PARTS AND MORE COMPACT LUBRICANTS AND FILTERS

WIRTGEN GROUP

Close to our customers

ROAD AND MINERAL TECHNOLOGIES

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WIRTGEN GROUP
Close to our customers

ORIGINAL WIRTGEN GROUP LUBRICANTS AND FILTERS

There is a large range of lubricants and filters available on the market. **Cheap or premium product: Ultimately, the quality determines the price you pay as a customer.**

When people are buying filters or lubricants, they usually focus on buying products at the lowest price possible. Yet providence should be exercised here: At the end of the day, the quality of the lubricants and filters has a great influence on the service life of the active parts in combustion motors, hydraulic components, gears and bearings.

In order to provide optimum protection for these high-quality components in Wirtgen Group machines, it is advisable only to rely on the best lubricants and most efficient filters, because 70% of all damage caused in engines, gears and hydraulic systems is due to the medium used or insufficient lubrication.

Every job site is different and presents different challenges to people and machines. For this reason, Wirtgen Group machines never work under standard conditions; rather they require perfectly matched lubricant and filter solutions.

Customers have to consider the following: **Are the lubricants and filters I am buying able to meet the demands made by my Wirtgen Group machines?** The question is justified, because the use of the wrong lubricant can quickly lead to the failure of important and expensive machine components.


WIRTGEN GROUP
SPECIAL GEAR OIL

ORIGINAL WIRTGEN GROUP LUBRICANTS AND FILTERS

The experts at the Wirtgen Group are available for support – good reasons to rely on Wirtgen Group lubricants and filters:

- The excellent quality of the Wirtgen Group filters has been proved by numerous tests in the lab and in the field. We are familiar with the machine components (diesel engines, gears, hydraulic pumps and motors), and thus with the loads they face in use.
- There's no such thing as a standard situation: Every machine is different, every site is new. We have the years of experience necessary to assess the requirements properly.
- The use of Wirtgen Group original filters will preserve the value of your Wirtgen Group machine in the long term, and secure warranty claims.
- Service and maintenance packages matched to servicing intervals make the order process easier and make regular servicing easier.

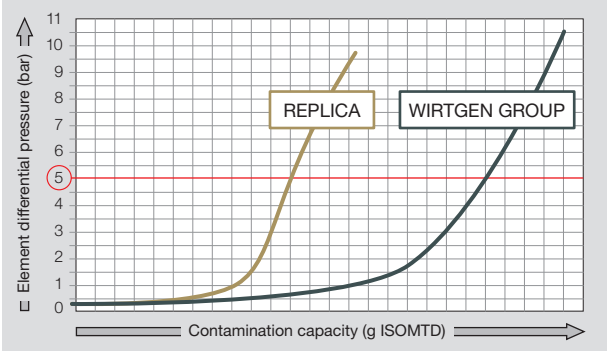
This brochure is designed to communicate basic knowledge of lubricants and filters. Knowledge that is intended to help you keep your Wirtgen Group machines in optimum shape for years.

FILTERS AT A GLANCE

Wirtgen Group filter elements – quality that pays off!
The filters used on construction machinery working under heavy-duty conditions in particular must be optimally adapted to the respective building site requirements, i.e. have been designed accordingly. When Wirtgen Group machines are converted to replica elements and supposed less expensive copies, experience shows that this often leads to considerable complications:

- Poor purity levels
- Reduced component protection
- Shortening of the service life of machine components
- Hazard for operational safety (machine standstill)
- Limited availability
- Increased life cycle costing

Whether it is **engine oil filters, air filters** or **fuel filters** we are talking about – the Wirtgen Group filters do very well, as a look at the following examples proves:

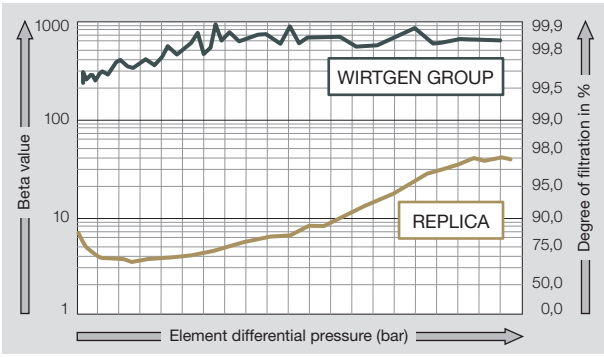


High contamination capacity
(seen on the example of a Wirtgen Group hydraulic filter)

High contamination capacity for long service lives and low operating costs
When the element is replaced (at an element differential pressure of 5 bar), the original Wirtgen Group element has absorbed much more contamination.

High filtration performance for reliable component protection and high operational safety
The filtration performance of the original Wirtgen Group elements is much higher than that of replica elements of lower quality.

Important: With all filter types, the deciding factor is not only the contamination capacity, but also the pressure differences this results in. In the case of replica elements, the blockages increase as the degree of contamination increases.



High filtration performance
(seen on the example of a Wirtgen Group hydraulic filter of the same type)

LUBRICANTS AT A GLANCE

Lubricants are usually made up of two components: the actual base oil and the additives which influence or cause certain desired lubricant characteristics.

Engine oils are lubricants that care for and take the strain off the engine. They prevent direct metal-on-metal contact, minimize friction and thus effectively engine wear. Engine oils also contribute to sealing and cooling the pistons, thus promoting greater compression, which in turn leads to improved engine performance.

Gear oils protect the gears from corrosion, neutralize acids that occur and prevent typical damage such as pitting and galling (spot-type fusing with subsequent separation through mechanical load). In machine parts such as gear wheels, bearings, friction clutches or brakes they also guarantee excellent smooth-running characteristics. The lubricant has to withstand large fluctuations in temperature, high partial pressures, condensation, dust and abrasion elements.

Hydraulic oils serve as hydraulic fluids to ensure the hydraulic power from the pump is transferred with as little loss as possible to the engine or cylinder. They also lubricate the moving parts, protect them from corrosion and help to discharge contamination from the system. Hydraulic oils have to be resistant to ageing and pressure, and have a high wetting and adhesive ability.

Greases are used for the permanent lubrication of roller bearings, plain and linear bearings, sliding surfaces, gear wheels and gear segments. Greasing ensures high corrosion protection and prevents age-related fatigue problems with the material. Greases have to remain soft and supple even at low temperatures. At the same time, they must not leak at high temperatures.

ORIGINAL WIRTGEN GROUP MOTOR AND GEAR OILS ADDITIVES

The term additives is used for oil-solvent substances added to the base oils. Additives are always added when the characteristics of the base oil are not sufficient for the required area of application, and to keep the finished products operational over as long a period of possible, even under maximum operational load.

We would like to present four important additives below: Please note that there are numerous other additives that only play a minor role in our context.

Detergent
Deposits in the form of paint and oil carbons in the piston area and other highly tempered components that result from the combustion process interfere with this to a significant extent. Detergents prevent or reduce these deposits and eliminate the acids produced during combustion.

Dispersant
Dispersants prevent or reduce sludge formation and deposit in the low temperature range.

Additives to minimize wear
If mechanical components such as camshaft and valve or hydraulic valve lifter come into contact in the combustion engine, damage is often caused, particularly under high loads (pitting = mechanical spalling; in extreme cases the engine may gall). To prevent this damage, special additives form thin, glidant layers and thus effectively prevent undesirable friction between the components.

Additives for increasing corrosion protection
Substances such as water and oxygen that are produced during the combustion process or contained in fuel, significantly increase the risk of corrosion formation. This additive group forms dense, fur-like and water-repellent barriers on metal surfaces that protect the surfaces from corrosion.

Wirtgen Group special gear oil for Hamm vibration or oscillation gears

Summary: There are numerous other additives besides the ones mentioned e.g. additives to increase lubricant service life. These can be oil-protective (age protection, anti-foaming agent) or oil-improving (improving viscosity). We guarantee that you can purchase the oils with the additives you need for your Wirtgen Group machines at any time.

ORIGINAL WIRTGEN GROUP GROUP MOTOR AND GEAR OILS VISCOSITY

Motor and gear oils are never suitable for universal use – Wirtgen Group machines require high-grade oils with optimum characteristics. We explain below what terms such as viscosity, viscosity classes and additives mean and give you a detailed overview of all important manufacturers' standards and engine specifications.

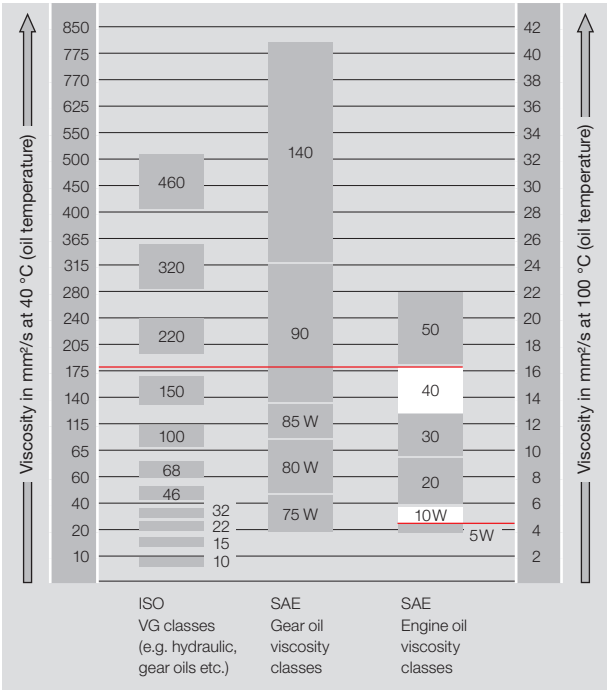
Viscosity and viscosity index

Within the context of lubricant description, we define viscosity as the property of a liquid to resist deformation (lubricant flow characteristic). The less fluid an oil is, the higher is its viscosity. Viscosity is a temperature-dependent parameter: If the temperature of the oil rises during the working process, viscosity falls at the same time. This change in viscosity varies from one oil to another. The range of variation is described using the viscosity index (VI). The higher the VI, the less change in viscosity occurs as oil temperature increases. So-called VI improvers (additives) allow this index to be influenced.

Viscosity and oil temperature

The change in viscosity is directly dependent on the temperature. In this context, we talk about VT-behaviour (viscosity-temperature behaviour) of an oil. This change in viscosity in relation to the oil temperature has a logarithmic curve: As temperature drops, viscosity increases disproportionately.

Summary:
High viscosity > less fluid > greater resistance
Low viscosity > thin fluid > lower resistance



Viscosity in Centistoke (mm²/s) depending on oil temperature

The graph compares the viscosity (in Centistoke (mm²/s)) of engine and gear oils at the reference temperatures 40 °C and 100 °C. In terms of their SAE specification (viscosity), engine and gear oils can have the same values, yet with regard to other values (additives, manufacturers' standards etc.) they do not correspond with the respectively other oil. At an oil temperature of 40 °C, the engine oil 10W-40 has a viscosity of approx. 180 mm²/s, at 100 °C a value of approx. 4 mm²/s.

ORIGINAL WIRTGEN GROUP MOTOR AND GEAR OILS VISCOSITY

Viscosity and outdoor temperature

As constant a viscosity as possible is desirable to ensure optimum lubrication over the whole temperature range. Engine oils with low viscosity ranges promote perfect engine operation all year round under all kinds of operating conditions: from cold starts in winter to working in regions with the hottest temperatures in summer.

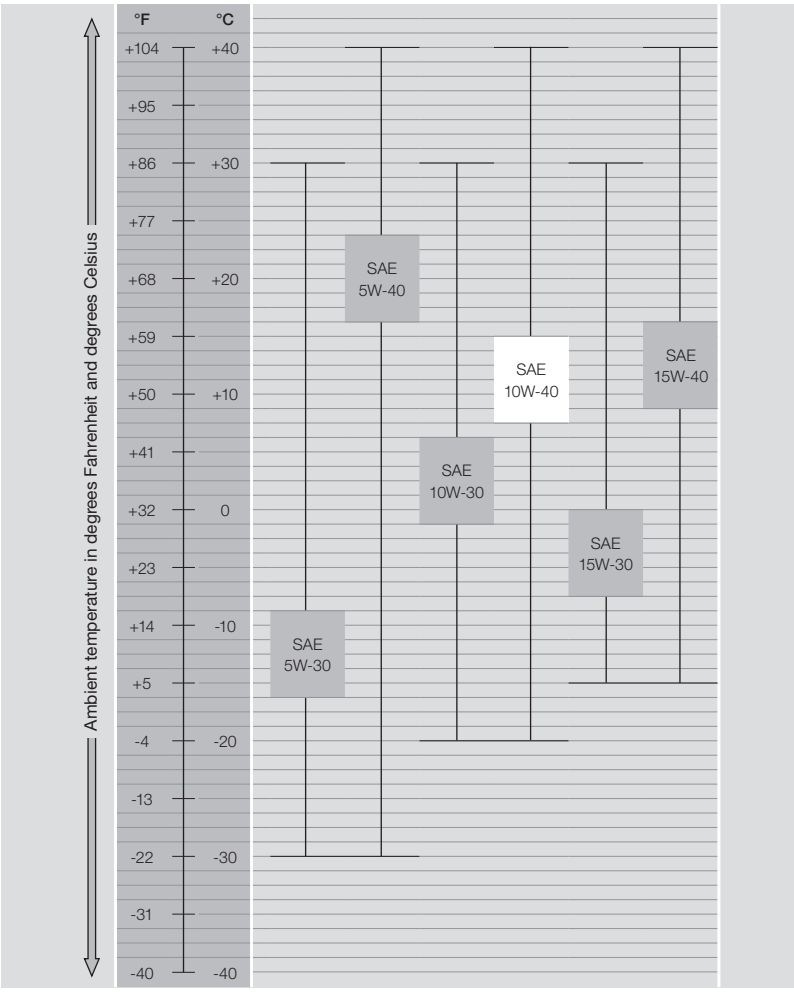
1

2

1 Use in the desert: SUPER 1900-2 in Abu Dhabi

2 Surface Miner in a dust-polluted environment

3 Six selected engine oils and their suitability for different outdoor temperature ranges. Our example oil, the multigrade oil 10W-40, can be used in an outdoor temperature range of -20 °C to +40 °C.


Ambient temperature in degrees Fahrenheit and degrees Celsius
°F
°C
+104
+40
+95
+86
+30
+77
+68
+20
+59
+50
+10
+41
+32
0
+23
+14
-10
+5
-4
-20
-13
-22
-30
-31
-40
-40
SAE 5W-40
SAE 10W-40
SAE 15W-40
SAE 10W-30
SAE 15W-30
SAE 5W-30

3

MOTOR AND GEAR OILS
SAE, MANUFACTURERS' STANDARDS ACEA AND API SPECIFICATIONS

SAE classification (Society of Automotive Engineers)
For many buyers, the SAE classification 10W-40 is the decisive quality argument for their choice of the right engine oil. It must be remembered, however, that SAE viscosity classes do not represent performance demands made on the engine or gears, rather they simply specify the viscosity at standard reference temperatures.

Summary: Whether a lubricant is suitable for or can be used for a circuit is determined by the manufacturer's standard (e.g. MB 228.3, CAT ECF-1, Cummins CES 20078/7/6/2/1 etc.) and/or by the specification of ACEA and API.

ACEA and API engine specification
In order to map the additional lubricant requirements of different engines adequately, there are further specifications available which define the requirements of national and international organisations:

- **ACEA** (**A**ssociation des **C**onstructeurs **E**uropéens d'**A**utomobiles; European Association of Vehicles Manufacturers)
- **API** (**A**merican **P**etroleum **I**nstitute)

Engine oils have to keep up with the development of new engines and the increasingly stringent standards required by emissions regulations.
International ACEA and API standards document the development stages and the suitability of the lubricants for a wide range of different requirements.

	Specification	Engine type	Power ratings
Increasing oil quality ↓	ACEA/E1	Diesel engine (commercial vehicles/ trucks)	For diesel engines without or with light boost under a light to medium load.
	ACEA/E2	Diesel engine (commercial vehicles/ trucks)	Standard quality for engines without or with light boost under a medium to heavy load with normal oil change intervals.
	ACEA/E3	Diesel engine (commercial vehicles/ trucks)	For diesel engines that meet the EURO 1 or EURO 2 exhaust gas requirements; under heavy-duty conditions and extended oil change intervals.
	ACEA/E4	Diesel engine (commercial vehicles/ trucks)	For diesel engines that meet the EURO 1 or EURO 2 exhaust gas requirements; under very heavy-duty conditions and extremely extended oil change intervals.
	ACEA/E5 WIRTGEN GROUP	Diesel engine (commercial vehicles/ trucks)	For diesel engines that meet the EURO 3 exhaust gas requirements; the specifications also include tests according to API CH-4 in order to guarantee world-wide acceptance.
	ACEA/E6 SAPS	Diesel engine (commercial vehicles/ trucks)	Engines with a particulate filter (SAPS = sulphate ash, phosphor, sulphur). Oils with limited contents of the given elements for use as an engine oil in vehicles with diesel particulate filter (DPF) and three-way catalytic converter (TWC).
	ACEA/E7 WIRTGEN GROUP	Diesel engine (commercial vehicles/ trucks)	For diesel engines that meet the EURO 4 and EURO 5 exhaust gas requirements; can be used for TIER 3 engines and is suitable for extended oil change intervals.

SPECIFICATIONS MOTOR OILS
API ENGINE SPECIFICATION

The API specification is the standard valid for the American market. It is divided into three classifications:

- API diesel engine classification
- API petrol engine classification
- API gear classification (see separate chapter)

The API standards are defined in the following way:

Organi-sation	Engine type (C = diesel engine; S = petrol engine)	Power rating	No. of engine strokes (e.g. 4-stroke engine)
API-	C	I	-4

API specifications are assigned when the engine and gear lubricants have been subjected to four tests:

- Increase in oil temperature during operation
- Check on the length of oil change interval according to manufacturer's recommendations
- Check on the efforts to achieve engine performance
- Environment protection standards

ACEA / E7 and API-CI-4 are the latest specifications. The fact that we introduce oils meeting these specifications is a sign of our efforts to extend the servicing intervals on our Wirtgen Group machines to keep maintenance expense to a minimum.

This is only possible when the engine oil has a respective load capacity within this period without any adverse effect on the positive oil characteristics e.g. component lubrication.

	Specification	Power rating
Increasing oil quality ↓	API-CF-4	Engine oil specification introduced in 1990 for fast and boosted 4-stroke diesel engines. Covers the requirements of API-CD & CE, supplemented by requirements concerning oil consumption and piston cleanness.
	API-CG-4	For truck engines under heavy load. Takes EPA emissions limits from 1994 onwards into account. Improved detergent characteristics and foaming behaviour compared with API CF-4. Can also be used instead of API-CD, CE and CF-4. Introduced in 1995.
	API-CH-4	Introduced in 1998 for high-speed 4-stroke engines designed for new, more stringent exhaust gas regulations. Comparable with ACEA E5, lower ash content. Suitable for sulphur contents > 0.5%. Is mainly required for engines made by American manufacturers. Can also be used instead of API-CD, CE, CF-4 and CG-4.
	API-CI-4 WIRTGEN GROUP	Presented in September 2002. Designed for high-speed 4-stroke engines that can only meet future exhaust gas legislation through exhaust gas recirculation. Suitable for sulphur contents > 0.5 %. Can also be used instead of API-CD, CE, CF-4, CG-4 and for sulphur contents > 0.5 %. All engine states (energy conserving).

This overview only provides the current conventional API standards.

SPECIFICATIONS GEAR OILS
API GEAR SPECIFICATION

In contrast to the ACEA, the API also assigns standards for gear oils. The API-GL-5 (**G**ear **L**ubricant) is the standard that currently makes the most demanding requirements. The different specifications are listed below.

	Specification	Power rating
Increasing oil quality ↓	API-GL-1	Plain gear oil for gear drives and worm gears as well as for helical and spiral gear axle drives for light operating conditions. Corrosion and oxidation inhibitors can be added.
	API-GL-2	Gear oils for axle drives with worm gear which no longer work perfectly with gear oils according to API-GL-1 on account of the requirements.
	API-GL-3	Mild-blend gear oils for shaft and special gears as well as for axle drives under light and medium operating conditions.
	API-GL-4 WIRTGEN GROUP	Gear oils for hypoid bevel gearing axle drives under normal operating conditions as well as for manual transmissions and special gears under a heavy load; corresponds approximately to MIL-L 2105*.
	API-GL-5 WIRTGEN GROUP	Gear oils for heavy-duty, hypoid bevel gearing axle drives, partly also for manual transmissions and special gears, corresponds approximately to MIL-L 2105B*. GL-5 gear oils in multigrade characteristics correspond to MIL-L 2105C/D*. This is currently (02/2010) the highest quality gear oil available.

** The abbreviation MIL stands for a US American military standard that was introduced to guarantee the provision of the right type of oil for military vehicles all over the world. It is sometimes still quoted today, although the standards from the civil sector (API) have become the leading specifications.*

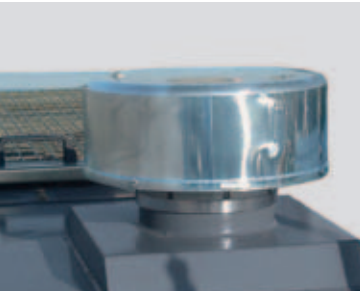
ORIGINAL WIRTGEN GROUP AIR FILTERS

Combustion engines require three substances to work safely: **air, oil** and **fuel**. There are three separate circuits for these three substances, each of which has to be equipped with a filter system. These filter systems are presented below, starting with the air filters.

Air filters clean the air required for combustion, thus reducing the risk of damage to engine components. As with all filters, dirt particles may only be allowed to pass up to a certain size in the µ-range depending on the engine in order to prevent damage.

Prefilter

To reduce the load on the actual air filter, prefilters are usually installed upstream in Wirtgen Group machines. The amount of air required by the engine is decisive for the choice of the right prefilter. Basically, two different systems can be used that fulfil the same purpose as far as the system is concerned:



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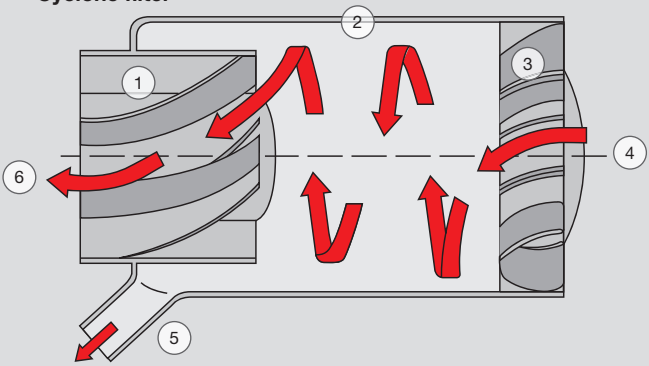
Cyclone filter



1 Outlet unit for swirl recuperation
2 Cyclone housing
3 Inlet diffuser for swirl generation
4 Soiled air from the environment
5 Dust output
6 Pre-cleaned air to the main air filter

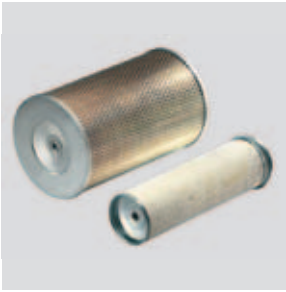
1 Prefilter with impeller: A rotor (impeller) is driven by the combustion engine airflow. On account of the high speed of the impeller, the dirt particles are subject to a very high centrifugal force, which means even the tiniest of particles can be ejected to the outside through an opening in the housing.

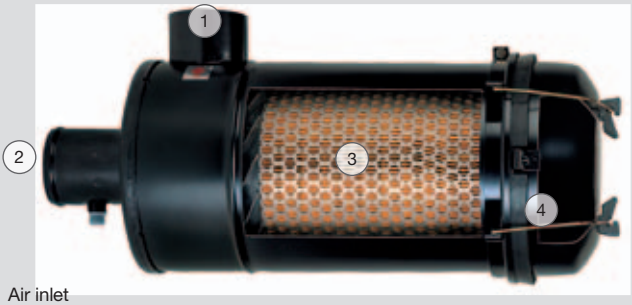
2 Cyclone filter:
This prefilter makes the air suctioned in rotate in order to free it from the coarsest soiling.

ORIGINAL WIRTGEN GROUP AIR FILTERS

Dust collector
The collector, which is attached to the main filter by metallic clips, allows simple regular emptying and cleaning to be carried out.

Main air filter
The main filter element is extremely sturdy thanks to its pleated design. It can effectively prevent packet assembling under unfavourable conditions. The filter is attached firmly to the seal seat through an axial tie rod welded in the housing. The efficiency of the main air filter depends to a decisive extent on its period of application. If air filter cartridges are replaced too soon, it means optimum capacity is not even achieved. The quality filters in Wirtgen Group machines achieve their maximum efficiency after about 10 to 15% of their possible application time. In other words, filter cartridges should only be replaced when the filter has been cleaned several times and the vacuum indicator signal appears.





1 Air inlet
2 Air outlet
3 Main air filter (+ secondary filter inside)
4 Dust collector

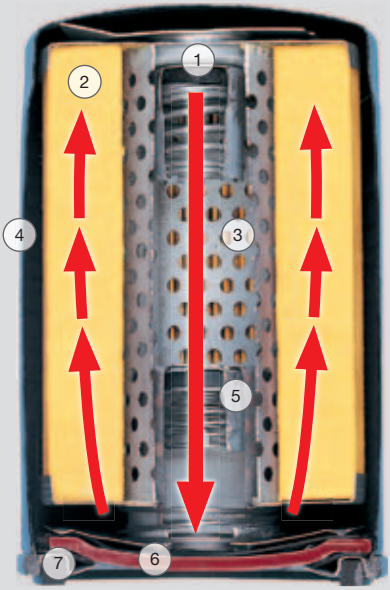
Secondary filter
This filter is a safety element that ensures large safety reserves with minimum pressure losses thanks to its fleece structure. It is only downstream from this element that optimally cleaned air enters the combustion engine.

Summary: The combustion air is thus routed through up to four filtering components including the prefilter. An effort that pays off, since Wirtgen Group machines have to work perfectly under a wide range of different dust-polluted construction site conditions all over the world, which means each and every one of these elements has to be able to do its job with above-average efficiency.

ORIGINAL WIRTGEN GROUP ENGINE OIL AND FUEL FILTERS

Engine oil filter

The engine oil, which lubricates and cleans valves and pistons, has to be cleaned reliably itself for this very reason. Heavily soiled oil causes significant damage to the engine. The service life of the oil itself and the engine can be extended considerably with the help of the engine oil filter.

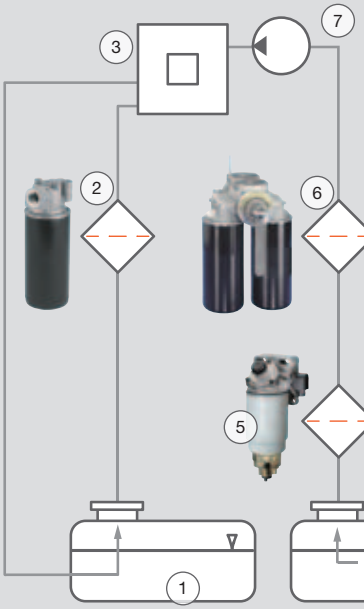


Engine oil filter

1 Bypass valve
2 Filter element
3 Centre tube
4 Filter housing
5 Non-return valve clean side
6 Non-return valve raw side
7 Seal

Fuel prefilter (water separator) and fuel filter

The demands made on fuel (diesel) are continually increasing on account of new engine technologies and emission limits. The fuel used for the combustion process has to be clean and free of contamination and water. For this reason, a water separator is located upstream from the actual fuel filter, which in turn filters the finer particles out of the diesel fuel before it enters the injection pump.



The engine oil and fuel circuit

1 Engine oil
2 Engine oil filter
3 Engine
4 Fuel
5 Fuel prefilter
6 Fuel main filter
7 Injection pump

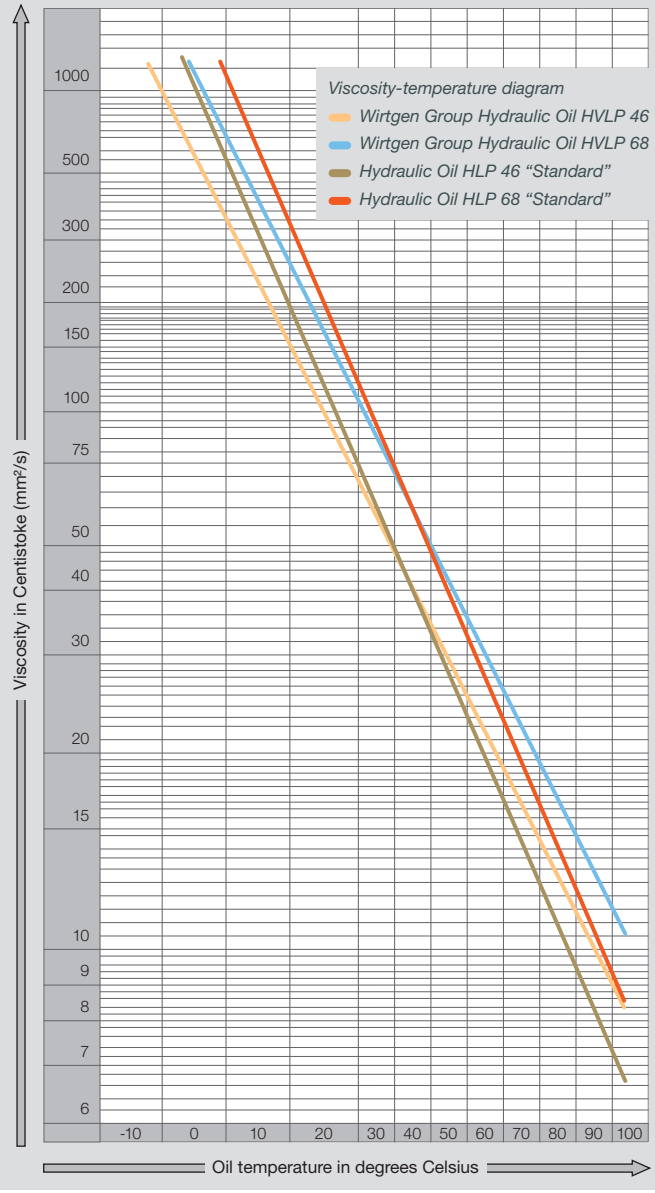
ORIGINAL WIRTGEN GROUP HYDRAULIC OILS

The hydraulic fluids most often used are based on mineral oil treated with respective additives. These oils are termed hydraulic oils. Hydraulic oil requirements are regulated in ISO 6743/4 under the codes **HL, HM** and **HV** (in Germany, the codes **HL, HLP, HVLP** are common in line with DIN 51524).

	Identification according to ISO 6743/4	Identification according to DIN 51524	Characteristics
Increasing oil quality ↓	HL	HL	Hydraulic oils with active components which increase corrosion protection and ageing resistance.
	HM WIRTGEN GROUP	HLP	Hydraulic oils with active components which increase corrosion protection, ageing resistance and reduce galling wear in the mixed friction area.
	HV WIRTGEN GROUP	HVLP	Hydraulic oils with active components which increase corrosion protection, ageing resistance, reduce galling wear in the mixed friction area and improve the viscosity-temperature behaviour (higher viscosity index) and suppress foam formation.


HAMM
3520

HYDRAULIC OIL SPECIFICATIONS



ISO (International Organisation for Standardization) divides hydraulic oils into viscosity classes *(see illustration of VG classes on page 15)*.
The characteristic curve for Wirtgen Group hydraulic oils is much flatter, i.e. they are less temperature-prone. At an oil temperature of 100 °C, it can clearly be seen that the viscosity value is much more stable than comparable oils from competitors: The Wirtgen Group hydraulic oil HVLP 68 has a viscosity of 10.5 mm^2/s, whereas “standard” hydraulic oil has an insufficient value of 8.6 mm^2/s.

The Wirtgen Group has a special VG 100 hydraulic oil for higher outdoor temperatures such as those found in tropical regions. VG 32 hydraulic oils can also be purchased for regions with permanently low outdoor temperatures.

ORIGINAL WIRTGEN GROUP HYDRAULIC OIL FILTERS

A distinction is made between filter types in hydraulic systems depending on their position and job within the system. The different demands made on hydraulic filters are reflected in different kinds of design. Six different filter types are explained below:

Suction filters
Suction filters have the job of protecting hydraulic pumps from coarse fluid contamination which can quickly lead to sudden pump failure during use. On account of the high cavitation risk (vapour bubbles caused by vacuum peaks resulting in damages in the µ-range) at the pump, relatively coarse filter materials with a filtration grade of greater 25 µm are used.

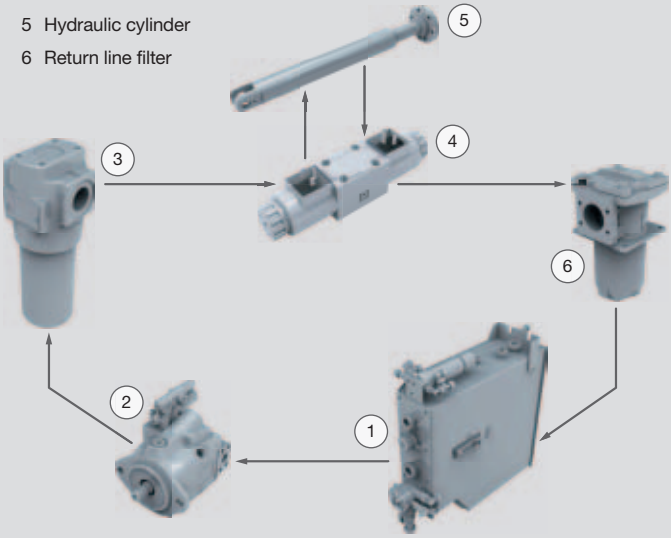
For this reason, suction filters are not suitable for guaranteeing the component protection necessary for economic operation of the system. Alongside the cavitation risk, the poorer cold-start behaviour is a further reason to replace this filter types by the more modern combined filter or charge pressure filter.

Pressure filter
The pressure filter is directly downstream from the system pump (e.g. cylinder function pump, open circuit); this filter should always be fitted with a contamination indicator. This type of filter has been specially designed for system pressure and volume flow. One of its main jobs is to protect sensitive components (e.g. servo-valves).

Pressure filters not only have to withstand maximum pressure in the system, they have to absorb pressure peaks in the long term. Only inline filters without a bypass valve should be used

upstream from highly sensitive hydraulic components. This is the position where the filter element has to stand up to the greatest differential pressure loads. Accordingly, the filter housing has to be designed in such a way that it can withstand maximum dynamic system pressure.

1 Hydraulic tank
2 Hydraulic pump
3 Pressure filter
4 Valve
5 Hydraulic cylinder
6 Return line filter



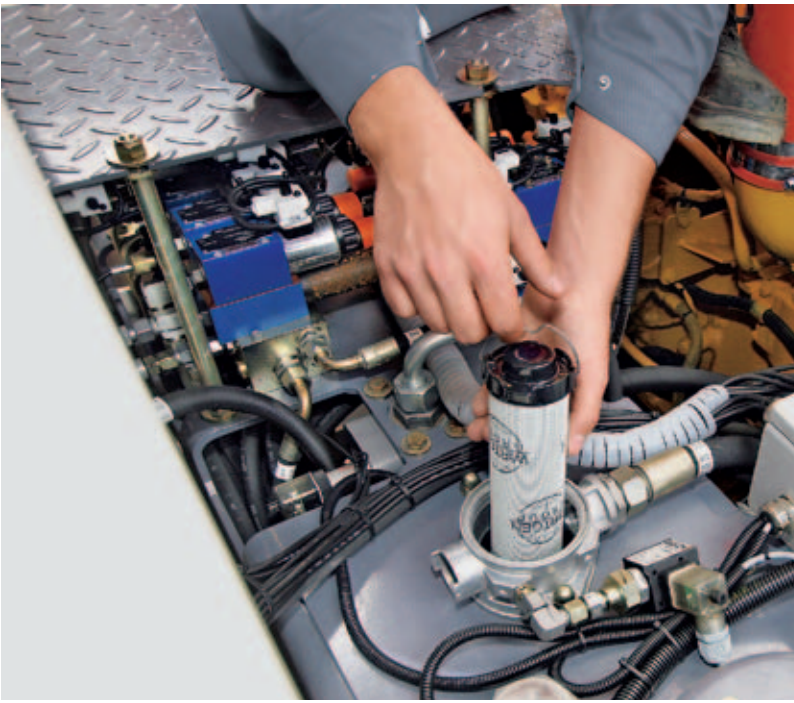
ORIGINAL WIRTGEN GROUP HYDRAULIC OIL FILTERS

Return line filter
This filter type is located in the return line. As a line filter or tank attachment filter on the tank or filter installed in the tank, it filters the pressure fluid that flows out of the system back into the tank.

The maximum possible volume flow is decisive in the choice of the right filter size. This corresponds to the area ratio between the piston and piston rod in the hydraulic cylinder and can be larger than the volume flow produced by the pumps.

Foaming in the tank always occurs when the fluid outlet from the filter is above the fluid level (watch the level of hydraulic oil in the tank). This means care must be taken that the outlet is always under the fluid surface. This can be achieved by a pipe (tube) or a volume flow diffuser in the filter outlet.

Breather filter
Changes in temperature and the use of cylinders or pressure accumulators causes fluctuation in the oil level in tanks belonging to hydraulic systems. The resulting difference in pressure to the surroundings has to be compensated by air exchange. This means dirt can get into the tank through the intake air. To ensure breather filters can prevent this efficiently, they should be fitted with the same filtration grade as the system filters used in the hydraulic circuit.



Hydraulic filter

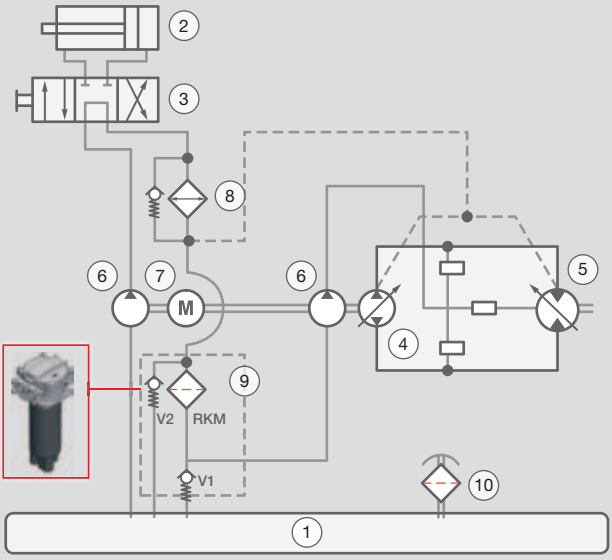
Charge pressure filter

The charge pressure filter is directly at the outlet of the feed pump. It filters the hydraulic oil required before it is pumped into the circuit loop. Thus the hydraulic system is always supplied with the necessary quantity of oil.

ORIGINAL WIRTGEN GROUP HYDRAULIC OIL FILTERS

Combined filter (return-suction filter)
Return-suction filters are used in mobile units that are equipped with a working hydraulics system (hydraulic cylinder) and drive hydraulics. The advantage of this type of filter is that filtered oil with an excess pressure of about 0.5 bar is routed into the feed pump of the drive (position 6 in the diagram): This reduces the cavitation risk in the pump and makes excellent cold-start characteristics possible.

To maintain the preload of about 0.5 bar at the feed pump connection, a surplus of at least 10 % is required between return and intake quantity under all operating conditions.



From a pressure of 2.5 bar, the oil is routed directly into the tank (no bypass to the closed loop) through a pressure relief valve (V2 in the diagram).

If the leak oil from the hydrostatic drive is routed through the filter in addition to the quantity from the open circuit, care must be taken that the permissible leak oil pressure at the filter is not exceeded in order to protect the radial shaft sealing rings (taking the rise in pressure of the leak oil pipes, oil cooler and pressure relief valve into consideration).

1 Tank
2 Cylinder
3 4/3-way valve
4 Adjustable hydraulic pump with two pumping directions (closed loop hydraulic system)
5 Adjustable hydraulic motor with two directions of rotation (closed loop hydraulic system)
6 Hydraulic pumps with one pumping direction (speed-dependent)
7 Combustion engine
8 Cooler with bypass
9 Combined filter
10 Breather filter

Note: The hydraulic filters presented are used for different applications within the individual plants belonging to the Wirtgen Group. The types of filter best suited to the respective purpose of application are preferred.

ORIGINAL WIRTGEN GROUP LUBRICATING GREASES

Lubricating greases are made from a base oil by adding so-called thickeners. In turn, thickeners are special soaps produced on the basis of the metals lithium, calcium, aluminium, barium or sodium.

Additives are also added to lubricating greases to protect the machine components from wear and corrosion.

Base oils	+	**Thickener metal soaps:** · Lithium · Calcium · Aluminium · Barium · Sodium	+	**Additives:** · Wear protection · Corrosion protection · Ageing protection · Loose solids	=	**Lubricating greases**

Tasks and requirements for lubricating greases:

- Lubrication: Permanent lubrication of roller bearings, plain and linear bearings, sliding surfaces, gear wheels, gear segments etc.
- Low-temperature behaviour: Soft, supple, conveyable in central lubricating systems
- High-temperature behaviour: Greases must not leak out
- Coating compatibility in hinges etc.
- Seal compatibility: Elastomers (polymers like rubber seals) must not become either brittle or soft
- Ageing stability: Many bearings have lifetime lubrication

Notes on the use of Wirtgen Group products:

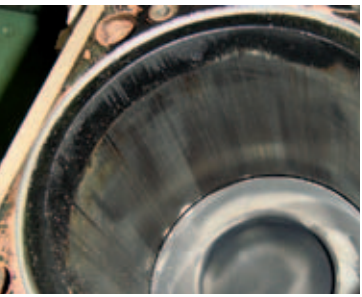
- Lithium grease, multipurpose grease, water-resistant, use -20 °C to 130 °C
- Calcium sulphonate grease, water-resistant, use -25 °C to 180 °C
- Lithium-calcium grease, high wear protection, use -30 °C to 130 °C

Please note: Greases with different thickeners must not be mixed since they dry out and reliable long-term component lubrication can no longer be guaranteed.

Summary: The use of different additives causes great changes in lubricant characteristics. This explains the large number of lubricants available: The Wirtgen Group offers you greases optimally matched to your machine.

COMPONENT DAMAGE CAUSED BY INSUFFICIENT FILTER AND LUBRICANT QUALITY

1

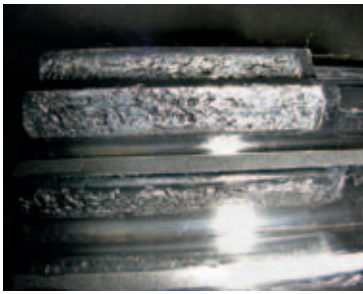


2

3

Machine components such as bearings, pistons or gears are subject to natural wear. **However, damage can also be caused by the choice of wrong lubricant or on account of poorly filtered combustion media (particles in the fuel, dust in the combustion air).** This risk can be reduced to a minimum by using the right lubricants and filters. The use of the wrong lubricants and filters led to malfunctions in the components shown here.

Important: Please check the specifications in your operating instructions before using the lubricants.



4

1 Damaged inner bearing ring

2 Damaged liner in the combustion engine

3 Dirt deposits in the gears lead to increased wear and damage

4 Gear wheel in milling gear box with damage to the contact surface

5 Corrosion and dirt deposits on a roller bearing

5

WIRTGEN GROUP
SERVICE INTERVALS AND WARRANTY

With more than 50 branches on all continents all over the world, we remain your partner after you have purchased one of our Wirtgen Group machines as well. Observing the prescribed service intervals is extremely important for maintaining the value and operational safety of your Wirtgen Group machine. You will reduce your costs in the long term through regular servicing and use of Wirtgen Group filters and lubricants.

Prevention saves costs – the 50-hour service!
The 50-hour service gives you as a customer and us as the machine manufacturer the possibility of checking over all the components under their daily load during the run-in phase, establishing the quality of the components in the various circuits and taking preventative measures against malfunction. Make sure you have this service carried out and point out any problems to your subsidiary or the dealer responsible. This is the only way we can guarantee you the high quality of the Wirtgen Group machines you have come to expect for the future, too.

In addition, you also have the possibility of finding out more information and tips concerning your Wirtgen Group machine at first hand through a service technician from your service partner.

Wirtgen Group spare parts orders and advice!
Ask your service partner about the filter units in the service kit or maintenance kit for your Wirtgen Group machine. Service kits contain the filter elements required, maintenance kits all

the filter elements and lubricants for the given maintenance intervals, thus giving you the opportunity of ordering all the parts you need quickly and easily using one single part number.

CAUTION - LOSS OF WARRANTY!
Please note that any warranty claims made to us as the manufacturer of the construction machine become invalid if you use a substandard replica element, since we do not know if the filter elements used comply with our specifications. You should not use replica elements after the guarantee and warranty rights for your construction machinery have expired either. Lower filter costs initially quite often turn into high costs for the purchase and replacement of expensive machine components!

ORIGINAL WIRTGEN GROUP FILLING AND LUBRICATING ACCESSORIES

To make the maintenance of your machines easier using Wirtgen Group resources, we also offer you the respective tools.

The tools listed below match our container and cartridge sizes and guarantee professional and straightforward maintenance procedures on site or in the workshop.

Description	Part No.
Hand pump for 20 l canisters	2065044
Lever operated hand pump for 208 l barrels	2065045
Pressure sprays 500 g	2065046
Pressure sprays 1000 g	2065047
Lever operated hand grease gun 400 g	2065048
Grease gun 400 g	2065049
Filling can 1 l	2065041
Filling can 2 l	2065042
Filling can 5 l	2065043
Filling funnel 180 mm	2065039
Filling funnel 220 mm	2065040

1

1 Pressure sprays and grease guns
- *Pressure sprays (metal version, flexible hose, sizes: 500 g and 1000 g)*
- *Lever operated hand grease gun (metal version, high pressure capacity, size: 400 g)*
- *Grease gun (size: 400 g)*

2 Oil pumps
- *Hand pump for 20 l canister (piston pump, discharge hose with spring spiral and bend protection spring, foot valve)*
- *Hand lever pump for 208 l barrel (metal version, telescope suction pipe, swivelling outlet elbow, capacity: 0.2 l per stroke)*

3 Filling cans and funnels

2

3

ORIGINAL WIRTGEN GROUP LUBRICANT PRODUCT RANGE

Item	Container size
Wirtgen Group Engine Oil 15W-40	5 l
Wirtgen Group Engine Oil 15W-40	20 l
Wirtgen Group Engine Oil 15W-40	208 l
Wirtgen Group Engine Oil 10W-40	5 l
Wirtgen Group Engine Oil 10W-40	20 l
Wirtgen Group Milling Drum Gear Oil VG 220	20 l
Wirtgen Group Milling Drum Gear Oil VG 220	208 l
Wirtgen Group Milling Drum Gear Oil VG 150	20 l
Wirtgen Group Gear Oil 85W-90	5 l
Wirtgen Group Gear Oil 85W-90	20 l
Wirtgen Group Gear Oil 85W-90	208 l
Wirtgen Group Special Gear Oil	5 l
Wirtgen Group Special Gear Oil	20 l
Wirtgen Group Special Gear Oil	208 l
Wirtgen Group Hydraulic Oil HVLP 46	20 l
Wirtgen Group Hydraulic Oil HVLP 46	208 l
Wirtgen Group Hydraulic Oil HVLP 68	20 l
Wirtgen Group Multi-Purpose Grease	400 g
Wirtgen Group Drum Bearing Grease	1 kg
Wirtgen Group Drive Bearing Grease	1 kg
Wirtgen Group Friction and Roller Bearing Grease	12 x 400 g
Wirtgen Group Telescoping Tube Grease	100 g
Wirtgen Group Clutch and Remixer Grease	400 g

	WIRTGEN	VÖGELE	HAMM	Part No.
	×		×	2065020
	×		×	2065025
	×		×	2065026
	×	×	×	2112355
	×	×	×	2112354
	×			2065033
	×			2065034
	×			199752
	×	×	×	2065030
	×	×	×	2065031
	×	×	×	2065032
		×	×	1238051
		×	×	2065037
		×	×	2065038
	×	×	×	2065028
	×	×	×	2065029
	×	×	×	2118574
	×	×	×	2065035
			×	1205757
			×	1227114
		×		2086136
		×		2086137
	×			47259

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