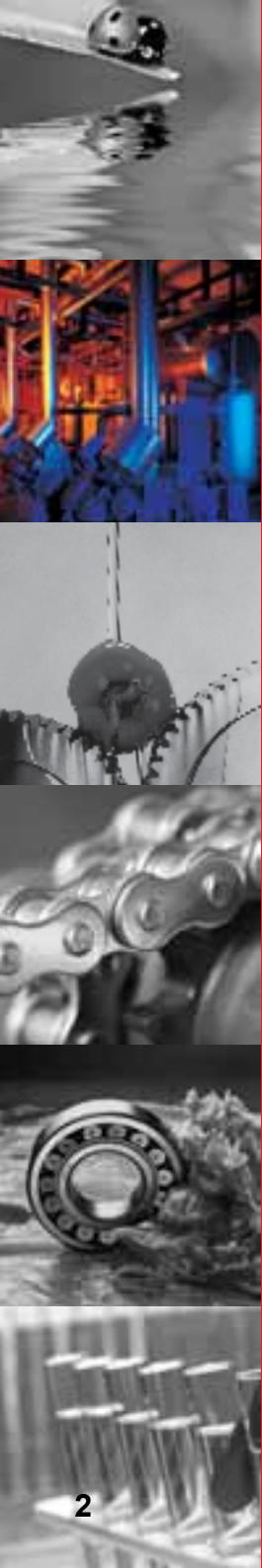




REFRIGERATION LUBRICANTS





## Matrix Specialty Lubricants

Matrix Specialty Lubricants is a company based in The Netherlands, producing and marketing specialty lubricants and greases.

Matrix Specialty Lubricants was created by a nucleus of industry specialists with a collective experience of many years working for major oil companies. Our vision is to harness new technology and with the expertise of our chemists provide the correct lubricant for each application. It is just a matter of knowledge.

Specific product information is available in our brochures and most of the technical data sheets can be found on our website; [www.lubes-portal.com](http://www.lubes-portal.com). Our main products are divided into groups with the most common being presented in our brochures. The most up to date information can always be found on our website.



### Bio lubricants

This group of products includes biodegradable hydraulic, gear, and other lubricants as well as a range of greases and concrete release agents. High performance, long life, low toxicity and biodegradability are key factors within this product group.



### Compressor, vacuum and refrigeration fluids

A comprehensive range of gas and refrigeration compressor fluids providing long life and low maintenance costs in combination with high efficiency. The range consists of mineral, and synthetic (hydro treated, PAO, POE, Alkyl Benzenes, Di-Ester, Ester, PAG, PFPE) based lubricants with a performance up to 12.000 hour drain intervals.



### Food grade lubricants

A complete range of fluids, lubricants and greases for applications whenever a food grade lubricant is required. The high performance Foodmax® line is NSF and InS approved and includes a range of spray cans.



### Industrial specialty products

This product group includes a range of specialty chain lubricants, gear oils, transformer oils and many more products. All the products exceed performance expectations contributing to lower maintenance costs.



### Grease and paste

An extensive range of specialty greases and pastes, including polyurea, calcium sulphonate, aluminium, barium, silicon, inorganic and PFPE. By using the latest technology and materials we are able to provide high performance and problem solving products.



### Specialty base oils and dispersions

These base oils are used in the formulation of metalworking fluids, biodegradable hydraulic fluids, top tier 2 stroke engine oils, mould release agents and many more. They include DTO, TOFA and various types of esters. Another range include both technical and pharmaceutical white oils.

The Matrix line of D-MAX colloidal dispersions contain products based on graphite, MoS<sub>2</sub>, PTFE and Boron Nitride (hBn). These can be used as additives, lubricants and processing products.





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## Refrigeration lubricants

The refrigeration industry has been on the move for a number of years. Being a relatively conservative industry they have been faced with many changes since the Montreal protocol came in place. New type of refrigerants require new type of lubricants. Retro-fit procedures were (and still are) needed to change over systems from old refrigerants to new HFC and blended refrigerants. In order to make this change special attention is required to the lubricant of choice. Matrix Specialty Lubricants BV has a very extensive range of refrigeration compressor fluids. This brochure highlights the majority of our products. For any special product request do not hesitate to seek the assistance of your local Matrix representative.

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### **Coolmax CFC**

Coolmax CFC is a standard refrigeration lubricant using naphthenic base oils.


### **Coolmax AB**


Coolmax AB is an Alkyl Benzene based refrigeration lubricant normally used for R 22 systems which require improved low temperature performance in comparison with Naphthenic based refrigeration fluids. Also suitable for halo carbon refrigeration.


### **Coolmax CO 85**

Coolmax CO 85 is a product specially designed to lubricate CO2 compressor units. It provides excellent miscibility with CO2 refrigerants and has excellent thermal and oxidation stability and long life in CO2 systems.

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<b>Coolmax CFC</b> 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	Pour Point °C	Flash Point °C
Coolmax CFC 32	Mineral Naphtenic	32	30	-40	168
Coolmax CFC 46	Mineral Naphtenic	46	43	-37	175
Coolmax CFC 68	Mineral Naphtenic	68	55	-36	179
Coolmax CFC 100	Mineral Naphtenic	100	100	-24	182
Coolmax CFC 150	Mineral Naphtenic	150	143	-23	194

<b>Coolmax AB</b> 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	Pour Point °C	Flash Point °C
Coolmax AB 46	Alkylbenzene	46	42.8	-44	>214
Coolmax AB 68	Alkylbenzene	68	64.9	-44	>228
Coolmax AB 100	Alkylbenzene	100	98.5	-35	>232

<b>Coolmax CO 85</b> 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	VI	Pour Point °C	Flash Point °C
Coolmax CO 85	Polyalkylene Glycol	na	80	120	-39	>282



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### **Coolmax HTA**

Coolmax HTA is a refrigeration compressor fluid (based on a 2 stage hydro treated base oil) specially designed for the use in ammonia refrigeration systems. In comparison to Naphthenic based refrigeration lubricants up to 80% less oil consumption can be realized. This will contribute to a better efficiency of the system (oil which remains in the system is isolating).


### **Coolmax PAO**


Coolmax PAO is a fully synthetic fluid of extreme low temperature properties in for example Ammonia systems which are operated below -45 C.


### **Coolmax PAG**

Coolmax PAG are double end capped Polyaklylene glycol based refrigeration lubricants suitable for automotive compressors in which and PAG based lubricant is used and HC (hydrocarbon) or CO2 refrigerant fluid applications. Coolmax PAG 4455 is specially developed to meet Friotherm OEM requirements.

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Coolmax HTA, HTA XL 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	VI	Pour Point °C	Flash Point °C
	Coolmax HTA 60	Hydro Treated	na	60	114	-44
Coolmax HTA XL	Hydro Treated	na	47	115	-63	>230

Coolmax PAO 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	VI	Pour Point °C	Flash Point °C
	Coolmax PAO 32	PAO (Polyalphaolefin)	32	34	128	-45
Coolmax PAO 46	PAO (Polyalphaolefin)	46	49	120	-39	>232
Coolmax PAO 68	PAO (Polyalphaolefin)	68	69.8	131	-35	>260
Coolmax PAO 100	PAO (Polyalphaolefin)	100	106	100	-33	>265

Coolmax PAG 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	Kinematic Viscosity 100°C	VI	Pour Point °C	Flash Point °C
	Coolmax PAG 46	PAG (Polyalkelene Glycol)	46	49.7	8.46	182	-48
Coolmax PAG 68	PAG (Polyalkelene Glycol)	68	75.3	12.16	165	-48	>215
Coolmax PAG 100	PAG (Polyalkelene Glycol)	100	95.8	16.19	187	-47	>223
Coolmax PAG 150	PAG (Polyalkelene Glycol)	150	140.2	22.38	185	-45	>226
Coolmax PAG 4455	PAG (Polyalkelene Glycol)	100	98.5	17	190	-43	>230

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## Coolmax POE

Coolmax POE is a range of Polyol Ester based lubricants for improved miscibility when used with Ozon friendly HFC and blended refrigerants. Provides excellent anti wear properties.

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## Coolmax POE

Coolmax POE is formulated to make conversions easier. Converting a HCFC (i.e. R-22) system to HFC (i.e. R-507, R-134a) often requires that you flush any mineral oil fluid from the system. Most competitive fluids will require that you have no more than 5% of the existing mineral oil remaining in the system. To reach this 5% level multiple flushes are often required, which can be very time consuming and costly. Coolmax POE makes systems conversions easier by being able to accommodate much high levels of residual mineral oil.

## Coolmax POE Hybrid


Coolmax POE Hybrid is a fluid specially formulated for electrically driven Airco compressor seen in Hybrid cars like Toyota Prius etc. Normally used compressor fluids like PAG and PAO based will be creating short circuits. Coolmax POE Hybrid provides excellent properties to safely lubricate and isolate compressors used in Hybrid cars.


## Coolmax LD Dye


Coolmax LD Dye has been formulated to assist in detecting the location of potential leakage in refrigeration systems. Can be added to almost all type of base oils and will not effect the performance of the refrigeration compressor fluids. In case of a leakage Coolmax LD Dye will highlight leaks when exposed to UV light.

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<b>Coolmax POE</b> 	Type of Base Oil	ISO VG	Kinematic Viscosity 40 °C	VI	Pour Point °C	Flash Point °C
Coolmax POE 32	POE (Polyol Ester)	32	5.85	127	-57	> 254
Coolmax POE 46	POE (Polyol Ester)	46	7.25	119	-57	> 254
Coolmax POE 68	POE (Polyol Ester)	68	9.1	109	-48	> 262
Coolmax POE 100	POE (Polyol Ester)	100	11	98	-30	> 270
Coolmax POE 150	POE (Polyol Ester)	150	13.1	97	-30	>270
Coolmax POE 170	POE (Polyol Ester)	170	14.7	95	-30	>270
Coolmax POE 220	POE (Polyol Ester)	220	23.3	124	-30	> 270

<b>Coolmax POE Hybrid</b> 	Type of Base Oil	ISO VG	Kinematic Viscosity 100 °C	VI	Pour Point °C	Flash Point °C
Coolmax POE Hybrid	POE (Polyol Ester)	na	91	135	-37	>271

<b>Coolmax LD Dye</b> 	Kinematic Viscosity 40 °C	Flash Point °C	Treat Rate
Coolmax LD Dye	34	232	1%

**Refrigerant Oil selection table**



Matrix Product	Abbreviation
Coolmax CFC 32	CFC 32
Coolmax CFC 68	CFC 68
Coolmax HTA 60	HTA 60
Coolmax HTAL XL	HTAL XL
Coolmax AB 32	AB 32
Coolmax AB 68	AB 68
Coolmax AB 100	AB 100
Coolmax PAO 32	PAO 32
Coolmax PAO 46	PAO 46
Coolmax PAO 68	PAO 68
Coolmax PAO 100	PAO 100
Coolmax PAO 220	PAO 220
Coolmax POE 22	POE 22
Coolmax POE 32	POE 32
Coolmax POE 46	POE 46
Coolmax POE 68	POE 68
Coolmax POE 100	POE 100
Coolmax POE 170	POE 170
Coolmax POE 220	POE 220
Coolmax PAG 150	PAG 150
Coolmax CO 85	CO 85

**Remarks**

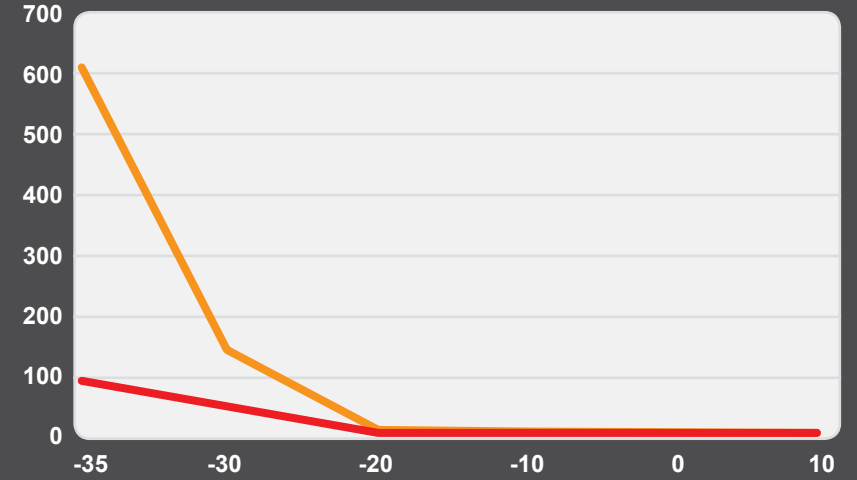
For more technical information for the Coolmax products please consult Technical Data Sheets @ [www.lubes-portal.com](http://www.lubes-portal.com)

Recommendations are given to our best knowledge, however they are guidelines Consult OEM manual

Refrigerant				Evaporator Temp.		Compressor Type				
ASHRAE Name	Type	Replacement for	From (°C)	To (°C)	Recip			Rotary Screw		Centrifugal
R12	CFC		-40	+40	CFC 32			CFC 68		
R502	CFC		-50	-20	CFC 32	AB 32		CFC 68	AB 100	
R22	HCFC		-25	+10	CFC 32	AB 32	PAO 68	CFC 68	AB 100	
R22	HCFC		-30	+10		AB 32	PAO 68		AB 100	
R22	HCFC		-40	+10		AB 32			AB 100	
R22	HCFC		-50	+10		AB 32			AB 68	
R123	HCFC	R11	0	+20						
R124	HCFC	R114	0	+80	CFC 68			AB 100		
R401a	HCFC	R12	-20	+10	CFC 32	AB 32				
R402a	HCFC	R502	-50	-30	AB 32					
R408a	HCFC	R502	-50	-30	AB 32			AB 100		
R409a	HCFC	R12	-20	+10	CFC 32	AB 32				
R290	C3H8(propane)		-30	+20	CFC 68			PAG 150		PAG 150
R600/600a	Butane & Iso But.		-30	+20	CFC 68			PAG 150		PAG 150
R717	NH3(ammonia)		-30	+10	CFC 68	HTA 60	PAO 68	CFC 68	PAO 68	CFC 68
R717	NH3(ammonia)		-50	+10		HTAL XL	PAO 68		PAO 68	CFC 68
R744	CO2		-55	-10			CO 85	CO 85		CO 85
R23	HFC		-100	-40	POE 22					
R134a	HFC	R12	-20	+10	POE 32			POE 220		POE 68
R134a	HFC	R12	-30	+10	POE 22			POE 100		POE 68
R404a	HFC	R502	-40	-30	POE 32			POE 220		POE 68
R404a	HFC	R502	-50	-30	POE 22			POE 100		POE 68
R407c	HFC	R22	0	+10	POE 68			POE 220		
R410a	HFC		-45	+10	POE 22			POE 100		POE 68
R410a	HFC		-25	+10	POE 32			POE 220		POE 68
R410b	HFC		-25	+10	POE 32			POE 220		POE 68
R417a (Isceon M059)	HFC	R22	-15	+15	POE 68			POE 220		POE 68
R422a (Isceon M079)	HFC	R22	-45	-5	POE 22			POE 100		POE 68
R422a (Isceon M079)	HFC	R22	-25	-5	POE 32			POE 220		POE 68
R422d (Isceon M029)	HFC	R22	-45	+10	POE 22			POE 100		POE 68
R422d (Isceon M029)	HFC	R22	-25	+10	POE 32			POE 220		POE 68
R427a (FX 100)	HFC	R22	-40	+10	POE 22			POE 100		POE 68
R427a (FX 100)	HFC	R22	-20	+10	POE 46			POE 220		POE 68
R507/507a	HFC		-40	0	POE 22			POE 100		POE 68
R507/507a	HFC		-20	0	POE 46			POE 220		POE 68

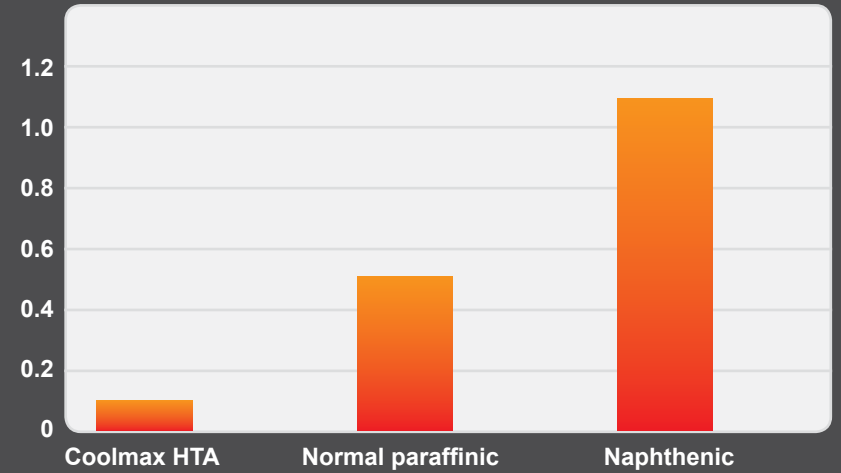
### Low temperature viscosity Coolmax HTA

Temperature	Naphthenic		Coolmax HTA	
	Viscosity (cP)	Viscosity (cP)	Viscosity (cP)	Viscosity (cP)
-35	600	170	85	50
-30	170	34.3	8.7	2.2
-20	34.3	8.5	2.2	0.9
-10	8.5	2.2	0.9	0.4
0	2.2	1.3	0.4	
10	1.3			



### Volatility of different type of refrigeration oils compared to Coolmax HTA

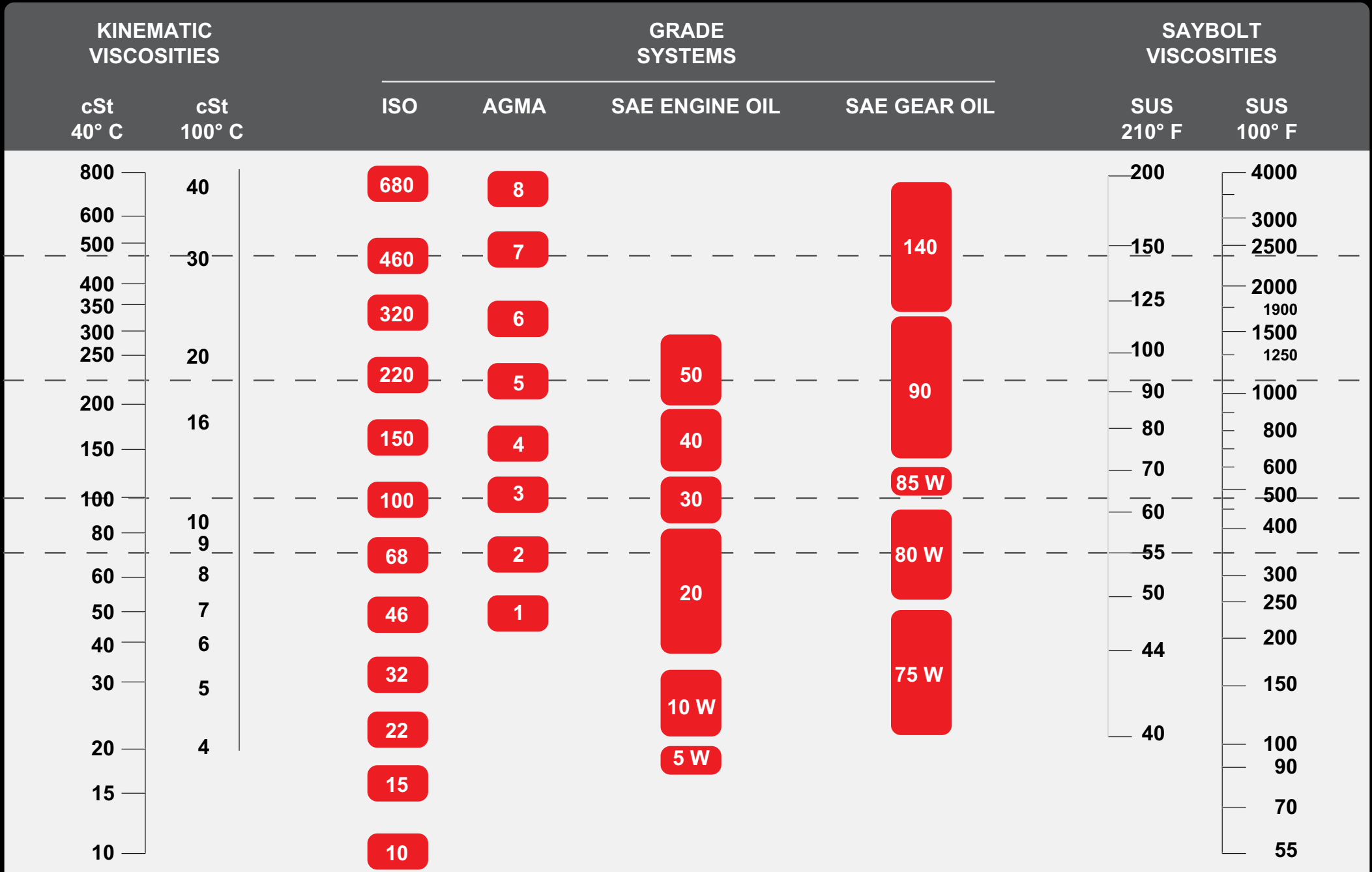
	% Loss 22hrs @ 100°C	
	Oil Type	% Loss
Coolmax HTA		0.1
Normal paraffinic		0.5
Naphthenic		1.1



**Disclaimer**

Information presented in this brochure is considered reliable, but conditions and methods of use, which are beyond our control, may modify results. Before adopting our products for commercial use, the user should confirm their suitability. In no case should recommendations or suggestions for the use of our products be understood to sanction violation of any patent.





Viscosities can be related horizontally only. For example, the following oils have similar viscosities: ISO 460, AGMA 7 and SAE GEAR OIL 140. The viscosity/temperature relationships are based on 95 VI oils and are usable only for mono grade engine oils, gear oils and other 95 VI oils. Crankcase oils and gear oils are based on 100° C viscosity. The "W" grades are classified on low temperature properties. ISO oils and AGMA grades are based on 40° C viscosity.

## Glossary of terms

### Additive

A chemical added in small quantities to a product to improve certain properties. Among the more common petroleum product additives are: oxidation inhibitors for increasing the product's resistance to oxidation and for lengthening its service life; rust and corrosion inhibitors to protect lubricated surfaces against rusting and corrosion, demulsifiers to promote oil-water, separation, VI improvers to make an oil's viscosity less sensitive to changes in temperature, pour-point depressants to lower the cold temperature fluidity of petroleum products, oiliness agents, anti-wear agents, and EP additives to prevent high friction, wear, or scoring under various conditions of boundary lubrication, detergents and dispersants to maintain cleanliness of lubricated parts, anti-foam agents to reduce foaming tendencies, and tackiness agents to increase the adhesive properties of a lubricant, improve retention, and prevent dripping or spattering.

### Anhydrous

Free of water, especially water of crystallization.

### Anti-Foam Agent

An additive that causes foam to dissipate more rapidly. It promotes the combination of small bubbles into large bubbles which burst more rapidly.

### Anti-Oxidant

A chemical added in small quantities to a petroleum product to increase its oxidative resistance in order to prolong its storage and/or service life. The additive activates in two ways: by combining with the peroxides formed initially by oxidation paralyzing their oxidizing influence, or reacting with a catalyst to coat it with an inert film.

### Anti Wear Agent

An additive that minimizes wear caused by metal-to-metal contact by reacting chemically with the metal by forming a film on the surfaces under normal operating conditions.

### Acid Number

Also referred to as NEUT or NEUTRALIZATION number: the specific quantity of reagent required to 'neutralize' the acidity or alkalinity of a lube oil sample. In service, the oil will, in time, show increasing acidity as the result of oxidation and, in some cases, additive depletion. Though acidity is not, of itself, necessarily harmful, an increase in acidity may be indicative of oil deterioration, and NEUT number is widely used to evaluate the condition of an oil in service. The most common measurement is ACID NUMBER, the specific quantity of KOH (potassium hydroxide) required to counterbalance the acid characteristics. How high an acid number can be tolerated depends on the oil and the service conditions, and only broad experience with the individual situation can determine such a value.

### Auto-Ignition Temperature

Minimum temperature at which a combustible fluid will burst into flame without the assistance of an extraneous ignition source. This temperature is typically several hundred degrees higher than the flash and fire point.

### Base Oils

Base stocks or blends used as an inert ingredient in the manufacturing of automotive and industrial lubricants.

### Base Stocks

Refined petroleum oils that can either be blended with one another or supplemented with additives to make lubricants.

### Base Oil Viscosity in a Grease

Because oil does the lubricating in a grease, and viscosity is the most important property of the lubricant, the viscosity of the base oil needs to be designed correctly for the application.

### Boundary Lubrication

A form of lubrication effective in the absence of a full fluid film. Made possible by the inclusion of certain additives in the lubricating oil that prevent excessive friction and scoring by forming a film whose strength is greater than that of oil alone. These additives include oiliness agents, compounded oils, anti-wear agents, and extreme pressure agents.

### Carbon Residue

Coked material formed after lubricating oil has been exposed to high temperatures.

### Copper Strip Corrosion

Evaluation of a product's tendency to corrode copper or copper alloys. ASTM D130. Test results are based on the matching of corrosion stains.

### Corrosion Inhibitor

A lubricant additive for protecting surfaces against chemical attack from contaminants in the lubricant.

### Compatibility of a Grease

This is one of the most important grease properties. Whenever two incompatible thickeners are mixed, grease usually becomes soft and runs out of the bearing. When mixing different thickener types, consult supplier on compatibility. Some incompatible thickeners are aluminum and barium soaps, clay and some polyureas.

### Consistency

NLGI grade is based on amount of thickener. Consistency describes the stiffness of the grease. NLGI 2 is the most common grade.

### Demulsibility

A lubricant's ability to separate from water, an important consideration in the lubricant maintenance of many circulating systems.

### Detergent

An additive which chemically neutralizes acidic contaminants in the oil before they become insoluble and fall out of the oil forming sludge. Particles are kept finely divided so that they can remain dispersed throughout the lubricant.

### Dropping point

The temperature at which a grease changes from semi-solid to a liquid state under test conditions. It may be considered an indication of the high temperature limitation for application purposes.

### Entrainment

Describing a state of an immiscible fluid component. Minute quantities of a fluid (typically water) can be dissolved or absorbed into the oil, but excess quantities can be most harmful to equipment due to the entrainment leaving gaps in the lubricated areas.

### Emulsion

A mechanical mixture of two mutually insoluble liquids (such as oil and water).

### EP agent

An additive to improve the extreme pressure properties of a lubricant.

### Flash Point

Lowest temperature at which the air vapor from a sample of a petroleum product or other combustible fluid will "flash" in the presence of an ignition source. The flash can be seen in the form of a small spark over the liquid.

### Fire Point

Lowest temperature at which a combustible fluid will burst into flame in the presence of an extraneous ignition source. Very little additional heat is required to reach the fire point from the flash point.

### Foaming

A possible reaction of an oil when mixed with air. This entrained air can result in reduced film strength and performance reduction.

### Foam Inhibitor

An additive which causes foam to dissipate more rapidly. It promotes the combination of small bubbles into large bubbles which burst more easily.

### Four-Ball Tests

Two test procedures on the same principle. The Four Ball Wear Test is used to determine the relative wear-preventing properties of lubricants operating under boundary lubrication conditions. The Four Ball Extreme Pressure Test is designed to evaluate performance under much higher unit loads.

### Hydrocarbons

Compounds of hydrogen and carbon of which petroleum products are typically examples. Petroleum oils are generally grouped into two parts: Napthenics, which possess a high proportion of unsaturated cyclic molecules; and paraffinic, which possess a low proportion of unsaturated cyclic molecules.

## Glossary of terms continued

### Hydro Treating

A Gulf patented process used to make lubricant base stocks. In the process, lubricant feedstocks are reacted with hydrogen in the presence of a catalyst at very high temperature (400oC) and pressure (3000 plus psi). The process displaces impurities and unsaturated hydrocarbons.

### Hydrodynamic Lubrication

A type of lubrication effected solely by the pumping action developed by the sliding of one surface over another in contact with an oil. Adhesion to the moving surface draws the oil into the high-pressure area between the surfaces, and viscosity retards the tendency to squeeze the oil out. If the pressure developed by this action is sufficient to completely separate the two surfaces, full-fluid-film lubrication is said to prevail.

### ISO

International Standard Organization

### Load Carrying Ability

Under high-load conditions, high-viscosity base stock is required and usually with an EP additive or solid additive like molybdenum disulfide.

### NLGI: classifying stiffness of a Grease

The best way to define the consistency or stiffness of the grease is set out by the NLGI (National Lubricating Grease Institute). A test method defines the following grades according to a level of penetration measured at a temperature of 25 °C. The consistency of the grease will change as soon as the temperature of the application will increase or decrease. When temperature falls below 25 °C, the NLGI grade rises and the grease will appear more stiff.

On the other hand, as soon as the temperature will go beyond 25 °C, the NLGI grade is reduced and the grease becomes less stiff.

### Oxidation

A form of chemical deterioration to which all petroleum products are subject to, and involves the addition of oxygen atoms resulting in degradation. It is accelerated by higher temperatures above 25oC, with the rate of oxidation doubling by each 10o increase. With fuels and lubricant oils, oxidation produces sludges, varnishes, gums, and acids, all of which are undesirable.

### Oxidation Inhibitor

A chemical added in small quantities to a petroleum product to increase its oxidation resistance in order to prolong its storage and/or service life. The additive activates in two ways: by combining with the peroxides formed initially by oxidation, paralyzing their oxidizing influence, or reacting with a catalyst to coat it with an inert film.

### Oil Separation of a Grease

For a grease to be effective, a small amount of oil must separate from the thickener (usually less than 3%).

### Pumpability of a Grease

This is an important property when pumping grease in centralized systems at low temperatures. Most common test is Lincoln Ventmeter.

### Pour Point

A widely used low temperature flow indicator, depicted as -15oC above the temperature to which a normal liquid petroleum product maintains fluidity. It is a significant factor in cold weather start-up. Paraffinic oils typically have higher pour points due to the formation of wax crystals, while many other lubricants reach their low pour points through an increase in viscosity.

### Rust Inhibitor

Alubricant additive for protecting ferrous (iron and steel) components from rusting caused by water contamination or other harmful materials from oil degradation.

### Shear Stress

A unit of frictional force overcome in sliding one layer of fluid along another. This is typically measured in pounds per square foot, with pounds representing the frictional force, and square feet representing the area of contact between the sliding layers.

### Shear Stability

Grease needs to maintain its consistency under high shear conditions. The shear stability test measures the softening of grease when sheared for 10,000 or 100,000 double strokes with a grease worker. Loss of less than one NLGI grease grade signifies a stable thickener under high shear conditions.

### Sludge

The collective name for contamination in a compressor and on parts bathed by the lubricating oil. This includes decomposition products from the fuel, oil, and particulates from sources external to the compressor.

### Solvency

The ability to dissolve into a solution producing a homogeneous physical mixture. The degree of solvency varies along with the rate of dissolution depending on the amount of heat added to the solution.

### Synthetic lubricants

Lubricants manufactured by a process, where a chemical conversion or transformation of one complex mixture of molecules into another complex mixture takes place.

Common types of synthetic base oil include: Polyalpha olefins (PAO), Hydrocracked/Hydroisomerized, Unconventional Base Oils (UCBO), Organic Esters, Polyglycols (PAG).

### Timken OK load

Measure of the extreme pressure properties of a lubricants.

### Thickener for Grease

A grease consists of a base oil, additives and a thickener. There are soap and non-soap thickeners. Each thickener type provides unique characteristics to the grease.

### Vapor Pressure

The measure of a liquid's volatility. The higher the pressure at a standard test temperature, the more volatile the sample, and the more readily it will evaporate.

### Varnish

A deposit resulting from oxidation and polymerization of fuels and lubricants. Similar to but softer than lacquer.

### Viscosity

Measure of a fluid's resistance to flow. This is typically measured as the time required for a standard quantity of fluid at a certain temperature to flow through a standard orifice. The higher the value, the more viscous the fluid. Viscosity varies inversely with temperature so the measurements are always expressed together. Tests are typically conducted at 40oC and 100oC.

### Viscosity Index

The measure of the rate of change of viscosity with temperature. Heating tends to make lubricants thinner, cooling makes them thicker. The higher a VI is on a particular fluid, the less of a change in viscosity there will be over a given temperature range. In determining the VI, two temperatures of viscosity are taken, one at 40oC and the other at 100oC.

### Volatility

The property of a liquid that defines its evaporation characteristics. Of two liquids, the more volatile one will boil at a lower temperature and will evaporate faster when both liquids are at the same temperature. The volatility of petroleum products can be evaluated with tests for flash point, vapor pressure, distillation, and evaporation rate.

### Water Resistance

Water washout test measures ability of a thickener to remain intact in bearing when submerged in water. Water spray-off measures ability of a thickener to remain in bearing in presence of water spray. Both of these tests measure percent grease removed.



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