetic engine oil made of selected synthetic base oils and additives. It is designed especially for diesel engines in cars and vans. The oil retains its properties even in case of extended oil change intervals and allows the extended intervals in many modern engines. Diamond Diesel is perfectly suitable for today's diesel engines with pump unit injectors and for most modern engines equipped with particle filters and catalyst converters. It is also an excellent choice for more conventional diesel engines of light vehicles.

Teboil Diamond eXtreme

- Viscosity
  SAE 10W-60
- Specifications
  API SL/CF, ACEA A3/B4
  BMW-, Porsche- and VW- performance level

Teboil Diamond eXtreme 10W-60 is a fully synthetic (Multi-Synthetic) engine oil for high-powered 4-stroke engines Its properties are tailored for racing or street use requiring extreme performance. Due to its higher-than-regular viscosity, Diamond eXtreme copes with fuel dilutions and high temperatures significantly better as compared to conventional engine oils.

Teboil Gold S

- Viscosity
  SAE 5W-40
- Specifications
  API SL/CF; ACEA A3/B3/B4; BMW LL-98; MB 229.3;
  GM-LL-B-025; Porche; VW
  502.00 and 505.00 (Quality level)

Teboil Gold S 5W-40 is a fully synthetic engine oil of especially high quality for demanding all-year-round use. It is suitable for most petrol and diesel engines of cars and minivans, including supercharged engines. Gold S 5W-40 is an excellent choice for older engines as well.

Teboil Silver

- Viscosity
  SAE 10W-40
- Specifications
  API SL/CF; ACEA A3/B4; BMW LL-98; MB 229.1; VW
  502.00 and 505.00 (Quality level)

Teboil Silver 10W-40 is a high-quality semi-synthetic engine oil. It is an excellent choice for older cars equipped with catalyst converter.

Teboil Moniaste

- Viscosity
  SAE 10W-30 and 15W-40
- Specifications
  API SF/CD

Teboil Moniaste is mainly intended for older petrol and diesel engines of cars and vans (without a catalyst converter). Because of the thick base oil, Moniaste 15W-40 is especially good for engines with increased oil consumption and operated in summer.

Automotive lubricants

Heavy-duty engine oils

Teboil Super HPD

- Viscosity
  SAE 5W-40,10W-40, 10W-30, 15W-40
- Specifications
  API CI-4, CH-4, CG-4, CF-4; ACEA E7, E5, E3, B3, B4; MB 228.3; MAN 3275; Mack EO-M Plus; RVI RLD; Volvo VDS-2, VDS-3; CAT ECF-1a, ECF-2; Global DHD-1; Cummins CES 20.071,-2,-6,-7 and 8; Jaso DH-1; MTU 2

Teboil Super HPD diesel engine oils are designed for heavy professional use typically involving high-powered engines and long service intervals. ACEA E7 and API CI-4 classifications guarantee that Super HPD is excellent for most European and American low-emission diesel engines. With long service intervals, most engine manufacturers require the use of SHPD classified oils. Teboil Super HPD series include fully synthetic 5W-40, synthetic 10W-40 and mineral oil-based 10W-30 and 15W-40 oils.

Teboil Super HPD ECV

- Viscosity
  SAE 10W-40, 15W-40
- Specifications
  API CJ-4, CI-4 Plus, CH-4 ; ACEA E9, E7 ; Volvo VDS-4, VDS-3 ; MB 228.31 ; MAN 3275 ; CAT ECF-3, -2, 1-a ; Renault Truck RLD-3 ; Cummins CES 20081 ; Mack EO-O Premium Plus

Teboil Super HPD ECV engine oils are designed for heavy duty professional use of new types of diesel engines. Because of specific characteristics of these oils they are suitable for a number of EGR (exhaust gas recirculation), SCR (selective catalytic reduction) and DPF(diesel particulate filter) systems. In addition, they can be used in engines requiring for example API CI-4 and ACEA E7, E5 type oils.

Teboil Super XLD-2

- Viscosity
  SAE 5W-30
- Specifications
  API CI-4; ACEA E7/E4; MB 228.5; MAN M3277; Volvo VDS-3; Mack EO-M Plus; MTU Type 3; Renault RXD, RLD-2; Cummins CES 20077; DAF Extended Drains; Deutz DQC III -05, DQC IV-10; CAT ECF-2

Teboil Super XLD-2 is a fully synthetic diesel engine oil that has mainly been developed for heavy-duty European diesel engines that have “ultra-long” service intervals. Super XLD-2 protects the engine efficiently against wear, carbon deposit formation and cylinder wear. The optimized viscosity helps to reduce fuel consumption compared to conventional oils. Exellent cold resistance properties of the oil ensure safe cold-starting.

Teboil Super XLD-3

- Viscosity
  SAE 10W-40
- Specifications
  API CF; ACEA E7, E4;
  Scania LDF-2, LDF-3; MB 228.5;
  MAN M3277; Volvo VDS-3; Renault RXD, RLD-2;
  Deutz DQC IV-05/10; MTU Type 3

Teboil Super XLD-3 is a fully synthetic heavy-duty diesel engine oil, which is developed especially for Scania Euro 6 diesel engines for extended oil change intervals. It's high level of performance efficiently protects such engines against cylinder wearing and carbon deposit formation, without endangering the functionality of exhaust gas system.

Teboil Power Plus

- Viscosity
  SAE 10W-30 and 15W-40
- Specifications
  API CH-4/SJ; ACEA E2, B3, A3; MB 228.1;
  Cummins CES 20.071, -6; Mack EO-M Plus;
  MAN 271; Volvo VDS-2; Allison C4; CAT TO-2;
  MTU1; CAT ECF-1a; Renault RD-2

Teboil Power Plus engine oils are developed to satisfy a full range of engine oil requirements in transport and construction equipment companies. Power Plus oils are an excellent choice for engines of heavy-duty groundwork machinery, forest machines and haulage vehicles with long oil drain intervals, covering all kinds of engines from powerful supercharged diesel engines to petrol engines of light vehicles.

Teboil Power D

- Viscosity
  SAE 10W-30 and 15W-40
- Specifications
  API CG-4, CF/SJ; ACEA E2, B2, A3;
  Volvo VDS; MB 228.1; Mack EO-L

Teboil Power D 10W-30 and 15W-40 — are multi-grade engine oils for year-round use in heavy-duty diesel engines – an excellent choice if there is no need to meet the latest specifications. Power D oils are also perfectly suitable for diesel engines of boats or agricultural machinery.

- Viscosity
  SAE 10W, 20W-20, 30, 40 and 50
- Specifications
  API CG-4, CF-4, CF-2, CF/SG, ACEA
  E2, MB 228.0, MIL-L-2104E, Allison C3/C4

Teboil Power D 10W, 20W-20, 30, 40 and 50 are mono-grade heavy-duty diesel engine oils. These oils may also be used in 2-stroke diesel engines and engines of light vehicles, if necessary. Mono-grade Power D oils can also be used in hydraulic systems and transmissions where the equipment manufacturer recommends using of engine oils.

Multi-purpose farming machinery oil

Teboil Monitra Plus

- Viscosity
  SAE 10W-30
- Specifications
  API CG-4, CF-4, CF/SF; GL-4/GL-5; ACEA E3;
  Massey Ferguson M1127, M1135, M1139, M1144;
  Case-IH M1207; Ford M2C 86A, 134C/D, 159B;
  John Deere J 20 A/C, J27; Allison C4; CAT TO-2;
  ZF TE-ML 06, 07, 12; MIL-L-2104D.

Teboil Monitra Plus is a multi-purpose oil for farming industry developed in co-operation with additive producers and tractor manufacturers. It is suitable for all farming machinery engines, transmissions, gear units and hydraulic systems. Due to its carefully selected friction properties, Monitra Plus is also suitable for most power take-off clutches and wet brakes.

Automotive lubricants

Two-stroke engine oils

Teboil 2T Bike

- Specifications
  API TC ; JASO FD ; ISO-L-EGD ; ISO GD++ ;
  Husqvarna ; Piaggio Hexagon

Teboil 2T Bike is a fully synthetic oil developed mainly for powerful 2-stroke motorbikes. It is excellently suitable for lubricating air-cooled and water-cooled 2-stroke engines operating at high temperatures. 2T Bike provides excellent protection against wear and has excellent low-smoke characteristics. Suitable for premix and autolube systems.

Teboil 2T Snow

- Specifications
  API TC ; JASO FD ; ISO-L-EGD ; ISO GD++ ;
  Rotax 253

Teboil 2T Snow is a fully synthetic engine oil developed especially for snowmobile engines. It is also perfectly suitable for other 2-stroke engines operating in cold climate conditions. Excellent low temperature performance and efficient top-grade additives ensure trouble-free lubrication at extreme circumstances. 2T Snow is suitable for both premix and autolube systems, provides excellent protection against wear and has good low-smoke characteristics.

Teboil 2T Mix

- Specifications
  API TC

Teboil 2T Mix is a self-mixing 2-stroke engine oil with excellent lubricating characteristics suitable for both premix and autolube systems of snowmobiles, motorbikes, mopeds, chain saws, gardening machinery and other machines equipped with 2-stroke engines.

Teboil 2T Special Outboard

- Specifications
  API TD, NMMA: TC-W3

Teboil 2T Special Outboard is a special 2-stroke engine oil for modern outboard engines. It includes ashless additives, which is why the carbon deposit formation is lower than with regular 2-stroke engine oils. 2T Special Outboard keeps the engine's pistons, exhaust ports and spark plugs clean. In addition, 2T Special Outboard provides good protection against engine wear and corrosion.

Teboil 4T SuperBike Oil

- Viscosity
  SAE 15W-50
- Specifications
  API SJ, SH, SG and JASO MA, API GL-1

Teboil 4T SuperBike Oil is a special fully synthetic engine oil for 4-stroke motorbikes and other small 4-stroke engines, especially if equipped with a wet clutch. 4T SuperBike has got an excellent high-temperature performance and stable viscosity. The oil's friction and pressure endurance properties are carefully determined to suit the gearboxes and wet clutches. It maintains the properties that protect the engine from wear, and improve the operation of clutch even in the most demanding conditions, through the entire oil-change interval. 4T SuperBike is also well suitable for most gearboxes of two-stroke engine motorbikes.

Teboil 4T Special Motorboat

- Viscosity
  SAE 10W-40
- Specifications
  NMMA FC-W; API SL/CF, CG-4, CH-4; Volvo VDS-2

Teboil 4T Special Motorboat is a special oil for 4-stroke engines of boats and water jets. Its improved anti-rust and anti-corrosion properties ensure excellent protection to outboard and inboard engines of boats and other vessels.

Teboil Pienkoneöljy

- Viscosity
  SAE 30
- Specifications
  API SJ, SF

Teboil Pienkoneöljy is a special oil for small 4-stroke engines. It is excellent for e.g. lawn mowers, cutters, shredders and aggregates.

Automotive lubricants

API GL-1 transmission and gear oils

Teboil Gear

- Viscosity
  SAE 80W-90
- Specifications
  API GL-1, Volvo 97305

Teboil Gear is an API GL-1 category transmission oil that contains efficient anti-wear and anti-corrosion additives, but does not contain any EP additives, as required by the API GL-1 specification conditions. It has good anti-wear properties and viscosity characteristics, even in case of heavy-duty applications.

Teboil Gear MTF-V

- Viscosity
  SAE 75W-80
- Specifications
  Volvo 97307; MAN 341SL; ZF TE-ML 02

Teboil Gear Oil MTF-V is a high-quality fully synthetic GL-4 category transmission oil intended primarily for heavy commercial vehicles. Excellent flow characters in cold conditions ensure that the transmission operates even at lowest temperatures and carefully selected additives provide excellent protection against wear, also in high temperatures and under heavy loads. Gear Oil MTF-V allows the longest possible service intervals specified by many transmission manufacturers.

API GL-4 transmission and gear oils

Teboil EP

- Viscosity
  SAE 80W and 80W-90
- Specifications
  SAE 80W:API GL-4; ZF TE-ML 02A, 17A; MIL-L-2105; MAN 341N; MB 235.1
  SAE 80W-90 : ZF TE-ML 02A, 17A, 16A, 19A; MIL-L-2105

Teboil EP oils are designed for both light and heavy machinery transmissions where API GL-4 rating is required from the oil. These oils contain efficient additives against gear abrasion, oil oxidation and foaming.

Teboil EP (fully synthetic)

- Viscosity
  SAE 75W-90
- Specifications
  API GL-4; MIL-L-2105; ZF TE-ML 17A

Teboil EP 75W-90 is a fully synthetic transmission oil for both light and heavy machinery. Its low pour point ensures that the transmission operates even at the lowest temperatures and its efficient EP additives gives the transmission first-rate protection against wear at high temperatures and under extreme loads. Due its excellent flowing characteristics at low temperatures, it reduces power loss in the power train and improves fuel economy.

API GL-5 transmission and gear oils

Teboil Hypoid

- Viscosity
  SAE 80W-90
- Specifications
  API GL-5;
  ZF TE-ML 05A, -16C, -17B, -19B, -21A;
  MIL-L-2105D; MAN 342N, 342 M-1

Teboil Hypoid is a transmission oil with efficient EP-additives suitable for both light and heavy machinery. It is also suitable for transmissions if the requirement is API GL-5. Due to its high EP additives content, this oil is not recommended for transmissions if the requirement is API GL-4.

Teboil Hypoid (fully synthetic)

- Viscosity
  SAE 75W-90 and 75W-140
- Specifications
  Specifications API GL-4/5 (75W-90), GL-5 (75W-140); MT-1; MIL-PRF-2105E; SAEJ 2360; MAN 3343 SL (75W-90); Scania STO 1:0;
  ZF TE-ML 05B, 12B, 16F, 17B(75W-90), 19C, 21B

Teboil Hypoid 75W-90 is a fully synthetic transmission and axle oil for light and heavy machinery, which is also suitable for transmissions if the requirement is API GL-5. Due to its excellent flowing characteristics at low temperatures, it reduces power loss in the power train and improves fuel economy. It also guarantees excellent lubrication and anti-wear performance in case of heavy use duty applications.

Teboil Hypoid 75W-140 is a fully synthetic gear and transmission oil for heavy machinery, which is intended for use in extremely demanding and difficult conditions. Its lubrication and anti-wear performance is exceptional under any conditions. Excellent low temperature performance decreases power loss in power train and improves fuel economy significantly as compared to regular SAE 140 oils.

Teboil Hypoid (semi-synthetic)

- Viscosity
  SAE 80W-140
- Specifications
  API GL-5; MIL-L-2105D; Scania STO 1:0;
  ZF TE-ML 05A, 12E, 16D, 19B, 21A

Teboil Hypoid SAE 80W-140 is a semi-synthetic gear/transmission oil for heavy machinery, intended for year-round use. Many truck manufacturers recommend this viscosity rating for final drives and (especially) hub reduction gears of vehicles used for exceptionally heavy-duty applications.

Teboil Hypoid LS

- Viscosity
  SAE 80W-90
- Specifications
  API GL-5 (LS); MIL-L-2105D; ZF TE-ML 05C, 12C, 21C

Teboil Hypoid LS is a high-quality special oil intended for lubrication of the gears of limited slip differentials. It is a so-called multi-purpose oil suitable for both light and heavy machinery. Teboil Hypoid LS meets the LS (Limited Slip) requirements.

Automotive lubricants

Special transmission and gear oils

Teboil Wetol, Wetol W and Wetol SHV

- Viscosity
  SAE 80, 80W and 75W-80
- Specifications
  API GL-4 ; Allison C4; Cat TO-2;
  Case NH CNH MAT3505, 3509, 3525;
  Case MS B6, 1206, 1207(80,80W),1210(75W-80);
  Ford ESN-M2C 86B/C, 134D, FNHA-2-C-200.00;
  John Deere J20C ; Kubota UDT Fluid;
  MF CMS M 1110, 1127 A/B, 1141(80,75W-80),
  1143, 1145; VCE WB 101; ZF TE-ML 05F, 06K, 17E

Teboil Wetol, Wetol W and synthetic **Wetol SHV** are transmission and gear oils designed especially for tractors and earth moving machines equipped with so-called wet brakes. They are excellently suitable for machines where the same oil is used in gearbox, transmission and hydraulic system. Wetol and Wetol SHV are intended for heavy-duty year-round use and Wetol W primarily for winter use. These oils have been developed with careful consideration of the power train anti-wear properties and smooth and silent operation of wet brakes. Owing to its excellent properties at both low and high temperatures, synthetic Wetol SHV oil ensures reliable operation of hydraulics and electrohydraulic transmission control systems even under most demanding circumstances. Wetol oils also meet the following quality requirements to hydraulic oils: Denison HF-0, HF-1, HF-2; Sauer Sundstrand; Vickers I-280-S, M 2950 S.

Teboil Outboard Gear

- Viscosity
  SAE 90
- Specifications
  API GL-4

Teboil Outboard Gear is a special gear oil for drive units in boats and final drives of outboard engines. Excellent water separation and corrosion inhibition properties are required from oils in this use.

Teboil Hydraulic Oil WB 46

- Viscosity
  ISO VG 46

Teboil Hydraulic Oil WB 46 is a special synthetic hydraulic oil that contains friction modifier, designed for hydraulic systems where the hydraulic oil also circulates in wet brake system. Such systems may be encountered in for example various harbour equipments.

Teboil Fluid D

- Specifications
  Dexron II, Allison C4, ZF TE-ML 03, -09, -014, ATF Type A Suffi x A, Ford M2C-138-CJ, Ford M2C-166-H, Cat TO-2, MB 236.2.

Teboil Fluid D is a conventional Dexron II type automatic transmission fluid, which is also suitable for most power steering systems.

Teboil Fluid E

- Specifications
  Dexron IIIH, Ford Mercon, MB 236.1, 236.2, 236.5 MAN 339 Type Z-1 ja V-1, Allison C4, ZF TE-ML 04D, -09, -11, -14A, -17C, CAT TO-2, Voith 55.6335

Teboil Fluid E is a semi-synthetic automatic transmission fluid intended for newer automatic transmissions that require e.g. Dexron IIIH and Ford Mercon specifications. Its friction properties are also maintained at high temperatures and its good low temperature performance ensures smooth operation of automatic transmission at varying temperatures.

Teboil Fluid S

- Specifications
  Dexron II/IID/IIIG/H; Ford Mercon, Mercon V; JWS 3309, ATF SP-II, SP-III; Chrysler ATF+3,ATF+4; ATF 7045E, LA2634, LT 71141, 3403, N402, ETL-8072B; Audi/VW G-052 025-A2, G-052-162-A1; MB 236.1/2/5/6/9/10; Honda ATF-Z1; Mazda ATF-M III, MV; Nissan Matic-D/J/K; Toyota T-III, T-IV

Teboil Fluid S is a fully synthetic automatic transmission fluid of the Dexron type, which is suitable for most modern automatic transmissions. Its excellent high and low temperature performance ensures trouble-free operation of the transmission at varying operating conditions.

Teboil Fluid ES-Max

- Specifications
  Dexron IIIH, Ford Mercon and Ford Mercon V, Allison C4 Allison TES-295 and TES-389, ZF TE-ML 02F, -04D, -09, -11B -14B/C, -16L, -17C, Voith H55.6336.xx, MB 236.6, MAN 339 Type V2, Z-2 and Z3, Volvo 97341

Teboil Fluid ES-Max is a fully synthetic automatic transmission fluid for the most demanding conditions. It is specifically designed for heavy-duty machinery with maximum service intervals, with consideration of the special requirements of transmission manufacturers.

Teboil Fluid TO-4

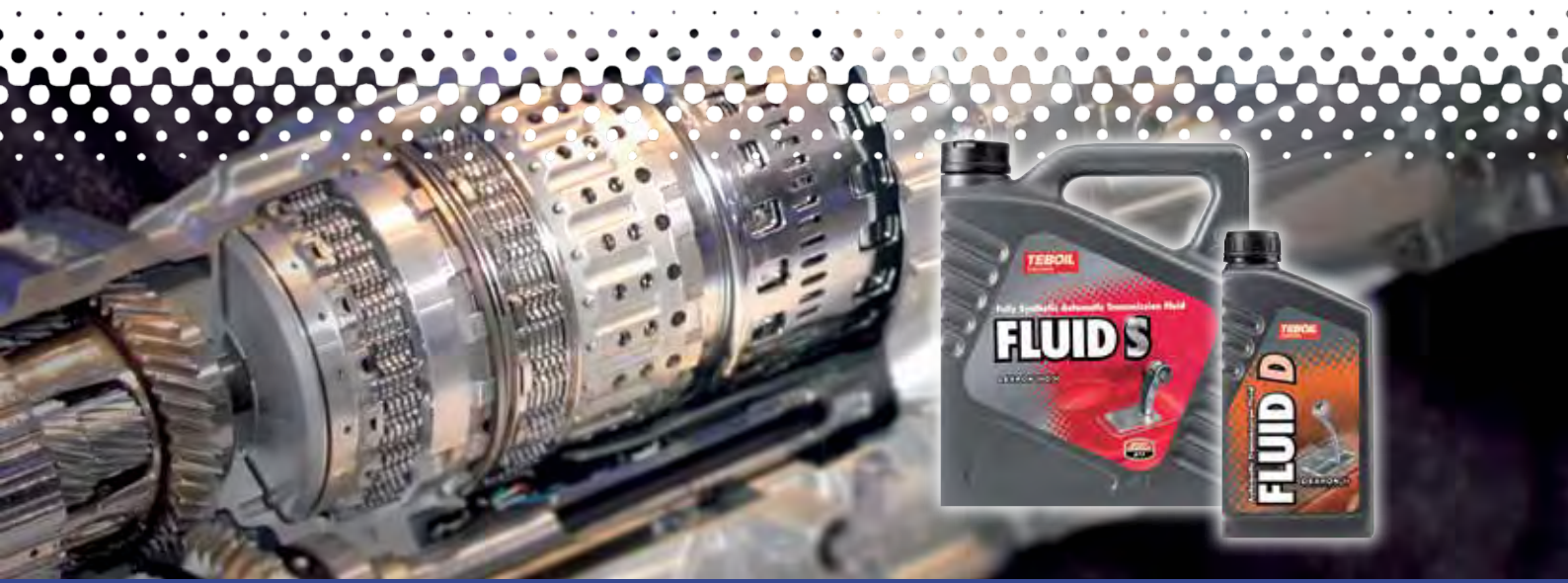
- Viscosity
  SAE 10W, 30 and 50
- Specifications
  CAT TO-4, Allison C4, Komatsu

Teboil Fluid TO-4 is a transmission and gear oil for heavy-duty machinery that requires Cat TO-4 fluids. It contains efficient additive substances against wear, oil oxidation and foaming. Fluid TO-4's friction-modifying additives maintain smooth and silent operation of wet brakes.

Teboil Fluid FD-1

- Viscosity
  SAE 50
- Specifications
  CAT FD-1

Teboil Fluid FD-1 is made for heavy earth moving and construction vehicles which requires CAT FD-1 type oil. Typical applications are mining- and construction machines manufactured by Caterpillar.



Automotive lubricants

Special automotive hydraulic oils

Teboil Hydraulic 46 Max-S

- Zinc-free special hydraulic oil based on novel additives, intended for use in heavy-duty hydraulic systems operating under especially demanding conditions. Thanks to its high viscosity index and extremely low shearing, the oil has got superb performance at both high and low temperatures.
  In case of extreme conditions, Hydraulic 46 Max-S improves the efficiency and fuel economy of machinery. Typical applications include forest and groundwork machines and other mobile machinery operating under demanding conditions. SS 15 54 34 AV DIN 51524 part 3 (HVLP), Eaton Vickers I-286-S, M-2950-S Cincinnati Machine P-70, Parker Hannifin (Denison) HF-0, HF-1, HF-2

	ISO VG class	Viscosity @40°C mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
46 MAX-S	46	46	9.2	208	– 39	185

Teboil Hydraulic Oil S

- Special hydraulic oils designed for hydraulic systems operating under varying temperatures, which are started in cold weather conditions or operate at high temperatures. The oils contain efficient additives against wear, oxidation and corrosion. Good air and water separation ensure trouble-free operation under any conditions. SS 15 54 34 AV DIN 51524 part 3 (HVLP), Eaton Vickers I-286-S, M-2950-S, Parker Hannifin (Denison) HF-0, HF-1, HF-2 Cincinnati Machine P-68 (32S), P-69 (68S), P-70 (46S)

	ISO VG class	Viscosity @40°C mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
32S	32	32	7.1	192	– 51	175
46S	46	46	9.2	188	– 48	178
68S	68	68	11.1	154	– 48	188

Teboil Hydraulic Oil (15, 22, 100)
Teboil Hydraulic Lift (32, 46)

- For hydraulic systems of mobile machinery operating at varying temperature conditions. Provide efficient protection against wear and corrosion to the system. DIN 51524 Part 3 (HVLP), Eaton Vickers I-286-S, M-2950-S.

	ISO VG class	Viscosity @40°C mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
15	15	15	3.7	141	– 54	175
22	22	22	4.7	141	– 54	175
100	100	100	14.1	145	– 36	200
Lift 32	32	31	6.0	147	– 42	185
Lift 46	46	46	7.8	141	– 42	195

Teboil Hydraulic Arctic Oil (15)
Teboil Hydraulic Oil Polar (22)
Teboil Hydraulic Deck Oil (32)

- Hydraulic oils of this series are designed for hydraulic systems operating within a wide range of temperatures. These oils have a very high viscosity index and excellent properties at low temperatures.
  An excellent choice, for example, for tail gate lifts in trucks and other systems that are used intermittently, but are required to function even at very low temperatures without any warming-up.

ISO VG class	Viscosity @40°C mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
15	15	5.5	375	– 60	110
22	22	7.5	375	– 60	110
32	36	8.9	245	– 54	170

Teboil Hydraulic SHV 36

- A fully synthetic zinc-free hydraulic oil designed for heavy-duty hydraulic systems that require a wide range of operating temperatures. Typically uses are groundwork and forestry machinery, truck hydraulics, port equipment and vessel deck hydraulics.

Viscosity @40°C mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
36	7.7	175	– 48	230

Teboil Hydraulic Oil 5W and 10W

- Fully synthetic **Hydraulic Oil 5W** and mineral oil-based **Hydraulic Oil 10W** are special oils for the hydraulic systems of groundwork machinery and harbor equipment where use of engine oil is recommended. Hydraulic Oil 5W performs excellently at both low and high temperatures, thus being perfectly suitable for heavy-duty year-round use.
  Zinc (Zn) content exceeds 1,000 ppm.

ISO VG class	Viscosity @40°C mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
5W	32	6.2	150	– 54	180
10W	41	6.5	110	– 39	210

Teboil Hydraulic Eco

- Teboil Hydraulic Eco oils are hydraulic oils manufactured of biodegradable synthetic esters. Their excellent cold-flowing characteristics enable a risk-free start even at the lowest temperatures. High viscosity index and extremely low shearing guarantee lubrication also at high operating temperatures.
  Biodegradability exceeds 70 % (OECD 301 B)

ISO VG class	Viscosity @40°C mm²/s	Viscosity @100°C. mm²/s	VI	Pour point. °C	Flash point. °C
15	15	4.0	170	– 60	200
32	32	7.3	185	– 54	200
46	43	9.2	205	– 54	200
68	68	13.0	195	– 48	230

Saw chain oils

Teboil Teräketjuöljy BIO

- **Teboil Teräketjuöljy BIO** is a biodegradable synthetic chain oil for chain saws used year-round.

Teboil Teräketjuöljyt

- **Teboil Teräketjuöljy** is a chain oil for chain saws made of mineral oil and adhesion-enhancing additives.

Teboil MoTo

- **Teboil MoTo** is a chain oil made of pure mineral oil. MoTo is an excellent choice for harvesters. The product is available in winter (T) and summer (K) modifications.

Lubrication greases

Multi-purpose greases

Teboil MultiPurpose Grease

- Multipurpose bearing grease for automotive and industrial use.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium	2	180	110	– 30...120

Teboil MultiPurpose EP and EP 0

- Grease for heavily loaded bearings, such as wheel bearings in automotive use. Also an excellent choice for multipurpose grease. Multi-Purpose EP 0 is suitable for extremely low temperatures and central lubrication systems and gearboxes.

	Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
EP	Lithium	2	180	200	– 30...120
EP 0	Lithium	0	> 160	200	– 30...120

Chassis greases

Teboil Universal M

- Chassis grease containing molybdenum sulphide (MoS_2), for lubrication of king pins, ball joints and bearing journals.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium	2	180	110	– 30...120

HD-M Grease

- Versatile heavy duty lubricating grease specially developed for mining and heavy land and extreme severe conditions. Typical applications are different kind of earth moving equipment when maximal antiwear protection and load carrying capacity is desired.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium complex	2	> 280	320	– 20...200

Teboil Solid 0 and 2

- Water-free calcium greases for heavily loaded, slowly running journal and roller bearings, especially in humid conditions. Characterised by excellent adhesion, water-resisting and load-carrying characteristics. An excellent choice for lubricating automotive and machinery joints and chassis bearings. Because Solid 0 is easier to pump, it is better suitable for winter use and central lubrication systems as compared to Solid 2.

	Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Solid 2	Calcium	2	145	800	– 20...120
Solid 0	Calcium	0	> 120	800	– 30...90

Multipurpose greases for use at higher temperatures and under heavy loads

Teboil MultiPurpose HT

- A special high temperature grease for industrial and automotive journal and roller bearings operating under heavy load and/or at extremely high temperatures. As an example, the grease is typically used in wheel hubs of heavy-duty vehicles. Excellent choice for multipurpose use.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium complex	2	> 260	200	– 30...150

Teboil Grease HL 520

- A lithium complex grease for heavily loaded bearings.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium complex	2	> 260	560	– 20...140

Teboil Syntec Grease

- A lithium complex grease based on synthetic base oil, with wide operating temperature range. Typical uses are journal and roller bearings operating at high and/or low temperatures. Syntec Grease is excellent multipurpose grease for industry, especially when high performance is required.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium complex	2	> 260	160	– 40...150

Central lubrication greases

Teboil Universal CLS and CLS-1

- Industrial and automotive central lubrication greases, which have excellent lubricating properties under humid and demanding conditions. Universal CLS has been designed especially for use at low temperatures. Suitable also for grease-lubricated gears.

	Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
CLS-1	Lithium complex	0.5	230	145	– 30...120
CLS	Lithium complex	00	170	110	– 35...100

Lubrication greases

Bearing greases for small loads and high speeds

Teboil MultiPurpose Extra

- A special grease designed for high speed bearings. Bismuth technology-based EP additives ensure good lubricating properties. Typical applications are industrial blowers.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium	2	185	55	– 35...110

Teboil EM Grease 102 X

- Lithium complex-based special grease optimised for the lubricating needs of industrial electric motors. It is also perfectly suitable for use as multipurpose grease covering a wide range of operating temperatures.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Lithium complex	2	> 260	110	- 30...140

Gear and chain greases

Teboil DKW-Grease

- Semi-solid mineral oil-based sodium grease containing anti-corrosion and EP additives. DKW-Grease is intended for lubrication of closed gears. An excellent choice for lubricating cone crushers' top bearings.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Natrium	0	> 100	200	– 30...100

Teboil Gear Grease XHP

- A special grease containing efficient EP additives for lubricating heavily loaded open gears and chains that operate in a wide range of temperatures. Short-term temperature peaks up to 240 °C are permissible. Typical applications are gas machines, chains, steel ropes and various sliding surfaces. Gear Grease XHP is also excellent for lubricating journal and roller bearings in hot and/or heavy-duty conditions.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Calcium/ Lithium complex	0.5	> 260	800	– 30...140

Teboil Gear Grease MDS

- A grease for open gears, steel ropes and chains based on inorganic thickening agent. Gear Grease MDS contains lubricants that efficiently prevent shearing, such as graphite, for example. Typical lubricating uses include extremely heavily loaded, slowly moving equipment and equipment exposed for vibration. For example, hydraulic hammers require this type of grease.

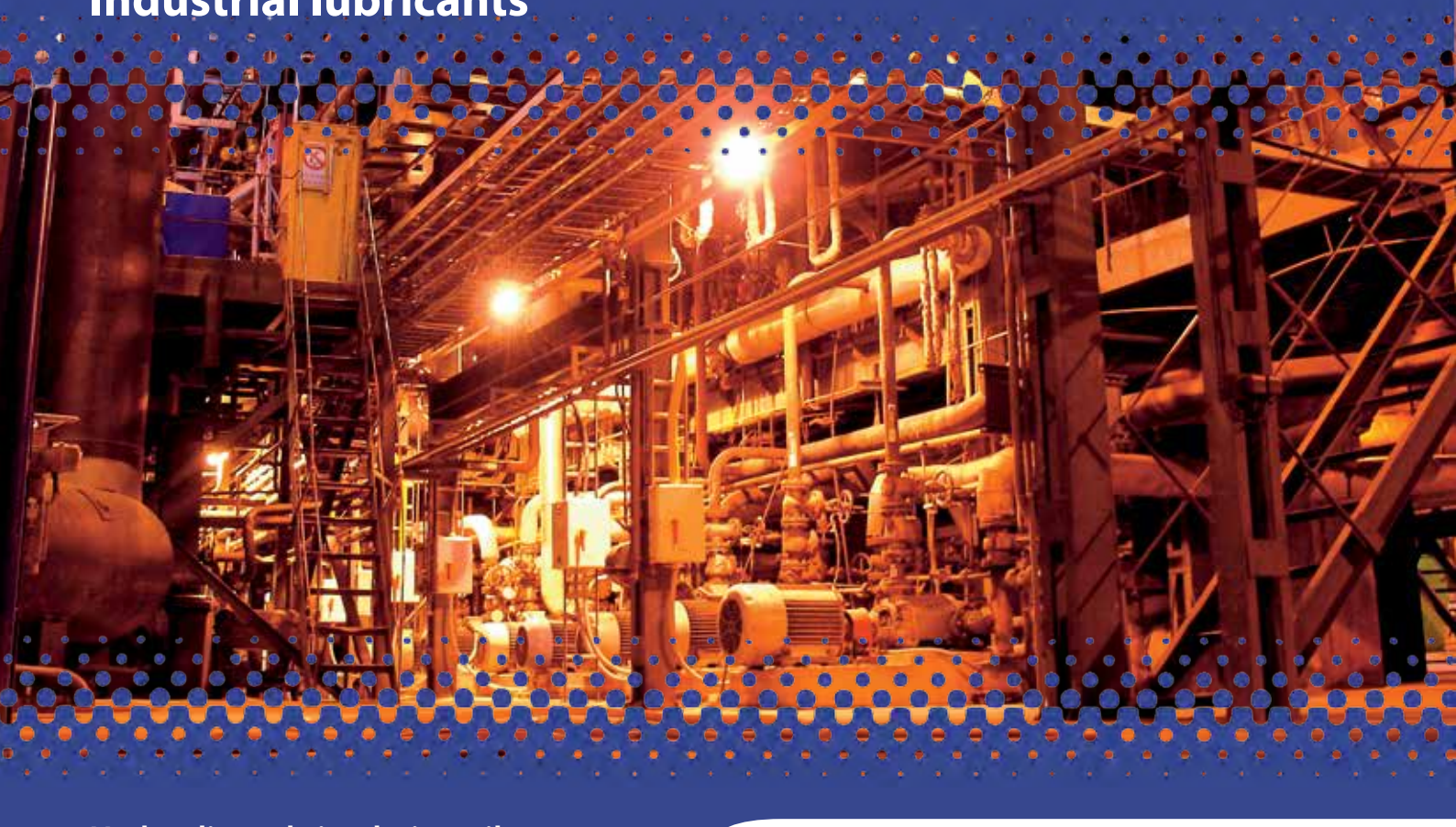
Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Bentonite	0.5	N/A	2100	– 10...150

Teboil FM-Grease

- A special grease for food industry machinery, characterised by excellent corrosion prevention and water resistance properties. The product does not contain hazardous substances that might cause health risks when accidentally getting in touch with food products.

Thickener	NLGI	Drop point °C	Base oil viscosity at mm²/s @ 40°C	Range of use temperature °C
Inorganic	2	N/A	65	– 30...100

Industrial lubricants



Hydraulic and circulation oils

Teboil Larita Oil

- Industrial oils for hydraulic and circulation systems that contain anti-wear, antioxidant, and anticorrosion additives. Typical applications include industrial high-pressure hydraulic systems, lightly loaded gears, journal and roller bearings and circulation oil systems.
- Specifications
  DIN 51524 part 2 (HLP), Vickers I-286-S, M-2950-S,
  Denison HF-0, HF-1, HF-2
  Cincinnati Machine P-68 (ISO VG 32), P-69 (ISO VG 68) P-70 (ISO VG 46)

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
10	10	2.7	80	– 51	165
22	22	4.2	90	– 45	195
32	32	5.3	105	– 39	200
46	46	6.9	105	– 36	200
68	68	8.8	100	– 33	220
100	100	11.0	95	– 15	220
150	150	14.0	90	– 15	230
220	220	18.0	90	– 12	240
320	320	23.0	90	– 9	260
460	460	29.0	90	– 9	260

Transmission and circulation oils

Teboil Pressure Oil

- High-quality industrial EP gear oils. A excellent choice for heavily loaded worm gears and gears, as well as in circulation lubrication systems.
- Specifications
  AGMA 9005-E2, 250.04; DIN 51517 part 3 (CLP);
  US Steel 224

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
68	68	9.1	110	– 27	220
100	100	11.4	100	– 27	240
150	150	15.0	100	– 21	240
220	220	18.0	90	– 18	250
320	320	23.0	90	– 15	270
460	460	29.0	90	– 12	290

Transmission and circulation oils

Teboil Sypres

- Fully synthetic industrial gear and circulation oils containing EP additives. Typical applications include gears operating at high or extensively varying temperatures, as well as if extended service intervals are required or if the objective is improvement of energy efficiency.
- Specifications
  AGMA 9005-E2, 250.04; DIN 51517 part 3 (CLP);
  US Steel 224

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
68	68	11.2	158	– 51	220
100	100	15.0	155	– 51	210
150	150	20.0	155	– 48	210
220	220	26.0	150	– 39	210
320	320	33.0	150	– 36	200
460	460	43.0	145	– 30	190

Teboil Synpag

- Special polyglycol-based gear oils with excellent friction properties and anti-oxidation performance. Main applications are worm gears with bronze-steel gear pairs and other transmissions operating at temperatures that are too high for ordinary gear oils.

  When using polyglycols, note:
  • Never mix these oils with any other lubricating oils.
  • The oils may dissolve some traditional paints. Use of epoxy-based or corresponding coatings and paints is recommended.

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
220	220	36.0	215	– 32	230
460	460	76.0	245	– 42	250

Compressor oils

Teboil Compressor Oil P

- These oils are specially designed for lubrication of piston compressors. They have excellent anti-oxidation characteristics and low carbon deposits build-up tendency at high temperatures. **Compressor Oil P 68 S** is semi-synthetic.
- Specifications
  DIN 51506 VDL

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
32	32	5.4	100	– 39	200
68	68	8.8	100	– 33	210
100	100	11.0	95	– 27	220
68 S	68	9.8	125	– 42	210

Teboil Compressor Oil SX

- A synthetic oil designed for lubrication of screw compressors, characterised by good oxidation stability and very low foaming tendency.
- Specifications
  ISO-L-DAH

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
46	44	7.3	135	– 39	250

Teboil Compressor Oil 46 SHV

- A fully synthetic compressor oil containing anti-wear, anti-oxidation and anti-corrosion additives. The oil is designed for air compressors operating under the most demanding conditions. Compressor Oil 46 SHV meets the ISO-L-DAH standard requirements for screw compressor oils.
- Specifications
  ISO-L-DAJ

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
46	46	7.8	139	< – 42	255

Pneumatic tool oils

Teboil Pneumo

- Special oils for impact and rotation pneumatic tools. EP and adhesion additives ensure that a permanent lubricating film is formed on metal surfaces, efficiently preventing metal-to metal contact. Corrosion inhibitors contained in the oils prevent moisture-induced corrosion. Teboil Pneumo oils do not release vapours hazardous for health.

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
22	22	4.5	115	– 42	180
46	46	6.9	105	– 25	205
100	100	11.4	100	– 15	210

Heat-transfer oils

Teboil Termo Oil

- High-quality heat-transfer oils characterised by good anti-oxidation qualities. Other properties include low cracking tendency, low vapour pressure and long service life. Termo Oil modifications are intended for use in closed heat-transfer systems. Teboil Termo 100 is designed for applications that re-quire extremely low vapour pressure.

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
15	15	3.3	80	– 42	180
32	32	5.4	100	– 12	200
100	100	11.0	95	– 12	220

Turbine oils

Teboil Turbine Oil XOR

- Turbine oil made of special base oil and intended for extremely demanding operating conditions. Excellent anti-oxidation, water and air separation, anti-foaming, and anti-corrosion characteristics. This product is recommended for circulation lubrication of steam and water turbines and for compressors that require the use of turbine oil.

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
32	32	5.9	128	– 15	240
46	43	7.3	135	– 12	250
68	65	8.7	105	– 12	230

Non-drip oils

Teboil Past Oil S

- This series oils are developed for sliding surfaces, the screws and chain lubrication. The characteristic of the products are good lubricating properties, adhesion, and very low deposit forming even in high temperature conditions. Typical applications include plywood mills in high temperature operating conditions, veneer dryer drive chains.

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
150 S	150	14.5	95	– 12	230
320 S	320	23.0	90	– 12	260
460 S	460	29.0	90	– 9	260

Slide-way oils

Teboil Slide

- These oils are designed for lubricating slide ways in machine tools. Their “anti slip-stick” properties enable smooth feed movements that ensure smooth surface quality for work piece even in case of heavy grinding and at low feeding speeds. Teboil Slide is also suitable for use as hydraulic oil, especially in case of machines where hydraulic oil lubricates guiding surfaces.

ISO VG class	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
32	32	5.4	100	– 12	200
68	68	8.7	105	– 12	210
220	220	19.0	95	– 12	240

Transformer oils

Teboil Muuntajaoljy SL 200

- A high quality transformer oil with good anti-oxidation and electrical isolation characteristics. It is designed for use in transformers and oil immersed breakers.
  Dielectric strength in a cup > 30 kV.
  Dielectric strength when dried (after treatment) > 70 kV.

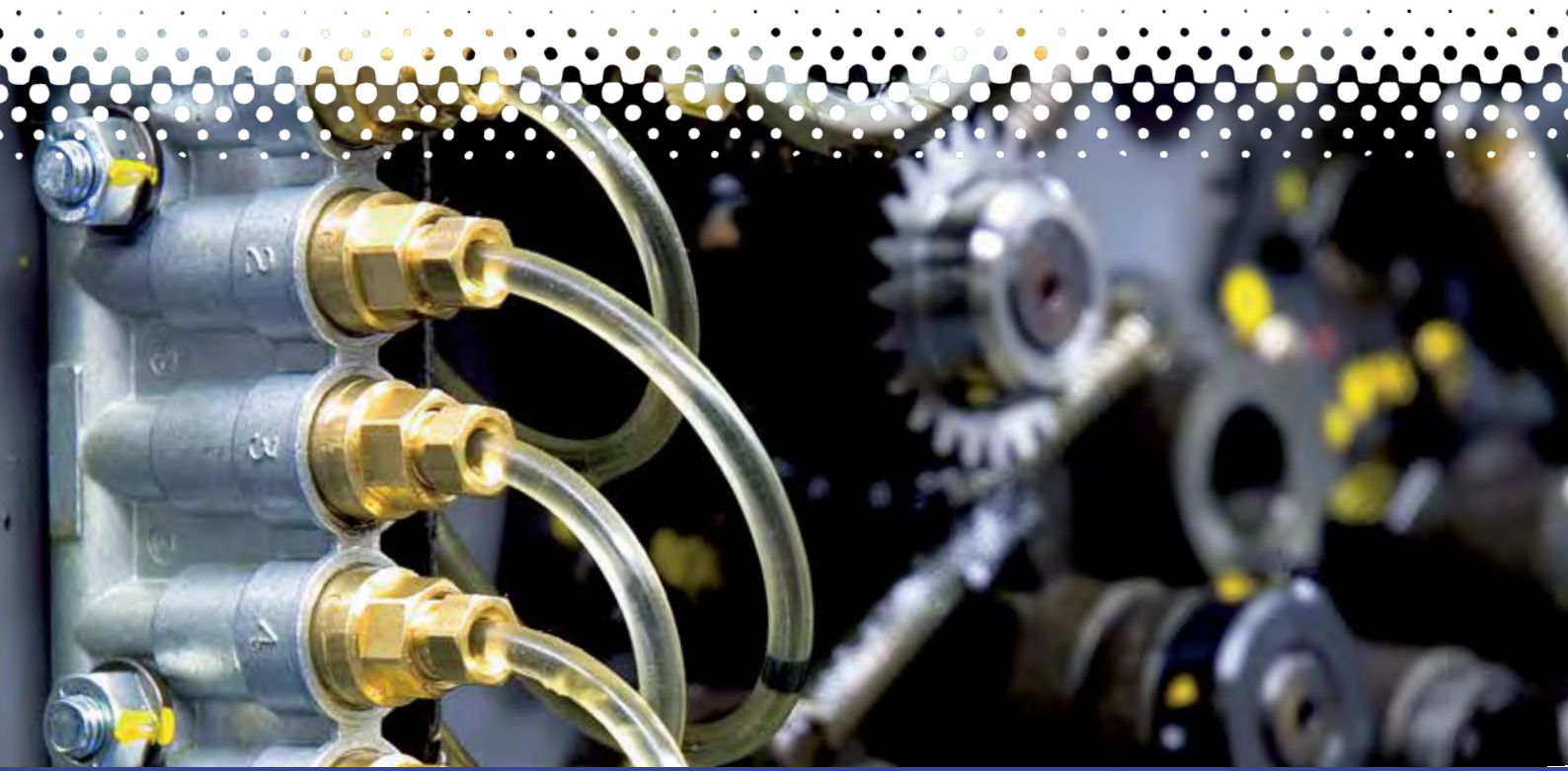
Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	VI	Pour point, °C	Flash point, °C
7.5	2	40	< – 51	> 140

Concrete form oil

Teboil Form Oil E

- Concrete form oil that eases removal of the casting from the form and protects steel forms from corrosion. It is suitable for all types of concreting and for use with conventional materials of which forms are made, in particular, with steel, wood, and hardboard. Optimal oil consumption is 1l / (35-55) m².

Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	Flash point, °C
8	–	75



Marine lubricants

Cylinder and system oils for low-speed crosshead engines

Teboil Ward L 10T

- Cylinder and system oils for marine medium-speed cross-head engines that use fuel with sulphur content of less than 1.0%.

SAE	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	TBN, mg KOH/g
SAE 30	110	12.0	12
SAE 40	148	14.5	12

Teboil Ward L 20T

- Cylinder and system oils for marine medium-speed cross-head engines that use fuel with sulphur content of less than 2.0 %.

SAE	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	TBN, mg KOH/g
SAE 30	110	12.0	20
SAE 40	148	14.5	20

Teboil Ward L 30T

- Cylinder and system oils for marine medium-speed cross-head engines that use fuel with sulphur content of less than 3.5 %.

SAE	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	TBN, mg KOH/g
SAE 30	110	12.0	30
SAE 40	148	14.5	30

Teboil Ward L 40T

- Cylinder and system oils for marine medium-speed cross-head engines that use fuel with sulphur content of less than 4.5 %.

SAE	Viscosity @40°C, mm²/s	Viscosity @100°C, mm²/s	TBN, mg KOH/g
SAE 40	148	14.5	40

Latest lubricant technologies in Europe

Teboil lubricants are manufactured at the Hamina lubricant plant, which is equipment-wise one of the most advanced in Europe. Comprehensive automation and quality control allow us to manufacture high-performance and quality lubricants. For product development and quality control, the plant operates its own oil laboratory, where research and development work of internationally acknowledged level is carried out.

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