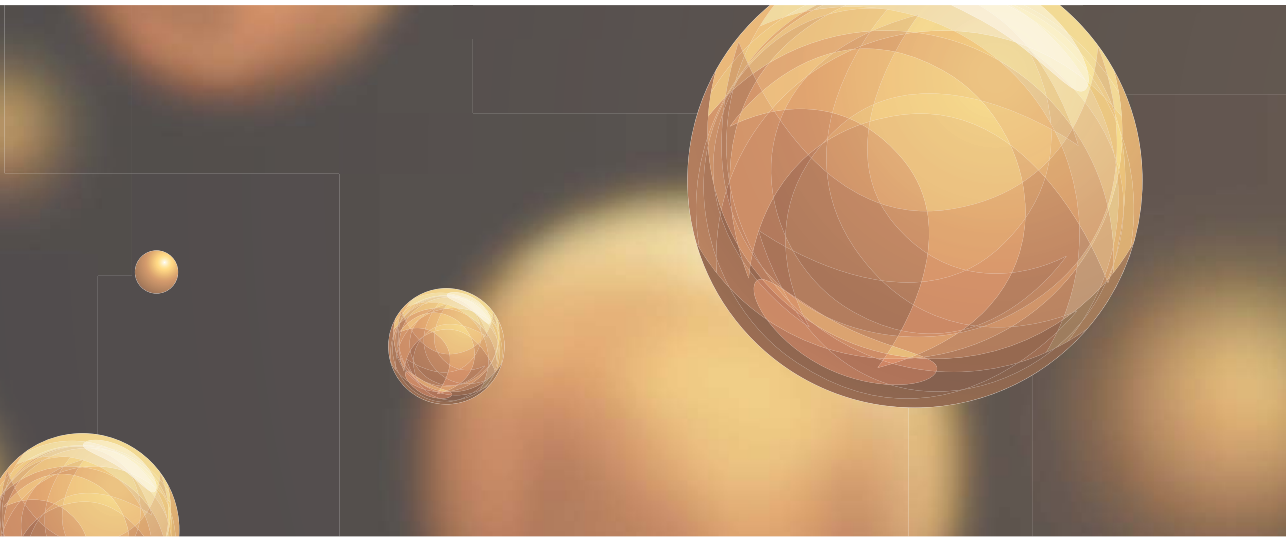
REFRIGERATION LUBRICANTS

The new standard in lubrication

errecom
AIR CONDITIONING & REFRIGERATION CHEMICAL SOLUTIONS

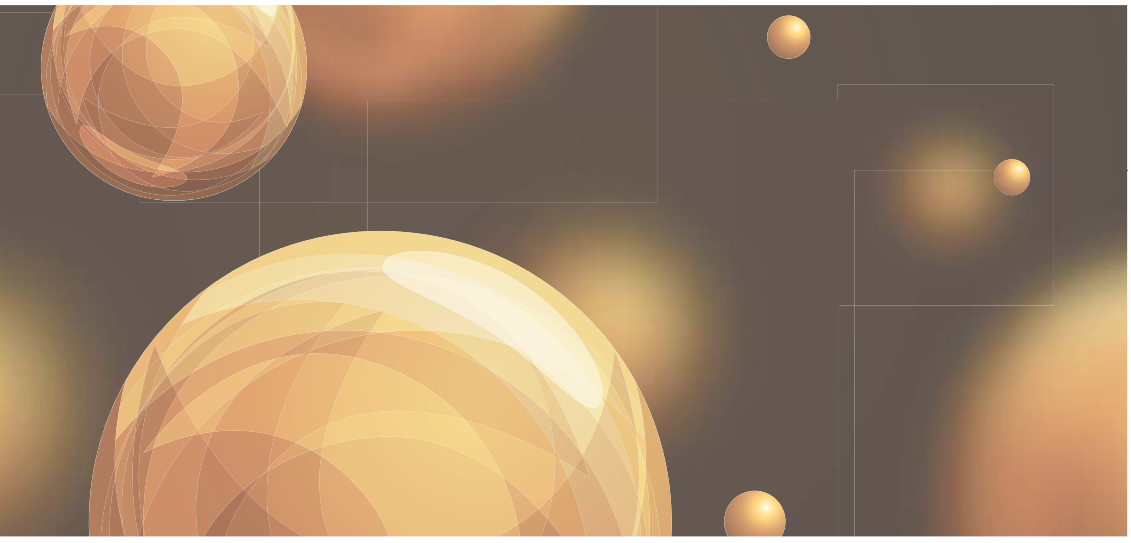
Chemical Excellence since 2001



Warranty and quality. These are the principles that have guided Errecom throughout the years.
Since 2001 we are in manufacturers of excellence in chemical solutions for AC/R systems..

We are what we produce.

We control every single process and component, in order to give life to the highest quality products ever.
As a European Company we do endorse tightened laws and protocols which aim at the preservation of our planet: we act, work and produce in a green vision, being aware that there are places and values to be preserved over time.



R&D: research becoming the heart of the company

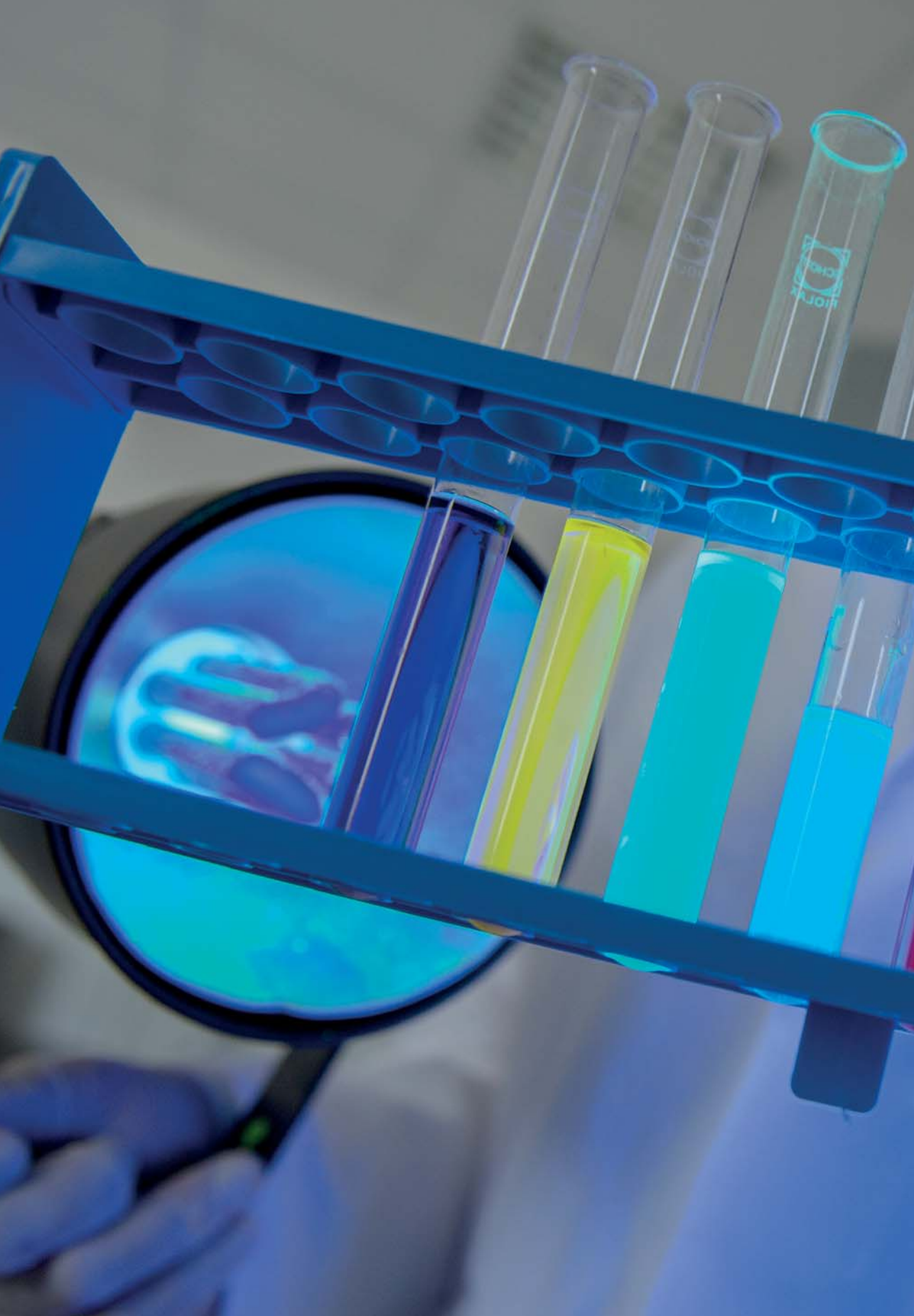
We have been investing for the development of our R&D department since the very beginning: advanced machinery and, above all, a highly qualified staff are the real showpieces of Errecom laboratories.

KNOWLEDGE. RESEARCH. AVANT-GARDE.

The depth knowledge of air conditioning and refrigeration systems has led Errecom chemists to develop products that basically solve the problems in many AC/R systems.

From additives to lubricants is a very short step.

Our laboratories have developed a products offer that is able to respond to a very specific and detailed market demand, coming quickly to the formulation of special lubricants for the refrigeration and air conditioning systems.
Our experience is synonymous with reliability, quality and 360° knowledge.



Synthetic lubricants: yes or not?

The answer is yes. But only high quality ones.
Our R&D department continuously studies the correct operation of the AC/R systems. Over the years it has defined what makes an oil efficient for the compressors working in refrigeration and air conditioning systems.

Production of synthetic lubricants was the choice.

Why?

Unlike mineral oils, synthetic oils guarantee an almost absent percentage of humidity, which therefore ensures a very low incidence in terms of acid formation.

Our lubricants also have high resistance to oxidation and are present with different viscosity indices (in order to please any type of requests).
Moreover, the synthetic nature of our lubricants gives us the opportunity to design ad hoc solutions starting from the need of each individual plant and in case of new refrigerants launched on market.

Fundamental pluses are also the higher chemical and thermal stability: these features ensure actually a limited formation of solid and laminated components that may settle within the plant and interfere with the performances of the compressor. All this is synonymous with longer compressor life and less power required for the same work at certain rhythms: in a word, SAVINGS.
Errecom philosophy is based on few, but solid concepts. In addition to our Made in Italy production quality, we have been working in a green vision, with a constant eye on the future: our synthetic lubricants have a pollutant impact which is almost null and certainly much less if compared to a oil mineral (not only in terms of the production process, but also speaking about disposal at the end of the product life and in case of accidental spilling).

Let's recap:

- Lower humidity = less acid formation = less risk of compressor breakage;
- High oxidation resistance;
- Several viscosity indices;
- Opportunity to calibrate the formulations of lubricants;
- Higher chemical and thermal stability = Higher savings;
- Lower rate of pollution and environmental impact.

POE-PAG-PAO

The world of lubrication has recently invested in specialization, in order to meet the needs of different circuits and many types of gas.
These features characterize our production of lubricants: we firstly consider the system and its specifications, as well as the gas or the refrigerant mixture in use.

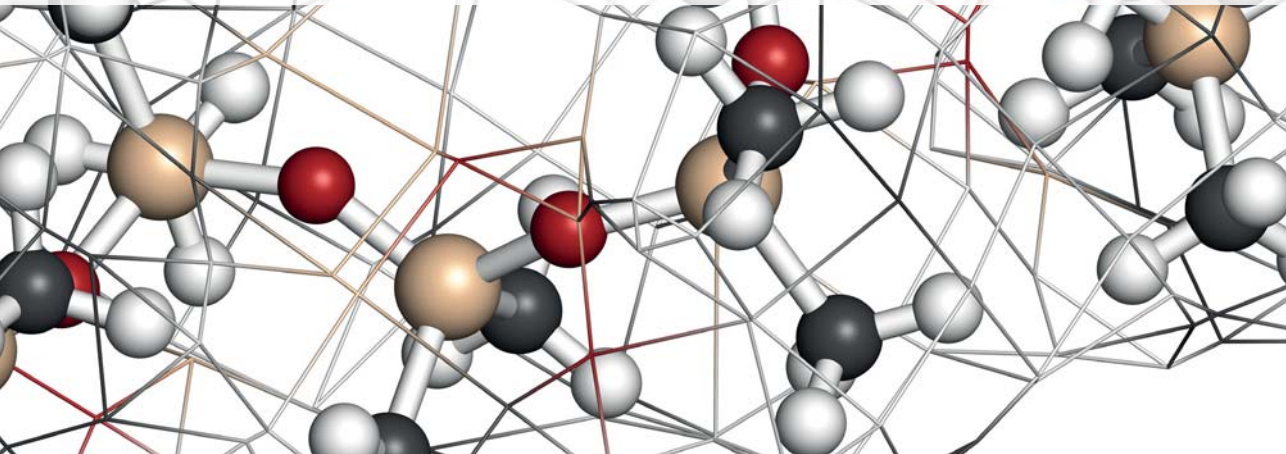
There are several families of synthetic lubricants on the market: POE, PAG and PAO (use the kind of lubricant suggested by the manufacturer).

Applications.

POE – The polyol esters (POE) are characterized by the excellent lubricity and reduced solubility. These features allow the usage of low-viscosity lubricants with hydrocarbons. POE lubricants are used in HVAC&R.

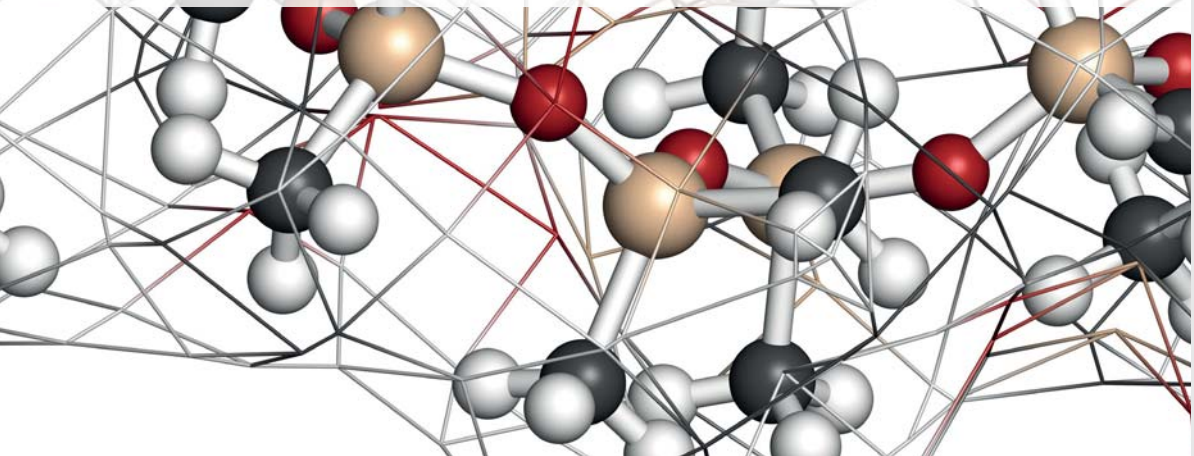
PAG – is the lubricant in the automotive sector, in particular with R134a refrigerant gas. R134a producers underline how the compatibility between the refrigerant-lubricant mixture and the plant material change when varying the type of lubricant itself.
The PAG is selected for the vehicles A/C systems for its better compatibility. In case of compressor replacement, a system working with PAG is easier to be flushed thanks to the reduced dispersion of this lubricant. In this way maintenance costs are even reduced. There is therefore no benefit in using different oils for automotive applications, just as indicated by the manufacturers.

PAO – PAO lubricants are stable solutions and therefore compatible with most plastics and elastomers. They are mostly used in addition to the PAG oils for automotive applications.



Double-end-capped VS Single-end-capped

PAG lubricant is a polymer, a chain composed of single joined by the hydroxyl (OH).
OH terminals remain free, allowing the hydroxyl group to have a polar behavior.
These terminals can be protected (end-capped) by different organic molecules. The choice of the number of protection and the type of protection (if it is present) confers different properties to the lubricant.
The protection of both terminals (double-end-capped technology) decreases the affinity with water, its hygroscopicity, oxidation and deterioration trend. Double-end-capped lubricants are therefore much more stable: no conveying moisture and acidity in the system, it also reduces the risk of corrosion.
Errecom has developed the best capped technology solutions for R134a refrigerants and subsequently for R1234yf and CO_2, in order to continuously improve the stability and efficiency.



Chemical and physical properties of refrigerants oils:
a guide to the knowledge of lubricants for AC/R compressors

Kinematic viscosity: refrigeration lubricants (as well as all oils) are classified by their kinematic viscosity according to ISO Kinematic Viscosity.
The viscosity (such as density) is a chemical/physical feature which depends on the temperature. The reference temperature is 40°C and the measurement unit is m^2/s, but also the cSt and the mm^2/s methods are in use.
Each ISO viscosity is described by its kinematic viscosity at 40°C, with a +/- 10% deviation from the ISO value.
The viscosity provides an index of the thickness formed by the lubricant and, consequentially, of the resulting lubricant strength. The viscosity tends to collapse with the increase of temperature: this decrease is much more contained at higher the viscosity indices.
The viscosity index describes perfectly this temperature dependence and it is calculated according to the ratio of the kinematic viscosity at 40°C and 100°C. A sufficiently high viscosity is required to form a lubricating film in the bearing and in the compressor cylinder. However, in the same refrigerant circuit, the oil must have the lowest possible viscosity.
Refrigeration or different viscosity oils are used depending on the type of compressor and application. The viscosity to be applied is normally specified by the compressor manufacturer.
However, this information is insufficient to evaluate the suitability of a lubricant in certail applications. Another determining factor is some lubricants' behavior in the Daniel Plots: this graph shows how the refrigerant and lubricant are compatible.
It is necessary to work on the additive package (even more than on the base), before checking these factors.

DIN 51519 VISCOSITY TABLE			
ISO Viscosity	Viscosity at 40°C [mm²/s]	Viscosity Limits	
Nominal	Mid range	Minimum	Maximum
ISO VG 2	2.2	1.98	2.42
ISO VG 3	3.2	2.88	3.52
ISO VG 5	4.6	4.14	5.06
ISO VG 7	6.8	6.12	7.48
ISO VG 10	10	9.00	11
ISO VG 15	15	13.50	16.5
ISO VG 22	22	19.80	24.2
ISO VG 32	32	28.80	35.2
ISO VG 46	46	41.40	50.6
ISO VG 68	68	61.20	74.8
ISO VG 100	100	90	110
ISO VG 150	150	135	165
ISO VG 220	220	198	242
ISO VG 320	320	288	352
ISO VG 460	460	414	506
ISO VG 680	680	612	748
ISO VG 1000	1000	900	1100
ISO VG 2200	2200	1,980	2420
ISO VG 3200	3200	2,880	3520

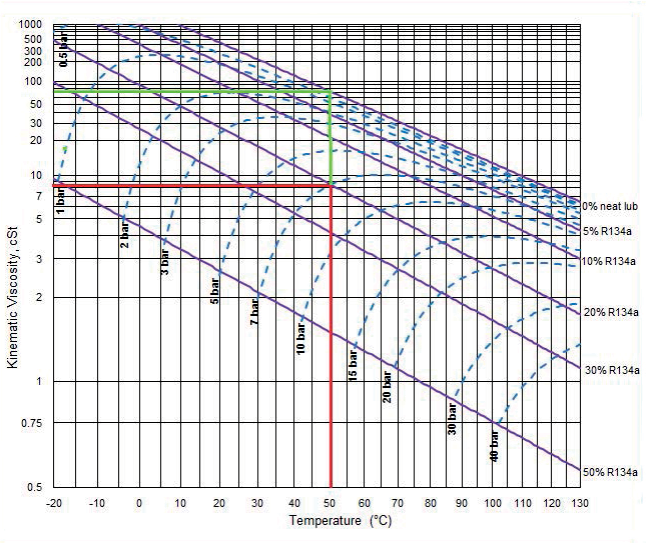
Flash Point is the minimum temperature at which a flame generates the lubricant vapors. It is determined through the ASTM-D 9 method and is an indirect parameter, useful to know the oil vapor pressure.

Density defines the mass of the fluid in relation to its volume. A refrigeration lubricant is normally characterized at 15°C.
The density is expressed in grams on cubic centimeter (g/cm^3) and the reference method is ASTM-D4052. The lubricant density depends strongly on the temperature of the lubricant itself: the volume actually grows with the increase of temperature.

Water content is determined with the Karl Fischer method (ppm = parts per million) through a ASTM-E1064 Coulometer. The water level in refrigeration lubricants must be extremely low in comparison to other oils. In HVAC&R sector lubricants are treated as very anhydrous (with the addition of drying agents).

Total Acidity determines the amount of acid in a lubricant, since the acid can corrode the materials it comes in contact with. High acidity levels created by oxidation, hydrolysis or aging are highly undesirable.
The total acidity is expressed in mg KOH/g, it is identified as Total Acid Number (TAN Total Acid Number) and determined by the ASTM D-974 method.
A refrigeration lubricant must have a very low acid level if compared to other oils: this value must be around <0.1 mg KOH/g.

Pour point expresses the lowest temperature at which the lubricant continues to be fluid and therefore it defines the lower temperature at which this lubricant can be used. This factor is crucial in the choice of the lubricant.
The pour point is determined according to ASTM-D 97. The percentage of refrigerant dissolved in the lubricant has a perceptible impact on this feature, as it reduces the pour point. An estimate of the amount of refrigerant that dissolves with the lubricant is made through the pressure-viscosity-temperature (PVT) graphic art of refrigeration oils, known as Daniel Plots.



The color is a specific data and can vary between crystal clear APHA 0 and dark brown APHA 500. It is determined in accordance with ASTM-D1209. These changes can be related to the type of additive applied to the lubricant base (in the case of new oils) or to the presence of contaminants (in the case of waste lubricats).

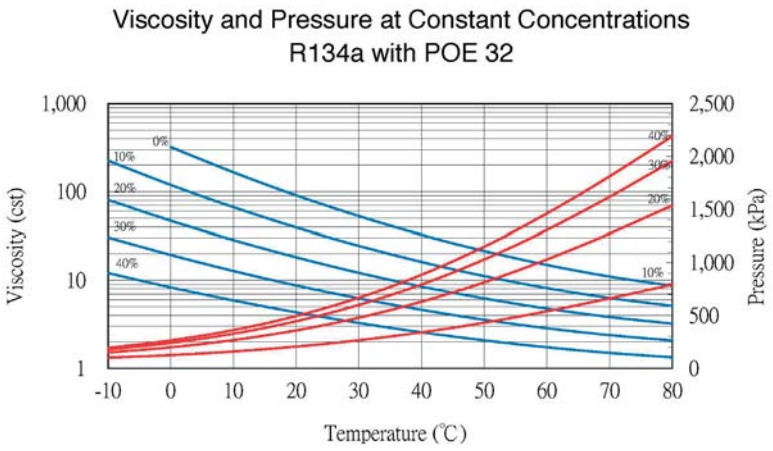
Miscibility with Refrigerants: the miscibility of the lubricants to the different refrigerants is analyzed at different temperatures, for different percentages of lubricant in the refrigerant itself.
It is a fundamental parameter for predicting the transport of oil by the refrigerant gas into the system and the efficiency of the system itself. The separation phase can lead to malfunctions and loss of system performances, with reduced heat exchange, insufficient return of lubricant to the compressor (due to inadequate lubrication) up to the breakage of the compressor.

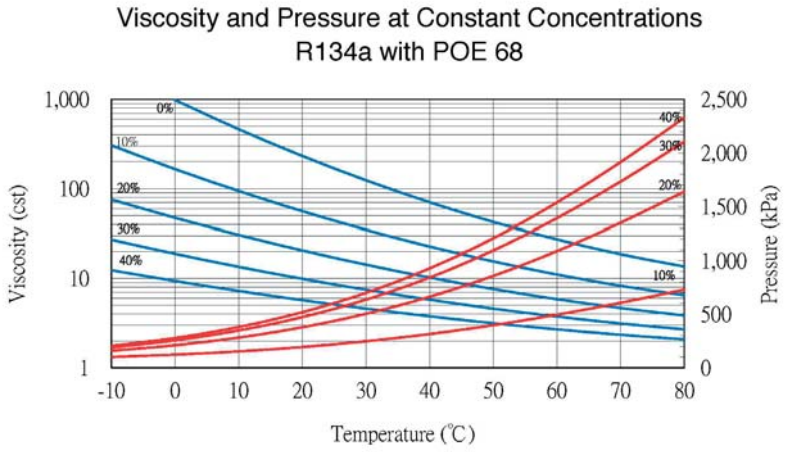
Refrigerant-Lubricant Compatibility: a determining factor for a lubricant is its compatibility with the refrigerants on the market and the compatibility of the refrigerant gas-lubricant mixture with the materials that compose the system (such as copper, aluminum and steel). These compatibility must be constant even at high temperatures and pressures (these are conditions that emulate the “stress” situations of a plant).

Chemical Stability: a lubricant must be stable in many respects in order to be suitable for refrigeration applications. In particular, its stability must be excellent to moisture, pH, oxidation, and have a very low residual catalyst. The presence of residual catalyst (even in very low quantity) may decrease critically the stability of a lubricant.
Moisture is a particularly damaging factor in synthetic POE and PAG lubricants, that are hygroscopic and must be well controlled. By forming hydrohalogenic and carbonic acids, humidity can promote the refrigerants and gases decomposition. This can consequently cause the corrosion of the system, by freeing metallic oxides which amplify the decay of the refrigerant and oil.
A correctly synthesized lubricant and additive must have a great resistance to these factors.

Thermal stability: high temperatures accelerate the decay reactions of gas and lubricant. An excellent thermal aging resistance is therefore one of the key characteristics for a lubricant that has to keep its peculiarities. It also accelerates the action of chemical reactions, favoring the decays due to moisture, acidity, to the presence of residues of reaction and metal of the circuit.

Example of Errecom lubricants behavior with R134a





Lubrication according to Errecom

Errecom lubricant proposal is mainly focused on new conception mixtures: synthetic oils that ensure low environmental impact, low power consumption for production and high performances for the system in order to reduce the final costs.

POE
Polyol Ester

POE are synthetic lubricants with high chemical and thermal stability.

Due to their good miscibility with refrigerants they are the best choice for applications with HFC/FC such as R134a, R404A, R407C. POE oils are also compatible with hydrocarbons such as R290 propane and R1270 propylene. In addition, our additive offer is always evolving: POE Errecom is also the best solution for applications with new generation HFO (hydrogenation of fluorinated olefins) such as R1234yf and R1234ze, which are both low-GWP latest formulation gases.

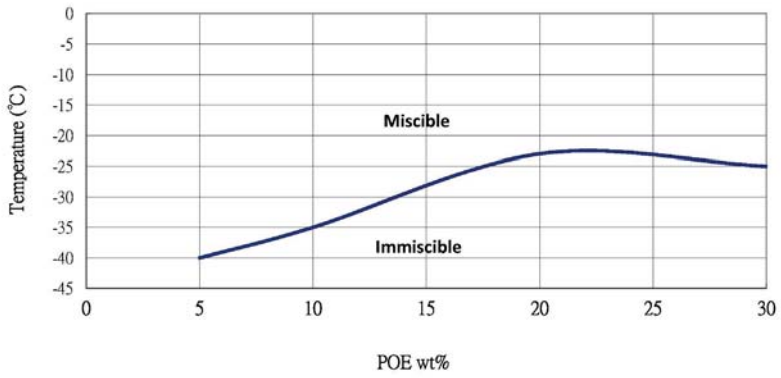
The high viscosity index ensures excellent low-temperature flowability and a stable film at high temperatures, thus confirming the maximum efficiency in all operating conditions.

The pursued aims in the development of new Errecom lubricants are:

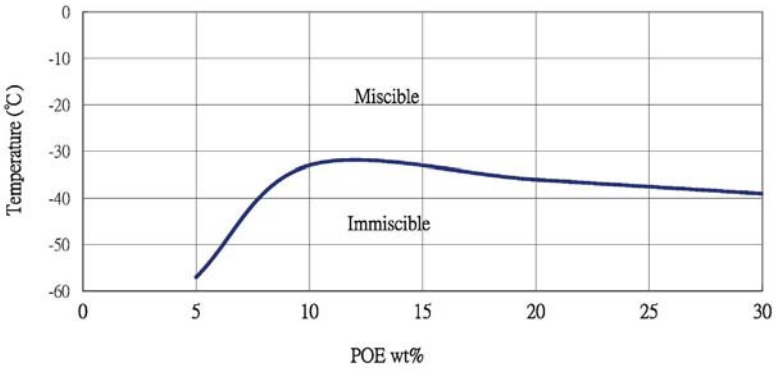
- Excellent lubricant ability;
- Hydrolytic stability;
- High compatibility with the materials of all kind of systems, both new and old ones (with a constant attention to their evolution over the time);
- Excellent properties at low temperature;
- Electrical isolation;
- Low toxicity and high biodegradability level, always following our green philosophy precepts;
- Reduced hygroscopicity and anti-humidity additive;
- High thermal stability to oxidation;
- High solubility performances with refrigerants;
- Optimal miscibility with refrigerants.

Errecom experience in the development of versatile or customizable additive packages and the use of the most innovative and environmentally friendly raw materials have led to one of the best lubricants for refrigeration now on the market.
Errecom POE synthetic lubricants, in all their viscosity indices, are composed of a mixture of esters of polyols and additives specifically formulated for a better lubricity, chemical and thermal stability and excellent anti-wear protection of the AC/R system components.
Thanks to the research and the complete removal of polymerization catalysts, Errecom POE is one of the more stable and less reactive products within a system with POE.

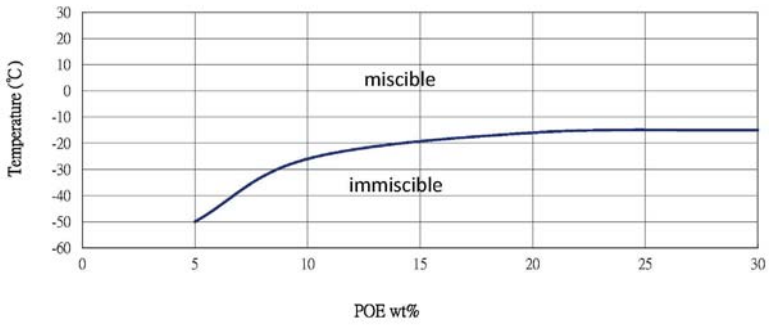
Miscibility of POE 22 in R134a



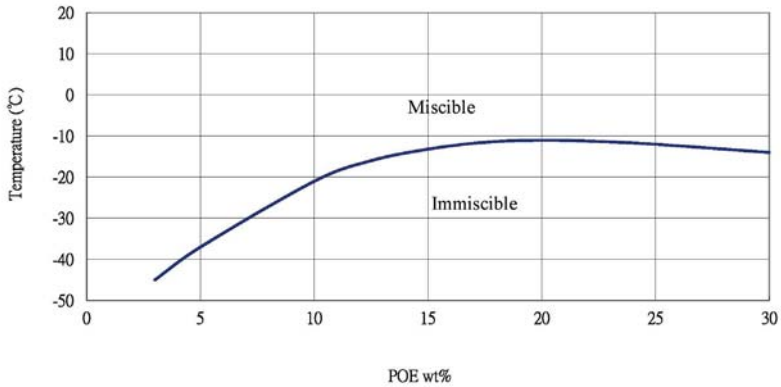
Miscibility of POE 32 in R134a



Miscibility of POE 68 in R134a



Miscibility of POE 100 in R134a



POE Lubricants

Lubricants for A/C and Refrigeration Systems

POE 22 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	22	
Kinematic viscosity @ 40°C (cSt)	22	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	4,1	ASTM-D445
Viscosity Index	82	ASTM-D2270
Pour point (°C)	-54	ASTM-D 97
Flash point (°C)	198	ASTM-D 92
Density @ 15°C (g/cm³)	0,935	ASTM-D4052
Humidity content (ppm)	24	ASTM-E1064
Total acidity (mg KOH/g)	<0,03	ASTM-D 974
Color (APHA)	22	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

POE 32 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	32	
Kinematic viscosity @ 40°C (cSt)	32	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	5,3	ASTM-D445
Viscosity Index	94	ASTM-D2270
Pour point (°C)	-48	ASTM-D 97
Flash point (°C)	215	ASTM-D 92
Density @ 15°C (g/cm³)	0,938	ASTM-D4052
Humidity content (ppm)	23	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Color (APHA)	20	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

POE 46 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	46	
Kinematic viscosity @ 40°C (cSt)	46	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	7,3	ASTM-D445
Viscosity Index	93	ASTM-D2270
Pour point (°C)	-45	ASTM-D 97
Flash point (°C)	235	ASTM-D 92
Density @ 15°C (g/cm³)	0,939	ASTM-D4052
Humidity content (ppm)	21	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Color (APHA)	20	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

POE 55 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	55	
Kinematic viscosity @ 40°C (cSt)	55	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	7,9	ASTM-D445
Viscosity Index	93	ASTM-D2270
Pour point (°C)	-42	ASTM-D 97
Flash point (°C)	245	ASTM-D 92
Density @ 15°C (g/cm³)	0,940	ASTM-D4052
Humidity content (ppm)	21	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Color (APHA)	25	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

POE 68 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	68	
Kinematic viscosity @ 40°C (cSt)	68	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	8,5	ASTM-D445
Viscosity Index	90	ASTM-D2270
Pour point (°C)	-39	ASTM-D 97
Flash point (°C)	255	ASTM-D 92
Density @ 15°C (g/cm³)	0,941	ASTM-D4052
Humidity content (ppm)	23	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Color (APHA)	30	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

POE 100 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	100	
Kinematic viscosity @ 40°C (cSt)	100	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	11,9	ASTM-D445
Viscosity Index	108	ASTM-D2270
Pour point (°C)	-42	ASTM-D 97
Flash point (°C)	270	ASTM-D 92
Density @ 15°C (g/cm³)	0,975	ASTM-D4052
Humidity content (ppm)	22	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Color (APHA)	99	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

POE 170 LUBRICANT

Method and reference unit	VALUE	Reference Method
ISO VG	170	
Kinematic viscosity @ 40°C (cSt)	170	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	16,3	ASTM-D445
Viscosity Index	101	ASTM-D2270
Pour point (°C)	-33	ASTM-D 97
Flash point (°C)	280	ASTM-D 92
Density @ 15°C (g/cm³)	0,971	ASTM-D4052
Humidity content (ppm)	22	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Color (APHA)	99	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

Packaging References

POE 22

Art.-Nr.	Description		**
OL6011.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6011.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6011.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6011.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6011.T	25 Litres (6.60 GAL.) Container	01	-
OL6011.B	200 Litres (52.8 GAL.) Container	01	-

POE 32

Art.-Nr.	Description		**
OL6012.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6012.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6012.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6012.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6012.T	25 Litres (6.60 GAL.) Container	01	-
OL6012.B	200 Litres (52.8 GAL.) Container	01	-

POE 46

Art.-Nr.	Description		**
OL6015.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6015.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6015.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6015.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6015.T	25 Litres (6.60 GAL.) Container	01	-
OL6015.B	200 Litres (52.8 GAL.) Container	01	-

POE 55

Art.-Nr.	Description		**
OL6055.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6055.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6055.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6055.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6055.T	25 Litres (6.60 GAL.) Container	01	-
OL6055.B	200 Litres (52.8 GAL.) Container	01	-

POE 68

Art.-Nr.	Description		**
OL6016.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6016.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6016.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6016.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6016.T	25 Litres (6.60 GAL.) Container	01	-
OL6016.B	200 Litres (52.8 GAL.) Container	01	-

POE 100

Art.-Nr.	Description		**
OL6017.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6017.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6017.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6017.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6017.T	25 Litres (6.60 GAL.) Container	01	-
OL6017.B	200 Litres (52.8 GAL.) Container	01	-

POE 170

Art.-Nr.	Description		**
OL6020.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6020.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6020.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6020.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6020.T	25 Litres (6.60 GAL.) Container	01	-
OL6020.B	200 Litres (52.8 GAL.) Container	01	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:

250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.) - 1 Litre (34 FL. OZ.)
5 Litre (1.32 GAL) - 25 Litres (6.60 GAL.) - 200 Litres (52.8 GAL.)

POE Hybrid

POE Lubricant for Hybrid/Electric Vehicles with R134a

POE 100 synthetic lubricant for Hybrid & Electric vehicles is composed of a mixture of esters of polyols and additives specifically formulated to achieve a better lubricity, chemical and thermal stability and excellent anti-wear protection of the A/C system in vehicles with hybrid and gasoline-electric power.
POE 100 Hybrid & Electric offers a better mixing with the R134a refrigerant, even at lower temperatures. It was developed to have a high level of resistance to electricity: this feature is essential in hybrid systems.

POE 100 for Hybrid/Electric Vehicles

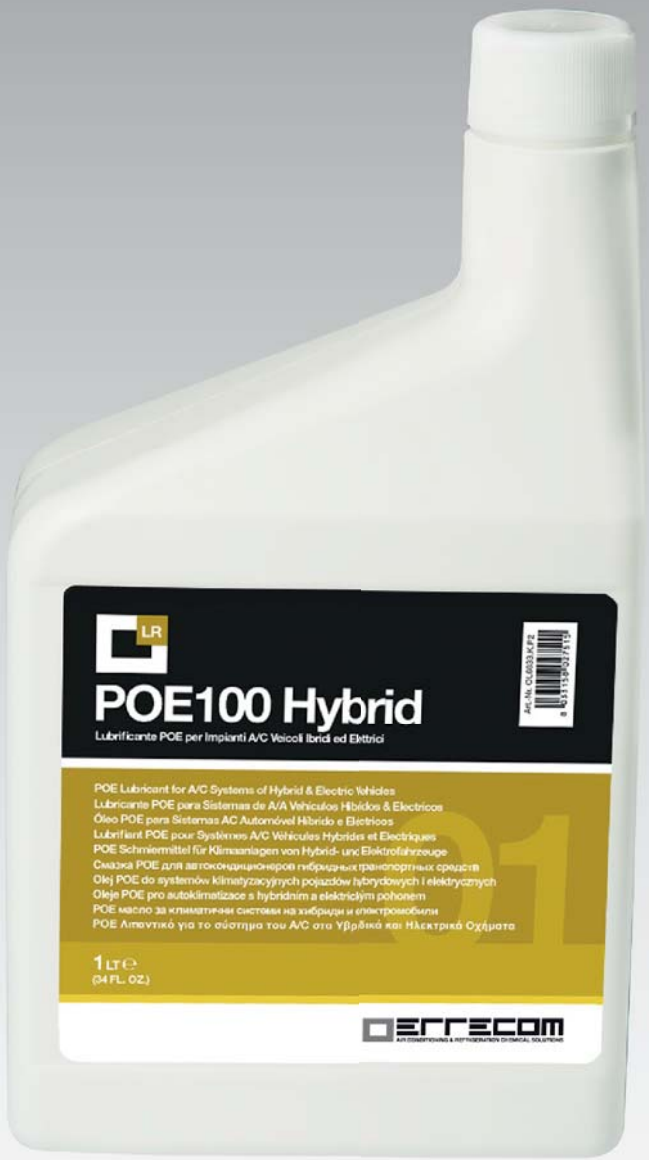
Method and reference unit	VALUE	Reference Method
ISO VG	100	
Kinematic viscosity @ 40°C (cSt)	100	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	11	ASTM-D445
Viscosity Index	99	ASTM-D2270
Pour point (°C)	-33	ASTM-D 97
Flash point (°C)	260	ASTM-D 92
Density @ 15°C (g/cm³)	0,958	ASTM-D4052
Humidity content (ppm)	22	ASTM-E1064
Total acidity (mg KOH/g)	<0,02	ASTM-D 974
Volume Resistivity	1x10e14 Ω.cm	ASTM-D2624
Color (APHA)	90	ASTM-D1209
Reaction catalyst residue (ppm)	<0,02	IM

Packaging References

POE 100

Art.-Nr.	Description		**
OL6033.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6033.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6033.K.P2	1 Litre (34 FL. OZ.) Container	12	672

**80x120xH200 cm (31,50x47,25xH78,75 inch.)



AVAILABLE IN:
250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.) - 1 Litre (34 FL. OZ.)

POE HYBRID - APPLICATION IN AUTOMOTIVE

PAG
Polyalkylene Glycol

PAG lubricants have been developed for automotive applications, specially with the use of R134a refrigerant gas.
Errecom PAG oils are a mixture of polyalkylene glycols and additives specially formulated to achieve a better lubricity, chemical and thermal stability as well as an excellent anti-wear protection of the AC/R system components.

The pursued aims in the development of new Errecom lubricants are:
- Excellent Lubricant ability
- Hydrolytic stability
- High Compatibility with the materials of all kind of systems, both new and old ones (with a constant attention to their evolution over the time)
- Excellent properties at low temperature
- Low toxicity and high biodegradability level, always following our green philosophy precepts
- Reduced hygroscopicity and additive anti humidity
- High thermal stability to oxidation
- High solubility performances with refrigerants
- Optimal miscibility with refrigerants

PAG LUBRICANT

LR Premium PAG

PAG Lubricants for A/C Systems with R134a, R1234yf and Hybrid & Electric Vehicles

Premium Pag lubricant defines the level in lubrication of every A/C system compressor thanks to the quality of its double-end-capped formula.
Premium Pag has been specifically formulated to be used in A/C systems vehicles with R134a, R1234yf, as well as in hybrid and electric vehicles.

Method and reference unit	VALUE	Reference Method
ISO VG	68	
Kinematic viscosity @ 40°C (cSt)	68	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	13	ASTM-D445
Viscosity Index	208	ASTM-D2270
Pour point (°C)	-42	ASTM-D 97
Flash point (°C)	210	ASTM-D 92
Density @ 15°C (g/cm³)	0,997	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	18	ASTM-D1209
Capping efficiency (%)	90	IM

Packaging References

PREMIUM PAG

Art.-Nr.	Description		
OL6057.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6057.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6057.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6057.P.P2	5 Litre (1.32 GAL) Container	12	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:

250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.)
1 Litre (34 FL. OZ.) - 5 Litre (1.32 GAL)

R134a PAG

PAG Lubricants for Vehicles A/C Systems with R134a

R134a PAG Universal

Method and reference unit	VALUE	Reference Method
ISO VG	68	
Kinematic viscosity @ 40°C (cSt)	68	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	12,4	ASTM-D445
Viscosity Index	181	ASTM-D2270
Pour point (°C)	-40	ASTM-D 97
Flash point (°C)	215	ASTM-D 92
Density @ 15°C (g/cm³)	0,992	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	16	ASTM-D1209
Capping efficiency (%)	95	IM

R134a PAG 46

Method and reference unit	VALUE	Reference Method
ISO VG	46	
Kinematic viscosity @ 40°C (cSt)	46	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	8,6	ASTM-D445
Viscosity Index	184	ASTM-D2270
Pour point (°C)	-43	ASTM-D 97
Flash point (°C)	226	ASTM-D 92
Density @ 15°C (g/cm³)	0,986	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	12	ASTM-D1209
Capping efficiency (%)	95	IM

R134a PAG 100

Method and reference unit	VALUE	Reference Method
ISO VG	100	
Kinematic viscosity @ 40°C (cSt)	100	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	19	ASTM-D445
Viscosity Index	212	ASTM-D2270
Pour point (°C)	-40	ASTM-D 97
Flash point (°C)	230	ASTM-D 92
Density @ 15°C (g/cm³)	0,993	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	18	ASTM-D1209
Capping efficiency (%)	95	IM

R134a PAG 125

Method and reference unit	VALUE	Reference Method
ISO VG	125	
Kinematic viscosity @ 40°C (cSt)	125	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	21	ASTM-D445
Viscosity Index	199	ASTM-D2270
Pour point (°C)	-42	ASTM-D 97
Flash point (°C)	215	ASTM-D 92
Density @ 15°C (g/cm³)	1,000	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	18	ASTM-D1209
Capping efficiency (%)	95	IM

R134a PAG 150

Method and reference unit	VALUE	Reference Method
ISO VG	150	
Kinematic viscosity @ 40°C (cSt)	150	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	25	ASTM-D445
Viscosity Index	200	ASTM-D2270
Pour point (°C)	-40	ASTM-D 97
Flash point (°C)	230	ASTM-D 92
Density @ 15°C (g/cm³)	1,005	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	18	ASTM-D1209
Capping efficiency (%)	95	IM

Packaging References

R134a PAG Universal

Art.-Nr.	Description		**
OL6002.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6002.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6002.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6002.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6002.T	25 Litres (6.60 GAL.) Container	01	-
OL6002.B	200 Litres (52.8 GAL.) Container	01	-
OL6002.IBC	1000 Litres (264 GAL.) Container	01	-

R134a PAG 46

Art.-Nr.	Description		**
OL6001.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6001.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6001.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6001.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6001.T	25 Litres (6.60 GAL.) Container	01	-
OL6001.B	200 Litres (52.8 GAL.) Container	01	-
OL6001.IBC	1000 Litres (264 GAL.) Container	01	-

R134a PAG 100

Art.-Nr.	Description		**
OL6003.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6003.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6003.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6003.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6003.T	25 Litres (6.60 GAL.) Container	01	-
OL6003.B	200 Litres (52.8 GAL.) Container	01	-
OL6003.IBC	1000 Litres (264 GAL.) Container	01	-

R134a PAG 125

Art.-Nr.	Description		**
OL6004.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6004.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6004.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6004.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6004.T	25 Litres (6.60 GAL.) Container	01	-
OL6004.B	200 Litres (52.8 GAL.) Container	01	-
OL6004.IBC	1000 Litres (264 GAL.) Container	01	-

R134a PAG 150

Art.-Nr.	Description		**
OL6005.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6005.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6005.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6005.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6005.T	25 Litres (6.60 GAL.) Container	01	-
OL6005.B	200 Litres (52.8 GAL.) Container	01	-
OL6005.IBC	1000 Litres (264 GAL.) Container	01	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:

250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.) - 1 Litre (34 FL. OZ.)
5 Litre (1.32 GAL) - 25 Litres (6.60 GAL.) - 200 Litres (52.8 GAL.) - 1000 Litres (264 GAL.)

LR R1234yf PAG

PAG Lubricants for Vehicles A/C Systems with R1234yf

R1234yf PAG Universal

Method and reference unit	VALUE	Reference Method
ISO VG	68	
Kinematic viscosity @ 40°C (cSt)	68	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	14	ASTM-D445
Viscosity Index	208	ASTM-D2270
Pour point (°C)	-46	ASTM-D 97
Flash point (°C)	215	ASTM-D 92
Density @ 15°C (g/cm³)	0,999	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	18	ASTM-D1209
Capping efficiency (%)	95	IM

R1234yf PAG 46

Method and reference unit	VALUE	Reference Method
ISO VG	46	
Kinematic viscosity @ 40°C (cSt)	46	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	10	ASTM-D445
Viscosity Index	213	ASTM-D2270
Pour point (°C)	-49	ASTM-D 97
Flash point (°C)	220	ASTM-D 92
Density @ 15°C (g/cm³)	0,999	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	15	ASTM-D1209
Capping efficiency (%)	95	IM

R1234yf PAG 100

Method and reference unit	VALUE	Reference Method
ISO VG	100	
Kinematic viscosity @ 40°C (cSt)	100	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	20	ASTM-D445
Viscosity Index	212	ASTM-D2270
Pour point (°C)	-41	ASTM-D 97
Flash point (°C)	230	ASTM-D 92
Density @ 15°C (g/cm³)	1,002	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	20	ASTM-D1209
Capping efficiency (%)	95	IM

Packaging References

R1234yf PAG UNIVERSAL

Art.-Nr.	Description		
OL6059.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6059.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6059.K.P2	1 Litre (34 FL. OZ.) Container	12	672

R1234yf PAG 46

Art.-Nr.	Description		
OL6047.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6047.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6047.K.P2	1 Litre (34 FL. OZ.) Container	12	672

R1234yf PAG 100

Art.-Nr.	Description		
OL6048.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6048.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6048.K.P2	1 Litre (34 FL. OZ.) Container	12	672

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:
250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.) - 1 Litre (34 FL. OZ.)

CO_2 PAG Lubricants

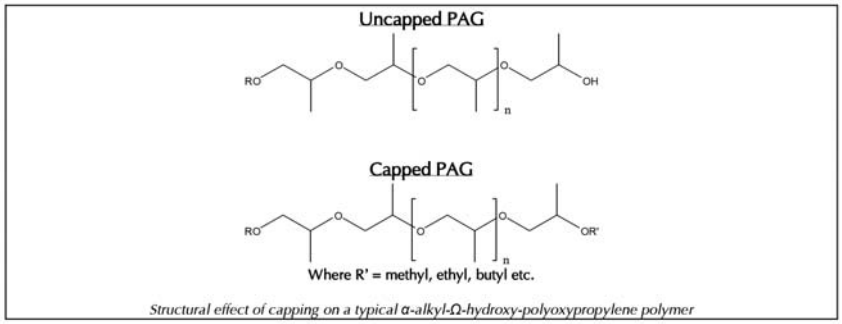
PAG are new polyalkylene glycol that guarantee high-performances in AC/R systems with CO_2.
CO_2 is a refrigerant with a complex and delicate balance, which requires outstanding performances to the lubricant.
PAG for CO_2 offer a better miscibility with CO_2 in a wide range of concentrations and temperatures. This means: excellent lubricating properties and higher efficiency for the refrigeration system.
PAG for CO_2 have a reduced hygroscopicity (if compared to normal PAG, which is unprotected to hydroxyl and used with other refrigerants). These oils also have high chemical stability, thermal and hydrolysis resistance.

CO_2 offers unfavorable characteristics in normal refrigeration applications, with a very high discharging pressure and a very low critical temperature (31°C - 74 bar). This situation requires sub and supercritical operating conditions in single-stage systems with delivery pressure exceeding 100 bar. In addition, the energy performance is lower than the conventional vapor compression process.
However, in applications with potentially high rates of dispersion and where flammable refrigerants cannot be used for safety reasons, there are opportunities to use CO_2. For example, CO_2 is a valid option for air conditioning systems in automotive. For commercial and industrial refrigeration units, CO_2 can be used as a secondary fluid in a cascade system.

Protection terminals technology and protective element choice (Capped or multi-capped)

Several performance advantages are associated with the use of PAG for CO_2 as synthetic lubricants for refrigeration with CO_2. A typical polyalkylene glycol generally consists of polymer chains terminated with a hydroxyl group that is chemically active at one end. On the contrary, a protected PAG is a chemically inactive group at both ends of the molecule. PAG for CO_2, based on the "capped PAG" technology, provide effective lubrication for refrigeration units and compression. Protection technology ("capped" technology) also provides improved lubricity for CO_2 systems.
High efficiency of the process typically results in ~ 95% for PAG for the CO_2 range.

- Miscibility with CO_2 in a wide range of lubricant concentration and temperature.
- Reduced hygroscopic than a PAG without protection in the process of absorbing water.
- High chemical stability to heat and hydrolysis
- Excellent lubricating capacity



Structural effect of capping on a typical α-alkyl-Ω-hydroxy-polyoxypropylene polymer

PAG 46 for CO_2 features:

Property	Method	Value
Viscosity @ 40°C, cSt	ASTM D445	49.7
Viscosity @ 100°C, cSt	ASTM D445	10.7
Viscosity Index	-	213
Density @ 20°C, kg/m ^{3}	ASTM D1298	998
Pour point, °C	ASTM D97	-49
Flashpoint, COC, °C	ASTM D92	>200
Water Content , % mass	ASTM E284	<0.05
TAN, mgKOH/g	ASTM D974	<0.10
4-Ball wear scar -40kg/1hr (mm)	ASTM D4172	0.53
Cu corrosion test	ASTM D130	1a
Steam turbine corrosion test	ASTM D665(a)	Pass
Miscibility in CO_2:		
Upper CST: 1% RFL-X in CO_2	ASHRAE 86	30.9
5% RFL-X in CO_2		30.9
30% RFL-X in CO_2		26.0
50% RFL-X in CO_2		13.0
Density Inversion temp: 1% RFL-X in CO_2		-31.0
5% RFL-X in CO_2		-31.0
30% RFL-X in CO_2		-31.0
50% RFL-X in CO_2		-29.2

PAG 68 for CO_2 features:

Property	Method	Value
Viscosity @ 40°C, cSt	ASTM D445	70
Viscosity @ 100°C, cSt	ASTM D445	14
Viscosity Index	-	210
Density @ 20°C, kg/m ^{3}	ASTM D1298	998
Pour point, °C	ASTM D97	-46
Flashpoint, COC, °C	ASTM D92	>200
Water Content , % mass	ASTM E284	<0.05
TAN, mgKOH/g	ASTM D974	<0.10
4-Ball wear scar -40kg/1hr (mm)	ASTM D4172	0.5
Cu corrosion test	ASTM D130	1a
Steam turbine corrosion test	ASTM D665(a)	Pass

Miscibility above and below the critical point of carbon dioxide (30.98°C).

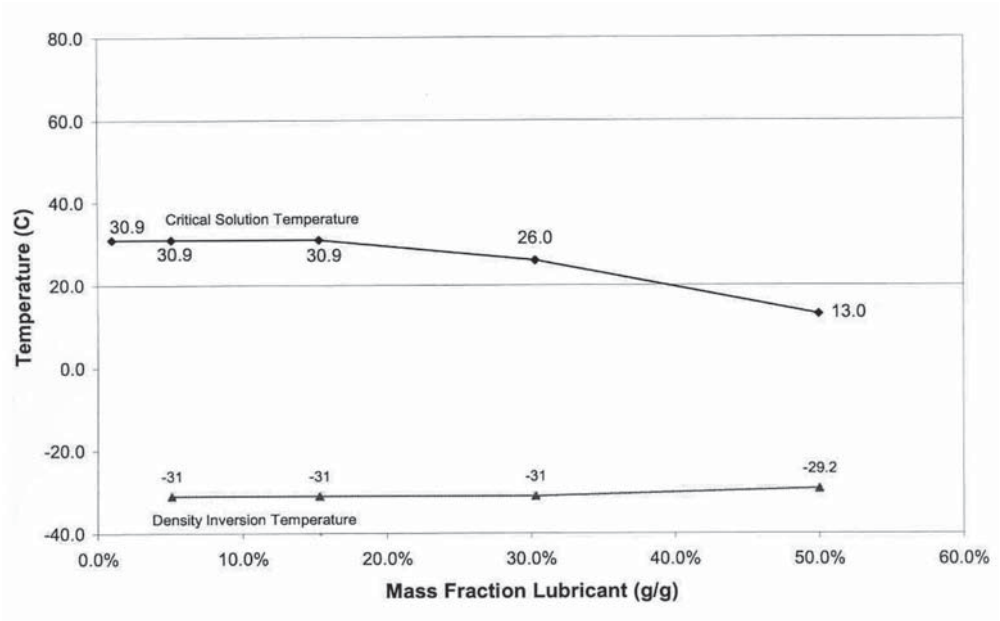
Most of the conventional lubricants such as mineral and alkylbenzene oils are not soluble with CO_2. The polyol ester (POE) show good miscibility properties, however this may cause a drastic viscosity reduction.

PAG shows partial miscibility with CO_2, but the viscosity properties of polyalkylenglycols remain unchanged and the decrease of viscosity (observed with POE) does not happen in PAG lubricants under dilution with CO_2.

PAG for CO_2 show miscibility with CO_2 in a wide range of temperatures and lubricant concentrations.

FOCUS ON:
PAG 46 Lubricant for CO_2

Miscibility of PAG 46 for CO_2 in CO_2



Even the upper critical temperature remains constant over a wide range of lubricant concentrations. The lower critical temperature does not occur, even if an inversion of density in the liquid phases is observed in the tested range of concentration.

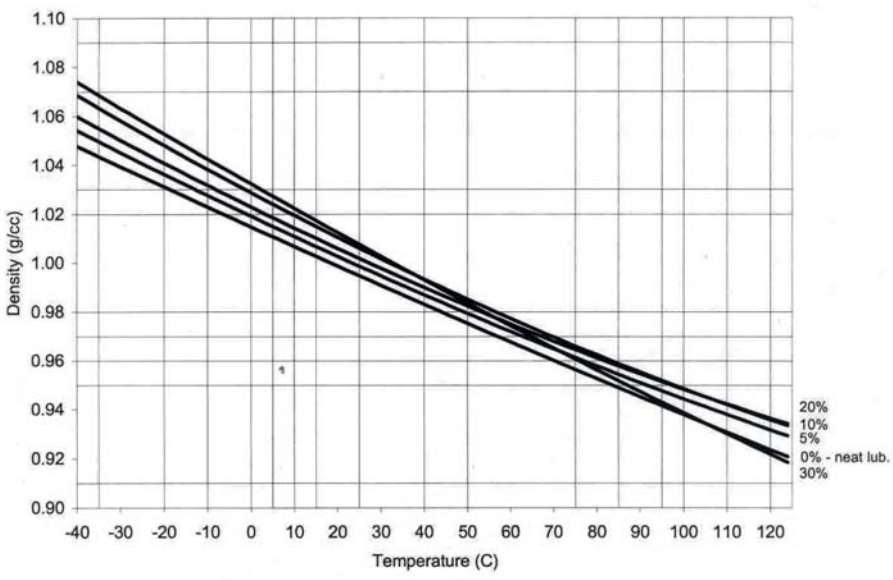
PAG 46 for CO_2 critic solution and inversion density

% Composition Lubricant	Critical Solution Temperature (°C)	Density Inversion Temperature (°C)
1.0	30.9	Suspended droplets
5.1	30.9	-31.0
15.3	30.9	-31.0
30.3	26.0	-31.0
50.0	13.0	-29.2

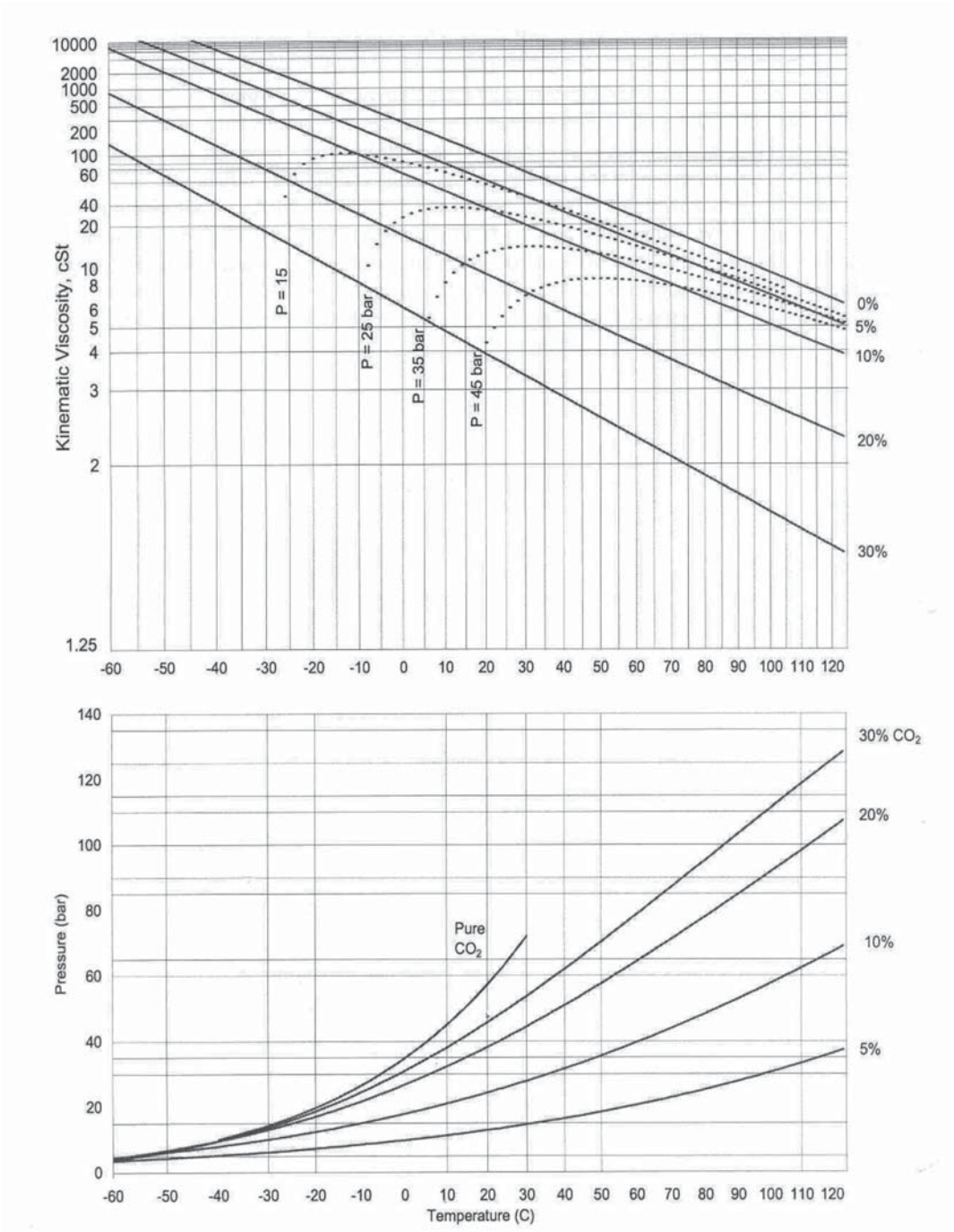
PAG 46 for CO_2 solubility, density and viscosity

Experimental measurements of the liquid density, vapor pressure (solubility) and the viscosity of the liquid were recorded for PAG 46 for CO_2 concentrations in 70, 80, 90 and 95% of weight, in a temperature range -40°C to +125°C.

PAG 46 CO2 density



PAG 46 per CO_2 Viscosity and Vapour Pressure



Lubricant properties

The development of the trans-critical CO_2 systems requires special lubricants because of high pressure and subsequently higher load on the bearings. The extreme PAG pressure and antiwear properties are superior to those of POE and other synthetic materials, such as PVEs.

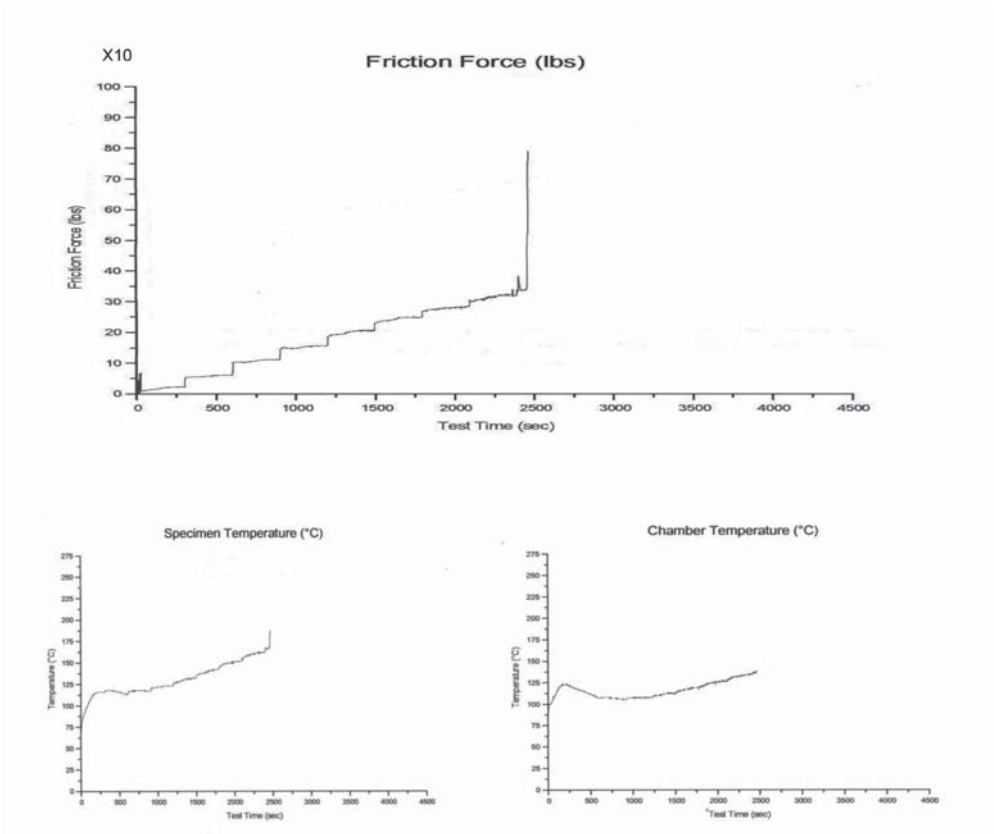
These lubricating properties are kept under high-pressure conditions. PAG 46 for CO_2 ("capped" technology based), provides efficient lubrication for refrigeration units.

These improved lubricating properties for CO_2 systems are obtained as a result of the terminals protection technology (capped technology).

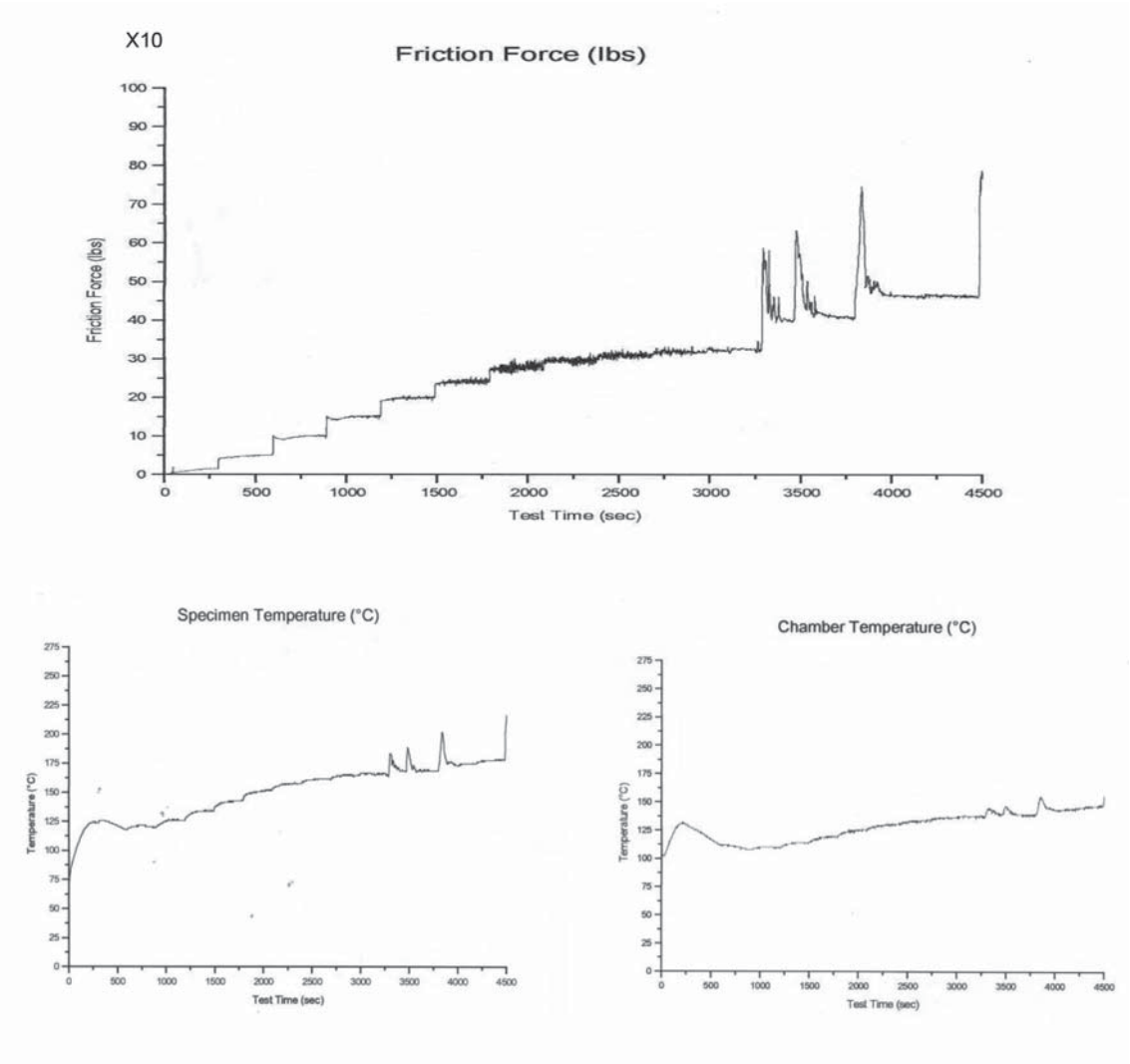
In order to simulate as accurately as possible the CO_2 pressurized environment, Falex Block-on-Ring test was used to evaluate the effect on the PAG 46 for CO_2 properties using the following parameters:

Load Steps	+50 lbs, followed by +20lbs
Rotation Speed	600 rpm
Atmosphere	CO_2
Overpressure	10 bar (150 psi)
Step Duration	5 minutes
Temperature	Min 90°C
Ring	Falex S10, SAE 4620 steel, Rc5 8-63 6-12 rms
Blocks	Falex H-30, SAE 01 steel, Rc 27-33, 4-8 rms

The load pressure (lbs) and estimated wear (mm) were recorded for PAG 46 for the CO_2 (and with the addition of additives EP / AW - PAG 46 for CO_2):



20lbs increase:

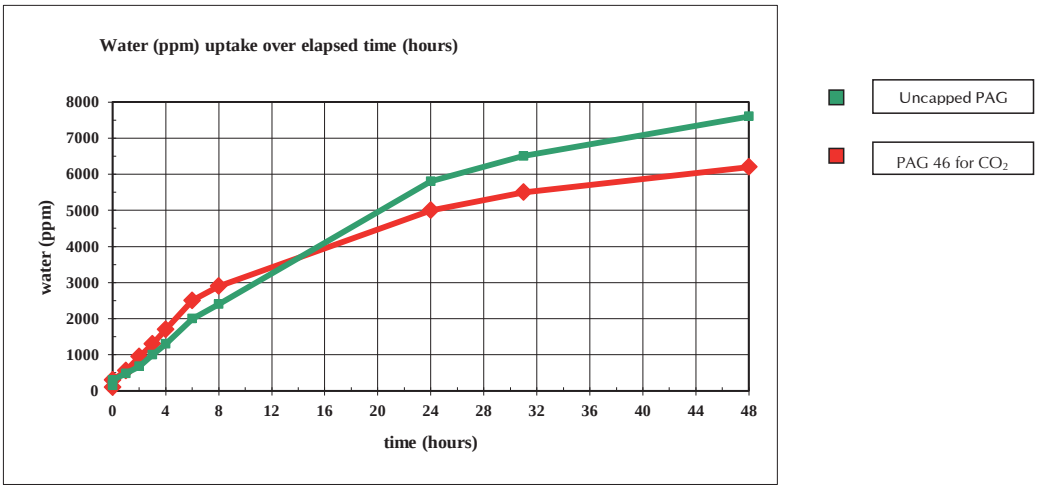


Stability to hydrolysis

Unprotected polyalkylenglycols hydroxyl are very hygroscopic and can absorb thousand ppm of water if exposed to humid conditions. Despite this PAG lubricants do not hydrolyze under normal operating conditions. Therefore problems related to water consumption in alternative synthetic lubricants (such as esters of polyols) cannot be caused - problems such as corrosion or ice formation in the expansion/capillary valve.

Due to the replacement of the hydroxyl terminal group with an alkyl species in the PAG 46 for CO_2, the hygroscopicity is lower than in a free PAG.

PAG 46 for CO_2 moisture absorption levels



While the water absorbed by the PAG is not free (but linked to PAG) and does not cause problems that may be associated with the free moisture, the reduced hygroscopicity exhibited by PAG 46 for CO_2 can be obtained through a careful choice of the end-capped hydroxyl. A maximum water content (0.05%) has been defined for PAG 46 for CO_2.

FOCUS ON:
PAG 68 Lubricant for CO_2

In order to simulate as accurately as possible the CO_2 pressurized environment, Falex Block-on-Ring test was used to evaluate the effect on the PAG 68 for CO_2 properties using the following parameters:

Load Steps	+50 lbs, followed by +20lbs
Rotation Speed	600 rpm
Atmosphere	CO_2
Overpressure	10 bar (150 psi)
Step Duration	5 minutes
Temperature	Min 90°C
Ring	Falex S10, SAE 4620 steel, Rc5 8-63 6-12 rms
Blocks	Falex H-30, SAE 01 steel, Rc 27-33, 4-8 rms

Lubricant properties

The development of the trans-critical CO_2 systems requires special lubricants because of high pressure and subsequently higher load on the bearings. The extreme PAG pressure and antiwear properties are superior to those of POE and other synthetic materials, such as PVEs.

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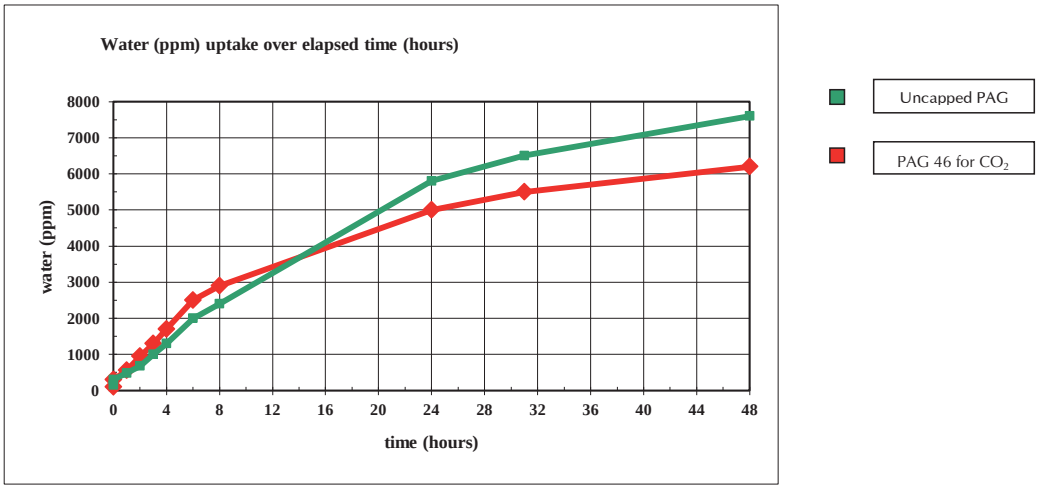

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LR CO_2 PAG

Lubricants for A/C and Refrigeration Systems

PAG ISO 46

Method and reference unit	VALUE	Reference Method
ISO VG	46	
Kinematic viscosity @ 40°C (cSt)	49,7	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	10,7	ASTM-D445
Viscosity Index	213	ASTM-D2270
Pour point (°C)	-49	ASTM-D 97
Flash point (°C)	>200	ASTM-D 92
Density @ 15°C (g/cm³)	998	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	20	ASTM-D1209
Capping efficiency (%)	95	IM

PAG ISO 68

Method and reference unit	VALUE	Reference Method
ISO VG	68	
Kinematic viscosity @ 40°C (cSt)	70	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	14	ASTM-D445
Viscosity Index	210	ASTM-D2270
Pour point (°C)	-46	ASTM-D 97
Flash point (°C)	>200	ASTM-D 92
Density @ 15°C (g/cm³)	998	ASTM-D4052
Humidity content (ppm)	300	ASTM-E1064
Total acidity (mg KOH/g)	0,02	ASTM-D 974
Color (APHA)	20	ASTM-D1209
Capping efficiency (%)	95	IM

Packaging References

PAG ISO 46

Art.-Nr.	Description		**
OL6036.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6036.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6036.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6036.P.P2	5 Litre (1.32 GAL) Container	02	-

PAG ISO 68

Art.-Nr.	Description		**
OL6037.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6037.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6037.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6037.P.P2	5 Litre (1.32 GAL) Container	02	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:

250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.)
1 Litre (34 FL. OZ.) - 5 Litre (1.32 GAL)

Stability and Compatibility Test

Errecom lubricants are strictly and constantly monitored to ensure the highest quality standards. Each lubricant is tested according to the ANSI / ASHRAE 97-2007 standard method.
The lubricant decomposition is simulated at high working temperature for long periods and accelerated through the control of temperature, humidity, acidity and the presence of reaction catalysts (residues from the synthesis process or lost by the main system materials such as copper, iron or aluminum).
Resistance to thermal oxidation gives an excellent indication of a lubricant life and of its future behavior in application.

It is prepared by a lubricant-refrigerant mixture, weight 1/1. This is placed in a test tube together with a small metal sheet: an iron tube is made, as well as a copper and an aluminum one.
Once everything has been welded, this is brought to 175°C for 14 days.

Examples of tests performed on POE series:

		POE		
Refrigerant		R134a	R410A	R404A
Aspect		Clear	Clear	Clear
Sludge formation		no	no	no
Total Acidity (mg KOH/g)	Initial	0,01	0,01	0,01
	Final	<0,1	<0,1	<0,1
System materials	Copper	NC	NC	NC
	Iron	NC	NC	NC
	Aluminium	NC	NC	NC

Examples of tests performed on different PAG:

		PAG R134a, R1234yf, CO_2		
Refrigerant		R134a	R1234yf	CO_2
Aspect		Clear	Clear	Clear
Sludge formation		no	no	no
Total Acidity (mg KOH/g)	Initial	0,02	0,02	0,02
	Final	<0,1	<0,1	<0,1
System materials	Copper	NC	NC	NC
	Iron	NC	NC	NC
	Aluminium	NC	NC	NC

We also test the compatibility of the materials with the lubricants and their additives through a method which is similar to the previous one. It provides a lower operating temperature (130°C) but for a longer time (500 hours). This process is performed for testing other components, also plastic ones.
Each lubricant is tested in pilot system, with different versions of components and refrigerants. In this process, we observe the normal plant operation, its performances and noise.
Through some windows placed along the system you can observe the state of the circulating refrigerant and lubricant. At the end of the test, the refrigerant and lubricant are recovered and subject to the necessary controls.

PAO
Poly-alpha-olefins

PAO synthetic lubricant by t is composed of a mixture of hydrogenated and Polyalphaolefins additives specifically formulated to achieve a better lubricity, chemical and thermal stability as well as an excellent anti-wear protection of the AC/R system components.
PAO based lubricants have better resistance to mechanical stress and excellent performances with refrigerants working at very low evaporation temperatures. They can be used with R723, Ammonia, CO_2, propane, and propylene.

The pursued aims in the development of new Errecom lubricants are:
- Excellent Lubricant ability
- Hydrolytic stability
- High Compatibility with the materials of all kind of systems, both new and old ones (with a constant attention to their evolution over the time)
- Excellent properties at low temperature
- Low toxicity and high biodegradability level, always following our green philosophy precepts
- Reduced hygroscopicity and additive anti humidity
- High thermal stability to oxidation
- Decent solubility performances with refrigerants
- Optimal miscibility with refrigerants

PAO Lubricant

Lubricants for Vehicles A/C Systems

PAO 68

Method and reference unit	VALUE	Reference Method
ISO VG	68	
Kinematic viscosity @ 40°C (cSt)	68	ASTM-D445
Kinematic viscosity @ 100°C (cSt)	10	ASTM-D445
Viscosity Index	150	ASTM-D2270
Pour point (°C)	-50	ASTM-D 97
Flash point (°C)	>250	ASTM-D 92
Density @ 15°C (g/cm³)	0,835	ASTM-D4052
Humidity content (ppm)	30	ASTM-E1064
Total acidity (mg KOH/g)	0,03	ASTM-D 974

Packaging References

PAO 68

Art.-Nr.	Description		**
OL6035.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6035.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6035.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6035.P.P2	5 Litre (1.32 GAL) Container	02	-
OL6035.T	25 Litres (6.60 GAL.) Container	01	-
OL6035.B	200 Litres (52.8 GAL.) Container	01	-
OL6035.IBC	1000 Litres (264 GAL.) Container	01	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:

250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.) - 1 Litre (34 FL. OZ.)
5 Litre (1.32 GAL) - 25 Litres (6.60 GAL.) - 200 Litres (52.8 GAL.) - 1000 Litres (264 GAL.)

VACUUM PUMP Lubricants

Errecom Vacuum Pump Lubricants are developed on a high viscosity index lubricant formulated from selected paraffinic base oils. These oils are designed with additives that achieve better lubricity, chemical and thermal stability as well as excellent anti-wear protection of the AC/R system components.

Vacuum Pump Lubricants are new conception lubricants: thanks to their chemical-physical characteristics, they have been developed for modern hydraulic systems also operating in severe operating conditions.

The pursued aims in the development of new Errecom lubricants are:

- Excellent lubricity;
- High viscosity index;
- Low pour point: this feature allows you to expand the temperature range of the product usage and ensures easy starting of the hydraulic systems in cold condition;
- High anti-wear properties to increase the efficiency and the life of the pumps and of all the system moving “organs”;
- High Compatibility with the materials of all kind of systems, both new and old ones (with a constant attention to their evolution over the time);
- High thermal stability which allows the usage also in closed systems operating at high temperatures and high pressures without causing the formation of deposits and sludge;
- High oxidative stability that allows extensions of the charge while operating. This avoids the possibility of early viscousing processes of the product;
- High hydrolytic stability capable of saving the working oil from decomposition processes even when in presence of small percentages of water;
- Good demulsibility: this property promotes rapid separation of oil from water which has possibly entered the system. Demulsibility can further inhibit the oxidation process;
- Higher filterability in comparison with the previous generation lubricants, even in presence of water: this prevents the clogging of filters and extends the normal filters replacement intervals;
- Anti-corrosion and anti-rust power to effectively protect all the metal components of the hydraulic system;
- Anti-foam properties to avoid the presence of foam and air. These are factors that can reduce the system efficiency because of the coefficient of cubic compressibility which is different from the one of the oil.

Applications

Errecom lubricants cover a vast field of applications, with no risk of sagging and/or decompositions: the classification is by kind of pumps (vane, gear, pistons, etc.), type of metals used in the system, as well as exercise severity (high temperatures, pressures, etc.). Vacuum Pump Lubricants have been specifically designed and manufactured for the usage in hydraulic systems whose proper operation requires a lubricant with high viscosity index, high mechanical strength, low pour point, outstanding anti-wear properties and chemical stability at high temperatures.
The product is presented in the various ISO gradations. The choice of the correct viscosity is performed according to the pump manufacturers recommendations and depending on the ambient temperature.

ISO 32 46 68

VACUUM PUMP LUBRICANTS

LR Vacuum Pump Lubricants

Method and reference unit	ISO 32	ISO 46	ISO 68
ISO VG	32	46	68
Kinematic viscosity @ 40°C (cSt)	32,2	46,4	67,9
Kinematic viscosity @ 100°C (cSt)	5,5	7,2	8,8
Viscosity Index	105	103	102
Pour point (°C)	-31	-26	-25
Flash point (°C)	210	215	220
Density @ 15°C (g/cm³)	0,870	0,872	0,877

Packaging References

ISO 32

Art.-Nr.	Description		**
OL6053.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6053.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6053.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6053.P.P2	5 Litre (1.32 GAL) Container	02	-

ISO 46

Art.-Nr.	Description		**
OL6054.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL6054.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL6054.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL6054.P.P2	5 Litre (1.32 GAL) Container	02	-

ISO 68

Art.-Nr.	Description		**
OL1008.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL1008.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL1008.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL1008.P.P2	5 Litre (1.32 GAL) Container	02	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)

AVAILABLE IN:
250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.)
1 Litre (34 FL. OZ.) - 5 Litre (1.32 GAL)

VACUUM PUMP HD Lubricants

High-performance Vacuum Pump HD by Errecom is a lubricant which has been specially designed to resist the high vacuum.

It is suitable for lubrication of every kind of compressor or vacuum pump (both mono and multistage).

It can be used: in alternative compressors (which have elevate compressure temperature); in rotating compressors with screw and with palette; in axial and centrifugal compressors for bearing lubrication.

Products Ash-Less (that are ash-free) are added to Vacuum Pump HD Lubricant, which has high anti-wear properties.

The pursued aims in the development of new Errecom lubricants are:

- Excellent lubricity;
- High viscosity index, whose viscosity changes as soon as the temperature changes;
- Low volatility and high flammability point: these features reduce the lubricant consumption;
- Low pour point: this feature allows you to expand the temperature range of the product usage and ensures easy starting of the oil-hydraulic systems in cold condition;
- High anti-wear properties to increase the efficiency and the life of the pumps and of all the system moving “organs”;
- High Compatibility with the materials of all kind of systems, both new and old ones (with a constant attention to their evolution over the time);
- High thermal stability which allows the usage also in closed systems operating at high temperatures and high pressures without causing the formation of deposits and sludge;
- High oxidative stability that allows extensions of the charge while operating. This avoids the possibility of early viscousing processes of the product;
- High hydrolytic stability capable of saving the working oil from decomposition processes even when in presence of small percentages of water;
- High demulsibility: this property promotes rapid separation of oil from water which has possibly entered the system. Demulsibility can further inhibit the oxidation process;
- Higher filterability in comparison with the previous generation lubricants, even in presence of water: this prevents the clogging of filters and extends the normal filters replacement intervals;
- Anti-corrosion and anti-rust power to effectively protect all the metal components of the oil-hydraulic system;
- Anti-foam properties to avoid the presence of foam and air. These are factors that can reduce the system efficiency because of the coefficient of cubic compressibility which is different from the one of the oil.

Performance levels

DIN 51506 VDL,
DIN 51524 part 2 HLP,
Afnor NFE 48-603HM,
Eaton Vickers I-286-S,
Cincinnati Machine P-68 / P-69 / P-70

Applications

Errecom lubricants cover a vast field of applications, with no risk of sagging and/or decompositions: the classification is by kind of pumps (vane, gear, pistons, etc.), type of metals used in the system, as well as exercise severity (high temperatures, pressures, etc.). This product has been specifically designed and manufactured for the usage in oil-hydraulic systems whose proper operation requires a lubricant with high viscosity index, high mechanical strength, low pour point, outstanding anti-wear properties and chemical stability at high temperatures.
The product is presented in the various ISO gradations.

ISO 46

LR Vacuum Pump Lubricants HD

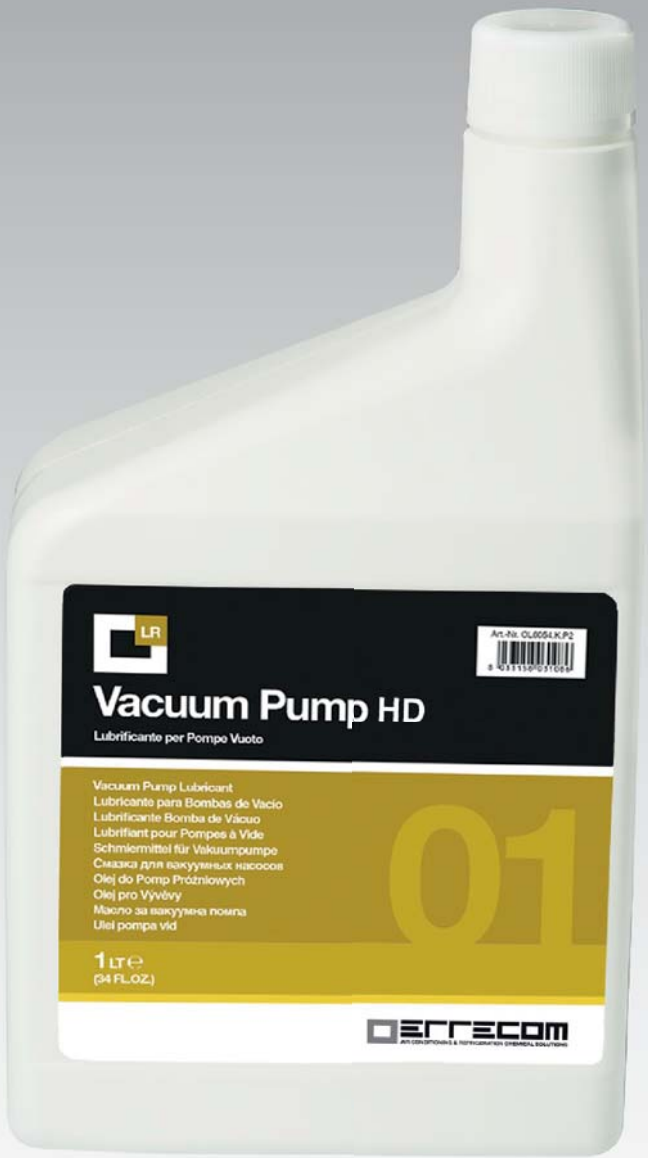
Method and reference unit	ISO 46
ISO VG	46
Kinematic viscosity @ 20°C (cSt)	143,9
Kinematic viscosity @ 40°C (cSt)	46,8
Kinematic viscosity @ 100°C (cSt)	7,6
Viscosity Index	133
Pour point (°C)	-16
Flash point (°C)	225
Specific gravity @ 15°C	0,845
Auto ignition point °C	360
Vapor pressure mbar 20 °C	$10X10^{-8}$
Vapor pressure mbar 100 °C	$1X10^{-3}$

Packaging References

ISO 46

Art.-Nr.	Description		
OL1010.Q.P2	250 ml (8.5 FL. OZ.) Container	24	2880
OL1010.M.P2	500 ml (17 FL. OZ.) Container	12	1080
OL1010.K.P2	1 Litre (34 FL. OZ.) Container	12	672
OL1010.P.P2	5 Litre (1.32 GAL) Container	02	-

**80x120xH200 cm (31,50x47,25xH78,75 inch.)



AVAILABLE IN:
250 ml (8.5 FL. OZ.) - 500 ml (17 FL. OZ.)
1 Litre (34 FL. OZ.) - 5 Litre (1.32 GAL)

Type of Refrigerant		Temperature		
GAS	**Category**	**From (°C)**	**To (°C)**	**Piston**
R290	Propane	-30	+20	POE 100
R1270	Propylene	-30	+20	POE 100
R600	Butane	-30	+20	POE 100
R600a	Isobutane	-30	+20	POE 100
R717	Ammonia	-30	+10	
R717	Ammonia	-40	+10	
R717	Ammonia	-50	+10	
R717	NH3 Dry Exp	-50	+10	PAG Premium
R744	CO2 Sub C.	-50	-10	PAG per CO2
R744	CO2 Trans C.	-50	-10	PAG perCO2
R23	HFC	-100	-40	POE 22/32
R134a	HFC	-20	+10	POE 32/55
R134a	HFC	-30	+10	POE 22/32
R404A	HFC	-40	-30	POE 32/55
R404A	HFC	-50	-30	POE 22/32
R407C	HFC	0	+10	POE 55/68
R410A	HFC	-45	+10	POE 22/32
R410A	HFC	-25	+10	POE 32/55
R410B	HFC	-25	+10	POE 32/55
R417A	HFC	-15	+15	POE 55/68
R422A	HFC	-45	-5	POE 22/32
R422A	HFC	-25	-5	POE 32/55
R422D	HFC	-45	+10	POE 22/32
R422D	HFC	-25	+10	POE 32/55
R427A	HFC	-40	+10	POE 22/32
R427A	HFC	-20	+10	POE 55
R507	HFC	-40	0	POE 22/32
R507	HFC	-20	0	POE 55

Type of Compressor				
s (ISO)	Screw (ISO)		Centrifugal (ISO)	
PA0 68	PAG	PAO 68	PAG	PAO 68
PAO 68	PAG	PAO 68	PAG	PAO 68
PAO 68	PAG	PAO 68	PAG	PAO 68
PAO 68	PAG	PAO 68	PAG	PAO 68
PAO 68				
PAO 68				
PAO 68				
PAO 68	PAG Premium	PAO 68		
	POE 170			
	POE 170/220		POE 68	
	POE 100		POE 68	
	POE 170/220		POE 68	
	POE 100		POE 68	
	POE 170/220			
	POE 100		POE 68	
	POE 170/220		POE 68	
	POE 170/220		POE 68	
	POE 170/220		POE 68	
	POE 100		POE 68	
	POE 170/220		POE 68	
	POE 100		POE 68	
	POE 170/220		POE 68	
	POE 100		POE 68	
	POE 170/220		POE 68	
	POE 100		POE 68	
	POE 170/220		POE 68	

Product Name	PAG 46 R134a	PAG 100 R134a	PAG 125 R134a
ISO VG	46	100	125
Kinematic viscosity @ 40°C (cSt)	46	100	125
Kinematic viscosity @ 100°C (cSt)	8,6	19	21
Viscosity Index	184	212	199
Total Acid Number (mg KOH/g)	0,02	0,02	0,02
Pour point (°C)	-43	-40	-42
Flash point (°C)	226	230	215
Density @ 15°C (g/cm³)	0,986	0,993	1
Product Name	**PAG 46 R1234yf**	**PAG 100 R1234yf**	**PAG Universal R1234yf**
ISO VG	46	100	68
Kinematic viscosity @ 40°C (cSt)	46	100	68
Kinematic viscosity @ 100°C (cSt)	10	20	14
Viscosity Index	213	212	208
Total Acid Number (mg KOH/g)	0,02	0,02	0,02
Pour point (°C)	-49	-41	-46
Flash point (°C)	220	230	215
Density @ 15°C (g/cm³)	0,999	1,002	0,999

Product Name	PAG Premium
ISO VG	68
Kinematic viscosity @ 40°C (cSt)	68
Kinematic viscosity @ 100°C (cSt)	13
Viscosity Index	208
Total Acid Number (mg KOH/g)	0,02
Pour point (°C)	-42
Flash point (°C)	210
Density @ 15°C (g/cm³)	0,997

Product Name	PAG 46 per CO2	PAG 68 per CO2
ISO VG	46	68
Kinematic viscosity @ 40°C (cSt)	46	68
Kinematic viscosity @ 100°C (cSt)	10,7	14
Viscosity Index	213	210
Total Acid Number (mg KOH/g)	0,02	0,02
Pour point (°C)	-49	-46
Flash point (°C)	219	215
Density @ 15°C (g/cm³)	0,998	0,998

Product Name	POE 22	POE 32	POE 46
ISO VG	22	32	46
Kinematic viscosity @ 40°C (cSt)	22	32	46
Kinematic viscosity @ 100°C (cSt)	4,1	5,3	7,3
Viscosity Index	82	94	93
Total Acid Number (mg KOH/g)	0,03	0,02	0,02
Pour point (°C)	-54	-48	-45
Flash point (°C)	198	215	235
Density @ 15°C (g/cm³)	0,935	0,938	0,939

Product Name	POE 100 Hybrid
ISO VG	100
Kinematic viscosity @ 40°C (cSt)	100
Kinematic viscosity @ 100°C (cSt)	11
Viscosity Index	99
Total Acid Number (mg KOH/g)	0,02
Pour point (°C)	-33
Flash point (°C)	260
Density @ 15°C (g/cm³)	0,958
Volume Resistivity	1x10e14

Product Name	PAO
ISO VG	68
Kinematic viscosity @ 40°C (cSt)	68
Kinematic viscosity @ 100°C (cSt)	10
Viscosity Index	150
Total Acid Number (mg KOH/g)	0,03
Pour point (°C)	-50
Flash point (°C)	>250
Density @ 15°C (g/cm³)	0,835

Product Name	Vacuum Pump ISO32	Vacuum Pump ISO46	Vacuum Pump ISO68
ISO VG	32	46	68
Kinematic viscosity @ 20°C (cSt)	-	-	-
Kinematic viscosity @ 40°C (cSt)	32,2	46,4	67,9
Kinematic viscosity @ 100°C (cSt)	5,5	7,2	8,8
Viscosity Index	105	103	102
Pour point (°C)	-31	-26	-25
Flash point (°C)	210	215	220
Density @ 15°C (g/cm³)	0,87	0,872	0,877
Specific Gravity @ 15°C	-	-	-
Auto Ignition Point °C	-	-	-
Vapor Pressure Mbar 20°C	-	-	-
Vapor Pressure Mbar 100°C	-	-	-

PAG 150 R134a	PAG Universal R134a
150	68
150	68
25	12,4
200	181
0,02	0,02
-40	-40
230	215
1,005	0,992

POE 55	POE 68	POE 100	POE 170
55	68	100	170
55	68	100	170
7,9	8,5	11,9	16,3
93	90	108	101
0,02	0,02	0,02	0,02
-42	-39	-42	-33
245	255	270	280
0,94	0,941	0,975	0,971

Vacuum Pump HD
46
143,9
46,8
7,6
133
-16
225
-
0,845
360
$10x10^{-8}$
$1x10^{-3}$

NOTES

CAT.L_03_17.EN

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T (+39) 030 971 9096
F (+39) 030 977 0123

info@errecom.it
errecom.com

Via Industriale, 14
25030 Corzano (BS), Italy.