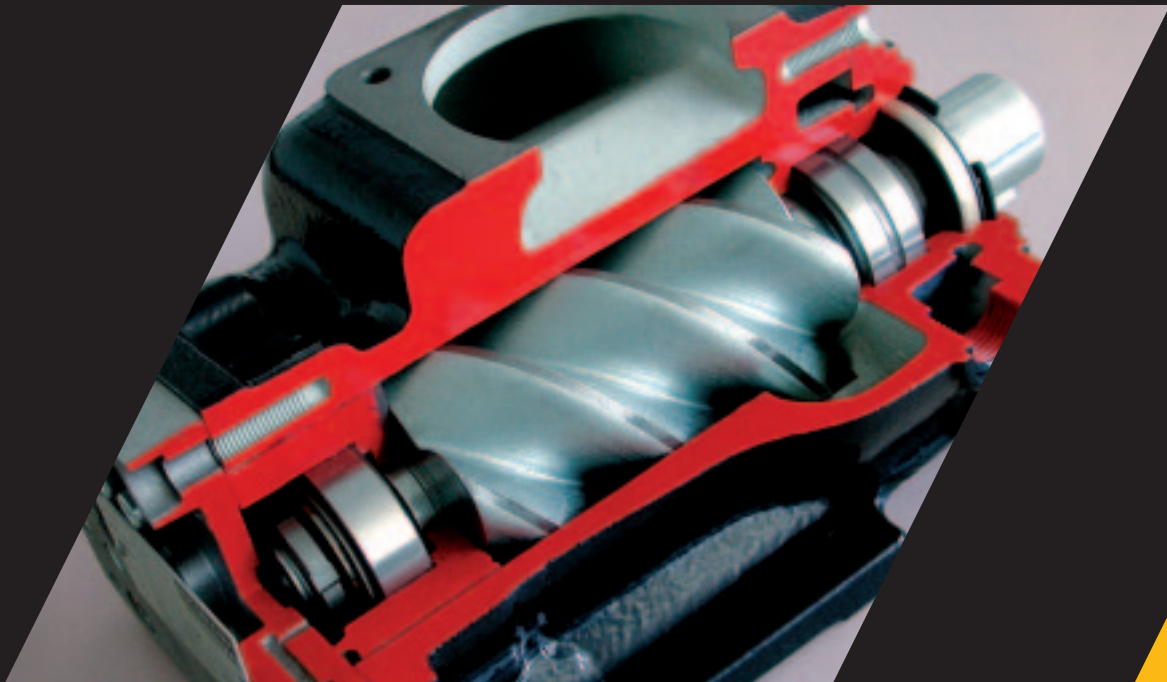


KLÜBER
LUBRICATION

Compression



Air compressor oils from
Klüber Lubrication

Lubrication is our World

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Compressor oils from Klüber increase productivity

In air compression, two issues are especially important: the availability of clean compressed air where it is needed, and economically reasonable air compression costs.

Picture this: production is in full swing, everyone's happy. But then, without warning, one of the compression cylinders breaks down. It just ceases to do what it's there for: delivering compressed air. In no time, there will be cries on the shop floor: *"Pressure's down! The compressor's gone!"*

This scenario illustrates that while compressed air is normally an inconspicuous element of the production process its absence is felt immediately: without it, nothing works.

The second critical issue is the impact of rising energy costs. Efficient solutions for economical energy consumption have become increasingly important to a company's bottom line.

In this brochure, Klüber Lubrication explains how the right compressor oil can help you meet the demands for higher availability and economy by ensuring reliable compressor operation and clean compressed air at an economical cost.

How to do it? Just have a look. Our specialists are also available to offer comprehensive on-site consulting.

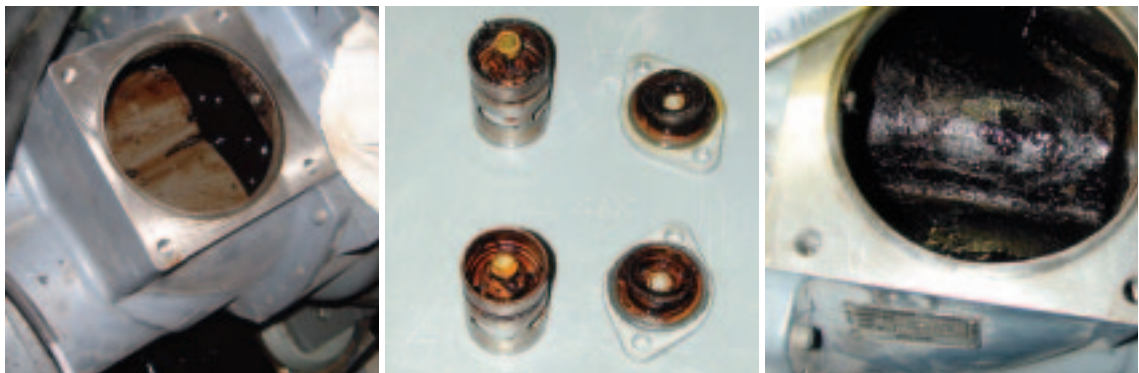
Extended oil change intervals reduce maintenance costs and increase availability

Extend the oil change intervals for your compressor by using special, oxidation-resistant compressor oils made by Klüber Lubrication. Our products offer the following benefits:

- ❑ Reduced maintenance costs otherwise spent for external or internal services
- ❑ Increased compressor availability
- ❑ Reduced spare parts costs for oil, oil filter and oil separator
- ❑ Less used oil disposal, more eco-friendly

Not all compressor oils are the same. A high quality product offers good oxidation protection. The intense contact between the oil and the oxygen contained in the air at high compression temperatures has a strong impact on the oil. Good oxidation protection depends on the base oil as well as on the additives used.

The primary characteristic of poor oxidation resistance is a sharp rise in the neutralization number, which manifests as limited oil life. If the oil is used longer, there is a risk of sludge and residue formation in the compressor oil cycle. Such residues can lead to wear and clog oil filters and separators, which reduces service life.



Residues in the compressor caused by oil

Synthetic Klüber Summit oils are more resistant

Klüber Lubrication offers several oxidation-resistant compressor oils designed for specific annual running times. Whether your compressors are operating for 5,000, 8,000 or as long as 12,000 hours per year, we have the right oil for every application. And most importantly, all of our products contain a special oil component that prevents deposit formation and keeps the oil circuit clean.

The positive effect is clear:

- ❑ long oil life
- ❑ clean oil circuit
- ❑ Long service life of oil filter and oil separator

	Mineral oil	Klüber Summit SH 46
Oil change interval [h]	2,000	8,000
Oil costs per change [€]	100.–	400.–
Oil change costs per year [€]	4 o.c. = 400.–	1 o.c. = 400.–
Used oil disposal [€]	40.–	10.–
Oil filter costs [€]	4 x 50.– = 200.–	1 x 50.– = 50.–
Oil separator [€]	2 x 250.– = 500.–	1 x 250.– = 250.–
Maintenance hours [h]	4 x 3 = 12	1 x 3 = 3
Maintenance costs at 50 €/h [€]	12 x 50.– = 600.–	3 x 50.– = 150.–
Total costs [€]	1,740.–	860.–
Savings [€]	--	880.–

Calculation example: screw-type compressor with oil injection running 8,000 hrs. per year

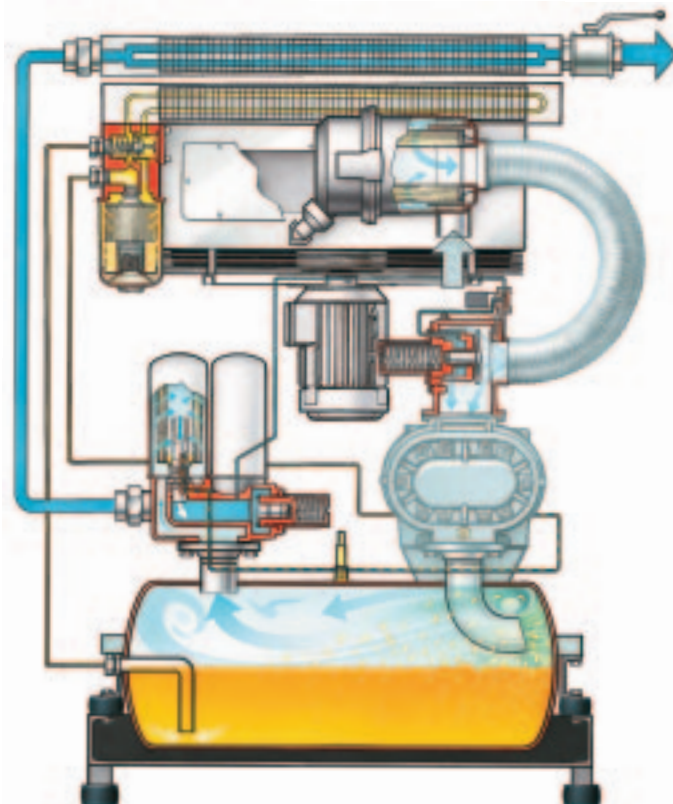
CONCLUSION: With Klüber Summit oils, you can significantly reduce your maintenance costs. Oil changes are less frequent, oil filters and oil separators last longer and there is less impact on the environment. All in all, the availability of your air compressor is increased.

Oil-free compressed air reduces worries and maintenance costs for compressed air processing and the compressed air network

Evaporated oil is not removed by the oil separator but entrained into the compressed air network. The oil's tendency towards evaporation depends on its exact composition. Klüber Summit compressor oils are close-fractionated, which means they evaporate up to 20 times less than conventional compressor oils. And why should that interest you?

- ❑ Low oil consumption of the compressor
- ❑ Oil-free compressed air
- ❑ Longer activated carbon filter life
- ❑ Clean compressed air network, less residues and glueing, problem-free operation of pneumatic valves

Compared with conventional mineral oils, the synthetic oils made by Klüber Lubrication offer a substantial benefit: they evaporate to a much lesser extent at the normal discharge temperatures. Conventional oils contain highly volatile components. The resulting oil vapor is entrained with the compressed air; it cannot be separated from the air by the oil separator because it is in gaseous state. This oil vapor causes additional strain on the processing of the compressed air as well as, upon condensation, on the entire compressed air network.



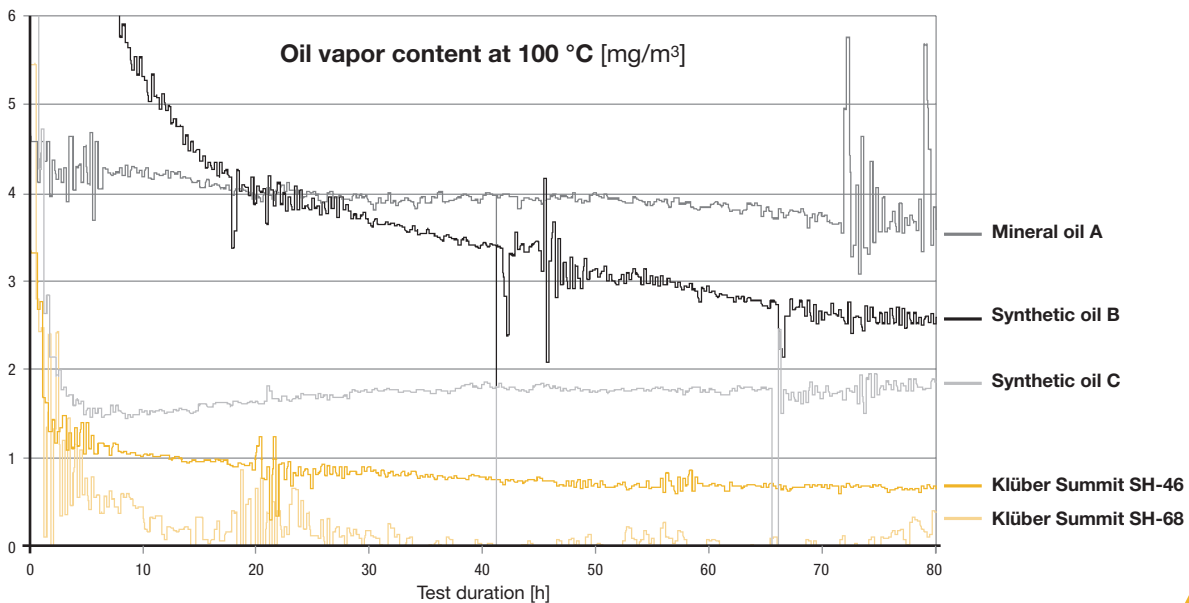
Oil circuit in screw-type compressor with oil injection

Considerably less evaporation with synthetic oils

Especially in applications where oil-free compressed air is a vital requirement, e.g. in the food-processing or pharmaceuticals industry, the positive effect is evident:

- ❑ **Low load on activated carbon filter and compressed air processing as well as longer service lives and maintenance cycles**
- ❑ **Higher reliability as less oil is contained in the compressed air**
- ❑ **Clean compressed air network**

To show you the differences between the individual oils, we have measured the oil content in compressed air over time. The following diagram contains the results for some competitor's oils and the synthetic Klüber Summit SH oils.



An example from practice:

A screw-type compressor with oil injection was switched over from a mineral oil to Klüber Summit SH 46. The oil change interval attained with the new oil was 8,000 operating hours. As a positive side effect, the deposits and sticky residues frequently encountered in pneumatic valves no longer occurred. In addition to the reduced maintenance costs for the oil changes, pneumatic valves no longer have to be replaced, which used to take up to two man-days every six months, and of course incurred the additional spare parts costs.

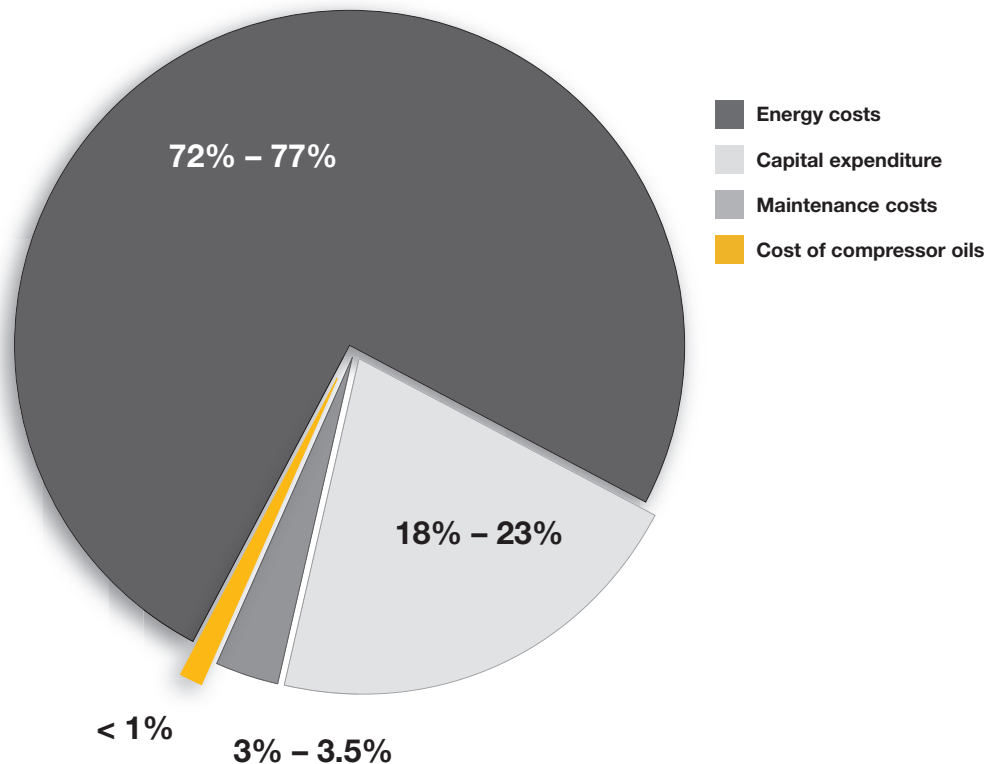
CONCLUSION: With synthetic oils made by Klüber Lubrication, maintenance costs are reduced considerably. Even where you might not expect it.

Synthetic Klüber Summit oils help save energy

Energy constitutes a major factor in air compression operating costs. With the use of suitable synthetic oils, you can reduce your energy costs considerably.

But how is this achieved? Since the right synthetic compressor oil reduces friction in the compressor and offers a better gap sealing effect, it can be expected to increase volumetric efficiency while reducing energy consumption.

We tested the power consumption of a compressor per compressed volume under standardized conditions. The results speak for themselves when comparing the power consumption rate for a conventional mineral oil versus that attained with Klüber Summit SH 46.



Typical cost shares in compressor operation. Less than one percent is spent on the compressor oil, yet choosing the right oil can lead to significant savings!

Are there calculations to back this?

There are. While synthetic compressor oils are more expensive than conventional mineral oils, the final

spend speaks a different language. The following results are feasible:

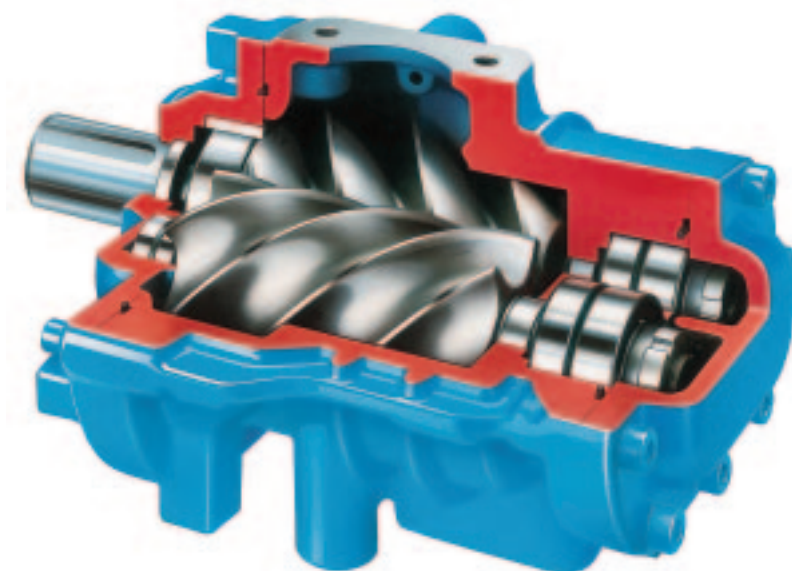
	Mineral oil	Klüber Summit SH 46
Driving power [kW]	125	125
Operating hours p.a. [h]	6,500	6,500
Energy consumption p.a. [kWh]	812,500	788,125
Energy costs at 0.08 €/kWh [€]	65,000.–	63,050.–
Savings per compressor [€]	--	1,950.–

Exemplary calculation

The added value is clear:

- Tangible reduction of operating costs
- Reduced maintenance and spare parts costs due to longer oil change intervals
- Less strain on environment and resources due to lower energy consumption and lower disposal quantities

CONCLUSION: With Klüber Summit oils, cost reductions are possible. After all, it's the bottom line that counts.



Compressor cleaning made easy – with Klüber Summit Varnasolv

Compressors are often contaminated with old oil residues. To combat this problem, many operators simply “flush” the system with a compressor oil, which offers questionable benefits at a significant cost. In other cases, the compressor is taken apart for manual cleaning of the individual components. Instead of these costly procedures, we suggest using Klüber Summit Varnasolv, a concentrated compressor conditioner, which offers the following benefits for your screw-type compressor:

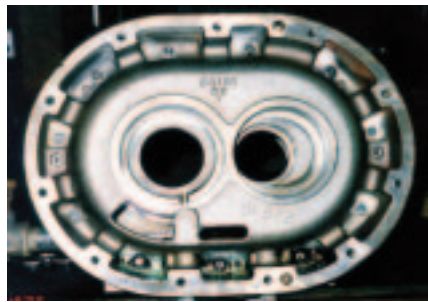
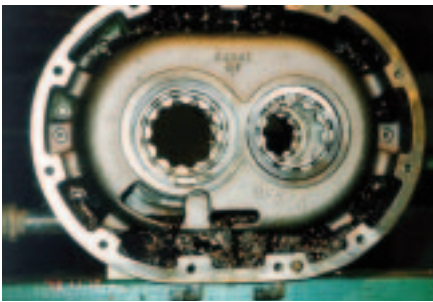
- ❑ Effective and time-saving cleaning during operation
- ❑ Reduced maintenance and downtime costs for unnecessary cleaning work
- ❑ Reduced operating temperature of the compressor, resulting in reduced energy costs
- ❑ Optimized oil life after cleaning



Easy compressor cleaning without downtime

Klüber Summit Varnasolv is a highly effective concentrated conditioner. Approximately 60 hours before an oil change is due, the conditioner is added to the oil fill in a concentration of 10%. While the compressor continues to operate, Klüber Summit Varnasolv dissolves the residues on the surfaces and keeps them in dissolved condition.

The residues are then flushed out in the course of the oil change. This method is much more effective than flushing the compressor with a normal compressor oil. Of course, you are still free to take your compressor apart for cleaning. But the more economical solution is Klüber Summit Varnasolv.



CONCLUSION: After only a short cleaning time with Klüber Summit Varnasolv, your compressor is clean again and runs reliably with the Klüber Summit oil.

Quick determination of compressor oil condition?
No problem with the Klüber Summit TAN Kit!

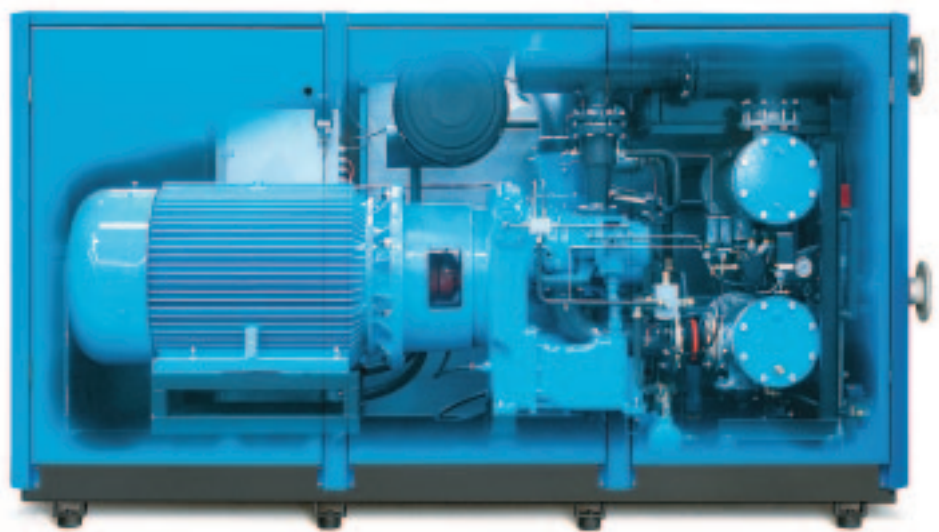
Want to know the condition of your compressor quickly? Right there in your plant, without a long wait time? The Klüber Summit TAN Kit can help you conduct a simple compressor oil analysis:

- ❑ Take a small oil sample, carry out the test and obtain an oil condition result immediately
- ❑ The color change indicates both the condition of the oil, and if an oil change is advisable

We are where you are. Whenever you need us.

Benefit from our comprehensive service:

- ❑ Personal consulting before, during and after oil changeover
- ❑ Oil analyses at regular intervals
- ❑ TAN Kit for quick oil condition checks at your site



We'll take care

Confidence in the new lubrication partner is a prerequisite of changeover to a new lubricant. The ample experience of Klüber Lubrication justifies such confidence. Together, we will analyze the current condition of your compressors, develop a changeover

scenario and assess its practical benefits. Our service staff will be present during the changeover procedure and after the changeover, the oil can be analyzed at regular intervals so as to respond to any irregularities without delay.

CONCLUSION: We offer individual and personal consulting for all questions regarding the changeover to Klüber Summit products you may have – anywhere you wish.



Product overview

Type of compressor*	Klüber product	Viscosity Nominal value	Chemical composition
Piston compressors	Klüber Summit PS 200 ... 400	68, 100, 150	Mineral oil, ester oil
Rotary vane compressors with total-loss or circulation lubrication	Klüber Summit DSL 68 ... 125	68, 100, 125	Ester oil
	Klüber Summit HySyn FG 68 ... 100	68, 100	Synthetic hydrocarbon
Screw-type compressors with oil injection	Klüber Summit PS 100 ... 200	32, 46, 68	Mineral oil, ester oil
	Klüber Summit SB 46 ... 68	46, 68	Synthetic hydrocarbon, mineral oil, ester oil
	Klüber Summit SH 32 ... 68	32, 46, 68	Ester oil, synthetic hydrocarbon
	Klüber Summit Ultima 46 ... 68	46, 68	Ester oil, synthetic hydrocarbon
	Klüber Summit HySyn FG 32 ... 68	32, 46, 68	Synthetic hydrocarbon
	Klüber Summit Supra 32	32	Polyglycol oil, ester oil
	Klüber Summit Supra Coolant	56	Polyglycol oil, ester oil
	Klüber Summit DSL 32, 68	32, 68	Synthetic ester oil

* Please observe the viscosities specified by the manufacturers

The right product for every requirement

Product characteristics, advantages, benefits

- /// Semi-synthetic compressor oil, suitable up to approx. 160 °C discharge temperature
- /// Reduced residue formation on valves and in cylinders
- /// Long service life of valves and piston rings resulting in reduced maintenance and downtime costs

- /// Fully synthetic compressor oil, suitable up to 220 °C discharge temperature
- /// Reduced residue formation on valves and in cylinders
- /// Long service life of valves and piston rings resulting in reduced maintenance and downtime costs

- /// Fully synthetic compressor oil, suitable up to 160 °C discharge temperature
- /// NSF-H1 registered for use in the food-processing industry

- /// Semi-synthetic compressor oil
- /// Suitable for oil change intervals up to 5,000 hours under normal operating conditions**
- /// Reduced maintenance and downtime costs
- /// Easy compressor oil changeover because product is miscible with mineral oils

- /// Synthetic compressor oil
- /// Suitable for oil change intervals up to 8,000 hours under normal operating conditions**
- /// Reduced maintenance and downtime costs
- /// Easy compressor oil changeover because product is miscible with mineral oils

- /// Fully synthetic compressor oil
- /// Suitable for oil change intervals up to 10,000 hours under normal operating conditions**
- /// Reduced maintenance and downtime costs
- /// Easy compressor oil changeover because product is miscible with mineral oils

- /// Fully synthetic compressor oil
- /// Suitable for oil change intervals up to 12,000 hours under normal operating conditions** or for compressors running under severe operating conditions like seawater, extreme temperatures
- /// Reduced maintenance and downtime costs
- /// Easy compressor oil changeover because product is miscible with mineral oils

- /// Fully synthetic compressor oil
- /// Suitable for oil change intervals up to 4,000 hours under normal operating conditions**
- /// NSF-H1 registered for use in the food-processing industry
- /// Easy compressor oil changeover because product is miscible with mineral oils

- /// Fully synthetic compressor oil
- /// Suitable for oil change intervals up to 8,000 hours under normal operating conditions**
- /// Particularly suitable for compressors filled with polyglycol-based compressor oils by the manufacturer
- /// Easy compressor oil changeover because product is miscible with polyglycols

- /// Fully synthetic compressor oil
- /// Suitable for oil change intervals up to 8,000 hours under normal operating conditions**
- /// Particularly suitable for compressors filled with polyglycol-based compressor oils by the manufacturer
- /// Easy compressor oil changeover because product is miscible with polyglycols

- /// Fully synthetic compressor oil
- /// Suitable for oil change intervals up to 8,000 hours under normal operating conditions**
- /// Particularly suitable for applications requiring rapidly biodegradable compressor oils acc. to GEC-L-33-A-93
- /// Easy compressor oil changeover because product is miscible with both mineral oils and polyglycols

** As normal operating conditions are considered a discharge temperature of max. 80 °C, a discharge pressure of max. 8 bar, dry and clean intake air, oil cycle > 1.5

Product overview

Type of compressor*	Klüber product	Viscosity Nominal value	Chemical composition
Oil-free screw-type compressors (gear lubrication)	Klüber Summit PS 200	68	Mineral oil, ester oil
	Klüber Summit SH 68		Synthetic hydrocarbon, ester oil
	Klüber Summit HySyn FG 68		Synthetic hydrocarbon
Turbocompressors (circulation lubrication of bearings)	Klüber Summit PS 100, 150	32, 46	Mineral oil, ester oil
	Klüber Summit SH 32, 46		Synthetic hydrocarbon, ester oil
	Klüber Summit Supra 32	32	Polyglycol oil, ester oil
Fan (gear lubrication)	Klüber Summit PS 400	150	Mineral oil, ester oil
	Klüberoil 4 UH 1-100 ... 220 N	100, 150, 220	Synthetic hydrocarbon, ester oil
Rolling bearings of electric motors	Klüberquiet BQH 72-102	--	Ester oil, polyurea thickener
Cleaning of screw-type compressors, turbocompressors and rotary vane compressors with oil circulation lubrication	Klüber Summit Varnasolv	78	Ester oil

The right product for every requirement

Product characteristics, advantages, benefits

- // Semi-synthetic compressor oil
- // Cost savings due to longer oil change intervals
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Fully synthetic compressor oil
- // Cost savings due to longer oil change intervals
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Fully synthetic compressor oil
- // NSF-H1 registered for use in the food-processing industry
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Semi-synthetic compressor oil
- // Cost savings due to longer oil change intervals
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Fully synthetic compressor oil
- // Cost savings due to longer oil change intervals
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Fully synthetic compressor oil
- // Particularly suitable for compressors filled with polyglycol-based compressor oils by the manufacturer
- // Easy compressor oil changeover because product is miscible with polyglycols

- // Semi-synthetic compressor oil
- // Cost savings due to longer oil change intervals
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Fully synthetic compressor oil
- // NSF-H1 registered for use in the food-processing industry
- // Easy compressor oil changeover because product is miscible with mineral oils

- // Synthetic rolling bearing grease for long-term lubrication
- // For the lubrication of rolling bearings in electric motors and generators
- // Cost savings due to long grease life

- // Cleaning fluid for screw-type compressors, turbocompressors and rotary vane compressors with oil circulation lubrication
- // The fluid is added to the compressor oil at a concentration of 10%
- // Effectively dissolves residues and impurities caused by mineral oils (e.g. carbon buildup, oxidation residues) and removes them together with the oil during oil change
- // No downtimes due to cleaning during operation
- // Lower costs due to simple cleaning procedure
- // Economical operation of the cleaned compressor

* Please observe the viscosities specified by the manufacturers

** As normal operating conditions are considered a discharge temperature of max. 80 °C, a discharge pressure of max. 8 bar, dry and clean intake air, oil cycle > 1.5

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With more than 2000 products available around the world, you can be sure that Klüber has the right product for your application. Please contact Klüber Lubrication specialists worldwide to assist you in all matters regarding lubrication.

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Lubricating greases
Lubricating wax
Lubricating pastes

Tribo-system materials

Bonded coatings

Release agent

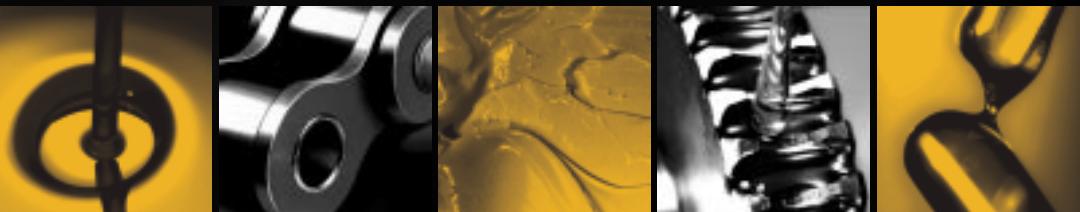
Corrosion preventive
Cleansing agent

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Klüber products are continually improved. Therefore, Klüber Lubrication reserves the right to change all the technical data in this technical brochure at any time without notice.

We are where you are.

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- subsidiaries in over 30 countries
- more than 1,700 staff
- products available worldwide

Klüber Lubrication offers expert tribological solutions.

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