

- The industry's choice of a fully formulated polyol ester lubricant
- Most OEM approved, recognizable POE lubricant in the market
- Some approvals: RL32-3MAF/RL68HB for Copeland, Caryle's RL68H, and RL85HB for Bitzer
- For HCFC, HFC, HFO/HFC blends, hydrocarbon and CO<sub>2</sub> refrigerants
- Compatible with mineral oils, alkylbenzenes, PVE and PAG lubricants
- RL68HB and RL85HB for subcritical and transcritical CO<sub>2</sub> applications
- Full line-up types and package sizes for market needs

## Description

The Emkarate family of lubricants is a wide range of polyol ester refrigeration oil products. They are designed specifically for use with HFC refrigerants, now HFC/HFO blends, HFO, hydrocarbon and CO<sub>2</sub> refrigerants developed to meet the performance demands of the refrigeration industry. This superior performance is achieved with basefluids that are specifically formulated to deliver optimum performance with minimal additive levels.

## Application

The requirements of today's refrigeration and air conditioning compressor lubricants are complex. They must be compatible and miscible with the HFC refrigerants and newer refrigerant options, and they must be compatible and miscible with the older refrigerants, such as HCFCs, as well as mineral and alkylbenzene oils. Polyol ester lubricants meet these needs, and the EMKARATE RL line is the preferred industry choice. Working in close collaboration with compressor and system manufacturers, these OEM-approved POE lubricants cover a wide viscosity range from 7 cSt (35-40 SUS) to 220 cSt (1100 SUS) to suit most applications. The lubricants have excellent thermal and chemical stability, and are compatible with a wide range of elastomers, polymeric materials and other materials of construction. Additionally, then higher viscosity index is an indication that their effective viscosity will not change drastically with the wide swings in temperature seen by most typical refrigeration and air conditioning systems. They are the preferred choice for servicing and retrofitting existing equipment as well as for OEM charging.

## Refrigeration Oils

### Emkarate® RL Lubricants



## Critical issues

**Additives vs Non-Additives.** The preference is to specify lubricants that do not contain additives, as they are not needed in the majority of cases using properly formulated base lubricants. Experiences such as decreased lubricant stability, sludge formation, and component deposits, are concerns related to the use of additives. At the same time, it is understood that additives can also enhance performance in certain particularly demanding applications may be necessary, such as CO<sub>2</sub> systems.

**Miscibility.** Since some lubricant will travel with the refrigerant in any air conditioning or refrigeration system, it is imperative that they be fully miscible and soluble with one another...at all temperatures that the system will experience. This ensures good oil return and lubricity to the compressor, and no blockage or loss of heat transfer in the evaporator. In traditional systems, the HCFC refrigerant is miscible and soluble with the mineral or alkylbenzene oil. On the other hand, if these oils and an HFC refrigerant are mixed, they are mutually immiscible and essentially insoluble. They will separate into two distinct phases in the evaporator and the oil will coat the inside of the tubes, resulting in a loss of heat transfer and potentially a lack of lubrication in the compressor.

HFC refrigerants and POE lubricants are fully miscible and have high mutual solubility. As a result, POE lubricants are the proper choice when using today's HFC refrigerants and the lubricant often selected with the newer choices in the market.

## Blending Different POE Brands

Compressor manufacturers often approve several lubricants for use in a particular compressor application. Part of the process of approving them is the understanding that the approved oils may end up being blended with each other in a system. The blending of approved oils is most acceptable. When in doubt, consult the compressor manufacturer.

There are two main types of POE oils currently approved for use in refrigeration compressor applications: unadditivated POEs and formulated POEs which may contain up to 3% additives.

When two unadditivated lubricants are mixed, the performance of the resulting blend is between the performance of the separate lubricants. So long as the lubricants are approved, the resulting mixture should be suitable. However, when a non-additivated lubricant is blended with an additivated lubricant, some decrease in the performance of the additive may be seen since the additive dose rate of the formulated lubricant will be diluted by the unadditivated lubricant. This can be especially problematic for formulated oils containing foaming agents as these agents tend to be very dose-rate sensitive. Care should be taken and the OEM consulted for advice.

## Moisture

Hygroscopicity is the term used to describe a lubricant's affinity for moisture, and POEs are known to be hygroscopic. They absorb water more quickly than mineral or alkylbenzene oils from the surrounding environment. For this reason, care should be exercised during the servicing of equipment charged with or about to be charged with a polyol ester.

At the same time, if acceptable packaging and good service procedures are used and care is exercised in the handling of the oil, moisture should not be a problem. If the container of the POE is metal and it is tightly sealed after each use, no serious ingress of moisture should occur to unused oil. In addition, the use of the appropriate filter-driers and proper service practices will result in the effective control and removal of moisture. In fact, since HFCs effectively compete with the POE for any moisture present (i.e. water moves from the oil to the refrigerant), the moisture will be more easily removed from the refrigerant by the filter-driers in the refrigerant-rich environment in the liquid and/or suction line.

## TYPICAL PROPERTIES

PROPERTY AND PROCEDURE	RL 22H	RL 32-3MAF	RL 32H*	RL 32HB	RL 46H	RL 46HB	RL 68H	RL 68HB	RL 68HP*	RL 85HB	RL 100H	RL 170H	RL 220H+	RL 220XL
Viscosity @ 40°C (cSt), ASTM D-445	19.3	31.2	32.5	32.5	46.8	46.8	68.3	68.3	67.1	84.1	98.5	170	220	220
Viscosity @ 100°C (cSt), ASTM D-445	4.2	5.6	5.8	5.8	7.3	7.3	9.5	9.5	9.2	10.6	11.4	17.0	19.0	19.0
Typical SUS Viscosity @ 100°F	100	150	150	150	200	200	300	300	300	425	500	850	1100	1100
Viscosity Index, ASTM D-2270	124	125	121	121	118	118	122	122	114	110	103	107	97	97
Pour Point (°C), ASTM D-97	-57	-40	-55	-46	-48	-48	-39	-39	-39	-39	-31	-25	-30	-30
Density @ 20°C (g/ml), ASTM D-1298	0.99	0.981	0.977	0.980	0.978	0.978	0.977	0.977	0.980	0.979	0.969	0.968	0.980	0.980
Flash Point (COC) (°C), ASTM D-92	260	240	264	264	260	260	270	270	270	273	265	290	300	300
Acid Value (mgKOH/g), ASTM D-974 modified	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Water Content (ppm), ASTM E 1064-85	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Refractive Index @ 28°C	1.4519	1.4540	1.4530	1.4540	1.4540	1.4540	1.4557	1.4566	1.4566	1.4590	1.4574	1.4590	1.4580	1.4580

Viscosity Designations: 3MAF = Copeland Formulation; H = High Solubility; N = HP & HC = Special for Carrier Internally Geared Chillers

## Approval Chart for Emkarate POE Lubricants

Company	Compressor Type	POE Lubricant Type
Bitzer	Reciprocating (M)	RL32H
	Reciprocating (H)	RL68H
	Reciprocating (CO <sub>2</sub> )	RL85HB
	Screw	RL170H
Blissfield	Reciprocating (M)	RL32H
	Reciprocating	RL68H
Bock	Reciprocating	RL22H, RL32H
	Reciprocating	RL46H, RL68H, RL100H
Boeing	Service (Aerospace)	RL68H
Carlyle,	Reciprocating (Marine Containers)	RL22H
Carrier,	Centrifugal (17DA & 17EA)	RL32H
Transicold	Centrifugal (17MPS & 17FA)	RL68H
	Centrifugal (17EX, 19EA, EB, FA, 19XL/XT, 19EX, 19XR/XRT)	RL68HP
	Centrifugal (17EX, 17FA with external gears, 17MPS)	RL68H
	Reciprocating (05G, 5K, 5F, 5H, 06D, 06E, 06CC)	RL68H
	Screw (23XL, 23XG, 30GX, 30HX)	RL220XL
Carrier Toyo	Reciprocating	RL68H
	Centrifugal	RL68HP
	Screw (06NF, 06NH)	RL220H+
Carrier/Transicold	Scroll	RL32-3MAF
Copeland	Reciprocating	RL32-3MAF, , RL68HB (transcritical CO <sub>2</sub> )
	Screw	RL170H
	Scroll	RL32-3MAF, RL68HB (subcritical CO <sub>2</sub> )
Dalin Bingshaw	Reciprocating	RL32H
	Screw	RL170H
Danfoss Commercial (Maneurop)	Scroll (SZ, MFZ and LFZ)	RL32H
	Reciprocating (LTZ and NTZ)	RL32H
Dorin	Reciprocating	RL22H, RL32H, RL46H, RL68H
Dunham Bush	Reciprocating (D-B Metic and D Line)	RL32H, RL68H
	Screw	RL68H
Frascold	Reciprocating	RL32H, RL68H
	Screw	RL170H
Frigopol	Reciprocating (60-DLB-13 to 80-DLB-30)	RL32H
Grasso	Reciprocating	RL32H, RL68H
	Screw	RL220H+
Hanbel	Screw (RA, RB and V Series)	RL170H, RL220H
Hartford	Reciprocating	RL32H, RL68H
	Screw	RL220H+, 120 POE (See Nu-Calgon)
HISPACOLD	Reciprocating	RL68H
Jiangsu Xuemei	Reciprocating	RL22H, RL32H
Kobelco	Screw	RL220H+
Lockheed Martin	Lockheed Compressors	RL68H
Daikin McQuay (J&E Hall)	Centrifugal	RL32H, RL46HB
	Screw	RL68H, RL68HP
	Screw	RL220H+

# Approval Chart for Emkarate POE Lubricants

Company	Compressor Type	POE Lubricant Type
MayeKawa (Mycm)	Screw	RL100H
	Reciprocating	RL68H, RL100H
NATO	NSN 6850-P4314-H	RL32H
Military NSN	NSN 9150-99-870-1432	RL32HB
	NSN 9150-01-443-9390	RL46H
	NSN 9150-01-443-9396	RL46H
	NSN 9150-01-435-1899	RL68H
	NSN 9150-01-410-8972	RL68H
	NSN 9150-01-387-4469	RL68H
Prestcold	Reciprocating	RL32-3MAF
Refcomp	Reciprocating	RL32H, RL68H
Roltec	Screw	RL46H, RL170H
Royce	Reciprocating	RL32H
Rotocold	Rotary	RL100E, RL100H
Sabroe	Reciprocating	RL32H, RL46H, RL68H
	Screw	RL68H, RL100H, RL170H, RL220H+
Tecumseh	Reciprocating	RL22H
Thermo King	Reciprocating	RL32H
Trane	Reciprocating	RL68H
	Screw	RL68H
	Scroll	RL32HB
York	Centrifugal	Call Nu-Calgon
	Reciprocating	Call Nu-Calgon
	Screw	Call Nu-Calgon
Vantanu-Cool	Orbital Vane Rotary	RL220H+
Yantai Moon	Reciprocating	RL32H

This approval list should be used as a guide only. Users should confirm with the original equipment manufacturer (OEM) which EMKARATE™ RL grade is qualified for use with a particular combination of compressor model, refrigerant and application. OEM's advice should always be taken. Only use approved lubricants. On systems calling for RL32S or RL68S substitute RL32H or RL68H, respectively.

## NU-CALGON PART NUMBERS

EMKARATE RL	VISCOSITY	1 QUART	1 GALLON	5 GALLON	53 GALLON
22H	100 SUS	-	4313-46	-	-
32H	150 SUS	4314-44	4314-46	4314-45	4314-41
32HB	150 SUS	-	-	4314-62	-
32-3MAF	150 SUS	4314-64	4314-66	4314-65	4314-67
46H	200 SUS	-	4315-46	-	4315-41
46HB	200 SUS	-	-	4315-62	-
68H	300 SUS	4316-44	4316-46	4316-45	4316-41
68HB	300 SUS	-	4316-86	4316-85	-
68HP	300 SUS	-	4316-76	-	-
85HB	425 SUS	-	4316-91	-	-
100H	500 SUS	-	4317-46	-	4316-71
170H	850 SUS	-	4318-26	4318-25	4318-21
220H+	1100 SUS	-	4318-66	4318-65	4318-61
220XL	1100 SUS	-	-	4318-75	-

Read and understand the product's label and Safety Data Sheet ("SDS") for precautionary and first aid information. The SDS is available on the Nu-Calgon website at [www.nucalgon.com](http://www.nucalgon.com).

