Air conditioning and refrigeration lubricants
Shrieve has developed a strong presence in the refrigeration and air conditioning compressor lubricant markets, providing a complete range of technically advanced ZEROL synthetic lubricants for application in systems employing a wide variety of refrigerants, including CFCs, HCFCs, and HFCs. We offer a full range of synthetic technologies for mobile applications, from OEM compliant products for existing HFC systems, through to lubricants for new systems employing primary alternate refrigerants such as HFO 1234yf (R1234yf) and CO₂ (R744).

A combination of many performance attributes has led to a broad global acceptance and usage of synthetics such as polyalkylene glycol (PAG) and polyol ester (POE) for the lubrication of mobile air conditioning (MAC) compressors. PAG technology broadly predominates due to the excellent lubricity, stability, system compatibility and wide temperature operating range which is afforded by this type of base fluid. Further to EU legislation requiring the adoption of less ozone depleting refrigerant technologies in MAC systems, PAG lubricants remain the preferred lubricants of choice for new refrigerant types, including both R1234yf and R744.

For R134a refrigerant mobile based systems: ZEROL® PAG

Our standard ZEROL PAG range are fully formulated ISO grade ‘single end-capped’ polyalkylene glycol lubricants designed specifically for application with R134a refrigerant in mobile air conditioning systems. These fully synthetic lubricants are a cost effective option for aftermarket applications where top-up of the existing system employing PAG lubricant is required during servicing.

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Single end-capped PAG lubricant, formulated with wear prevention technology</td>
<td>Good hydrodynamic and boundary lubrication properties, resulting in minimal levels of wear</td>
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<tr>
<td>Specifically designed for R134a refrigerant in mobile air conditioning systems</td>
<td>Full miscibility with R134a across the full MAC operating temperature range</td>
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<tr>
<td>Good thermal, chemical and hydrolytic stability</td>
<td>Helps to reduce downtime and lower maintenance costs</td>
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<tr>
<td>High Viscosity Index</td>
<td>Helps to ensure lubrication is not compromised at temperature extremes</td>
</tr>
<tr>
<td>Excellent system component compatibility</td>
<td>Compatible with metallic and elastomeric components commonly employed in MAC systems</td>
</tr>
<tr>
<td>High flash point and low pour point</td>
<td>Helps to ensure operation across the broadest temperature range</td>
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The Shrieve ZEROL PAG range is available in the following ISO viscosity grades to accommodate varying system designs:

- ZEROL PAG 46  •  ZEROL PAG 56  •  ZEROL PAG 100  •  ZEROL PAG 150
For R134a refrigerant based systems:
**ZEROL® RFL-X**
ZEROL RFL-X ‘double-end capped’ or ‘di-capped’ PAGs have been designed specifically as an OEM approved product choice for application with R134a refrigerant in MAC systems. They are formulated for compressors that require a superior, high-performance lubricant with viscosities ranging between 46-150 cSt @ 40°C. They are fully compliant with the technical requirements for MAC double end-capped PAG lubricants specified by leading global compressor manufacturers and carry a number of OEM approvals.

### Features
- Double end-capped PAG lubricant with optimised miscibility in R134a
- Exceptional EP performance, primarily derived from the di-capped base fluid structure
- Lower water absorbing tendency compared to alternative PAG products
- Excellent thermal, chemical and hydrolytic stability
- High flash point and low pour point
- Excellent system component compatibility

### Benefits
- Maximises oil return to the compressor ensuring highest system efficiency
- Excellent hydrodynamic and boundary lubrication properties, resulting in minimised levels of wear
- Improves system reliability and lifetime
- Helps to reduce downtime and maintenance costs
- Helps to ensure operation across the broadest temperature range
- Compatible with metallic and elastomeric components commonly employed in MAC systems

The Shrieve ZEROL RFL-X range is available in the following ISO viscosity grades to accommodate varying system designs:

- ZEROL RFL 46-X
- ZEROL RFL 100-X
- ZEROL RFL 150-X

For hybrid/electrically driven R134a mobile refrigerant based systems:
**ZEROL® HYBRID**
An increasing industry trend towards hybrid and electrically driven vehicles has led to specific requirements for these vehicles air-conditioning lubricants. This is primarily related to ensuring that the electrical insulating properties of the lubricant are suitable for use in electrically driven compressors where motor windings are in direct contact with the lubricant. ZEROL HYBRID 46 is a polyalkylene glycol lubricant designed specifically for application in electrically driven mobile air conditioning compressors, manufactured to exacting standards which ensures the electrical resistivity properties are suitable for the use of this material in hybrid & electric systems.

### ZEROL HYBRID 46 advantages:
- Compressor production plant complexity and dealership/workshop contamination issues can be avoided by the use of a single PAG type lubricant for both conventional belt driven and electrically driven MAC compressors. ZEROL HYBRID 46 is suitable for use in both belt and electrically driven systems and is compatible with all PAG technologies currently employed in belt driven compressors. The use of a single PAG technology therefore eliminates the safety hazard potentially posed by the contamination of a hybrid system with a lubricant not designed for application in a hybrid system
- Suitable for use in R134a systems
- Highly optimised product quality to ensure specification compliance with electrical property requirements for hybrid applications
- Superior lubricity, viscosity index and chemical stability compared with non-PAG based technologies available for electrically driven systems
For R1234yf mobile refrigerant based systems:
ZEROL® HD
With increasing emphasis being placed on the use of more environmentally conscious refrigerants in the refrigeration and air conditioning industry, the mobile sector has pioneered the use of Hydro Fluoro Olefin (HFO 1234yf) technology as a cost-effective alternative to R134a. The mobile air conditioning industry has validated this refrigerant as the primary technology to replace R134a. Shrieve has participated proactively throughout the industry during this period and developed the synthetic lubricant solutions specifically required to meet the performance parameters for mobile R1234yf based applications.

The ZEROL HD range is based on double end-capped PAG technology optimised specifically to maximise miscibility in R1234yf, thereby ensuring highest levels of system efficiency, and contains additive technology specifically developed to ensuring thermal, chemical and hydrolytic system stability is maintained in R1234yf belt driven applications.

The ZEROL HD range complies with the performance specifications being established by leading compressor OEMs for lubricants to be utilised with R1234yf, and is available in the following grades*:

* ZEROL HD46  •  ZEROL HD100
*Further viscosity grades can be implemented as required

For hybrid/electrically driven R1234yf mobile refrigerant based systems:
ZEROL® HD ELECTRIC
This PAG based lubricant has been specifically designed to meet the needs of electrically driven compressors utilising R1234yf as a refrigerant and is available as a VG 46 grade.

For R1234ze stationary systems:
ZEROL® HD TECHNOLOGY
Shrieve is currently developing optimised lubricant solutions for medium temperature applications utilising the new R1234ze refrigerant and blends being considered by the stationary HVAC&R industry. Once refrigerant formulations have been finalised, Shrieve will announce specific lubricant technology to meet the needs of the industry.

For R744 (CO₂) refrigerant based systems:
ZEROL® RFL-EP
The refrigeration industry has recently realised a number of significant changes due to problems associated with ozone depletion. Halogen-free alternatives are now offering significant possibilities as refrigerants, with more environmentally acceptable refrigerant choices now being adopted, such as ammonia (R717), propane (R290), iso-butane (R600a) and carbon dioxide (R744).

Our ZEROL RFL-EP range provides efficient lubrication for both stationary and mobile R744 compressors, with optimised levels of refrigerant miscibility being achieved as a result of the capping technology.
Our ZEROL RFL-EP range is extensively OEM approved for established applications utilising R744 (e.g. commercial and industrial stationary systems) and is available in the following viscosity grades to accommodate varying system designs:


For systems utilising ester lubricant technology:

**ZEROL® ESTER**

The ZEROL ESTER range is a complementary range of synthetic air conditioning/refrigeration lubricants based on polyol ester (POE) technology. ZEROL ESTERs are suitable for use in HFC systems, including mobile and stationary commercial/industrial applications, where an ester lubricant has been specified.

ZEROL ESTERs are produced to the tightest moisture and acid value tolerances to meet the exacting standards for refrigeration and air conditioning applications with low moisture and TAN specifications. ZEROL ESTERs offer excellent miscibility and compatibility with HFC refrigerants, high thermal stability, together with good electrical insulating properties for hermetic systems.

**ZEROL ESTER 85H** has been developed for mobile R1234yf applications where an ester lubricant has been specified. Our range is summarised as follows:

- ZEROL ESTER 22 • ZEROL ESTER 32 • ZEROL ESTER 46 • ZEROL ESTER 68 • ZEROL ESTER 85H (for R1234yf applications where specified) • ZEROL ESTER 100 • ZEROL ESTER 170

**ZEROL PAG & ESTER lubricant technology application summary**

<table>
<thead>
<tr>
<th>Lubricant required</th>
<th>R134a MAC Belt driven</th>
<th>R134a MAC Hybrid/electric</th>
<th>R134a Stationary</th>
<th>R717 Stationary</th>
<th>R744 Stationary or MAC systems</th>
<th>R1234yf MAC systems</th>
<th>R1234yf MAC Hybrid/electric</th>
<th>R1234ze Stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium PAG</td>
<td>ZEROL RFL-X</td>
<td>ZEROL HYBRID 46</td>
<td>ZEROL PAG R717</td>
<td>ZEROL RFL-EP</td>
<td>ZEROL HD</td>
<td>ZEROL HD ELECTRIC</td>
<td>Please contact us for further information</td>
<td></td>
</tr>
<tr>
<td>Standard PAG</td>
<td>ZEROL PAG</td>
<td></td>
<td>Where a miscible lubricant is required</td>
<td>ZEROL ESTER 85H</td>
<td>ZEROL ESTER 85H</td>
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<tr>
<td>Polyol Ester (POE)</td>
<td>ZEROL ESTER</td>
<td>ZEROL ESTER</td>
<td>ZEROL ESTER</td>
<td>ZEROL ESTER 85H</td>
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Note: Instructions from the system builder should always be followed.
The ZEROL® product range can be offered in a variety of pack sizes to suit usage requirements.

For more information on our complete ZEROL range of synthetic lubricants, please contact us at any of the following regional locations: