

# Air conditioning solutions

for new generation refrigerants



**snow leopard**  
technical lubricants



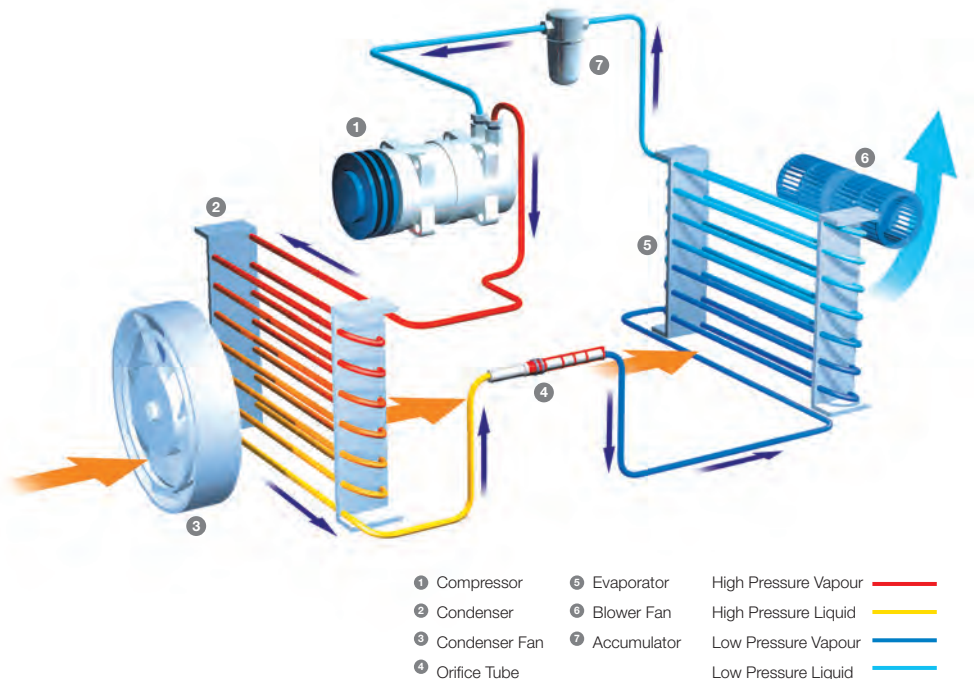
# Why new generation refrigerants need next generation lubricants

R1234yf, the new Automotive HFO refrigerant, has been with us since the start of 2011 when all newly Type Approved cars had to use an AC refrigerant with a GWP below 150. Since January 2017, all newly built vehicles have had to use R1234yf because there is no commercially viable alternative. This new gas did allow car manufacturers to continue using most of the existing A/C components without major re-design, but R1234yf

- is less stable and more expensive than R134a
- requires special compressor lubricants, and
- requires more careful servicing than its predecessors

Added to that, A/C electric compressors, which need special lubricants with the correct dielectric properties, are increasing common as more hybrids and plug-in electric vehicles join the road.

That is why you need the knowledge and experience of Primalec to provide you with the right lubricants for the job.



## What is the A/C lubricant for?

Its main job is of course to lubricate the moving parts of the refrigerant compressor, dissipate heat, seal the compression chambers and valves and keep the seals and flexible pipes throughout the system in good condition, minimising leakage through elastomer degradation.

The oil shares its home with the refrigerant, so the two must be compatible and mix well together, and with all the different materials used in a mobile A/C system. Good miscibility lets the circulating refrigerant carry oil safely round the system to the o-rings, seals and flexible pipework and back to the compressor.

Electric compressors add a further dimension in that refrigerant and oil come into contact with live electrical parts, so they need a lubricant with the correct de-electric profile.

That is why it is important to use the right oil for the job.

### Key points for R1234yf:

- Normal Aftermarket R134a PAG oils do not mix with R1234yf
- R1234yf is relatively unstable and needs optimally additised double end-capped HFO-PAG oils, blended from select base stocks
- Electric compressors must have the correct di-electric profile and compatibility with R1234yf
- R1234yf is mildly flammable
- One or two VMs specify a POE for electric R1234yf compressors

To make your job easier and more profitable, Primalec has teamed up with world leading specialists in synthetic lubricant chemistry to bring you a complete yet compact range of Mobile AC oils that you can trust.

## Snow Leopard

### technical lubricants offer OEM-quality solutions

Inspired by that rare and beautiful feline that inhabits the high Himalayas, Snow Leopard Technical Lubricants are made for the alternating hot and cold environments of A/C and refrigeration systems.

Formulated from select synthesised oils, refined with special additives to meet and exceed the needs of your compressor, Snow Leopard oils have the power and performance to lubricate and protect your refrigerant system and to optimise the performance of any AC&R system.

## R1234yf + R134a + Hybrid/ev

**NEW formula Snow Leopard HFO-PAG46e and HFO-PAG100e are the right oils to use in R1234yf systems when, as most VMs do, a PAG based lubricant is specified.**

These low moisture HFO-PAGs are now fully compatible with electric compressors found in Hybrids and plug-in EVs. They also give better lubricity and performance in all R134a systems than any ordinary R134a PAG oil. Their low hygroscopicity and exceptional viscosity index enhances compressor life by ensuring efficient running even at high temperatures.

That means that Snow Leopard HFO-PAGs can be considered as a genuine 'one type fits all' solution. When you choose these top level lubricants, you escape the risk of using the wrong oil.



### Key points:

- Optimum miscibility with R1234yf and R134a refrigerants
- Optimised additive technology <3% by weight
- Select double end-capped base fluid with >80% capping efficiency for superior lubricity
- Low hygroscopicity minimises moisture ingress
- High Viscosity Index for efficiency at high temperatures
- Good chemical stability

**MRL85 is a polyolester (POE) based lubricant that has been engineered with an additive package that is better suited R1234yf than standard POE oils.** Some VMs specify a POE oil for their R134a hybrid and electric vehicles, and one or two have done so for R1234yf vehicles.

Being compatible with R1234yf, R134a, and with electric compressors, MRL85 is your preferred choice for mobile AC compressors when the vehicle manufacturer has specified a POE.



**With Snow Leopard oils, just 3 part numbers will cover the market**

**AC55046A** - 250ml | Snow Leopard HFO-PAG46e AC lubricant  
R1234yf/R134a/HYB/EV

**AC55100A** - 250ml | Snow Leopard HFO-PAG100e AC lubricant  
R1234yf/R134a/HYB/EV

**AC54085A** - 250ml | Snow Leopard MRL85 POE AC lubricant -  
R1234yf/R134a/HYB/EV

*Other pack sizes and types are available, including our unique Concertina hermetic cartridges. Please ask for a full list.*



## R134a Snow Leopard ExtraCool™ PAG oils for R134a

ExtraCool Glo-PAG46/ExtraCool Glo-PAG100 HIGH PERFORMANCE

**These premium high performance R134a PAGs restore original cooling power to older A/Cs.** Their special additive package removes gummy deposits built up over years, and forms a slippery thin film boundary layer on metal surfaces. The resultant faster refrigerant flow, better oil return and more efficient heat exchange help restore the original cooling power to older A/Cs.

ExtraCool R134a PAGs also contain Glo-Leak® UV for leak detection. They are great when topping up a system which has already been treated with Glo-Leak®, so as to maintain the oil's uv-fluorescence and also when refilling with oil after a system flush and/or a change of compressor. They should not be used with R1234yf.



**AC53046A** - 250ml | ExtraCool HP-PAG46 R134a Glo-Lube

**AC53100A** - 250ml | ExtraCool HP-PAG100 R134a Glo-Lube

**AC53046Y** - 260ml Concertina-Nozzle | ExtraCool HP-PAG46 R134a lubricant

*Other pack sizes and types are available, including our unique Concertina hermetic cartridges. Please ask for a full list.*

## Airco Lube Standard every day R134a PAGs.

Airco Lube PAGs are standard mono end capped oils. They are fully synthetic and additised polyalkylene glycols which are well suited to automotive aftermarket use, in most normal climatic and environmental conditions experienced in Europe. They should not be used with R1234yf.

Available in ISO grades 46, 100 and 150. Packaged in Primalec's unique moisture barrier treated polymer bottle under a nitrogen blanket and heat sealed lid.



**AC2173A** - 250ml | **AC2173B** - 1000ml  
Airco Lube standard PAG oil ISO 46

**AC2174A** - 250ml | **AC2174B** - 1000ml  
Airco Lube standard PAG oil ISO 100

**AC2175A** - 250ml | **AC2175B** - 1000ml  
Airco Lube standard PAG oil ISO 150

## Safely add lubricants to air conditioners Primalec's Concertina hermetic injection system

Concertina adds measured amounts of Glo-Leak UV test fluid, PAG oil, Ester oil or other lubricants, without degassing, and without adding refrigerant. (The law requires you to leak-test before topping up refrigerant)

The factory pre-filled Concertina cartridge collapses as the liquid is forced out by back pressure or drawn out by vacuum. It stays collapsed thanks to the valve built into the bottle cap. This allows the liquid out, prevents air and moisture entering in. This also helps to prevent use of the wrong lubricants.

There are two types:



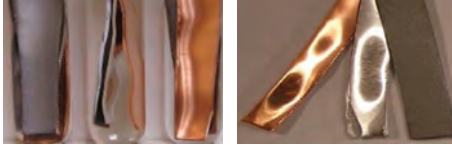
Soft skin vacuum activated cartridges, which are typically fitted to air conditioning service machines. Concertina vacuum cartridges are offered with either a unique fitting for equipment manufacturers, or an industry standard fitting. They are mounted directly onto the machine in place of standard bottles.

Injectable hard skin cartridges are for use with a Concertina injector. For direct injection, place the cartridge inside a Concertina injector tool, connect its hose to the system's low pressure service port, and the liquid is forced in by the turn of your hand



R1234yf breaks down rapidly in the atmosphere. It is intrinsically less stable than older refrigerants. Therefore the compressor oil must remain stable and retain its lubricity in all conditions. The data below is drawn from tests on our HFO-PAGs and on three other products sold in Europe today.

### Snow Leopard HFO-PAG46 - Stability test



Appearance of tubes & metal coupons pre-test



Appearance of tubes & metal coupons post-test

#### ASHRAE 97/SAE J2670

- The chemical, thermal and hydrolytic stability of Snow Leopard HFO-PAG46 has been evaluated using ASHRAE 97 sealed glass tube testing.
- Testing was conducted under standard conditions of 50/50 wt/wt R1234yf/lubricant with 1000ppm water at 175°C, for 14 days.
- After aging the tube contents are examined for change in lubricant colour, cloudiness, flocculant, particulate and changes in the appearance of the metal coupons such as surface corrosion and metal plating.

### Competitive Products Analysis – Composition:

Tests of 4 products currently sold on the European market

#### Competitor A - Compositional Analysis

**Basefluid composition is 100%**

- A standard type of single end-capped water insoluble single end-capped PAG
- Butanol initiated propoxylate (100%), hydroxyl terminated
- Mn approx. 1600

#### Competitor B - Compositional Analysis

**Basefluid composition is a blended mixture of 3 components:**

- A polyol type TMP (trimethylol propane) ester: 25wt%
- A phthalate ester: 50wt%
- A standard type single end-capped PAG, water insoluble butanol initiated propoxylate: 25wt%

#### Competitor C - Compositional Analysis

**Basefluid composition is a double end-capped propoxylate. It is present at 77.9 wt%**

Competitor C is **heavily additised** with the following components:

- Alpha-olefin epoxide
- Beta-pinene
- Butylated hydroxytoluene
- Tricresyl phosphate (TCP)

#### Snow Leopard HFO-PAG46

**Basefluid composition is a double end-capped PAG**

- Basefluid is present at >97wt%.  
**HFO-PAG46** contains low **level additisation** at <3wt% consisting of:
  - Antioxidation
  - Yellow & white metals corrosion protection
  - Extreme-pressure/antiwear
  - Acid scavenging

### Competitive Products Analysis - Conclusions

	Competitor A	Competitor B	Competitor C	Snow Leopard HFO-PAG46
Appearance	Unchanged	<b>Two phases &amp; cloudy</b>	Unchanged	Slight yellowing of lubricant
Coupons	Unchanged	<b>Copper completely black</b>	Unchanged	Unchanged
TAN mgKOH/g	0.01/0.35	0.31/0.90	0.03/0.38	0.05/0.13
Fluoride (ppm) [b/a]	<b>0/196</b>	0/1	0/71	0/44
Butyrate (ppm) [b/a]	0/300	0/17	0/149	0/119
Sulphate	0/0	<b>24</b>	0/0	0/0

- Lubricant **separation** indicates immiscibility with refrigerant
- Change to **coupons** indicates metal incompatibility
- Increase in **fluoride** levels indicates refrigerant breakdown

- Increase in **butyrate** levels indicates lubricant breakdown
- Increase in **sulphate** levels indicates issues with additive package

Conclusion	Competitor A	Competitor B	Competitor C	Snow Leopard HFO-PAG46
	Significant refrigerant & lubricant breakdown	Inappropriate add. pack for R1234yf; Attacks Cu & brass	Acceptable performance	<b>Good performance</b>

Use the chart below to select the right oils for the vehicle you are working on.

Refrigerant Type	Compressor Type	Oil Type	Cross ref examples	Primaltec Code		
				AircoLube	Snow Leopard	
R134a	Belt driven	PAG 46	ND-8, SP10, ZXL100, WSH-M1C231-B, YN-12, JLM12260, NO52-154-VXOO	AC2173	AC53046	AC55046
		PAG 100	ND-9, SP20, ZXL200, RS20	AC2174	AC53100	AC55100
		PAG 150	SP15, UCON-488	AC2175	AC53150	-
	Electric	HFO-PAG46e		-	-	AC55046
		HFO-PAG100e		-	-	AC55100
		POE	ND-11, SE-10Y, MA68EV	AC2177	-	AC54085
R1234yf	Belt driven	HFO-PAG46e	ND-12, SPA2, PS-D1, WSH-M1C321-B, VC200yf, FD46XG	-	-	AC55046
		HFO-PAG100e		-	-	AC55100
	Electric	HFO-PAG46e	FD46XG is a hermetic PAG	-	-	AC55046
		HFO-PAG100e		-	-	AC55100
		HFO-POE	ND-11	-	-	AC54085

Snow Leopard R1234yf oils are also compatible with R134a. HFO-PAG46e & HFO-PAG100 are double end-capped polyalkylene glycol oils with optimal additisation that meet OEM specifications. HFO-PAG46e may be used in all mobile AC systems, whether belt driven or electric, for which a PAG is specified by the VM. MRL85 is a POE based lubricant that meets OEM specifications for use in all MAC systems for which a POE is specified by the equipment manufacturer.

CO2 R744	EP-PAG46	Extreme PAG RL46 CO2 system lubricant	AC56046
	EP-PAG68	Extreme PAG RL68 CO2 system lubricant	AC56068
	EP-PAG100	Extreme PAG RL100 CO2 system lubricant	AC56100
Hydrocarbons (HCs) R290 R600 R600a & Ammonia R717	Alkylbenzene	Zerol 150 Alkylbenzene lubricant ISO VG 32	AC57032
		Zerol 250 Alkylbenzene lubricant ISO VG 46	AC57046
		Zerol 150 Alkylbenzene lubricant ISO VG 68	AC57068

Some of the customers who benefit from Primaltec's air conditioning solutions



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