



Finke

LUBRICANTS



AVIATICON LUBRICANTS
BEST QUALITY SINCE 1884 – MADE IN GERMANY!



BUILDING TRUST THROUGH RELIABLE CONTINUITY

AVIATICON LUBRICANTS – KEEPING THE WORLD OF TECHNOLOGY PERFECTLY MOVING!

“Lubricants – Made in Germany since 1884” – so goes the slogan behind our company. At first it may be somewhat annoying that a German company has chosen a motto in English, but our high-quality **AVIATICON** Lubricants can now be found all over the world - and we are particularly proud of this!

Finke Mineralwerk is part of the Hoyer Group – an enterprise owned by Heinz-Wilhelm Hoyer’s family and based in Visselhövede. As a mid-sized lubricant company, we develop, manufacture and distribute high-quality lubricants under our own **AVIATICON** brand.

All products can be received in private-label packagings. Here, we develop customised solutions, from labels to material safety data sheets.

At our main production site in Visselhövede, we have very large storage capability for base oils, additives, antifreeze, finished products and mineral oils with surface and underground storage tanks having a total capacity of more than 5,000,000 litres. As a result, we are always able to meet customer needs straight away.

An additional product line is the AdBlue® production. With regard to this, we obtained a First Company Certification for Germany by the German Association of the Automotive Industry (VDA Verband der Automobilindustrie), owner of AdBlue® trade mark

rights. Naturally, our performance capability is also monitored by ISO 9001:2008* Quality Management System through the DEKRA association.

In the food-grade lubricant market segment, we cooperate as Master Distributor in Europe with LUBRIPLATE Lubricants Company, one of the world’s major food-grade lubricant manufacturers. With our Lubriplate food-grade lubricants, we can offer unique products along with our well-known services – from consulting to delivery through to technical support! This brochure will give you as a consumer an insight into Finke Mineralölwerk’s performance capability. Our trained, experienced

team is also available for tribological consultancy on the phone and directly at your site at all times. Your problem is a challenge for us to find the best solutions. Because we are simply excited of being able to keep the world of technology perfectly moving with our **AVIATICON** Lubricants.

Gerald Lutz
Managing Director



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DEKRA CERTIFICATION



VDA CERTIFICATION





BUILDING TRUST THROUGH QUALITY

Without fuel and lubricants, the gear mechanisms of modern technology would be doomed to grind to a standstill. Fish oil, tallow and wool grease, as well as olive, castor, mustard and rapeseed oils were used as animal and vegetable lubricants respectively for hundreds of years.

Castor oil – appropriate for the purpose yet expensive – was the favourite lubricating oil for racing and aircraft engines for decades. Due to its strong tendency to oxidation and therefore acid formation, as well as thickening and gum formation, this product is not suitable for today's high requirements of modern lubricant technology.

We manufacture our lubricants exclusively with high quality base oils. For their production, we use mineral

oils, hydrocracked oils, synthetic hydrocarbons and various esters.

These products can be used unmixed as well as variously mixed with one another as base oils.

Unfortunately, neither in Germany nor worldwide is there a standardised designation for base oils, so that the marketing experts of all mineral oil companies have repeatedly come up with new word creations. Terms such as synthetic, HC synthetic, semi-synthetic and many other designations do not actually give any hint about the real composition of lubricants.

One of our basic guidelines is to use only the best, selected base oils and additive packages, each featuring the highest and latest technology.



1,200 active formulations are currently produced in our mineral oil plant. These include the classic engine, gear, hydraulic and industrial oils, but also customised special formulations such as concrete release agents or special metalworking oils.

Our production facility has different mixing tanks in which we can produce complete tank truck batches, but also small volumes. In a 2-shift operation, up to 500 tonnes of lubricants can be manufactured and packaged daily.

The quality of our manufactured products is permanently monitored in our own operating laboratory. In so doing, a reference sample is created for each batch. The control analyses carried out on raw materials, additives and each product batch in our own

plant laboratory ensure a high, consistent quality of our products. Our services naturally also include oil analyses performed by our customer service.

Even in case of AdBlue®, a sample of each manufactured batch is sent to an independent laboratory for analysis, and released for delivery only after the laboratory result.

Thanks to scrupulous, close checks, the highest quality is constant a guarantee from our company.

For each product delivered by us, you will receive product and safety data sheets fully complying with the latest legal requirements in accordance with the GHS/CLP regulations.

All products are packaged with the latest filling equipment into different containers. Highly motivated employees and technically premium-quality filling equipment ensure that properly packaged and labelled lubricants are delivered to you in different containers, from 1 litre units to 1,000 litre IBCs.

Bulk lubricants are delivered via the company's own tank trucks, which are provided with different types of tank chambers and delivery systems, so that single-variety products can be always filled into each customer's tanks.

In addition, all delivery vehicles are equipped with calibrated delivery systems.



BUILDING TRUST THROUGH EXPERTISE

Properly using lubricants can help save energy, reduce downtimes, decrease costs and efforts for replacing spare parts, as well as preserving the machine, motor or investment value.

Each customer has individual wishes and demands tailor-made solutions for its specific purpose of application – for that to happen, our team is available to assist you anytime.

Starting from tribological and tribotechnical basics, each aspect of the lubrication systems in machinery or machine elements is taken into account to

develop customised lubrication plans for single applications or complete works.

Our service also deals with special partial aspects of lubrication in certain units. Furthermore, we are always available to competently handle any questions about emulsion filters, industrial hygiene, disposal of waste oils, hydraulic oil filters, oil change intervals and much more.

To always be able to find the right **AVIATICON** lubricant, we have installed an Oil Finder on the home page of our www.finke-oil.de website, through which

the correct viscosity required for motor vehicles, utility vehicles, as well as construction and agricultural machinery can be determined.

Our entire team is always available to provide application-specific advice to consumers. We place a high value on our employees' training and continuous education (e. g. technical business administrators, management assistants in mineral oil services, or certified specialists for lubrication technology).



THE FINKE TEAM

– OUR EMPLOYEES MAKE THE DIFFERENCE!

As a lubricant manufacturing company, we attach great importance to the best lubricant qualities and first-class service, which places tribological consulting in the foreground.

Our team is a healthy mix of employees who have gained tremendous experience in the field of mineral oils over many decades, and young people who are continuously trained to become lubricant specialists through in-house and external courses.

We place great emphasis on training management assistants in mineral oil services (German abbreviation TMK) and certified specialists for lubrication technology (German abbreviation ZFS).

We continually evolve our formulations and tailor-made design solutions for our customers. Many specially formulated products have been explicitly developed for a single customer and application!

Our extensive service also includes laboratory analyses for our customers. Especially in the case of bio-gas plants or heat transfer oil systems, these service analyses are indispensable for flawless operation and therefore the best possible oil dwell times.

It is precisely when suitable lubricant qualities must be selected that thorough research is required to recommend the best lubricant for an application. Finke's lubricant usage plan is customised to each type of application. The consumer has thus a perfect overview of its lubricant requirements and the intended use for each product. Considerable cost

savings can be often obtained by optimising the product range.

For large customers and resellers, we offer a complete private label service, namely we can help you design your own label or a special customer-container, as well as creating tailor-made product range and material safety data sheets. Our label service includes the creation of labels in accordance with current legal requirements.

It goes without saying that, for our export customers, we carefully take into account all country-

specific laws and regulations. Each customer can rely on the greatest possible support from us. Our aim is to advise every customer in the best possible way, and find the ideal tribological solution for them. Try us – we are there for you!

You can find your personal reference person at **www.finke-oil.de**.

Your team at Finke Mineralölwerk



OUR CONTAINERS – SOME SELECTED PRODUCTS



OUR SALES PROGRAMME: ENGINE OILS

Under engine oil, the quality of a lubricant suitable for lubricating a combustion engine is most important. Engine oils are primarily used to lubricate the engine moving parts and reduce friction. In addition, they can absorb mechanical abrasion and combustion residues. In doing so, they also have a cleansing effect. They protect against rust, cool down engine parts becoming particularly hot, and impermeability.

Our **AVIATICON** engine oils are designed for a wide range of engines – passenger cars and utility vehicles, two-stroke engines, engines of agricultural equipment such as tractors, building machines, marine engines, gas and lawn mower engines – and are also available as anti-corrosion oils.

When selecting the correct and suitable engine oil, manufacturer approvals must be observed (e. g. Mercedes Benz approval 229.51 or VW 504.00/507.00). If no special manufacturer approvals are available, then API or ACEA specifications must be adhered to. The specifications required for choosing the correct oil can be found in the operating instructions of the relevant engine or in our Oil Finder at **www.finke-oil.de**.

If vehicles do not have an automatic oil level indicator, we recommend checking the oil level after every third tank refill. A question that is frequently raised concerns the miscibility of different types of oil. In general, one can say that varieties having identical specifications can be mixed with each other. Also, it does not matter whether it is mineral or synthetic oil – mixing high-quality varieties is harmless. It should

be noted, however, that the oil change intervals approved by manufacturers may change.

Closed engine oil containers can be stored without problems for about 3 years. Open containers should be properly disposed of after one year.

The addition of special additives from “promising” engine oil additives is categorically rejected by almost all automotive manufacturers. As a matter of fact, Mercedes Benz prescribes that adding special additives to lubricants shall solely be the vehicle owner’s sole responsibility. In so doing, in a damage event, warranty and warranty claims may be restricted.

We also strongly advise against adding special additives to engine oils since a subsequent mixture can adversely affect the balance between oil and additives.

You can find the definitions of technical terms such as API, ACEA, SAE at **www.finke-oil.de/schmierstoff-abc**.



■ ENGINE OILS FOR PERSONAL MOTOR VEHICLES

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Unique LX 0W-16	Fuel-saving, specially formulated engine oil for Japanese OEMs	API SN		
AVIATICON Unique LV 0W-20	Fuel-saving high-performance engine oil for modern petrol engines in passenger cars	API SN ILSAC GF-5		Ford WSS-M2C 925-A; Chrysler MS 6395
AVIATICON Unique VO 0W-20	HC synthesis low-viscosity engine oil for petrol and diesel engines	ACEA A1/B1		Volvo VCC RBS0-2AE
AVIATICON Unique SX 0W-40	Fully synthetic low-viscosity engine oil	ACEA A3/B4 API SN		Mercedes Benz 229.3; Mercedes Benz 229.5; Volkswagen 502.00; Volkswagen 505.00; BMW Longlife-01; Renault RN 0700; Renault RN 0710; Porsche A40
AVIATICON Unique SD 0W-40	Universal multigrade engine oil for petrol and diesel engines.	API CF/SN ACEA C3		Mercedes Benz 229.31; Mercedes Benz 229.51; BMW Longlife-04; GM dexos2®
AVIATICON Unique FO ECO 5W-20	Special low SAPS High-Performance Low-Viscosity Engine Oil	ACEA A1/B1 API SN	Ford WSS-M2C 948-B	
AVIATICON Unique Longlife WIV 5W-30	HC Synthesis Longlife High-Performance Engine Oil	ACEA C3	MB Approval 229.51; Volkswagen 504.00; Volkswagen 507.00; BMW Longlife-04	Mercedes Benz 229.31 Porsche C30
AVIATICON Unique BM 5W-30	mid SAPS Longlife High-Performance Engine Oil	API SN/CF ACEA C3	Mercedes Benz 229.51; 229.52 BMW Longlife-04; GM dexos 2	Mercedes Benz 229.31; Volkswagen 502.00; Volkswagen 505.00; Volkswagen 505.01; Ford WSS-M2C 917-A; Fiat 9.55535-S2; Fiat 9.55535-S3

■ ENGINE OILS FOR PASSENGER CARS - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Unique DC 5W-30	HC Synthesis High-Performance Low-Viscosity Engine Oil	ACEA A3/B4 API CF/SM	MB Approval 229.5	Mercedes Benz 229.3; Volkswagen 502.00; Volkswagen 503.01; Volkswagen 505.00; BMW Longlife-01; BMW Longlife-98; Renault RN 0700; GM-LL-A-025; GM-LL-B-025; Fiat 9.55535-H2; Fiat 9.55535-M2; Fiat 9.55535-N2
AVIATICON Unique FO Plus 5W-30	HC Synthesis Longlife High- Performance Engine Oil	ACEA A1/B1 API SL/CF ACEA A5/B5		Renault RN 0700; Ford WSS-M2C 913-A; Ford WSS-M2C 913-B; Ford WSS-M2C 913-C; Ford WSS-M2C 913-D; Jaguar
AVIATICON Unique SC 5W-30	HC Synthesis High-Performance Low-Viscosity Engine Oil	ACEA C2 API SN/CF		Renault RN 0700; Fiat 9.55535-DS1; Fiat 9.55535-S1; IVECO 18-1811 SC1; PSA B71 2290
AVIATICON Unique RN 5W-30	low SAPS Low Viscosity Multi-Grade Engine Oil for petrol engines	ACEA C4		Mercedes Benz 226.51; Mercedes Benz 229.51; Renault RN 0720
AVIATICON Unique LSC 5W-30	Very Ash-Low High-Performance Low-Viscosity Engine Oil	ACEA C1/C2		Ford WSS-M2C 934-B; Mazda; Mitsubishi; Fiat; Honda; Citroen; Peugeot; Toyota
AVIATICON Unique PD 5W-40	Universal multigrade engine oil for petrol and diesel engines	ACEA A3/B4/C3 API SN/CF		Mercedes Benz 226.5; Mercedes Benz 229.31; Mercedes Benz 229.51; Volkswagen 502.00; Volkswagen 505.00; Volkswagen 505.01; BMW Longlife-04; Renault RN 0700; Renault RN 0710; Ford WSS-M2C 917-A; Fiat 9.55535-S2; Porsche A40
AVIATICON Unique SL 5W-40	HC Synthesis High-Performance Low-Viscosity Engine Oil	API SN/CF ACEA A3/B4		Mercedes Benz 226.5; Mercedes Benz 229.3; Volkswagen 502.00; Volkswagen 505.00; BMW Longlife-01; Renault RN 0700; Renault RN 0710; GM-LL-B-025; Porsche A40; PSA B71 2296

■ ENGINE OILS FOR PASSENGER CARS - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Unique LL 10W-40	Universal low-viscosity engine oil for petrol and diesel engines	API SL/CF ACEA A3/B4		Mercedes Benz 229.1; Volkswagen 501.01; Volkswagen 505.00
AVIATICON Unique TW 10W-60	Fully synthetic low-viscosity engine oil	ACEA A3/ B4 API SL API CF		Mercedes Benz 229.3; Volkswagen 501.01; Volkswagen 505.00; BMW Longlife-01
AVIATICON Unique D 15W-40	Universal multigrade engine oil for petrol and diesel engines	API CG-4/SJ ACEA A3/B3/E2		Mercedes Benz 228.1; Mercedes Benz 229.1; MAN 271; Volvo VDS; DEUTZ DQC-II-05
AVIATICON Unique D 20W-50	Universal multigrade engine oil for petrol and diesel engines	ACEA A2/B2/ E2/E3 API SJ/CG-4		Mercedes Benz 228.1; Mercedes Benz 229.1; MAN 271; Volvo VDS; DEUTZ DQC-II-05



■ ENGINE OILS FOR UTILITY VEHICLES AND BUILDING MACHINERY

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finko Premium Truck LA 5W-30	Synthetic USHPD Low-Viscosity Engine Oil for EURO 5 and EURO 6 Engines	API CJ-4/SN JASO DH-2 ACEA E6/E7/E9	MB Approval 228.51; 228.31 MAN M 3271-1; MAN M 3477; MAN M 3677; Volvo VDS-3 (STD 417-0002); Volvo VDS-4 (STD 417-0001); Renault VI-RLD-2; Renault VI-RLD-3; DEUTZ DQC IV-10 LA; Mack EO-N; Mack EO-O Premium Plus	Volvo CNG; Renault VI-RGD; Renault VI-RXD; CAT ECF-1a; CAT ECF-2; CAT ECF-3; MTU MTL 5044 Typ 3.1
AVIATICON Finko Turbo ECO LA 10W-30	Low Saps synthesis SHPD low-viscosity engine oil for diesel engines	API SM API CJ-4 ACEA E7/E9		Mercedes Benz 228.31; MAN M 3575; Volvo VDS-4 (STD 417-0001); Renault VI-RLD-3; Caterpillar ECF-2; Caterpillar ECF-3; Cummins CES 20081; DEUTZ DQC III-10 LA; Mack EO-O Premium Plus
AVIATICON Turbo D 10W-40	SHPD Universal Low-Viscosity Engine Oil	API CI-4 JASO DH-1 ACEA E7/A3/B4 Global DHD-1	MB Approval 228.3; MAN M 3275-1; Volvo VDS-3 (STD 417-0002); Renault VI-RLD-2; DEUTZ DQC III-10; Mack EO-M Plus	Mercedes Benz 229.1; Allison C4 ; Cummins CES 20076; Cummins CES 20077; Cummins CES 20078; DAF; Detroit Diesel DDC 93K215; Mack EO-N; MTU MTL 5044 Typ 2; Voith Retarder Typ A
AVIATICON Turbo LA Plus 10W-40	SHPD Engine Oil for Turbo Diesel Engines	ACEA E7/E9 API SN API CJ-4 Global DHD-1 JASO DH-2	MB Approval 228.31; MAN M 3575; Volvo VDS-4 (STD 417-0001); Renault VI-RLD-3; DEUTZ DQC III-10 LA; Mack EO-O Premium Plus	CAT ECF-1; CAT ECF-1a; CAT ECF-2; CAT ECF-3; CNH MAT 3521; Cummins CES 20081; Detroit Diesel DDC 93K218; MTU MTL 5044 Typ 2.1; MTU DDC BR 2000; MTU DDC BR 4000
AVIATICON Finko Truck LD 10W-40	USHPD high-performance diesel engine oil for extended oil change intervals	ACEA E4/E7 Global DHD-1 API CI-4	MB Approval 228.5; MAN M 3277; DEUTZ DQC III-10	MAN M 3377; Volvo VDS-3 (STD 417-0002); Renault VI-RLD-2; Renault VI-RXD; CAT ECF-1a; CAT ECF-1a; CAT ECF-2; Cummins CES 20078; Detroit Diesel DDC 93K215; IVECO T3 E4; Mack EO-M Plus; Mack EO-N Premium Plus; MTU MTL 5044 Typ 3; MTU DDC BR 2000; MTU DDC BR 4000

■ ENGINE OILS FOR UTILITY VEHICLES AND BUILDING MACHINERY - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finko Truck LD Plus 10W-40	High-Performance Low-Viscosity Engine oil for utility vehicles	ACEA E4/E7 API CI-4	Scania LDF-2	Mercedes Benz 228.5; MAN M 3277; Volvo VDS-3 (STD 417-0002); Renault VI-RLD-2; Renault VI-RXD; Cummins CES 20077; Cummins CES 20078; DAF HP-2; DEUTZ DQC III-10; Mack EO-M Plus; Mack EO-N; MTU MTL 5044 Typ 3; MTU DDC BR 2000; MTU DDC BR 4000
AVIATICON Finko Truck DLF-3 10W-40	Fully Synthetic High-Performance Diesel Engine Oil for Euro 4, Euro 5 and SCANIA-Euro 6 Engines	API CF ACEA E4/E7	Scania LDF-3	Mercedes Benz 228.5; MAN M 3277; Volvo VDS-3 (STD 417-0002); Renault VI-RLD-2; Renault VI-RXD; Mack EO-N Premium Plus; MTU MTL 5044 Typ 3; Scania LDF-2
AVIATICON Finko Super Truck LA 10W-40	USHPD low-viscosity diesel engine oil for extended oil change intervals	JASO DH-2 API CI-4 ACEA E6/E7	MB Approval 228.51; MAN M 3477; MAN M 3271-1; DEUTZ DQC III-10 LA	Mercedes Benz 226.9; MAN M 3277 CRT ; Renault VI-RLD-2; Renault VI-RXD; Renault VI-RGD; Mack EO-N Premium Plus; Caterpillar ECF-1; Caterpillar ECF-1a; Caterpillar ECF-2; Volvo VDS-3 (STD 417-0002); MTU MTL 5044 Typ 3.1; MTU DDC BR 4000; MTU DDC BR 2000; DAF HP-2; Scania Low Ash; Cummins CES 20077; Cummins CES 20076
AVIATICON Finko Super Truck LA Plus 10W-40	High-Performance Low-Viscosity Engine oil for utility vehicles	JASO DH-2 API CI-4 ACEA E6/E7/E9 SAE 10W-40		Mercedes Benz 226.9; DEUTZ TTCD-Motoren; IVECO 18-1804 TLS E9; Caterpillar ECF-1a; MAN M 3477; Mercedes Benz 228.51; MAN M 3271-1; MTU MTL 5044 Typ 3.1; MTU DDC BR 2000; Renault VI-RGD; MTU DDC BR 4000; Renault VI-RLD-2; Renault VI-RXD; Volvo VDS-3 (STD 417-0002); DEUTZ DQC IV-10 LA; Mack EO-M Plus; Mack EO-N; Cummins CES 20076; Cummins CES 20077; Scania Low Ash; DAF; Mercedes Benz 235.28; Volvo CNG; Voith Retarder Typ B

■ ENGINE OILS FOR UTILITY VEHICLES AND BUILDING MACHINERY - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Turbo Super 15W-40	SHPD Universal Multigrade Engine oil	API CI-4/SL ACEA A3/B3/E7 Global DHD-1	MB Approval 228.3; MAN M 3275-1; Volvo VDS-3 (STD 417-0002); Renault VI-RLD-2; Mack EO-N Premium Plus	Mercedes Benz 229.1; Renault VI-RLD; Caterpillar ECF-1a; Caterpillar ECF-2; Cummins CES 20071; Cummins CES 20072; Cummins CES 20076; Cummins CES 20077; DEUTZ DQC III-10; John Deere JDQ 78 A; MTU MTL 5044 Typ 2; MTU DDC BR 2000; MTU DDC BR 4000; ZF TE-ML 07C
AVIATICON Turbo Super Plus 15W-40	SHPD engine oil for diesel engines	ACEA E9 API SN/CJ-4 Global DHD-1 JASO DH-2	MB Approval 228.31; MAN M 3575; Volvo VDS-4 (STD 417-0001); Renault VI-RLD-3; DEUTZ DQC III-10 LA; Mack EO-O Premium Plus	CAT ECF-1a; CAT ECF-2; CAT ECF-3; Cummins CES 20081; Detroit Diesel DDC 93K218; John Deere JDQ 78X; MTU MTL 5044 Typ 2.1; MTU DDC BR 2000; MTU DDC BR 4000
AVIATICON Turbo JD 15W-40	SHPD Multi-Grade Engine Oil	API CH-4/CI-4/SL ACEA A3/B3 Global DHD-1 ACEA E3/E5/E7		Mercedes Benz 228.3; Mercedes Benz 229.1; MAN M 3275-1; Volvo VDS-3 (STD 417-002); Renault VI RLD; Renault VI-RLD-2; Cummins CES 20071; Cummins CES 20072; Cummins CES 20076; Cummins CES 20077; Cummins CES 20078; John Deere JDQ 78A; Mack EO-M Plus; Mack EO-N Premium Plus; MTU MTL 5044 Typ 2
AVIATICON Turbo Premium 20W-50	SHPD Universal Engine Oil	ACEA E7/E5/E3 API CH-4/CI-4 JASO DH-1		Mercedes Benz 228.3; MAN M 3275-1; Volvo VDS-2; CAT ECF-1; CAT ECF-1a; CAT ECF-2; Cummins CES 20076; Cummins CES 20077; Cummins CES 20078; Detroit Diesel DDC 93K215; DEUTZ DQC II-10



■ TWO-STROKE ENGINE OILS

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION
AVIATICON Finko 2T Rot	Mineral oil-based two-stroke oil, self-mixing and low-smoke for air-cooled two-stroke engines	JASO FB API TC
AVIATICON Finko 2T Outboard	Mineral oil-based two-stroke oil, self-mixing and low-smoke for water-cooled outboard engines	NMMA TC-W3
AVIATICON Finko 2T-HS	Semi-synthetic two-stroke oil, self-mixing and low-smoke for water-cooled outboard engines as well as air-cooled two-stroke engines	JASO FD API TC ISO-L-EGD Global GD
AVIATICON Finko 2T Synth	Fully synthetic two-stroke oil, self-mixing and low-smoke for water-cooled outboard engines as well as air-cooled two-stroke engines	API TC ISO-L-EGD JASO FD

■ MOTORCYCLE OILS

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION
AVIATICON Moto HS 4T 10W-40	Semi-synthetic four-stroke motorcycle oil	API SL JASO MA2 JASO MA
AVIATICON Moto FS 4T 15W-50	Synthetic four-stroke motorcycle oil	JASO MA2

■ SINGLE-GRADE ENGINE OILS

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	SAE CLASS	RECOMMENDATIONS FOR USE
AVIATICON HDS-3	Single grade engine oil for all petrol and diesel engines, also turbochargers	CF/SF E2	10W; 20W-20; 30; 40; 50	Mercedes Benz 228.0; MAN 270; Allison C4; Caterpillar TO-2; MTU MTL 5044 Typ 1; ZF TE-ML 04B
AVIATICON HDS Heavy Duty	Single grade engine oil with low ash content for heavy-duty two-stroke Detroit diesel engines	CD-2/CF CF-2/SF	40	Allison C4; Detroit Diesel DDC
AVIATICON Motac	Non-alloy single-grade engine oil for petrol and diesel engines		10W; 20W-20; 30; 40; 50	Suitable for old-timers

■ LAWN MOWER OIL

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	SAE CLASS	RECOMMENDATIONS FOR USE
AVIATICON Rasenmäheröl	4-stroke engine oil for lawn mowers	CF/SF E2	30	

■ ENGINE ANTI-CORROSION OILS

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	SAE CLASS	RECOMMENDATIONS FOR USE
AVIATICON Motoren-Korrosionsschutzöl	First operation and corrosion protection oil with multiple application options		20W-20	

UNIVERSAL OILS (STOU AND UTTO)

Many tractors or building machines with power shift transmission and older tractors have a common transmission oil circuit, rear axle and hydraulic system in which wet multi-plate clutches operate in an oil bath. In this kind of machines, a universal oil (Super Tractor Oil Universal, STOU) that is able to fulfil the requirements of axle and transmission oils (API GL4), as well as engine and hydraulic oils, is used.

STOU oils have been specifically designed for agriculture so as to avoid mix-ups of different varieties. Precisely for the agricultural sector, a distinction must be made:

UTTO – UNIVERSAL TRACTOR TRANSMISSION OIL

This oil is suitable for hydraulic systems, manual gearboxes, wet multi-plate clutches (power shift/brakes) and in part also for final drives.

SUPER TRACTOR OIL UNIVERSAL

This universal oil is suitable for engines, hydraulic systems, manual gearboxes, and partly also for final drives. The new requirements of emission standards often call for special engine oils which are more suitable than traditional STOU oils; this way, planetary gears can receive a special GL-5 oil instead of STOU oil.

Manufacturer approvals must in any case be always observed because, if these universal oils are improperly used, problems such as rattling brakes may quickly arise.

STOU oils are ideally suited for single-variety vehicle fleets such as John Deere tractors.



■ UNIVERSAL OILS

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	RECOMMENDATIONS FOR USE
AVIATICON Super Agra 15W-30	S. T. O. U. (Super Tractor Oil Universal)	API CE/CG-4/GL4 ACEA E3 SAE 80W-85 HVLP-D (ISO VG 32-68)	Ford ESN-M2C-134 D; Ford ESN-M2C-86 B; Ford M2C 159-B; Ford M2C 159-C; Ford New Holland 82009202; Allison C4; Case IH MS 1204; Case IH MS 1206; Case IH MS 1207; Caterpillar TO-2; CNH MAT 3525; John Deere JDM J27; Massey Fergusson M 1135; Massey Fergusson M 1139; Massey Fergusson M 1144; New Holland NH 030 C; New Holland NH 410 A; SauerSunstand/Danfoss Hydrostatic Trans Fluid; Sperry Vickers/Eaton M2950-S, I-280-S; ZF TE-ML 03A; ZF TE-ML 06B; ZF TE-ML 07B; ZF TE-ML 07D
AVIATICON Super Agra 10W-30	S. T. O. U. (Super Tractor Oil Universal)	API CG-4/GL4/SF ACEA E3 SAE 80W-85 HVLP-D (ISO VG 32-68)	Ford ESN-M2C-134 D; Ford ESN-M2C-86 B; Ford M2C 159-B; Ford M2C 159-C; Ford New Holland 82009202; Allison C4; Case IH MS 1204; Case IH MS 1206; Case IH MS 1207; Case IH MS 1209; Caterpillar TO-2; CNH MAT 3525; CNH MAT 3526; John Deere JDM J20 C; John Deere JDM J27; Massey Fergusson M 1135; Massey Fergusson M 1139; Massey Fergusson M 1144; Massey Fergusson M 1145; New Holland NH 030 C; New Holland NH 410 B; SauerSunstand/Danfoss Hydrostatic Trans Fluid; Sperry Vickers/Eaton M2950-S, I-280-S; ZF TE-ML 03A; ZF TE-ML 05K; ZF TE-ML 06B; ZF TE-ML 06C; ZF TE-ML 07B; ZF TE-ML 07D
AVIATICON Super Agra 10W-40	S. T. O. U. (Super Tractor Oil Universal)	API CG-4/GL4/SF ACEA E3 SAE 10W-30 SAE 15W-30 SAE 10W-40 SAE 80W-85 HVLP-D (ISO VG 46-100)	Mercedes Benz 227.1; Ford ESN-M2C-134 D; Ford ESN-M2C-86 B/C; Ford M2C 159-B; Ford M2C 159-C; Ford New Holland 82009201; Ford New Holland 82009202; Ford New Holland 82009203; Allison C4; Case IH MS 1204; Case IH MS 1206; Case IH MS 1207; Case IH MS 1209; Caterpillar TO-2; CNH MAT 3525; CNH MAT 3526; John Deere JDM J20 C ; John Deere JDM J20 D; John Deere JDM J27; Massey Fergusson M 1135; Massey Fergusson M 1139; Massey Fergusson M 1143; Massey Fergusson M 1144; Massey Fergusson M 1145; SauerSunstand/Danfoss Hydrostatic Trans Fluid; Sperry Vickers/Eaton M2950-S, I-280-S; ZF TE-ML 06B; ZF TE-ML 06C; ZF TE-ML 06R; ZF TE-ML 07B

■ UNIVERSAL GEAR/HYDRAULIC OILS

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	RECOMMENDATIONS FOR USE
AVIATICON Agra Utto	Universal Tractor Transmission Oil	API GL4 SAE 80W-85 HVLP-D (ISO VG 32-68)	Ford ESN-M2C-134 D; Ford ESN-M2C-86 B; Ford New Holland 82009202; Allison C4; Caterpillar TO-2; John Deere JDM J20 C; Massey Fergusson M 1135; Massey Fergusson M 1145; New Holland NH 030 C; New Holland NH 410 B; SauerSunstand/Danfoss Hydrostatic Trans Fluid; Sperry Vickers/Eaton M2950-S, I-280-S; ZF TE-ML 03A; ZF TE-ML 05K; ZF TE-ML 06B; ZF TE-ML 06C; ZF TE-ML 07B
AVIATICON Agra Utto Bio	Universal Tractor Transmission Oil	API GL4	Case; Ford New Holland; John Deere; Massey Fergusson
AVIATICON Agra Utto Premium	Universal Tractor Transmission Oil	API GL4 API GL5 landw. SAE 80W-85 SAE 10W-30 HVLP-D (ISO VG 46-100)	Volvo WB 101; Ford ESN-M2C-134 D; Ford ESN-M2C-86 B/C; AGCO Powerfluid 821 XL; AGCO Q-186 White farm; Allison C4; Case IH MS 1206; Case IH MS 1207; Case IH MS 1209; Case IH MS 1210; Case IH MS 1230; Case IH MS 1317; Caterpillar TO-2; CLAAS/Renault; CNH MAT 3505; CNH MAT 3506; CNH MAT 3509; CNH MAT 3510; CNH MAT 3525; CNH MAT 3526; Fendt (außer Vario); John Deere JDM J20 C; John Deere JDM J20 D; Komatsu (Wet Brake Axle); Kubota UDT; Leyland Trucks LTS 22 AF 10; Massey Fergusson M 1135; Massey Fergusson M 1141; Massey Fergusson M 1143; Massey Fergusson M 1145; New Holland FNHA 2-C-200.00, 201.00; Same-Deutz-Fahr; ZF TE-ML 03E; ZF TE-ML 05F; ZF TE-ML 17E; ZF TE-ML 21F
AVIATICON Agra Utto WB HT	Universal Tractor Transmission Oil	API GL4 SAE 5W-20 SAE 75W-80	Volvo WB 101; Volvo WB 102; Ford ESN-M2C-134 D; Allison C3; Allison C4; Case IH MS 1206; Case IH MS 1207; Case IH MS 1210; Caterpillar TO-2; CNH MAT 3525; John Deere JDM J20 A; John Deere JDM J20 C; Kia SP-II; Komatsu AXO (KES 07.866); Kubota UDT; Massey Fergusson M 1135; Massey Fergusson M 1141; Massey Fergusson M 1143; Massey Fergusson M 1145; ZF TE-ML 03E; ZF TE-ML 05F; ZF TE-ML 06K
AVIATICON Agra CVT	UTTO (Universal Tractor Transmission Oil) for agricultural and construction machines with synthetic-based CVT transmission	API GL4 HVLP-D (ISO VG 46-100) SAE 75W-85	AGCO CVT ML 200; Claas CVT; CNH MAT 3540 (CVT); Fendt Vario; JCB Fastrac CVT; John Deere JDM J20 C/Hyguard; Same Deutz-Fahr ZF 06 D; Valtra G2-08; ZF TL-ML 06D; ZF TL-ML 06E; ZF TL-ML 06F; CNH MAT 3525; ZF TE-ML 06H; ZF TE-ML 06M

■ UNIVERSAL GEAR/HYDRAULIC OILS - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	RECOMMENDATIONS FOR USE
AVIATICON Duo Fluid 20W-40	Universal Tractor Transmission Oil		Volvo WB 101; Ford ESN-M2C-134 D; Ford ESN-M2C-86 B/C; Allison C4; Caterpillar TO-2; CNH MAT 3505; CNH MAT 3525; John Deere JDM J20 C; Massey Fergusson M 1135; Massey Fergusson M 1141; Massey Fergusson M 1143; Massey Fergusson M 1145; ZF TE-ML 05F; ZF TE-ML 06K; ZF TE-ML 17E; ZF TE-ML 21F
AVIATICON CTO 10W	High-performance power transmission oil	API CF-2 API CF	Allison C4; CAT TO-4; Eaton; Komatsu Wet Brake Axle; ZF TE-ML 03C
AVIATICON CTO 30	High-performance power transmission oil	API CF API CF-2	Allison C4; CAT TO-4; Eaton; Komatsu Wet Brake Axle; ZF TE-ML 03C; ZF TE-ML 07F
AVIATICON CTO 50	High-performance power transmission oil	API CF API CF-2	Allison C4; CAT TO-4; Eaton; Komatsu Wet Brake Axle
AVIATICON CTO Premium 10W-30	High-performance power transmission oil		Allison C4; Caterpillar TO-4; Claas Ecom 3.5 (CSE); Komatsu KES 07.868.1; ZF TE-ML 03C; ZF TE-ML 06H; ZF TE-ML 06M





VEHICLE TRANSMISSION OIL

Transmissions are machinery parts or assemblies designed to increase or reduce rotational speed and transfer performance and movements. The structure of modern transmissions has required the development of synthetic transmission oils. Transmission oils are exposed to high stress in transmission systems due to changing motion and loading conditions.

For this reason, demands on lubricants depend on the transmission structure. While the friction ratios of the lever transmission pivot points are very close to those of the slide bearing, the friction ratios on the flanks of the cogwheels are completely different. On the cogwheels, an overlapping of sliding friction and rolling friction occurs, and the lubricating film must separate the friction bodies despite great stress.

High-speed, low-stress transmissions require transmission oils with lower viscosity than slow-speed, high-stress transmissions. Please observe manufacturer approvals also when using transmission oils.

- GL 1 GL 1 non-alloy transmission oil for cogwheel and worm gears, as well as oblique and arched final drives under light operating conditions; corrosion and oxidation inhibitors may be added
- GL 2 Transmission oils for final drives with worm gears that can no longer be properly opera-

ted with GL 1 transmission oils due to requirements

- GL 3 Mildly alloyed (EP) transmission oils for manual and special gearboxes as well as final drives in light and medium operating conditions
- GL 4 Transmission oils for hypoid-toothed final drives under normal operating conditions, as well as heavy-duty manual and special gearboxes; approximately corresponding to MIL-L 2105
- GL 5 Transmission oils for highly stressed hypoid-toothed final drives, sometimes also for manual and special gearboxes; approximately corresponding to MIL-L 5 B; GL 2105 multi-range transmission oils correspond to MIL-L 2105 C/D
- GL 6 Transmission oils for very highly stressed hypoid-toothed final drives (offset over 25 % of the crown gear diameter); withdrawn in the meantime. API GL 6 is equivalent to Ford M 2C-105 A

Automatic Transmission Fluids (ATFs) are speciality lubricants with specific, stringent requirements according to the unit functions in automatic transmissions. They require very good VT and low temperature properties, shear stability, high oxidation stability, excellent foaming behaviour and air release capacity, defined friction characteristics, EP properties, etc.

■ TRANSMISSION OILS FOR SHIFT TRANSMISSIONS AND DRIVE AXLES

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Gold MZ 80W	High-pressure transmission oil classified as GL 4 by API	API GL4	MB Approval 235.1	MAN 341 Typ E-1; MAN 341 Typ Z-2; Ford SQ-M2C-9008 A; ZF TE-ML 02B; ZF TE-ML 16A; ZF TE-ML 17A; ZF TE-ML 19A
AVIATICON Gold MZ 85W-90	High-pressure transmission oil classified as GL 4 by API	API GL4		Mercedes Benz 235.1; MAN 341 Typ E-1; MAN 341 Typ Z-2; Volvo 97305; ZF TE-ML 02B; ZF TE-ML 16A; ZF TE-ML 17A; ZF TE-ML 19A
AVIATICON Gold MZ 140	High-pressure transmission oil classified as GL 4 by API	API GL4		Volvo 97305; ZF TE-ML 16A; ZF TE-ML 17A; ZF TE-ML 19A
AVIATICON Gold MZ 80W-90	High-pressure transmission oil classified as GL 4 by API	API GL4		Mercedes Benz 235.1; MAN 341 Typ E-1; MAN 341 Typ Z-2; Volvo 97305; ZF TE-ML 02B; ZF TE-ML 16A; ZF TE-ML 17A; ZF TE-ML 19A
AVIATICON Hypoid EP 80W	Hypoid transmission oil classified as GL 5 by API	API GL5		MIL-L-2105 C/D; MAN 342 Typ M-1; DAF; ZF TE-ML 17B
AVIATICON Hypoid EP 85W-90	Multigrade hypoid transmission oil with API classification GL 5	API GL5		Mercedes Benz 235.0; MIL-L-2105 C/D; VOITH 132.00374400; Volvo 97310; MAN 342 Typ M-1; Ford SQ-M2C-9002 AA; DAF; ZF TE-ML 16B; ZF TE-ML 16C; ZF TE-ML 17B; ZF TE-ML 19B; ZF TE-ML 21A
AVIATICON Hypoid EP 140	Hypoid transmission oil classified as GL 5 by API	API GL5		MIL-L-2105 C/D; DAF
AVIATICON Hypoid EP 80W-90	Multigrade hypoid transmission oil with API classification GL 5	API GL5		MIL-L-2105 C/D; VOITH 132.00374400; Volvo 97310; Mercedes Benz 235.0; MAN 342 Typ M-1; Ford SQ-M2C-9002 AA; DAF; ZF TE-ML 16B; ZF TE-ML 16C; ZF TE-ML 17B; ZF TE-ML 19B; ZF TE-ML 21A
AVIATICON Hypoid EP 80W-140	Multigrade hypoid transmission oil with API classification GL 5	API GL5		MIL-L-2105 C/D; Volvo 97310; DAF; ZF TE-ML 16D; ZF TE-ML 21A

■ TRANSMISSION OILS FOR MANUAL GEARBOXES AND FINAL AXLES - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Hypoid EP 85W-140	Multigrade hypoid transmission oil with API classification GL 5	API GL5		MIL-L-2105 C/D; Volvo 97310; ZF TE-ML 16D; DAF; ZF TE-ML 21A
AVIATICON Hypoid LS 90	Multigrade hypoid transmission oil with API classification GL 5	API GL5		Ford M2C 104-A; MIL-L-2105 B; MIL-L-2105 C/D; ZF TE-ML 05C; ZF TE-ML 12C; ZF TE-ML 16E; ZF TE-ML 21C
AVIATICON Hypoid LS 80W-140	Multigrade hypoid transmission oil with API classification GL 5	API GL5 LS		MIL-L-2105 D; ZF TE-ML 05C; ZF TE-ML 12C; ZF TE-ML 16E; ZF TE-ML 21C
AVIATICON Finkogear Super 80W-90	Multigrade Transmission Oil for motor vehicle gears API GL4/GL5	API GL4 API GL5 API MT-1	MAN 341 Typ E-2 MAN 341 Typ Z-2 MAN 342 Typ M-2	Mercedes Benz 235.0; Arvin Meritor 076-A; Arvin Meritor 076-D; Renault; DAF; IVECO; Mack GO-J; Scania STO 1:0; ZF TE-ML 02B; ZF TE-ML 05A; ZF TE-ML 12L; ZF TE-ML 12M; ZF TE-ML 16B; ZF TE-ML 17B; ZF TE-ML 19B; ZF TE-ML 21A
AVIATICON Finkogear Synth 75W-90	Synthetic Multigrade Transmission Oil for motor vehicle gears API GL4/GL5	API GL4 API GL5 API MT-1		Mercedes Benz 235.8; MAN 341 Typ E-3; MAN 341 Typ Z-2; MAN 342 Typ M-3; Arvin Meritor 076-N; MIL-L-2105 E; Renault B0032/3 Annex 3; Mack GO-J; Scania STO 1:0; ZF TE-ML 02B; ZF TE-ML 05B; ZF TE-ML 07A; ZF TE-ML 08; ZF TE-ML 12B; ZF TE-ML 12M; ZF TE-ML 16F; ZF TE-ML 17B; ZF TE-ML 19C; ZF TE-ML 21B
AVIATICON Gold MTF 75W-80	High-pressure transmission oil classified as GL 4 by API	API GL4	MAN 341 Typ E-3 MAN 341 Typ Z-4	DAF XF; IVECO 18-1807; Mercedes Benz 235.4; Volvo 97305; Eaton; ZF TE-ML 01L; ZF TE-ML 02L; ZF TE-ML 16K
AVIATICON Gold Synth 75W-80	GL-4 transmission oil for extended oil change intervals in utility vehicles manual gearboxes.	API GL4		MAN 341 Typ Z-5; Volvo 97307; Mercedes Benz 235.28; ZF TE-ML 01E; ZF TE-ML 02E; ZF TE-ML 16P

■ TRANSMISSION OILS FOR MANUAL GEARBOXES AND FINAL AXLES - continued

PRODUCT	SHORT DESCRIPTION	API CLASSIFICATION ACEA	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Gold Synth MB 75W-90	GL-4 transmission oil for extended oil change intervals in utility vehicles manual gearboxes.	API GL4		MAN 341 Typ MB; Mercedes Benz 235.11; ZF TE-ML 08
AVIATICON Hypoid Synth 75W-90	Fully synthetic GL-5 transmission oil for axle gears of utility vehicles, for extended oil change intervals	API GL5		Mercedes Benz 235.8; MAN 342 Typ S-1; Volvo 97312; John Deere JDM J11 E; John Deere JDM J11 G; Scania STO 1:0; ZF TE-ML 05B; ZF TE-ML 07; ZF TE-ML 08; ZF TE-ML 12B; ZF TE-ML 16F; ZF TE-ML 17B
AVIATICON Finkogear Outboard	Special transmission oil for outboard engine transmissions			
AVIATICON Blau T 80W	Transmission oil classified as GL 3 by API	API GL3		Old-timer
AVIATICON Blau T 90	Transmission oil classified as GL 3 by API	API GL3		Old-timer
AVIATICON Blau T 140	Transmission oil classified as GL 3 by API	API GL3		Old-timer

■ TRANSMISSION OILS FOR AUTOMATIC TRANSMISSIONS

PRODUCT	SHORT DESCRIPTION	RECOMMENDATIONS FOR USE
AVIATICON Fluid A4A	Automatic Transmission Fluid	VOITH; Mercedes Benz 236.2; Volvo 97325; GM Suffix A; GM Type A; Allison C4
AVIATICON Dexron II D	Automatic Transmission Fluid	Mercedes Benz 236.1; Mercedes Benz 236.6; MAN 339 Typ V-1; MAN 339 Typ Z-1; GM DEXRON II-D; Allison C4; CAT TO-2; RENK DOROMAT; VOITH H55.6335.3x (G607); ZF TE-ML 02F; ZF TE-ML 03D; ZF TE-ML 04D; ZF TE-ML 09; ZF TE-ML 11B; ZF TE-ML 14A; ZF TE-ML 17C
AVIATICON Dexron III	Automatic Transmission Fluid	Mercedes Benz 236.7; Mercedes Benz 236.1; Mercedes Benz 236.5; Mercedes Benz 236.6; MAN 339 Typ V-1; MAN 339 Typ Z-1; Volvo 97340; Volvo 97341; Ford Mercon; GM DEXRON III-H; Allison C4; Allison TES 389; CAT TO-2; VOITH H55.6335.3x (G607); ZF TE-ML 03D; ZF TE-ML 04D; ZF TE-ML 14A
AVIATICON Dexron VI	Automatic Transmission Fluid	Mercedes Benz 236.1, 236.5, 236.7, 236.8, 236.9, 236.41; Volkswagen G-055-025-AZ, G-052-162; GM DEXRON II-D, II-E, III-G, III-H, VI; Aisin Warner JWS 3309, JWS 3324; Allison TES 228 C3/C4, TES 389; BMW ETL-7045, ETL-7045E, ETL-8027, ETL-LA 2634; Chrysler ATF +3, ATF +4; Chrysler Dodge Mopar AS 68 RC (Type IV), ATF +2; Fiat Type IV; Ford Mercon LV; Ford WSS-M2C138-CJ, WSS-M2C166-H, WSS-M2C922-A1, WSS-M2C924-A; GM TASA; Honda Acura DW Z-1, DW-1; Hyundai JWS 3314, JWS 9683, SP-II, SP-III, SP-IV; Isuzu Besco ATF II/III; Jaguar ATF 3403 JLM 20238, 3403 M 115; Jaso M 315 Type 1A, M315-2013 1A-LV, M315-2013 2A, Typ 1A; Kia SP-II, SP-III, SP-IV, SP-IV; Mazda ATF 3317, ATF N-1, ATF S-1, D-II, F-1, FZ, M-III, M-V; Mitsubishi ATF PA, AW, J2, J3, SP-II, SP-III, SP-IV & ATF J-2; Nissan Matic D/J/K/S, Matic Fluid C/D/J; Porsche ATF 3403-M115/Type IV; Subaru ATF, ATF 5 AT, ATF HP; Suzuki ATF 3309, ATF 2326, ATF 2384K, ATF 3314, ATF 3317; Toyota D-II, T-III, T-III, T-IV, WS; Voith 55.6335; Volvo 1161540, 97340; ZF TE-ML 11A; ZF TE-ML 11B; ZF TE-ML 18FL; ZF TE-ML 19FL; ZF TE-ML 24A; ZF TE-ML 30; ZF TE-ML 4HP 20; ZF TE-ML 5HP
AVIATICON Fluid ATF DCT	Dual clutch transmission oil, synthetic	BMW; Ford WSS-M2C 936-A; Mercedes Benz 236.21; Mitsubishi Dia-Queen SSTF-1; Porsche; PSA; Volkswagen G-052-182; Volkswagen G-052-529; Volvo 1161838; Volvo 1161839
AVIATICON Fluid S	Automatic Transmission Fluid synthetic	Mercedes Benz 236.8; MAN 339 Typ V-2; MAN 339 Typ Z-2; GM DEXRON II-E; VOITH 55.6336.XX (G 1363); ZF TE-ML 04D; ZF TE-ML 09X; ZF TE-ML 14B; ZF TE-ML 16L
AVIATICON Fluid FO	Automatic Transmission Fluid	Volvo 97330; Ford ESP-M2C-33 G; Ford ESW-M2C-33 F; Ford SQ-M2C-9007 AA; John Deere JDM J21A
AVIATICON Fluid ATF-MVT	Automatic Transmission Fluid	BMW 7045E; Chrysler ATF, ATF +3, ATF +4; Daihatsu Alumix ATF Multi; Honda Ultra HMMF, Ultra II, Ultra Z-1; Hyundai ATF SP-IV; Isuzu Besco ATF II/III; JASO M 315 Type 1A; JWS 3309; JWS 3317; Kia; Mercedes Benz 236.6, 236.7, 236.8, 236.9, 236.10; Nissan Matic Fluid C/D/J; Subaru ATF; Suzuki ATF Oil; Suzuki ATF Oil Special; Toyota D-II, D-III, T, T-II, T-III, T-IV, WS; Volkswagen G-055-025-AZ; GM DEXRON II-D, III-G; Allison C4

HYDRAULIC FLUIDS

Hydraulic systems serve to transmit force by means of oil pressure. The hydraulic oil is pressurised by means of a pump (hydraulic pump). Through the hydraulic lines and corresponding control devices, e. g. valves, the pressurised oil reaches the working cylinders, which are then moved and perform the desired function. The tribologically most sensitive components of a hydraulic system are hydraulic pumps.

Hydraulic oils are mainly required to:

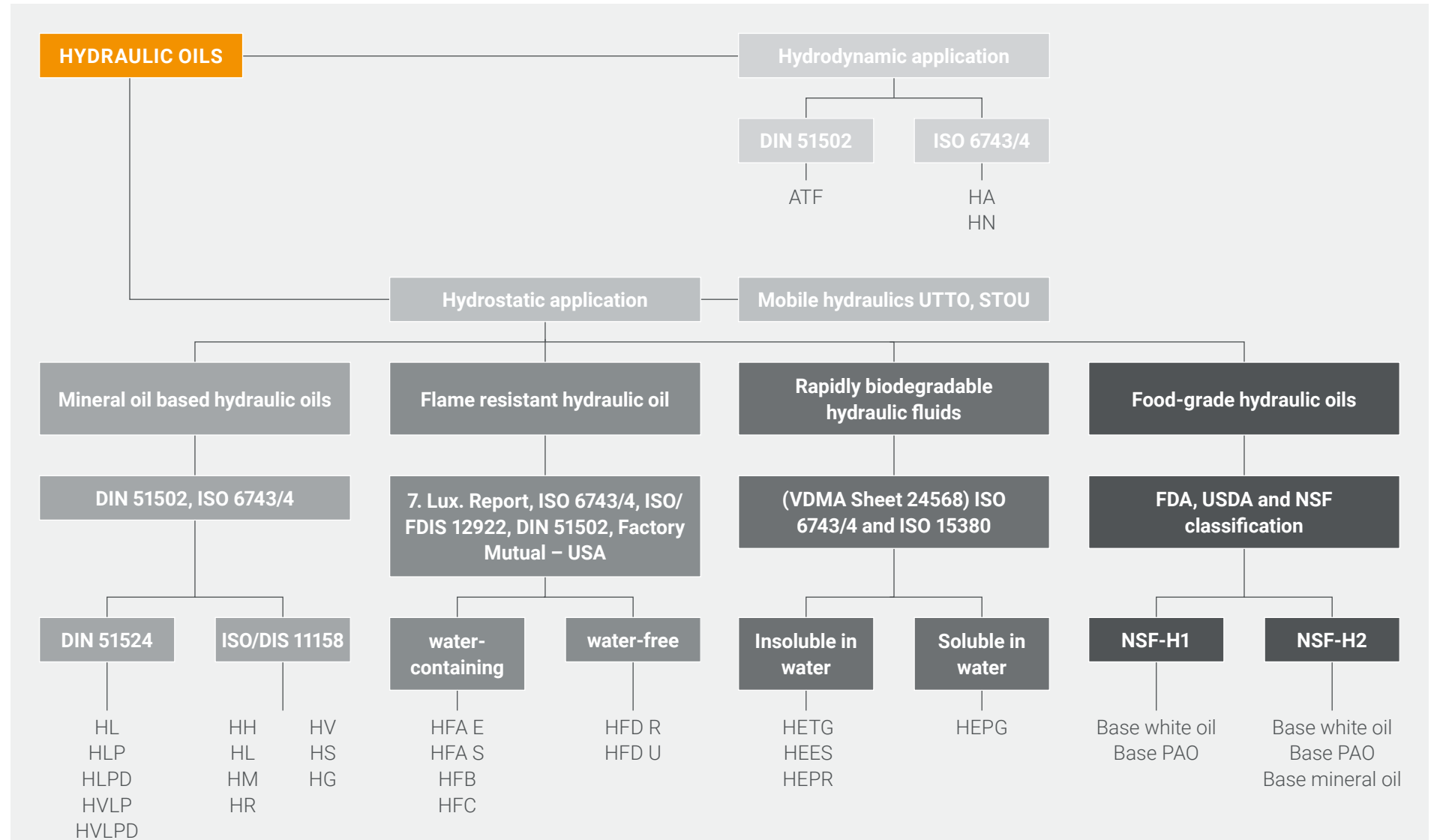
- Lubricate all moving parts
- Protect all metal surfaces against corrosion
- Dissipate heat
- Ensure effective transmission of force
- To meet these requirements, hydraulic oils must have the following features:
- Optimum viscosity over a wide temperature range
- Good air separation characteristics
- Compatibility with sealing materials
- High aging resistance
- Anti-wear properties

To optimally accomplish the purpose and ensure the properties mentioned, there are hydraulic oil formulations made of mineral or synthetic base oils and suitable additives. For ecologically compatible hydraulic oils, rapidly biodegradable base oils are also used. The following additives are added to base oils:

- Pour point improver
- Viscosity index improver
- Anti-friction and anti-wear additives
- Oxidation inhibitors
- Corrosion inhibitors



OVERVIEW OF HYDRAULIC OILS



■ HYDRAULIC OILS

The most frequently used hydraulic fluids are produced on a mineral oil basis with appropriate additives. They are also referred to as hydraulic oils. The requirements for these hydraulic oils are defined in ISO 6743/4 and ISO 11158 with the designations HL, HM, HV, etc. In Germany, markings such as HL, HLP, HLP-D, etc. are common in accordance with DIN 51 524.

In addition to these standardised hydraulic oils, engine and transmission oils can also be used for mobile hydraulic applications. Especially ATF (Automatic Transmission Fluid) oils are used in hydrodynamic converters. They are subject partly to manufacturer-specific standards, partly to standards issued by manufacturers which are also used elsewhere.

HL	With active agents to increase corrosion protection and aging resistance (also H as per DIN 51524, Part 1). They are used at a pressure of up to 200 bar and meet standard thermal loads.
HLP	With active agents to increase corrosion protection, with high pressure additives and aging resistance (HLP as per DIN 51524, Part 2). They are used at a pressure of up to and above 200 bar and meet standard thermal loads.
HLP-D	With active agents – to increase corrosion protection, resistance to aging, as well as reducing scoring wear in mixed friction areas and detergent additives (German designation not standardised).
HVLP	With active agents – to increase corrosion protection and resistance to aging, as well as reducing scoring wear in mixed friction areas and improving viscosity and temperature properties (HVLP DIN 51524, Part 3).
HVLP-D	With active agents – to increase corrosion protection and resistance to aging, as well as reducing scoring wear in mixed friction areas and improving the viscosity and temperature properties and detergent additives (German designation not standardised).

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
AVIATICON HY	HLP anti-wear hydraulic oil with high aging resistance as well as good air release and demulsification capacity	DIN 51524 Part 2; HLP	10 up to 150
AVIATICON HV	Hydraulic oil with excellent viscosity and temperature properties	DIN 51524 Part 3; HVLP	10 up to 100
AVIATICON HLP-D	Hydraulic oil with detergent and dispersing characteristics, wear protection, high durability and good air release characteristics and demulsibility	DIN 51524 Part 2; HLP-D	10 up to 100
AVIATICON HVLDP	Multigrade hydraulic oil with detergent and dispersing properties	DIN 51524 Part 3; HVLDP	32 up to 68
AVIATICON HY-ZAF	Ash-free, anti-wear hydraulic oil (zinc-free) with high thermal stability	DIN 51524 Part 2; HLP	10 up to 100

■ HYDRAULIC OILS - continued

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
AVIATICON HV-ZAF	HVLP hydraulic oil with a special additive package, zinc-free, and therefore ash-free additives for use in hydraulic systems with ultra-fine filtration	DIN 51524 Part 3, HVLP, CETOP HM	32 up to 46
AVIATICON HLP-D-ZAF	A detergent and dispersing hydraulic oil based on mineral oil, zinc- and ash-free	DIN 51524, Part 2 DIN 51525, HLPD	46

■ SPECIAL HYDRAULIC OILS

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
AVIATICON HY-ROT	Special pressure medium for hydraulic units	DIN 51524 Part 3	46
AVIATICON HV-ROT	A mineral oil-based pressure fluid with particularly favourable viscosity and temperature properties (high VI hydraulic oil), red coloured.	DIN 51524 Part 3	46
AVIATICON SAE 10W-30	Special pressure medium for hydraulic installations in construction machines and cranes as well as for equipment for which engine oil is transported as a detergent pressure medium	DIN: HVLP-D	32 up to 68
AVIATICON HV-CHF	High-performance hydraulic fluid for use in the low temperature range		19
AVIATICON HV-DSO	High-performance hydraulic oil with very good low temperature characteristics	DIN 51524 Part 3 (HVLP)	
AVIATICON HY-HFC	Flame-resistant hydraulic fluid, type HFC		46

■ CENTRAL HYDRAULIC AND STEERING OIL

PRODUCT	SHORT DESCRIPTION	RECOMMENDATIONS FOR USE
AVIATICON CHF 8642	Power steering fluid	ISO 7308; PSA B71 2710

■ BIODEGRADABLE HYDRAULIC OILS

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
AVIATICON HY-HE	Biodegradable hydraulic oil, zinc-free, based on synthetic esters.	VDMA-RL; 24568 HEES	22 up to 68
AVIATICON HY-HF	Biodegradable hydraulic fluids based on synthetic esters and hydrocarbons, awarded with the ECO-label	HEES-Fluid; VDMA 24568/24569	46
AVIATICON HY-BD	Biodegradable hydraulic oil based on vegetable basic components	VDMA-RL; 24568 HETG	46
Neste BioHydrauli SE	Biodegradable hydraulic oil, based on synthetic esters, approved in class B by "Ren Smörja" from Göteborg, Sweden	HEES-Fluid	46
AVIATICON Bio Hydrauliköl ES	A fully synthetic, biodegradable hydraulic oil to be used for systems, inside and outside buildings, approved in class B by "Ren Smörja" from Gothenburg, Sweden		46
AVIATICON HE-PR	Biodegradable hydraulic oil based on synthetic polyalphaolefins (PAO) with a zinc-free and detergent additive combination	ISO 6743-4 (HEPR) DIN 51524 Part 3 (HVLDP)	46

INDUSTRIAL TRANSMISSION OILS

A distinction must be made between closed and open gearboxes. Closed gearboxes contain various types of cogwheels which are serviced by a central or splash lubrication system. Transmission oils and, in special cases, transmission greases are generally used as lubricants.

Open gears generally use spur gears which are often serviced with loss lubrication.

Lubricants are mainly required to:

- Prevent wear on cogwheels
- Minimise friction
- Dissipate heat
- Prevent idle time corrosion

For this to occur, a lubrication film must form between the toothed flanks. For this purpose, special transmission oils, transmission greases and adhesive spray lubricants are formulated. These lubricants can be unalloyed or alloyed, and also contain additives.

Mineral or synthetic oils can be used as base oils for transmission oils.

Additives are matched to operating conditions. The following types of additives may be used:

- Anti-wear (AW) and anti-seizure (EP) additives
- Friction modifiers
- Oxidation inhibitors
- Corrosion inhibitors
- Foam inhibitors and much more.

Transmission greases (semi-fluid greases) are used in the industry for reducing gears and geared motors. Spray adhesive lubricants are used for lubricating open gearboxes (e. g. chain drives). The classification of industrial transmission oils according to DIN 51517 is as follows:

- C transmission oils
Unalloyed mineral oils for low service life and load requirements
- CL transmission oils with oxidation and corrosion inhibitors for longer service life
- CLP transmission oils with oxidation and corrosion inhibitors for longer service life and anti-wear and anti-seizure additives for low wear

For industrial transmission oils, ISO VG classes apply. Lower ISO VG (22-68) classes are mainly used in high-speed gearboxes, whereas transmission oils with higher ISO VG (220-680) classes are usually used for the majority of systems.





■ INDUSTRIAL TRANSMISSION OILS

PRODUCT	SHORT DESCRIPTION	DIN STANDARD	ISO-VG
AVIATICON EP	Industrial gear and circulating oil	DIN 51517, Teil 3; CLP	32 up to 680
AVIATICON MB	Industrial transmission oil with addition of MoS ₂	CLP; CLP-F	68 up to 680
AVIATICON EFG	EP Industrial transmission oil with eutectoid flow smoothing	DIN 51517, Teil 3; CLP,	100 up to 680
AVIATICON Finkel GK	Synthetic industrial transmission oil based on polyglycols	DIN 51517, Teil 3; CLP	150 up to 680
AVIATICON Finkel PA	Synthetic industrial transmission oil based on polyalphaolefins (PAO)	DIN 51517, Teil 3; CLP	150 up to 680
AVIATICON HY-Super 32	Operating equipment for fluid mechanics in locomotives and stationary systems	DIN 51 524 Teil 2 (HLP) DIN 51 517 Teil 3 (CLP)	

■ STEAM CYLINDER OILS

PRODUCT	SHORT DESCRIPTION	DIN STANDARD	ISO-VG
AVIATICON Löwenmarke	Special oils for steam cylinders		680 up to 1500



SPINDLE AND MACHINE OILS

PRODUCT	SHORT DESCRIPTION	DIN STANDARD	ISO-VG
AVIATICON CR	Low viscosity paraffin-based spindle oils for high-speed spindles	DIN 51524 HL, DIN 51517 C	2 up to 15
AVIATICON CR	Solvent-refined paraffin-based lubricating oils for continuous and circulating lubrication of industrial machines and compressors	DIN 51524 HL, DIN 51517 C	22 up to 320

SLIDEWAY OILS

Slideway oils are special oils for machine tool as chain saw oils, block train oils and slideway oils. slideway and track lubrication. Our products are used

PRODUCT	SHORT DESCRIPTION	DIN STANDARD	ISO-VG
AVIATICON Collfin KL	Lubricating oil for continuous lubrication	51517 Teil 2	46 up to 320
AVIATICON Collfin KL-GX	Special oils for slideway and track lubrication of machine tools to prevent stick-slipping	DIN 51502 CGLP	32, 46, 100, 150, 320, 460
AVIATICON Collfin GBD	Special oils for slideway and track lubrication of machine tools with good demulsifying characteristics to prevent stick-slipping	DIN 51502 CGLP	68, 220

CHAIN SAW OILS

Adhesive chain saw oils serve to reduce the friction between the saw chain and the rail of motor chain saws, thus minimising wear, especially of the rail.

Oil is fed to the chain from a separate tank in the motor saw via an oil pump. The oil pump is driven together with the saw chain so that no oil is supplied during idling. In expensive motor chain saws,

the flow rate of the oil pump can be adjusted along with the lubricant quantity for the rail length used, the type of wood and the viscosity of the oil used.

For large sawmills, we have developed special chain oils ensuring significantly longer dwell times of the chains due to special anti-wear additives.

PRODUCT	SHORT DESCRIPTION	DIN STANDARD
AVIATICON SKM	Highly adhesive chain saw oil based on mineral oil with very good wear protection for all high-performance chain saws	DIN 55350, Teil 12
AVIATICON SKM Bio	Environmentally friendly, rapidly biodegradable chain saw oil with very good anti-wear properties	
AVIATICON SKM HV Bio 150	Biodegradable adhesive oil for use on slideways, conveyor chains, block trains and saw gates as well as at lubrication points with loss lubrication	DIN 38409.1
AVIATICON SKM HV Bio 220	Biodegradable adhesive oil for use on slideways, conveyor chains, block trains and saw gates as well as at lubrication points with loss lubrication	DIN 38409.1
AVIATICON Bio-Chain Guide	A modern vegetable oil (triglyceride) based on rapeseed oil which is used as a chain lubrication and guideway oil if a biodegradable quality is required with no distinctive adhesive additives.	



COMPRESSOR OILS

Compressor oils are lubricating oils (V) which are used in air compressors with oil-lubricated pressure chambers without injection cooling. These

lubricating oils can also be used in air vacuum pumps operating at a pressure higher than the atmospheric pressure.

Lubricating oil groups For mobile air compressors and compressors with which compressed air braking, tipping, signalling or conveying devices are actuated in vehicles with compression end temperatures

For air compressors with tanks for compressed air storage or pipeline networks with compression end temperatures

VDL up to 220 °C
VC/VCL up to 220 °C
VB/VBL up to 140 °C

up to 220 °C
up to 160 °C¹⁾
up to 140 °C

¹⁾Rotary slide compressors (multi-cell compressors) with fresh oil lubrication can be operated at compression end temperatures of up to 180 °C; with lubricating oils alloyed according to the type of engine oils; with alloyed compressor oils, provided the requirements of the VCL lubricating oil group specified in Table 2 of DIN 51 506 are met.

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
AVIATICON VCL	Compressor oils for screw and piston compressors	DIN 51506, VCL	32 up to 220
AVIATICON VDL	Compressor oils with active substances to increase aging resistance	DIN 51506, VDL	32 up to 220
AVIATICON Leuenöl LHG	Compressor oils with very good demulsifying characteristics	DIN 51506, VCL	46, 68
AVIATICON Finkel SK 80	Compressor oils based on synthetic hydrocarbons	DIN 51506, VDL	100
AVIATICON Finkel SKP	Compressor oil based on synthetic polyalpha-olefins for use in air compressors	DIN 51506, VDL	46, 68



VACUUM PUMP OILS

Vacuum pump oils, are lubricants for use in vacuum pumps. These oils are used for lubrication and sealing. Unlike lubricants in normal pumps, they are subject to additional requirements. Low pressure values increase volatile components being outgassed from lubricants, which in turn contaminates the vacuum to be generated.

PRODUCT	SHORT DESCRIPTION	DIN STANDARD	ISO VG
AVIATICON Vakuum-pumpenöl	Special oils for vacuum and pressure-vacuum pumps, rotary piston and rotary slide vacuum pumps	DIN 51506, VC	22 up to 150
AVIATICON Vakuumpumpen-öl 100 Plus	Special vacuum pump oil with a narrow boiling range for mechanical fine and high vacuum pumps	DIN 51506	100

AIR COMPRESSOR FLUIDS (AIR LINE OILS, FRL SYSTEMS)

Air Compressor fluids are special products of Finke Mineralölwerk which are used for lubricating compressed air tools and soil displacement devices.

PRODUCT	SHORT DESCRIPTION	DIN STANDARD	ISO VG
AVIATICON Collfin KN	Haze-free and highly adhesive special oils for lubricating pneumatic power tools	DIN 51502, D-LP	32 up to 150
AVIATICON Zerotol Plus	Synthetic special lubricating oil for hydraulic and pneumatic power tools		
AVIATICON Collfin LW	Lubricant for compressed air maintenance units	DIN 51502 DLP-D	10 up to 46

REFRIGERATION COMPRESSOR OILS

Refrigeration compressor oils are light raffinates which cannot be chemically attacked by refrigerants. Coolant resistance is measured according to DIN 51503 T1/2 Group KA and KC, 51 590 T 2, 51593. In this connection, time and recognisable or detectable cleavage products play a significant role (KA oils for refrigerators with refrigerant NH₃: DIN 8960; KC oils for refrigerators with halogenated hydrocarbons and their azeotropes as refrigerants: DIN 8960; 8962). Due to the CFC Halon Prohibition Ordinance, tests are currently performed using other refrigerants such as, for example, R 134a or new mixtures of mainly ester-based synthesis oils.

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
Next Lubricant NXT-717	Refrigerating machine oil with high aging resistance and very good low temperature properties for use in screw, piston and rotary slide compressors for refrigeration.		68

Further Next products available on request

TURBINE OILS

Turbine oils are highly refined, aging-resistant lubricating oils (TD lubricating oil) which are used to lubricate and cool the steam turbine gearboxes, regulators and bearings as well as powered machines such as generators, compressors and pumps. TDL steam turbine oils contain active compounds to improve corrosion protection and aging resistance as well as reducing foam formation in accordance with DIN 51515 T1.

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE	ISO VG
AVIATICON TDL	Turbine oils with high aging resistance for turbines, transmission turbines and turbo compressors	DIN 51515, Part 1, L-TD	32 up to 68

TRANSFORMER OILS

Transformer oils or insulating oils are highly refined mineral oils or low-viscosity silicone oils which are stable at high temperatures. They are used in high-voltage technology in transformers, capacitors and switches for insulation, spark suppression, lubrication (e. g. of step switches) and cooling (e. g. in power electronics).

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE
AVIATICON TRS 60	Insulation transformer oil in accordance with DIN 57370 Part 1, VDE 0370/12.78	DIN 57370

HEAT TRANSFER OIL

Heat transfer oils are temperature and oxidation resistant mineral or synthetic oils with a high flashpoint which can be used as heat transfer media for cooling or heating. Other important features are: Initial boiling point, steam pressure, fluidity and cracking temperature; heat transfer oils Q: DIN 51522.

PRODUCT	SHORT DESCRIPTION	STANDARDS, TYPE
AVIATICON Finkotherm M-300	Mineral heat transfer medium	DIN 51522/Q

ANTI-CORROSION OILS

The word corrosion comes from the Latin word “corroder” and means something like “gnaw away.”

The term “corrosion” means the gradual destruction of a mostly metallic material due to electrochemical reactions. The attacking medium is referred to as a corrosive agent.

In accordance with DIN 50900, the following types of corrosion can be distinguished:

- Uniform corrosion in which surfaces are evenly damaged
- Pitting in which surfaces are unevenly damaged
- Hole corrosion in which only small surface areas are destroyed
- Crevice corrosion in which small surface areas are attacked and crevices are formed

For protection against corrosion, we offer a wide range of anti-corrosion oils and greases.

PRODUCT	SHORT DESCRIPTION
AVIATICON Finkox KSA Fluid	Liquid and easy-to-spray maintenance product for all types of chains
AVIATICON Finkox KSP Fluid	Liquid maintenance product for all types of chains; the product has good penetration capability and is extremely adhesive
AVIATICON Finkox RD Fluid	Liquid anti-corrosion agent suitable for storage periods of up to 6 months, has passed ASTM 1748 tests, at least 50 days
AVIATICON Finkox RSO Fluid	Liquid anti-corrosion agent for long storage periods, seawater-proof
AVIATICON Finkox RSL Fluid	Liquid anti-corrosion agent for long storage periods, protection in accordance with ASTM 1748
AVIATICON Finkox RSU Fluid	Liquid anti-corrosion agent, resistant to salt water and other corrosion-enhancing substances
AVIATICON Finkox RT Fluid	Liquid anti-corrosion agent in the form of an immersion bath, can be used for sheets, pipes, workpieces, etc.



PRODUCT	SHORT DESCRIPTION
AVIATICON Finkox RTW Fluid	Liquid anti-corrosion agent, resistant to salt water and other corrosion-enhancing substances
AVIATICON Finkox Wire Rope Fluid	Anti-corrosion agent (wire rope oil) with very good penetration capability, liquid and easy to process
AVIATICON Solutol 112	Liquid rust remover, rust inhibitor and penetrating oil used for motor vehicles, agricultural machinery and equipment of all kinds
AVIATICON Solutol M	Liquid, easy-to-spray, multi-purpose product, which is effective as a rust dissolver, anti-rust protection, fine lubricant and penetrating lubricant
AVIATICON Solutol 16	Liquid anti-corrosion product for motor vehicles, agricultural machines and devices; a spray oil without graphite and MoS2
AVIATICON Solutol 18	Liquid anti-corrosion product for motor vehicles, agricultural machines and devices; a spray oil with synthetic, extremely fine graphite
AVIATICON Solutol WET	A liquid, dewatering anti-corrosive agent with good penetration properties, it forms an oily, highly adhesive protective layer with a thickness of 0.03 mm
AVIATICON Solutol BD-Sprühöl	Environmentally friendly spray oil without solids; for vehicles, equipment and machinery as well as iron and steel parts. After application, a thin, oily layer forms
AVIATICON Seilöl BD	A mineral oil-free care and protective oil, built on the basis of a native oil; for wire ropes or other treated parts. A semi-solid, viscous and adhesive film is formed, which is resistant to rain

RELEASE AGENTS

Release agents are used in a wide variety of application processes. A release agent is used to prevent moulds from sticking to parts during moulding processes.

A classic kitchen example is baking mould greasing. In doing so, cakes can be perfectly separated from their moulds.

Release agents often contain wax or grease. Release agents are used as formwork oil to separate concrete from casting moulds or cladding.

Silicon oils are used as release agents in die-casting machines; wax is applied to plastic moulds as a release agent.

Release agents can be synthetically manufactured or mineral- or vegetable-based.

■ ASPHALT RELEASE AGENT

PRODUCT	SHORT DESCRIPTION
AVIATICON Solutol BW 59/02	Emulsifying and water-miscible release agent concentrate, suitable for separation effects during asphalt transport and processing
AVIATICON Solutol FA	Non-water miscible, biodegradable release agent for asphalt mixtures
AVIATICON Solutol Forte	Water-miscible, biodegradable release agent for concrete mix manufacturers
AVIATICON Solutol Bio	Water-miscible, biodegradable release agent for concrete mix manufacturers

■ CONCRETE RELEASE AGENT

PRODUCT	SHORT DESCRIPTION
AVIATICON Solutol 140-C 11	Special product for smoothly separating moulding materials when manufacturing foundry moulds in ironworking
AVIATICON Solutol N-17/K	Non-emulsifying mould oil for concrete finished parts
AVIATICON Solutol N-22	Formwork oil and release agents for manufacturing large structural elements and concrete finished parts
AVIATICON Solutol BA	Biodegradable special release agent for the concrete industry
AVIATICON Solutol BD Trennmittel	Biodegradable, non-water soluble separating agent for building materials manufacturers and processors

METALWORKING LUBRICANTS

Under machining, the production of a workpiece by removing material from a slug is meant. The lubricants used for machining are also referred to as cooling lubricants with a view to expressing their double cooling and lubrication function.

The most important machining processes are: turning, drilling, milling, planing, thread cutting, grinding, lapping and honing. The cooling lubricant is intended to improve the machining performance and thus make the manufacturing process more economical compared to dry machining.

The machining performance is affected by the following factors:

- Machinability of the material
- Tool (geometry and material)
- Lubricant and how it is supplied

The cooling lubricant has the following tasks:

- Reduce cutting forces (friction) and thus energy consumption
- Improve surface quality and dimensional stability
- Extend the tool service life, e. g. by reducing wear and friction
- Removing chips
- Protecting workpieces against corrosion
- Lowering the workpiece temperature

■ WATER SOLUBLE COOLING LUBRICANTS

Water-miscible cooling lubricants are mixed with water before use. The mixing ratio between water and oil depends on the desired result of the machining process. The higher the water content, the better the cooling effect; the higher the oil content, the better the lubricating effect.

Since water and oil are not soluble in each other, a stable compound has to be produced by means of a so-called emulsifier. An emulsifier is a molecule which contains both an oleophilic (oil-loving) and a hydrophilic (water-loving) moieties. Several emulsifier molecules can thus stabilise an oil droplet in the water. Depending on whether water or oil is the outer phase, there will be an oil-in-water or a water-in-oil emulsion:

- oil-in-water emulsions especially for machining techniques
- and water-in-oil emulsions especially for moulding processes

Depending on how the emulsion is composed, it will appear different:

- conventional emulsions with high mineral oil content are mostly milky
- semi-synthetic emulsions with low mineral oil content are transparent to milky
- mineral oil-free emulsions (solutions) are transparent





■ WATER-MISCIBLE COOLING LUBRICANTS - continued

PRODUCT	SHORT DESCRIPTION
AVIATICON Finkomex B	Cooling lubricant containing mineral oil emulsifiable with water. Worthy of emphasis its good cooling and rinsing effects as well as very good corrosion prevention. Suitable as drilling emulsion
AVIATICON Finkomex AMR	Mineral oil-based EP cooling lubricant with high stability and great resistance to microorganisms; universally usable
AVIATICON Finkomex FMB	Partially synthetic, water-emulsifiable high-performance cooling lubricant with low mineral oil content
AVIATICON Finkomex CSA	Cooling lubricant containing mineral oil, emulsifiable with water. The product is suitable for cutting all common metals
AVIATICON Finkomex KTS	Cooling lubricant containing mineral oil emulsifiable with water. Especially suitable for precision grinding processes Free of boric acid and amines
AVIATICON Finkomex ULB	4 th generation, water-miscible cooling lubricant, containing mineral oil and free of boric acid and amines. Versatile application
AVIATICON Finkomex ABF	Cooling lubricant with EP additives, free from amines and boric acid as well as chlorine and nitrite, based on ester oils.
AVIATICON Finkomex SV	Primary amine-based universal abrasive. The product is primarily used for grinding operations
AVIATICON Finkomex FH	Water soluble, mineral oil-free cooling lubricant, especially suitable for grinding operations and processing commercial steel and cast iron
AVIATICON Finkomex CC	Synthetic cooling lubricant, clear abrasive, suitable for hard metal processing
AVIATICON Finkomex ESS	Water soluble cooling lubricant developed especially for processing of casting materials, casting alloys, and steel

■ SERVICING PRODUCTS FOR WATER SOLUBLE COOLING LUBRICANTS

Previously, the main focus was on the technical performance of cooling lubricants.

Today, their compatibility with humans and service products is increasingly emphasised.

In the case of water-miscible cooling lubricants, it is necessary to steadily combine oil – the basic component – with water. Crucial to this task are

emulsifiers which, by lowering the interfacial tension between the oil and water phases, allow for a distribution of oil droplets in the water.

The emulsifier is therefore a crucial binding element in the emulsion, thus ensuring the cooling lubricant optimal performance. To protect the emulsifier system over the longest possible dwell time, various additives are added to the water-miscible cooling

lubricant. These service products must be carefully selected.

In this regard, Finke Mineralölwerk's complete cooling lubrication service, along with customised advice on the spot, are available for you.



■ NON-WATER MISCIBLE COOLING LUBRICANTS

Non-water-miscible cooling lubricants consist of base oils, wear-reducing and antifouling additives as well as other additives.

It should be noted that oils with sulphur-containing additives are often not allowed for use when machining and moulding copper-containing alloys.

Non-water-miscible cooling lubricants are also used for the so-called minimum quantity lubrication, where extremely small amounts of lubricant are applied.

Also moulding processes may require very small lubricant quantities. In this case, lubricant is already applied to metal sheets in the steel mill.

PRODUCT	SHORT DESCRIPTION
AVIATICON Statac ALU	Cooling lubricant, chlorine-free, for specific cutting and drawing oils. Storage as per VbF A III
AVIATICON Statac HFS	Metal working oil for honing, fine grinding, fine cutting and super finishing
AVIATICON Statac HMS	Cooling lubricant, chlorine-free, especially suitable for grinding hard metals
AVIATICON Statac WSM	Mineral-oil based, chlorine-free drawing oil with higher viscosity, suitable for drawing and deep-drawing steels and all types of non-ferrous metals
AVIATICON Statac DCF	Low-viscosity, high-alloyed, special cutting oil for complex machining processes in high tensile steel alloys
AVIATICON Statac ME-15 Statac ME-22 Statac ME-32	Cutting oil, suitable for processing iron as well as light and non-ferrous metals. It is an alloyed oil containing highly effective EP additives as well as polar agents
AVIATICON Statac RCF	Highly active, chlorine-free high-performance cutting oil, which is very effective primarily for complex cutting operations of tough hard high-alloy steels.





■ NON-WATER MISCIBLE COOLING LUBRICANTS - continued

PRODUCT	SHORT DESCRIPTION
AVIATICON Statac CF-3	Cutting oil for processing materials with tensile strength above 100 kp/cm ²
AVIATICON Statac RX-2	Cooling lubricant, chlorine-free, suitable for cutting processes of high-alloyed steels
AVIATICON Statac TLB	High-performance cutting oil for deep drilling operations and for the slow, difficult internal broaching of tough high-alloy steels
AVIATICON Statac STZ	Non water-soluble cooling lubricant, which can be used as cutting oil, punching oil as well as drawing oil
AVIATICON Statac LS 90	The product can be used as cutting oil as well as for non-cutting shaping
AVIATICON Statac VD 107	Non water-soluble cooling lubricant especially designed for shear cutting and punching of sheer metals; storage as per VbF A III
AVIATICON Statac BD 146	Transparent cutting oil, suitable for the processing of ferrous, light and non-ferrous metals. This product is biodegradable and suitable for minimum quantity lubrication

■ SPARK EROSION OILS

PRODUCT	SHORT DESCRIPTION
AVIATICON Finkel 80	Spark-erosion oils/dielectrics for spark-erosive metal processing
AVIATICON Finkel 125	Spark-erosion oils/dielectrics for spark-erosive metal processing

■ QUENCHING AND HARDENING OILS

PRODUCT	SHORT DESCRIPTION
AVIATICON Finkofirm 400	Quenching and hardening oils
AVIATICON Finkofirm 600	Quenching and hardening oils



WHITE OILS

White oils are paraffin oils, whereby a distinction must be made between technical and medical white oils. Technical white oils are mainly used in lubricants, weapon oils, furniture polishes and the plastic industry. Technical white oils are very

stable with respect to environmental influences. They do not harden and cannot become rancid. Medical grade white oils (Paraffinum liquidum) are used in the pharmaceutical and cosmetic industries; these products are odourless and tasteless. Medi-

cal white oils are also used in the food industry and also as production oils for food-safe plastics. Both grades are available in different viscosity classes.

■ TECHNICAL WHITE OILS

PRODUCT	SHORT DESCRIPTION	APPROVALS
AVIATICON Microfin W-30	The Microfin product name includes technical white oils featuring a high degree of cleaning, aging resistance and inodorousness. As process oils, they are used in the textile and leather industry and in colour and plastic manufacturing as well as in crop protection. Technical white oils are available in various viscosity classes.	US-FDA 21.CFR 178-3620B
AVIATICON Finkoblanc 15	Highly refined mineral oil solvent raffinate	

■ MEDICAL WHITE OILS

PRODUCT	SHORT DESCRIPTION	APPROVALS
AVIATICON Pharmawhite W-00	Colourless and odourless pharmaceutical medical white oils for manufacturing within the pharmaceutical and cosmetic industries. These products are used as process oils in the chemical industry. In the food industry and medical engineering, these products are recommended for lubrication. The white oils are available in various viscosities.	DAB 10 BP
AVIATICON Pharmawhite W-11	Colourless and odourless pharmaceutical medical white oils for manufacturing within the pharmaceutical and cosmetic industries. These products are used as process oils in the chemical industry. In the food industry and medical engineering, these products are recommended for lubrication. The white oils are available in various viscosities.	USP NF

VASELINE

Vaseline is a semi-solid mixture of hydrocarbons obtained from mineral oil and used as an ointment in pharmacy.

In addition to vaseline used in pharmacy, there is also a technical vaseline which is used in the industry as an effective, anti-corrosion lubricant. It is chemically neutral to all materials.

Vaseline serves as a basis for the production of milking fat, as antifreeze for car door gums, for the

care and protection of objects made of smooth leather, and much more.

There are different types of vaseline:

- Vaselinum album: a purified, almost completely decolourised mixture of semi-solid hydrocarbons.
- Vaselinum flavum: Yellow vaseline; contains minor impurities, including aromatic polycyclic hydrocarbons.

PRODUCT	SHORT DESCRIPTION	APPROVALS
AVIATICON	Ointment-like hydrocarbon mixture with the highest degree of purity, homogeneous, high-quality and suitable for manufacturing pharmaceutical and cosmetic items	DAB
Pharmaline		BP
V-15		USP
V-18		





GREASES

Lubricating greases are very viscous lubricants which are in reality no greases at all. They mainly consist of a base oil and a thickener, the latter serving as a sponge-like structure holding the base oil. To ensure certain properties, additives may be added. Lubricating greases are used where lubricating oils would flow away, for example in rolling bearings.

Single components are contained in greases in the following concentrations:

- Base oils: 75 – 94 %
- Thickeners: 5 – 20 %
- Additives: 1 – 10 %

Important properties of lubricating greases are:

- Low and high temperature with high melt point
- Resistance to water
- Wear protection properties
- As thickeners, soaps consisting of a fatty acid with a metal, are frequently used. Lubricating greases based on sodium soaps are sensitive to water but very temperature resistant.

Calcium soaps, on the other hand, are water resistant but not very temperature resistant (up to approx. 150 °C). Lithium saponified lubricants are very water and temperature resistant and therefore widely used as universal greases. Lubricating greases are often combined with solid lubricants (graphite, Teflon (PTFE)) or molybdenum disulfides (MoS_2) to upgrade anti-wear and extreme pressure operating capability.

LUBRICANT THICKENERS

While oils with the same specifications are relatively easily miscible with one another, lubricating greases are quite different. Greases should not be mixed together if possible. When changing to a new grease, the following parameters must be considered:

- a) The oil base must be identical in any case (mineral oil, synthetic oil or PAO oil)
- b) The lubricating grease thickeners must be the same (aluminium complex, barium, calcium, calcium complex, lithium, bentonite, lithium complex, polyurea and others)
- c) The NLGI classes must be identical
- d) The base oil viscosity should also be identical and differ by a maximum of one ISO VG class from one another

When mixing incompatible greases with one another, their structures change within days: lubricating greases "leak out". Lubricating greases, which are hardly compatible with one another, include lubricating greases which contain an aluminium or calcium complex soap or in which oil is retained with polyurea or bentonite thickeners.

The "Grease compatibility according to NLGI" on page 75 provides helpful tips.

PHYSICAL PROPERTIES

DRIP POINT

The drip point of a lubricating grease characterises the temperature at which the grease reaches a certain degree of fluidity (viscosity). The grease operating temperature must be below a drip point if the grease is to be used as a consistent lubricant.

PENETRATION

The penetration of a lubricating grease is a measure of its "mechanical strength" or the resistance exerted by the grease against a change in shape. Penetration serves to classify lubricating greases in NLGI classes. There are 9 NLGI classes: 000, 00, 0, 1, 2, 3, 4, 5, 6 (Tab. 4.3).

Very soft greases of classes 0 to 000 are referred to as fluid greases and used, inter alia, for the lubrication of utility vehicle units by means of central lubrication systems. Lubricating greases of classes 000 and 00 may be used in an operating temperature range from -25 °C to +80 °C. Lubricating greases of class 0 may be only used in a limited operating temperature range from -10 °C to +80 °C.

CHEMICAL PROPERTIES

WATER RESISTANCE

Since lubricating greases use soap structures as thickeners, they are very susceptible to decomposition by water. For this reason, the water resistance of lubricating greases is always determined. Water resistance is dynamically determined by injecting

water into a grease-filled roller bearing during operation. The assessment is carried out by measuring the extent of the lubricating oil washed out of the bearing.

OXIDATION RESISTANCE

When determining the oxidation resistance of a grease, the grease is exposed to an oxygen pressure. In so doing, the pressure drop is determined as a measure for the reactivity of the grease against oxygen.

TECHNOLOGICAL PROPERTIES

OIL SEPARATION

Oil separation is a measure of the pressure stability of a grease. Oil separation is measured in a static test in which the grease is subjected to high pressure and the amount of oil released by the grease is then measured. The practical importance of this method is limited.

FLOW PRESSURE

Under flow pressure, the pressure which is necessary to press a lubricant grease out of a test nozzle is meant. It is a measure of the grease consistency and flow properties.

CONVEYING RESISTANCE

Under this concept, the pressure of a pump required for conveying lubricating grease via a central lubrication system is meant. Thus, the maximum pipe length or the necessary pipe cross-section can also be calculated for a given conveying capacity.

ANTICORROSIVE PROPERTIES

These properties refer to the effectiveness of a grease to suppress the occurrence of rust and corrosion. The anticorrosive behaviour of lubricating greases in rolling bearings occurs after assessing in an experiment in which water has been added to a grease-filled rolling bearing the corrosion state of bearing rings.

MECHANICAL-DYNAMIC PROPERTIES

Under mechanical-dynamic properties, the anti-fatigue and anti-wear properties of a lubricating grease in roller bearings is meant. This properties are also included in the standard minimum requirements for greases. In the case of oils, viscosity serves to distinguish whether an oil is rather thick or thin. In greases, the (rest) penetration or consistency shows whether a grease is soft or firm.

Penetration is not to be confused with base oil viscosity. Depending on the amount of grease present, it is measured in a penetrometer using a full or a quarter cone. As per DIN ISO 2137, a standard beaker is filled with grease at room temperature (25 °C). The tip of a standard double cone touches the surface. After releasing the holding device, the cone has 5 seconds to penetrate into the grease. By means of a scale, which is applied to the holding rod of the cone, this penetration depth is specified as being 0.1 mm. Penetration thus characterises the deformability of a grease by a weight-loaded cone.

■ GREASES

PRODUKT	SHORT DESCRIPTION	DIN 51502	NLGI CLASS	WORKING TEMPERATURE RANGE
AVIATICON Mehrzweckfett 2	High-quality lubricating grease based on a lithium soap, bright natural colours, with smooth consistency and short fibre structure	K2K-25	2	-25 °C up to +120 °C short-term approved temperature 130 °C
AVIATICON Mehrzweckfett 3	High-quality lubricating grease based on a lithium soap, bright natural colours, with smooth consistency and short fibre structure	K3K-25	3	-25 °C up to +120 °C short-term approved temperature 140 °C
AVIATICON Mehrzweckfett 2 + Graphit	High-quality lubricating grease based on a lithium soap, black, with smooth consistency, tempered with graphite of the highest purity	KF2K-30	2	-30 °C up to +120 °C short-term approved temperature 130 °C
AVIATICON Finkox LZM	High-quality lubricating grease based on a lithium soap, black, with smooth consistency, tempered with molybdenum disulfides	KPF2K-30	2	-30 °C up to +130 °C short-term approved temperature 140 °C
AVIATICON Fett EP-01	High-quality lubricating grease with EP additives based on a lithium soap, light brown, with smooth consistency	KP1K-30	1	-30 °C up to +130 °C short-term approved temperature 140 °C
AVIATICON Fett EP-07	High-quality lubricating grease with EP additives based on a lithium soap, light brown, with smooth consistency	KP2K-30	2	-30 °C up to +120 °C short-term approved temperature 130 °C
AVIATICON Fett EP-SAL	Special long-term grease with EP additives based on a Ca-12-OH soap, white, tempered with special white solid lubricants	KPF2G-30	2	-30 °C up to +110 °C
AVIATICON Finkox LZ-84	High-quality, long-term grease with EP additives, based on a lithium soap, light beige, with smooth consistency	KP2N-30	2	-30 °C up to +140 °C short-term approved temperature 150 °C
AVIATICON Finkox LZ-84+MoS ₂	High-quality, long-term grease with EP additives, based on a lithium soap, black, with molybdenum disulfides	KPF2N-30	2	-30 °C up to +140 °C short-term approved temperature 150 °C

■ GREASES - continued

PRODUKT	SHORT DESCRIPTION	DIN 51502	NLGI CLASS	WORKING TEMPERATURE RANGE
AVIATICON Finkox KEP 2	Heavy-duty special high temperature grease with EP additives, based on a lithium complex soap, green, with smooth consistency	KP2P-30	2	-30 °C up to +150 °C short-term approved temperature 200 °C
AVIATICON Finkox KEP 3	Heavy-duty special high temperature grease with EP additives, based on a lithium complex soap, beige, with smooth consistency	KP3N-30	3	-30 °C up to +140 °C short-term approved temperature 180 °C
AVIATICON Alba	Special high temperature grease with EP additives, based on a lithium complex soap, white, tempered with PTFE solid lubricants	KPF2N-30	2	-30 °C up to +140 °C short-term approved temperature 220 °C
AVIATICON Fett GX-FL	High-quality, special grease with EP additives, based on a lithium soap, green, with semi-fluid consistency	GP00/000 K-50	00/000	-50 °C up to +120 °C
AVIATICON Fett GL	High-quality, fluid transmission grease with EP additives, based on a lithium soap, light brown, with semi-fluid consistency	GP0/00-30	0/00	-30 °C up to +120 °C
AVIATICON Mystico Novo	Special long-term grease with EP additives based on a Ca-12-OH soap, yellowish transparent, with smooth consistency	KP2K-30	2	-30 °C up to +120 °C short-term approved temperature 130 °C
AVIATICON Fett AC	Special wire rope and underwater grease based on calcium soap, black, tempered with black solid lubricants	MF2G-20	2	-25 °C up to +100 °C
AVIATICON Finkox CAS	Temperature-resistant high-pressure grease based on a calcium sulphonate complex soap, beige, with smooth consistency	KP2P-25	2	-25 °C up to +180 °C short-term approved temperature 220 °C
AVIATICON Fett LC-0	High-performance fluid grease with EP additives for stone-crushers, sieving plants, conveyor systems in quarries, recycling plants, gravel or sand	OGP0.5N-20	0	-20 °C up to +140 °C short-term approved temperature 180 °C
AVIATICON Fett NT-00	High-quality semi-fluid grease based on a special lithium-calcium soap, orange, with soft consistency	GP00K-40	00	up to +120 °C

■ GREASES - continued

PRODUKT	SHORT DESCRIPTION	DIN 51502	NLGI CLASS	WORKING TEMPERATURE RANGE
AVIATICON Fett GT-XRF	High-quality, semi-fluid transmission grease with EP additives, based on a sodium soap, light brown, with semi-liquid consistency	GP0/00H-30	0/00	-30 °C up to 100 °C short-term approved temperature 150 °C
AVIATICON Finkox PMH	High temperature grease with EP additives, based on a special polyurea thickener, light brown, with smooth consistency	KP1-2P-20	1-2	-20 °C up to +180 °C short-term approved temperature 200 °C
AVIATICON Finkox HT 2/EP	Light brown bentonite grease based on a partly synthetic base oil with EP active substances	KP2P-10	2	-15 °C up to +150 °C short-term approved temperature 200 °C
AVIATICON Finkox AKF-2	Special high temperature grease with EP additives, based on an aluminium complex soap, brownish transparent, with smooth consistency	KP2P-20	2	-20 °C up to +160 °C short-term approved temperature 200 °C
AVIATICON Finkox GC	Chisel paste based on an aluminium complex soap, brown-black, tempered with metal powder and solids	MF2U-20	2	-20 °C up to +1.100 °C
AVIATICON Finkox GR 10-15	Aluminium complex soap semi-fluid grease based on high-quality, semi-fluid synthetic oils, tempered with graphite	OGPF0S-20	0/00	-20 °C up to +200 °C short-term approved temperature 250 °C
AVIATICON Finkox IGF	Special low temperature grease with a synthetic base oil, based on a lithium complex soap, cream coloured, with smooth consistency	KPHC2N-60	2	-60 °C up to +140 °C
AVIATICON Finkox SLF	High-quality, heavy-duty grease with EP additives based on a lithium complex soap, light beige, tempered with white solid lubricants	KPF2N-20	2	-25 °C up to +150 °C short-term approved temperature 200 °C
AVIATICON Finkox LZ-84 Sprühfähig	High-quality, long-term grease with EP additives, based on a lithium soap, light beige, sprayable after adding solvent	KP2N-30		-30 °C up to +140 °C short-term approved temperature 150 °C



BIODEGRADABLE GREASES

■ BIO GREASES

PRODUKT	SHORT DESCRIPTION	DIN 51502	NLGI CLASS	WORKING TEMPERATURE RANGE
AVIATICON Fett BD 80-1	Biodegradable multi-purpose grease, based on a calcium soap, yellow, with smooth consistency, in the NLGI 1	KE1E-20	1	-20 °C up to +80 °C; short-term appr. Temperature 110 °C
AVIATICON Fett BD 80-2	Environmentally-friendly, biodegradable multi-purpose grease, based on a calcium soap, yellow, with smooth consistency, in the NLGI 2 class	KE2E-20	2	-20 °C up to +80 °C; short-term appr. Temperature 110 °C
AVIATICON Fett BD 120	Environmentally-friendly, biodegradable synthetic rolling bearing grease with EP additives, based on a lithium soap, yellow, with smooth consistency, in the NLGI 2 class	KPFE2K-30	2	-35 °C up to +120 °C; short-term appr. Temperature 130 °C
AVIATICON Spur- & Zahnkranzfett BD	Environmentally-friendly, biodegradable flange grease, based on a calcium soap, dark, tempered with graphite, in the NLGI class 000	MFE000 E-30	000	-30 °C up to +80 °C
AVIATICON Fett BD-ZSA	Environmentally-friendly, biodegradable synthetic fluid grease with EP additives, based on a lithium soap, light green, with semi-liquid consistency, in the NLGI class 00/000	GPE00/000 K-40	00/000	-40 °C up to +120 °C

AEROSOLS

Aerosols are substances finely distributed in gas for a wide range of applications. The most famous aerosol is the so-called penetrating oil, a low-viscosity oil with a low surface tension and water-propelling properties. As a result of their capillary action,

these oils penetrate even the finest cracks, thereby infiltrating soils, oxides and moisture. Special H1 aerosols are also designed for use in food-producing plants. In this area, Finke Mineralölwerk has a rich repertoire.

PRODUCT	SHORT DESCRIPTION
AVIATICON Black G	Cogwheel spray
AVIATICON Omnilub Spray	Colourless and odourless high-performance grease
AVIATICON Penetrant +	Multi-purpose spray, ideal as penetrating oil, rust remover and contact spray
AVIATICON Silicone No. 1	Silicone spray
AVIATICON Special Chain	Chain spray
AVIATICON Brake Cleaner	Brake cleaner
AVIATICON PTFE Extra	Lubricating film spray
AVIATICON Schneidspray	High-performance cutting oil for stainless steel
AVIATICON Molyplex RH-20	Lubricating and mounting spray with MoS ₂ + graphite





CLEANER

PRODUCT	SHORT DESCRIPTION
AVIATICON Finkoclean 70	Quick evaporating cold cleaner for removing oily and greasy soiling
AVIATICON Finkoclean AX	Biodegradable cleaner, removes tar and bitumen stains, oily and greasy soiling
AVIATICON Finkoclean UWF	Liquid solvent cleaner for steam jet appliances, high pressure washers, steam bath systems, etc.
AVIATICON Petroleum	Mineral oil and hydrocarbon mixture with an excellent cleaning action
AVIATICON Waschbenzin F	Colourless, clear petroleum ether
AVIATICON Finkoclean RD	Concentrate for steam jet cleaners, hot water and high pressure washing machines in workshops, commercial and industrial enterprises
AVIATICON Finkoclean RIM	Special cleaning powder which can be safely used in all parts washing machines. Also suitable for dewaxing new parts (shafts, screws, worms, etc.)
AVIATICON Finkoclean OR	Cleaning concentrate for machines, devices and parts (resin and rapeseed oil deposits) with heavy soiling
AVIATICON Finkoclean GL	Water soluble cleaning concentrate for cleaning industrial and commercial machines and plants
AVIATICON Finkoclean BC	Special cleaner for buildings and industrial areas; for all mineral and synthetic oil and grease contamination in the vehicle fleet as well as on contaminated surfaces of all kinds

BRAKE CLEANER

PRODUCT	SHORT DESCRIPTION
AVIATICON Bremsenreiniger	Special cleaner/degreaser for brakes, small parts, etc.

BRAKE FLUIDS

PRODUCT	SHORT DESCRIPTION
AVIATICON Brake Fluid	Special power transmission medium for hydraulic brake and clutch systems
AVIATICON Anti-Icing Fluid	Brake antifreeze agent; it can be used at temperatures down to -80 °C

WINDSCREEN CLEANER

PRODUKT	SHORT DESCRIPTION
AVIATICON Scheibenreiniger Sommer	Windscreen cleaner for the summer; streak-free visibility in the rain, night and back light
AVIATICON Scheibenreiniger Winter	Frost-proof windscreen cleaner concentrate; prevents windscreens and headlamp washing system from freezing



ANTIFREEZE

In earlier times, the term “radiator antifreeze” was often used, but this designation, due to modern engine technology, is no longer up to date, as radiator antifreeze is actually engine protection. Due to the very high temperatures present in cooling systems and the water used in the cooling liquid, there are ideal conditions for corrosion.

If no antifreeze were poured in, the coolant pump would fail and, in the worst case, the entire cooling system would do so. The result would be complete engine damage.

The anti-corrosive inhibitors contained in antifreeze combine with the metals of the cooling system and form a flimsy yet highly load-bearing protective layer on the surface. Thus, our antifreeze qualities not only protect the cooling system and all components made of rubber alloys and plastics, but also the engine.

In addition to a wide range of our own products, our extensive antifreeze product range also includes a premium product line with BASF OEM approvals.

Most products are available as antifreeze concentrates but also ready-mix formulations.

TIPS FOR SELECTING THE IDEAL ANTIFREEZE PRODUCT

1. An antifreeze is not just a frost protection agent but an all-year protection for the cooling system.
2. The age structure of a vehicle plays a decisive role for antifreeze use.
For vehicles over 6 years old, the antifreeze should be changed every three years.
3. Always completely replace the antifreeze during repairs. Definitely flush and clean the cooling system beforehand.
4. Antifreeze concentrate must never be used pure! They must always be diluted with clean water. This is best done with deionised or distilled water. When using tap water, the water hardness degree should not exceed 3.5 mmol/l.
5. When diluting an antifreeze concentrate, always observe the mixing ratio!
In principle, we recommend a 50:50 (antifreeze / water) mixing ratio. This ensures the best protection against corrosion, overheating and frost. The concentration should never be below 35 %.
6. In principle, in the case of antifreeze products, a distinction is made between silicate-containing and silicate-free products. Products with different technologies must not be mixed with one another since this would influence the effectiveness of additive packages. The result would be a significantly deteriorated protection. In the worst case, engine failure could occur.
7. Always observe the vehicle manufacturers' approvals in the operating instructions.



■ ANTIFREEZE

PRODUCT	SHORT DESCRIPTION	CLASSIFICATION	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finkofreeze F30	Silicate-, nitrite-, amine- and phosphate-free premium antifreeze concentrate, based on ethylene glycol, with an additive package based on OAT technology; also suitable for aluminium motors	AS 2108-2004 ASTM D 3306/D 4985 BS 6580:2010 CUNA NC 956-16 AFNOR NFR 15-601 ÖNORM V 5123 SAE J1034 SANS 1251:2005 SH 0521-1999		Mercedes Benz 325.3; MAN 324 SNF; Volkswagen TL 774-F (G12+); Volkswagen TL 774-D (G12); DAF 74002; MTU MTL 5048; Ford WSS-M97 B 44-D; Ford ESE M97B49-A; Ford ESD M97B49-A; Renault 41-01-001-D; Volvo
AVIATICON Finkofreeze F40	Nitrite-, amine-, borate- and phosphate-free premium antifreeze concentrate, based on ethylene glycol, with an inhibitor package based on silicate and salts of organic acids (Si-OAT coolant); also suitable for aluminium motors	ASTM D 3306/D 4985/D 6210 SAE J 1034 Önorm V 5123 CUNA NC 956-16 JIS K 2234:2006 SANS 1251:2005 SH 0521-1999 BS 6580:2010		MAN 324 Si-OAT; Volkswagen TL 774-G (G12++); Mercedes Benz 325.5; Mercedes Benz 325.6
AVIATICON Finkofreeze F40 RM 40:60	Ready-mixed nitrite-, amine-, borate- and phosphate-free premium antifreeze, based on ethylene glycol, with an inhibitor package based on silicate and salts of organic acids (Si-OAT coolant) for temperatures up to approx. -25 °C; also suitable for aluminium motors	BS 6580:2010 SH 0521-1999 SANS 1251:2005 JIS K 2234:2006 CUNA NC 956-16 Önorm V 5123 SAE J 1034 ASTM D 6210/D 4985/D 3306		Mercedes Benz 326.5 MAN 324 Si-OAT Volkswagen TL 774-G (G12++)

■ ANTIFREEZE - continued

PRODUCT	SHORT DESCRIPTION	CLASSIFICATION	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finkofreeze F40 RM 50:50	Ready-mixed nitrite-, amine-, borate- and phosphate-free premium- antifreeze, based on ethylene glycol, with an inhibitor package based on silicate and salts of organic acids (Si-OAT coolant) for temperatures up to approx. -37 °C; also suitable for aluminium motors	ASTM D 3306/D 6210/D 4985 SH 0521-1999 SANS 1251:2005 JIS K 2234:2006 CUNA NC 956-16 Önorm V 5123 SAE J 1034 BS 6580:2010		Mercedes Benz 326.5 MAN 324 Si-OAT Volkswagen TL 774-G (G12++)
AVIATICON Finkofreeze F48	Nitrite-, amine- and phosphate-free premium antifreeze concentrate based on ethylene glycol with an additive package based on a hybrid technology; also suitable for aluminium motors	ASTM D 3306/D4985 BS 6580:2010 AFNOR N FR 15-601 SAE J1034; Önorm V 5123 CUNA NC 956-16 JIS K 2234:2006 AS 2108-2004; SH 0521-1999 SANS 1251:2005	DEUTZ H-LV 0161 0188; MB Approval 325.0; MAN 324 NF	BMW N 600 69.0; Bundeswehr TL 6850-0038/1; Jenbacher TA-Nr. 1000-0201; Liebherr TLV 035; TLV 23009 A; Opel/Vauxhall (until man. year 2000): B 040 0240; Saab 6901599; Volvo Car 1286083 Issue 002; Volkswagen G 11 TL 774-C; MTU MTL 5048
AVIATICON Finkofreeze F48 RM 40:60	Ready-mixed premium anti-freeze free of nitrite, amine and phosphate, based on ethylene glycol with an additive package based on hybrid technology, mixed with demineralised water for temperatures up to approx. -25 °C; also suitable for aluminium motors	JIS K 2234:2006 BS 6580:2010 AFNOR N FR 15-601 SAE J 1034 Önorm V 5123 CUNA NC 956-16 AS 2108-2004 ASTM D 3306/D 4985 SANS 1251:2005 SH 0521-1999		MAN 324 NF; BMW N 600 69.0; Volvo Car 1286083 Issue 002; Bundeswehr TL 6850-0038/1; DEUTZ DQC CA-14; Jenbacher TA-Nr. 1000-0201; Liebherr TLV 035, TLV 23009 A; Mercedes Benz 325.6; MTU MTL 5048; Opel/Vauxhall (until man. year 2000): B 040 0240; Saab 6901599

■ ANTIFREEZE - continued

PRODUCT	SHORT DESCRIPTION	CLASSIFICATION	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finkofreeze F48 RM 50:50	Ready-mixed premium anti-freeze free of nitrite, amine and phosphate, based on ethylene glycol with an additive package based on a hybrid technology, mixed with demineralised water for temperatures up to approx. -37 °C; also suitable for aluminium motors	AS 2108-2004 CUNA NC 956-16 Önorm V 5123 SAE J 1034 AFNOR N FR 15-601 BS 6580:2010 ASTM D 4985/D 3306 SANS 1251:2005 SH 0521-1999 JIS K 2234:2006		MAN 324 NF; Volkswagen TL 774-C (G11); BMW N 600 69.0; Volvo Car 1286083 Issue 002; Bundeswehr TL 6850-0038/1; DEUTZ DQC CA-14; Jenbacher TA-Nr. 1000-0201; Liebherr TLV 035, TLV 23009 A; Mercedes Benz 325.6; MTU MTL 5048; Opel/Vauxhall (until man. year 2000): B 040 0240; Saab 6901599
AVIATICON Finkofreeze P11	Nitrite-, amine- and phosphate-free antifreeze concentrate based on ethylene glycol, with silicate-containing additives, to be diluted with clean water when used; also suitable for aluminium motors	ASTM D 3306/D 4985 BS 6580:2010 AFNOR N FR 15-601		Mercedes Benz 325.0; MAN 324 NF; Volkswagen G 11 TL 774-C
AVIATICON Finkofreeze P11 RM 40:60	Ready-mixed nitrite-, amine- and phosphate-free antifreeze based on ethylene glycol with an additive package based on modern inhibitor technology, for temperatures up to -27 °C; also suitable for aluminium motors	ASTM D 3306/D 4985 BS 6580:2010 AFNOR N FR 15-601		Mercedes Benz 325.0; MAN 324 SNF; Volkswagen TL 774-C (G11)

■ ANTIFREEZE - continued

PRODUCT	SHORT DESCRIPTION	CLASSIFICATION	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finkofreeze P11 RM 50:50	Ready-mixed nitrite-, amine- and phosphate-free antifreeze based on ethylene glycol with an additive package based on modern inhibitor technology, for temperatures up to -37 °C; also suitable for aluminium motors	ASTM D 3306/D 4985 BS 6580:2010 AFNOR N FR 15-601		Mercedes Benz 325.0; MAN 324 SNF; Volkswagen TL 774-C (G11)
AVIATICON Finkofreeze P12+	Silicate-, nitrite-, amine- and phosphate-free antifreeze and corrosion protection allowing for change intervals of up to five years	ASTM D 3306/D 4985 BS 6580:2010 AFNOR N FR 15-601 NATO S 759; UNE 26361-88 FFV Heft R443; SAE J1034 CUNA NC 956-16 JIS K 2234:2006		B&W D 36 5600; Cummins 85T8-2; Cummins 90T8-4; DAF 74002; Ford ESD M97B49-A; Ford ESE M97B49-A; GM 1899 M; John Deere H 24 B1 & C1; Leyland Trucks LTS 22 AF 10; Mack 014GS 17004; Volvo; Mercedes Benz 325.3; MAN 324 SNF; Volkswagen G 12 TL 774-D; Volkswagen G 12 TL 774-F; Renault 41-01-001-D; Ford WSS-M97 B 44-D; GM QL 130100; GM US 6277 M
AVIATICON Finkofreeze P12+ RM 40:60	Ready-mixed nitrite-, amine- and phosphate-free antifreeze based on ethylene glycol with an additive package based on modern inhibitor technology, for temperatures up to -27 °C; also suitable for aluminium motors	ASTM D 3306/D 4985 BS 6580:2010 AFNOR N FR 15-601 NATO S 759 CUNA NC 956-16 FFV Heft R443 JIS K 2234:2006 UNE 26361 - 88 SAE J 1034		Mercedes Benz; MAN 324 SNF; Volkswagen TL 774-D (G12); Volkswagen TL 774-F (G12+); Volvo; Renault 41-01-001-D; Ford ESD M97B49-A; Ford ESE M97B49-A; Ford WSS-M97 B 44-D; GM 1899 M; GM QL 130100; GM US 6277 M; B&W D 36 5600; Cummins 85T8-2; Cummins 90T8-4; DAF 74002; John Deere H 24 B1 & C1; Leyland Trucks LTS 22 AF 10; Mack 014GS 17004; Scania TB 1451

■ ANTIFREEZE - continued

PRODUCT	SHORT DESCRIPTION	CLASSIFICATION	MANUFACTURER APPROVALS	RECOMMENDATIONS FOR USE
AVIATICON Finkofreeze P12+ RM 50:50	Ready-mixed nitrite-, amine- and phosphate-free antifreeze based on ethylene glycol with an additive package based on modern inhibitor technology, for temperatures up to -37 °C; also suitable for aluminium motors	ASTM D 3306/D 4985 UNE 26361 - 88 JIS K 2234:2006 FFV Heft R443 CUNA NC 956-16 NATO S 759 AFNOR N FR 15-601 BS 6580:2010 SAE J 1034		Mercedes Benz; MAN 324 SNF; Volkswagen TL 774-D (G12); Volkswagen TL 774-F (G12+); Volvo; Renault 41-01-001-D; Ford ESD M97B49-A; Ford ESE M97B49-A; Ford WSS-M97 B 44-D; GM 1899 M; GM QL 130100; GM US 6277 M; B&W D 36 5600; Cummins 85T8-2; Cummins 90T8-4; DAF 74002; John Deere H 24 B1 & C1; Leyland Trucks LTS 22 AF 10; Mack 014GS 17004; Scania TB 1451
AVIATICON Finkofreeze P13	Long-term antifreeze, based on ethylene glycol with a silicon additive package.			Volkswagen G 13 TL 774-J ASTM D3306
AVIATICON PRO Kühler-frostschutz	Biodegradable antifreeze concentrate based on propylene glycol	ASTM D 5216; NATO S 759 JIS K 2234:2006 Önorm V 5123; BS 6580:2010		Ulstein Bergen 2.13.01; Volkswagen TL-5217

■ DISTILLED AND DEMINERALISED WATER

PRODUKT	SHORT DESCRIPTION
AVIATICON Destilliertes Wasser	It is obtained by distillation from tap water or purified water; free of salts, organic substances and microorganisms
AVIATICON Demineralisiertes Wasser	Water (H ₂ O) without the minerals (salts, ions) present in normal spring and tap water; free of salts, organic substances and micro-organisms

CARCARE

PRODUKT	SHORT DESCRIPTION
AVIATICON CarCare Scheiben- enteiser	Defroster with cleaning effects and protection against re-icing; effective down to about -30 °C; guarantees clear, streak-free visibility. Paints, metals, plastics and rubber are not attacked.
AVIATICON CarCare Insekten- entferner	Reliably dissolves insect residues from paint and windscreens
AVIATICON CarCare Innenreiniger	Cleaning agent and stain remover for the vehicle interior surfaces. Quickly and reliably dissolves grease and stubborn dirt on textiles, rubber, vinyl and plastic
AVIATICON CarCare Felgenreiniger	For rims and wheel sides made of steel, aluminium and plastic. Removes oily dirt, road salt, brake dust, oxides, etc.





SKIN PROTECTION PROGRAMME

Each company concerned about skin protection will also provide information on the specific protective measures to be taken at the respective workplace. An important aid is the hand and skin protection plan. This plan allows workers to ascertain which skin remedies should be used for which type of

work in certain work areas. In this case, a distinction must be made between skin protection before work (pre-treatment) and skin protection after work (post-treatment) in addition to identifying the appropriate concentrated skin cleaners to be used in case of heavy contamination (eXtra-clean).

PRODUCT	SHORT DESCRIPTION
AVIATICON FINKO PRÄ	The ideal lotion for skin protection to be used before work
AVIATICON eXtra-clean	Concentrated hand wash with double action. Ideal for medium to strong stains from e. g. tar, bitumen, colours, ink, dispersion paint, watery glues, cement, dusts, pickle, handling cooling lubricants, etc.
AVIATICON FINKO PAST	Skin care product rich with active substances, with natural vitamins, to be used after work
AVIATICON Zubehör	Various accessories are available for the skin care programme, such as for example, dispensers, dosing pumps, three-chamber dispensers and much more.

SKIN PROTECTION	BEFORE WORK	SKIN CLEANING	HEAVILY SOILED	SKIN CARE	AFTER WORK
AVIATICON FINKO PRÄ		AVIATICON eXtra-clean		AVIATICON FINKO PAST	
Long-lasting skin protection for all application fields		Concentrated, alkali-free hand cleanser* with double action		Skin care product rich with active substances, natural vitamins and oils	

*Removes water-soluble and non-water-soluble materials (oils, greases, tar, bitumen, colours, printing ink, emulsion paints, aqueous adhesives, cement, dust, stains, stains due to handling coolants, etc.)



OIL BINDER

Oil binding agents, which are also referred to as oil binders, are designed for binding or absorbing mineral oils and chemicals. Base materials are mineral, vegetable or natural products (e. g. cereals,

rock types, molar concentrations). To keep oils in water bodies under control, floating oil binding agents are used.

PRODUCT	SHORT DESCRIPTION
AVIATICON Finkosorb Dry	Binds all types of fluids to every solid surface; grain size: 1-3 mm, for all types of fluids
AVIATICON Finkosorb Dry Super	Binds all types of fluids to every solid surface; with its fine grain size, Dry Super penetrates into small cracks and indentations

SPECIAL FUELS

Alkylate or equipment petrol for two- and four-stroke engines is non-aromatic fuel which sharply reduces the emission of substances particularly hazardous to health in exhaust gases.

Alkylate petrol is also referred to as “green petrol” in Scandinavia, since it is particularly environmentally friendly. In Germany, the terms “equipment petrol” or “special fuel” are often used.

PRODUCT	SHORT DESCRIPTION
AVIATICON Finko Green 2T	Special fuel free of aromatic compounds and benzole for two-stroke engines with an up to 1:50 mixing ratio
AVIATICON Finko Green 4T	Lead-free, 4-stroke special fuel with extremely low amounts of sulphur and harmful or irritating aromatic compounds



TANK PROTECTION LIQUID

PRODUCT	SHORT DESCRIPTION
AVIATICON Leckanzei- flüssigkeit	Low-smelling ready-mixed mixture based on ethylene glycols containing inhibitors for protection against corrosion, aging and fungal infestation



LUBRIPLATE H1 FOOD GRADE LUBRICANTS

■ FOOD-GRADE LUBRICANTS

PRODUCT	SHORT DESCRIPTION	DIN MARKING
LUBRIPLATE FMO-85-AW up to 500-AW	Food-grade hydraulic and multi-purpose high-performance oils protecting against wear. FMO-85-AW (ISO22), FMO-150-AW (ISO 32), FMO-200-AW (ISO46), FMO-350-AW (ISO 68), FMO-500-AW (ISO 100)	NSF H1
LUBRIPLATE SFGO ULTRA 7 up to 100	Fully synthetic lubricant for deep-freezing-chains. Due to the food-grade synthetic PAO additive, it can be used at down to -68 °C	NSF H1
LUBRIPLATE FMO-500-AW up to FMO-3800-AW	Food-grade gear oils based on usp white oil with EP tear protection additives and rust inhibitors	NSF H1
LUBRIPLATE SFGO-Ultra 150 up to 1000	Fully synthetic food-grade gear oils for closed gear cases which, if fully loaded, may get prematurely worn and cause transmission failure	NSF H1
LUBRIPLATE PGO-FGL 150 up to 680	CLP industrial gear oils as per DIN 51.517.3 based on 100 % PAG provided with a high-performance additive system and offering excellent protection against micropitting, wear and corrosion besides being highly thermal resistant.	NSF H1
LUBRIPLATE HTCL-FG 220 HTCL-FG 68	High temperature chain lubricating oils based on 100 % synthetic polyol ester (POE)	NSF H1
LUBRIPLATE FR-150-L FP-150	Colourless, highly adhesive, non-drip lubricants; for chains, linkages, cams and spur gears	NSF H1



You can request the complete "LUBRIPLATE Food-grade Lubricants" brochure at: www.finke-oil.de



■ FOOD-GRADE GREASES

PRODUKT	SHORT DESCRIPTION	DIN MARKING
LUBRIPLATE FGL-Serie	Food-grade, high performance greases, formulated for wide use in all food and beverage processing environments	NSF H1
LUBRIPLATE Synxtreme FG-Serie	The ultimate grease for food machines when high temperatures together with high storage performance can cause premature wear of lubricated parts	NSF H1
LUBRIPLATE SFL-Serie	Synthetic grease for refrigerators and applications in which temperatures can go down to -45 °C	NSF H1

■ FOOD-GRADE AEROSOLS

PRODUCT	SHORT DESCRIPTION	DIN MARKING
LUBRIPLATE SFGO-Ultra 7	High performance rust dissolvers for use in areas where the regulations of the USDA and FDA do not allow ordinary industrial rust dissolvers	NSF H1
LUBRIPLATE FMO-350-AW	Food-grade anti-wear oil with EP additives. The product consists of rust prevention agents and a high proportion of high-temperature polymers	NSF H1
LUBRIPLATE GEN. PURPOSE FOOD GRADE SILICONE	A Top Aerosol Silicon Spray with hundreds of application possibilities, including all lubricant applications and sealing against water. The NSF H1 approval allows for use in all sanitary applications of the food industry	NSF H1

TECHNICAL AIDS

FINKE OIL FINDER – THE PERFECT WAY TO FIND THE BEST OIL

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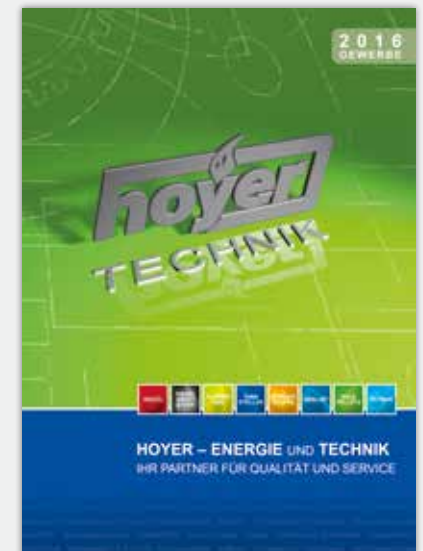
OUR TECHNICAL CATALOGUE

In the selection of the lubrication technology, we have especially taken into account the optimisation of the lubricant cleanliness targets from an economic point of view. What is the benefit of using the best lubricant if the wrong technology is employed?

In our technical catalogue you will find the best technical solution for nearly all applications.

From grease presses to lubricant pumps, waste oil collecting tanks, and storage systems for lubricants through to complete fresh oil systems and much more – in our technical catalogue you will find a comprehensive range of high-quality equipment.

**Lubricants
and lubricant
technology –
we are your
partner!**



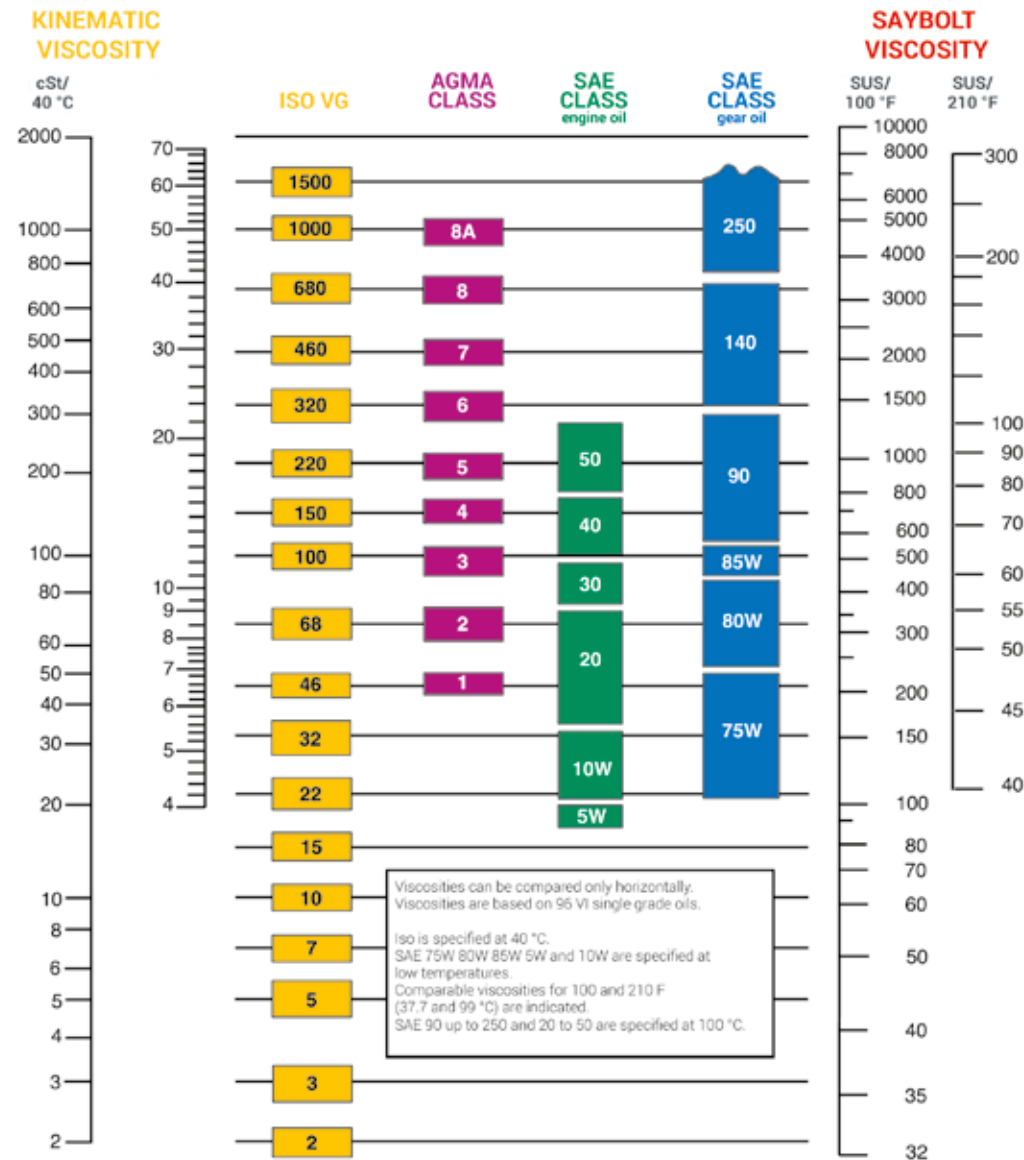
TECHNICAL TABLES

TYPICAL VALUES OF SOME SAE CLASSES IN COMPARISON TO ISO VG

SAE CLASS Transmis- sion oil	SAE CLASS Engine oil	TRANS- MISSION OIL kin. Min. visc. 100 °C	TRANS- MISSION OIL kin. max. visc. 100 °C	ENGINE OIL kin. Min. visc. 100 °C	ENGINE OIL kin. Max. visc. 100 °C	TRANS- MISSION OIL approximate ISO viscosity group	ENGINE OIL approximate ISO viscosity group
	0W			3,8	-		5, 7, 10
	5W			3,8	-		15
70W, 75W	10W	4,1	-	4,1	-	22, 32	22, 32
80W	15W	7,0	-	5,6	-	46	46
80W	20W	7,0	-	5,6	-	68	68
80W	25W	7,0	-	9,3	-	68	68
	20			5,6	< 9,3		
85W	30	11	-	9,3	< 12,5	100	100
90	40	13,5	< 18,5	12,5	< 16,3	150	150
90	50	13,5	< 18,5	16,3	< 21,9	220	220
110		18,5	< 24,0			220, 320	
140	60	24	< 32,5	21,9	< 26,1	320, 460, 680	320
190		32,5	< 41			460, 680	
250		41	-			1000, 1500	



COMPARISON OF DIFFERENT VISCOSITY CLASSIFICATION SYSTEMS



GREASE COMPATIBILITY AS PER NLGI

	Aluminium complex	Barium	Calcium	Calcium 12 hydroxy	Calcium complex	Alumina	Lithium	Lithium 12 hydroxy	Lithium complex	Polyurea	Calcium sulphonate
Aluminium complex		■	■	■	■	■	■	■	■	■	■
Barium	■		■	■	■	■	■	■	■	■	■
Calcium	■	■		■	■	■	■	■	■	■	
Calcium 12 hydroxy	■	■	■		■	■	■	■	■	■	
Calcium complex	■	■	■	■		■	■	■	■	■	■
Alumina	■	■	■	■	■		■	■	■	■	■
Lithium	■	■	■	■	■	■		■	■	■	■
Lithium 12 hydroxy	■	■	■	■	■	■	■		■	■	■
Lithium complex	■	■	■	■	■	■	■	■		■	■
Polyurea	■	■	■	■	■	■	■	■	■		■
Calcium sulphonate	■	■			■	■	■	■	■	■	

■ Compatible ■ Borderline compatibility ■ Incompatible

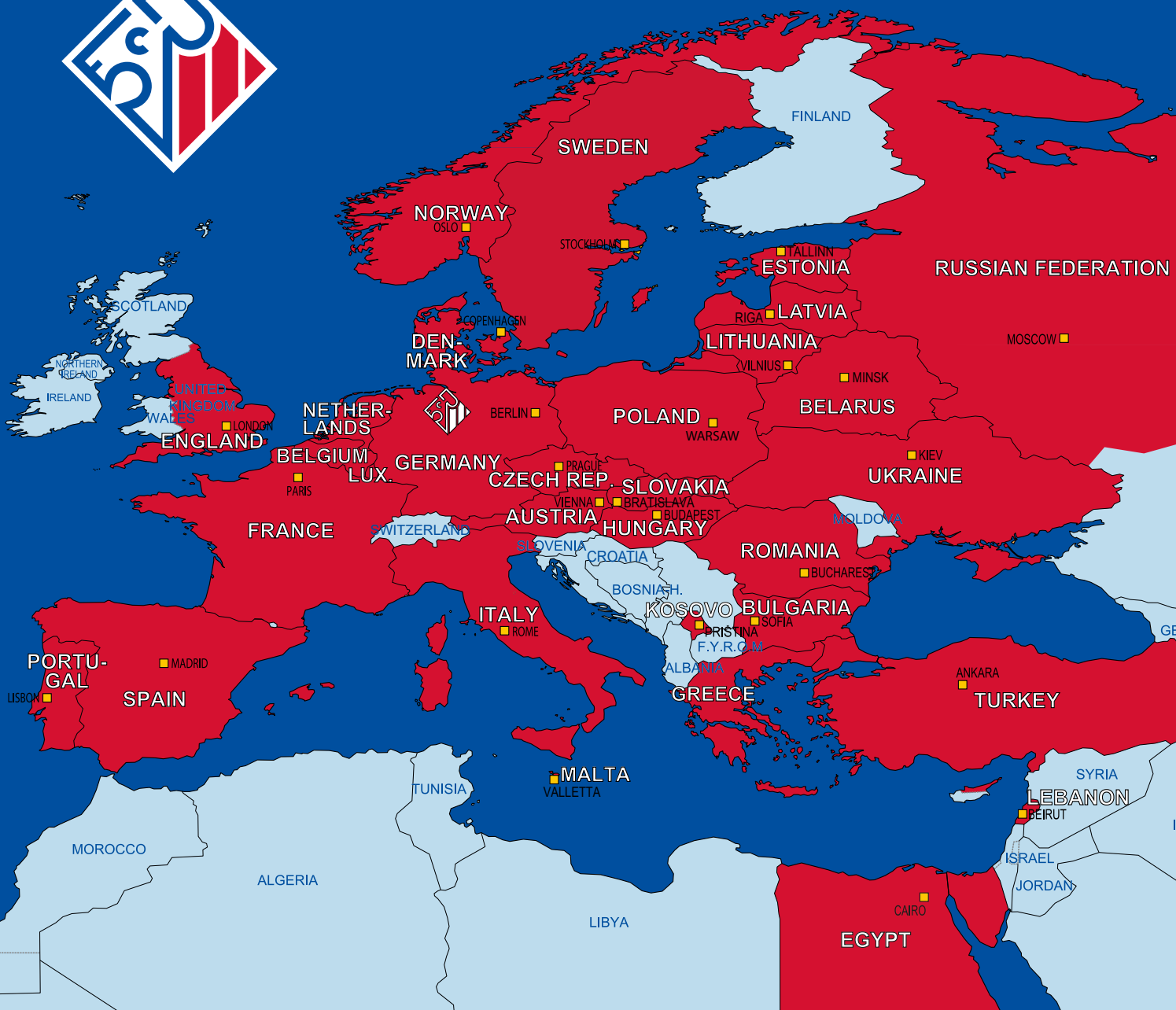
NLGI GREASE CLASSIFICATIONS

NLGI NO.	DESCRIPTION	WALK PENETRATION ASTM AT 77 °F/25 °C
000	semi-liquid	445 – 475
00	semi-liquid	400 – 430
0	very soft	355 – 385
1	soft	310 – 340
2	medium soft	265 – 295
3	medium	220 – 250
4	hard	175 – 205
5 – 6	very hard	85 – 160





AVIATICON



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