Selecting lubricating oil for SABROE compressors

When selecting a lubricating oil for refrigerating compressors, bear in mind the type of refrigerant, the plant's operating temperatures and the compressor type, as shown in the enclosed selection tables.

The various types of refrigerants in use today influence the properties of the oil used in refrigeration plant in different ways.

In the following some of the important general issues have been summarized:

- R717 (ammonia) is only slightly soluble in oil and consequently does not reduce the lubricating capacity of the oil. Likewise, the miscibility between refrigerant liquids and oils is poor. Thus, any content in the refrigeration system of oil picked up from the compressor will be separated on the liquid side of the plant.

The so-called halocarbons include the following types:

- CFC – Chlorideflourocarbon (e.g. R12 and R502) contains chloride and because of its ozone deteriorating effect it is included in the list of the Montreal Agreement of substances whose application is being abandoned.
- HCFC – Hydrogenchlorideflourocarbon (e.g. R22) contains chloride as well as hydrogen which has the effect of reducing the ozone deteriorating effect of this substance considerably. It has recently been included in the Montreal Agreement in view of its abandonment over a number of years.
- HFC – Hydrogenfluorocarbon (e.g. R134a, R404A and R507) does not contain any chloride and is thus not limited in its use.
- CFC and HCFC refrigerants are easily dissolved in most oils for refrigeration plants which means a reduction in the lubricating capacity of the oil. In return, the miscibility with the refrigerant is good for most oil types, which means that any oil that might be left in the refrigeration plant will be taken back to the compressor with the refrigerant.
- HFC refrigerants, however, are not soluble to the same degree in the oils used so far and, consequently, special lubricating oils are required for plants using these refrigerants.

The oils are divided into two main groups, according to their chemical composition, and provided with an identification code for their selection.

Fig. 1 is an outline of applicable oil types with an indication of the size of the viscosity index (see its description later on) as well as their miscibility with halocarbonic refrigerants.

Code desig.	Main oil groups	Viscosity Index	Miscibility with		
			CFC	HCFC	HFC
M	Mineral oil	L – M	M	L	–
A	Synthetic oil based on Alkyl Benzene	L	H	H	–
MA	Mixture of M and A oils	L – M	H	M	–
P	Synthetic oil based on polyalphaolefin	H	L	L	–
AP	Mixture of A and P oils	M	H	M	–
MP	Mixture of M and P oils	M – H	M	L	–
E	Synthetic ester based lubricants	M – H	H	H	M
G	Synthetic oil based on polyglycol	M – H	–	–	–

L = low
M = medium
H = high

Fig. 1

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Below, you will find a description of the most important characteristics of each main oil group.

In the table section you will find the oil products recommended by various oil companies for use in refrigeration plants and which, on the basis of the information received from these oil companies, have been approved by SABROE.

In case of any doubt as to the suitability of a certain oil product in a particular refrigeration plant, please, contact the oil company that supplies this very oil product.

The main oil groups:

M Mineral oils are refined crude oils, of which Naphtene based oils are best suited for refrigeration plants.

Oils based on paraffin also occur. These are deparaffinated during the refining process and treated in such a way that they "behave" more or less like Naphtene based oils.

Mineral oils are characterised by their relatively low miscibility with CFC/HCFC at low temperatures.

Oils have been presented which are produced from crude oil by a special hydro-treatment, resulting in oils with improved properties, such as a high viscosity index, as well as low vapour pressure, which reduces the oil carry-over.

Hydro-treated mineral oils are coded with "°**M**".

A Oils based on Alkylated benzene are synthetic oils generally extracted from natural gases and characterised by high miscibility with CFC/HCFC at low evaporating temperatures. This makes them very suitable for CFC/HCFC plants.

Generally, oils based on Alkyl Benzene have a higher degree of thermal stability than mineral oils. This stability is also an advantage in R717 plants, as the risk of coke formation will be reduced.

Furthermore, **A** oils only have a slight tendency to froth in compressors, which improves the lubricating quality and operational stability.

However, please observe that the oil has strongly purifying qualities. This may cause the oil filters to clog frequently, especially on R717 plants, when the compressor has previously operated with **M** oil.

MA is a mixture of mineral and Alkyl Benzene oils with greater stability and less tendency to froth than mineral oils.

P Oils based on polyalphaolefin are synthetic oils, with good chemical and thermal stability. They are, therefore, frequently used in compressors operating at high temperatures, e.g. heat pumps (please refer to the special instruction in *Capacities* entitled *Selecting lubricating oils for heat pumps*).

Polyalphaolefin oil is particularly suited to R717 plants as it is very resistant to air present in the plant. Additionally, it has a low **pour point** which makes it suitable for R717 plants with low evaporating temperatures.

Polyalphaolefin oils have a lower vapour pressure than **M** and **A** oils: The amount of oil carried over from the compressor to the plant with the R717 discharge gas during operation is, therefore, reduced significantly, thus giving a markedly reduced oil consumption.

Polyalphaolefin oil and refrigerant mix poorly in CFC/HCFC refrigeration

plants with low evaporating temperatures. Thus, we recommend **not** to use **P** oils under such conditions.

A drawback with **P** oils is the high **Aniline point** (see relevant section) which causes the rubber gasket to shrink, e.g. O-rings, which can give rise to leaks if **M** or **A** oils are replaced with **P** oils. This problem can, however, be solved by fitting new O-rings of the same dimensions and quality.

Before changing to **P** oils, please consult SABROE Refrigeration.

P and **AP** oils can only be used for CMO and TCMO Mk 1 compressors when the regulating cylinders are altered. In this instance, we would recommend that you contact SABROE Refrigeration.

MP Mixtures of mineral and polyalphaolefin oils. They are specially suited to low-temperature R717 plants, where there is a potential risk of air leaking into the refrigerant circuit, due to the higher resistance to oxidation and the low **pour point.**

AP Mixtures of alkyl benzene and polyalphaolefin synthetic oils have a higher miscibility with CFC/HCFC than **P** oils and are, therefore, better suited to plants with lower evaporating temperatures than the relevant **P** oil.

Furthermore, the **Aniline point** is lowered, which minimizes the risk of leaks at rubber gaskets and O-rings.

E Synthetic ester-based lubricants, mainly of the polyol-ester type. In contrast to **M, A** and **P** oils, Ester lubricants are partly soluble in the non-chloride HFC refrigerants.

Consequently, **E** oils constitute the only main group that can be recommended in connection with these refrigerants.

E oils may also be used in connection with CFC/HCFC refrigerants. However, the greater solubility of these refrigerants in **E** oils must be taken into consideration by selecting an oil with a higher viscosity than the one recommended for operation with HFC refrigerants under the same operating conditions. A greater tendency of oil foaming may also occur.

E oils are distinguished by their high **flash point** which ensures a low oil carry over from the compressor unit. On the other hand, they are hygroscopic, i.e. they absorb water when exposed to the atmosphere. Therefore, it is important to keep the oil in closed vessels and to carry out a correct evacuation of the compressor unit before oil charging.

On changing the refrigerant from CFC/HCFC to HFC whereby the oil charge must also be replaced by an **E** oil, it is important to follow the instructions of the oil supplier as well as the indications of the maximum residue of any other oil in the **E** oil.

G Synthetic oils, based on polyglycol, are generally extracted from the natural gases Ethane and Propane, and are characterised by their low miscibility with LPG. Polyglycol based oils should only be used with LPG plants.

G oils should only be used for CMO and TCMO Mk 1 compressors when the regulating cylinders have been altered. In this instance, we recommend that you contact SABROE Refrigeration.

Selection tables:

When selecting a suitable oil type for a particular compressor, please refer to the selection tables for:

SABROE reciprocating compressors
SABROE screw compressors

A key shows the suitability of the oil to ammonia, R717. If possible, an oil code no. depicted as recommended or highly recommended (♦ *or* Δ) should be used. This corresponds to oils with properties like a mineral oil from the viscosity group ISO VG 68 or better.

A similar key has not been drawn up for CFC/HCFC refrigerants. Instead, temperature limits have been noted which indicate the permitted operating area for each oil type.

When selecting an oil for CFC/HCFC plants, find an oil code no. with temperature limits that permit your particular operating conditions. More than one code no. may be relevant as there is a certain degree of overlapping. We would advise you to select the oil with the best overall viscosity properties (see fig. 1). If the columns do not indicate temperature limits, then the relevant SABROE code no. can **not** be used.

Use the list of oil companies (listed alphabetically), to find an oil type and supplier which correspond to the SABROE code number that has been determined. A similar list for SABROE LPG compressors is also shown.

Please contact SABROE Refrigeration for information regarding the use of oils supplied by companies not listed.

The list of refrigeration oils

is characterised by the following properties, according to international standards:

Specific gravity

The specific gravity is significant when selecting an oil type. For example, an Alkyl Benzene oil is lighter and oils based on polyglycol heavier than mineral oils.

A mineral oil with increased paraffin content will have a lower specific gravity than an oil based on naphtene. The measuring method refers to ASTM D 1298 and DIN 51757.

Viscosity

According to the international standard ISO 3448, lubricating oils are classified in viscosity groups which are given an ISO VG no. To qualify for an ISO VG no. the oils viscosity (cSt – Centistoke) should lie between the two values shown in table 2 at +40°C. I.e. the viscosity, at +40°C, for an ISO VG 68 oil will be between 61.2 and 74.8 cSt.

In the table, oils outside of the ISO VG groups are given the two ISO VG numbers within which they naturally fall.

The viscosity is determined according to ASTM D 445 and DIN 51562 and is stated at both +40°C as well as +100°C .

ISO VG No.	Viscosity Range Kinematic cSt at +40 °C
15	13.5 – 16.5
22	19.8 – 24.2
32	28.8 – 35.2
46	41.4 – 50.6
68	61.2 – 74.8
100	90.0 – 110.0
150	135.0 – 165.0
220	198.0 – 242.0
320	288.0 – 352.0
460	414.0 – 506.0

Fig. 2

Viscosity Index

Viscosity index (VI) is the technical term to indicate how the viscosity of the oil changes when the temperature changes.

Viscosity index is prescribed in ISO 2909 and ASTM D 2270 and shows, in principal, that a high V_I indicates smaller viscosity changes under temperature changes compared to a lower V_I.

Flash point

States the temperature at which the oil vapour from an open, heated vessel can be ignited by a flame.

The method of measuring this is prescribed in ASTM D92-57, COC (Cleveland Open Cup) and in ISO 2592.

Flash point is used to determine the oils suitability at high temperatures.

Oils with a high **flash point** have a low vapour pressure. This improves the possibility of separating the oil from the discharge gas in the oil separator, and thereby reducing the oil carry-over from the compressor to the plant. This can be utilized with advantage in R717 plants.

Pour point

States the temperature at which the oil stiffens and doesn't move for five seconds when the vessel holding the cooled oil is laid down. According to the norm, the **pour point** temperature is 3°C lower than the measured temperature. This method of measuring is prescribed in ASTM D97-66 and in ISO 3016.

The **pour point** is particularly interesting in relation to oils used in R717 plants, as oils with a low **pour point** are easier to drain from the plants low pressure side.

It is usually possible to use oils at evaporating temperatures lower than the **pour point** shown in the selection table, without causing operational problems.

To reduce oil carry-over from compressor to plant in R717 plants with evaporating temperatures lower than -40°C, we would recommend the use of a more effective oil separator or a **P** or **AP** oil.

Floc point

States the temperature at which R12 liquid, when mixed with 10% of the relevant oil, becomes cloudy with wax particles which have separated from the oil, when cooled.

The method of measuring this is prescribed in ASHRAE 86-76 and DIN 51351.

The **floc point** is particularly important when oils and refrigerants are likely to mix, e.g. in CFC/HCFC refrigeration plants.

A low **floc point** indicates that the oil has a low wax content and is, therefore, particularly suited for CFC/HCFC plants with low evaporating temperature. When the wax is separated from the oil, problems may occur with expansion and regulating valves becoming blocked.

For **E** oils, a **critical solution temperature** is indicated, measured on a mixture of 10% of the oil present and 90% R134a and which constitutes the lowest temperature by which the oil is completely dissolved in the refrigerant. This information corresponds to the indications from the oil companies as there are yet no standard specifications for the measuring of this value.

Colour no.

This is a phrase used to describe the oils translucency using a particular source of light. The translucency is graded in comparison with coloured glass: 0,5 being the lightest colour and 8,0 the darkest. "**L**" in connection with the degree of translucency indicates that the oil is slightly lighter than the colour stated.

The method of measuring is prescribed in ASTM D1500 and ISO 2049. Refrigeration machine oils are normally very light in colour.

Aniline point

States the temperatures in degrees Celsius at which the relevant oil can become an homogenous mixture with pure aniline.

The **aniline point** is the measure of the quantity of non-saturated carbon which can be found in the oil, and which is of significance in determining the oil's compatibility with the various rubbers with which it will come into contact.

The method of measuring is prescribed in ASTM D611 and ISO 3977.

As the majority of refrigeration machine oils have a very low **aniline point**, the neoprene rubber becomes swollen without being dissolved or affecting the size. Therefore, rubber gaskets, e.g. O-rings, may have to be replaced after dismantling.

P oils have a high **aniline point** and therefore affect the neoprene rubber in such a way that it shrinks (please refer to the passage on **P** oils).

Neutralization no.

Indicates the acid content of the oil and is measured by titrating kaliumhydroxide (KOH) to the oil sample. The value is given in mg KOH pr. 1 gram of oil sample.

The method of measuring is prescribed in ASTM D974 and DIN 51558.

Refrigeration oil generally has, due to the high refinement, a low **neutralization no.**

For used oils, the **neutralization number** is stated as TAN (Total Acid Number) in accordance with the standard stated above. The number indicates the content of acid components in the oil, e.g. oxidizing products which are active in decomposing the oil.

Changing the oil in SABROE compressors:

The brand or quality of oil should not be changed without first consulting SABROE, and it is not advisable to recharge the compressor with an oil other than that specified for the particular plant.

In either instance, operational problems may occur in the refrigeration unit and the compressor itself may become unduly worn as a result of poor compatibility between different oil types, or due to the various oils' ability to dissolve or decompose oil residue in the compressor and oil separator.

The dissolved oil residue may block the filter or prevent movement in the compressor.

If it is necessary to change to a different type or brand of oil, it is absolutely necessary to drain the refrigeration plant of any old oil and clean the compressor and oil separator. Please also refer to the section on **P** oils.

Oil used must be taken from an original container, and the manufacturer and type of oil must be in accordance with the specification for the particular refrigeration plant.

The container must be air tight and stored so that moisture from the atmosphere is not absorbed by the oil. It is therefore, advisable to purchase the oil in containers of a size suitable for one, or at the most, two charges. If a container is not completely emptied, store the remaining oil in a suitably warm place.

The compressor instruction manual will advise how frequently the oil should be changed.

Selection tables for oil in SABROE refrigerating compressors

Reciprocating compressors type: BFO – CMO/TCMO
SMC/TSMC 100 – HPO* - HPC* -SMC/TMC 180

SABROE code no.	R 717		R 22		R 12		R 502		R 134 a		R404 A - R507	
	Evap. temp.	Rec.	Evaporating temperature		Evaporating temperature		Evaporating temperature		Evaporating temperature		Evaporating temperature	
	min. °C		min. °C	max. °C	min. °C	max. °C	min. °C	max. °C	min. °C	max. °C	min. °C	max. °C
M 46	-50	•	-35	0	–	–	-25	-5	–	–	–	–
M 46-68	-50	♦	-35	+5	-45	0	-25	-5	–	–	–	–
M 68	-50	♦	-35	+10	-45	+5	-25	-5	–	–	–	–
M 100	-35	•	-20	+10	-30	+10	–	–	–	–	–	–
M 150	–	–	-10	+15	-20	+15	–	–	–	–	–	–
MA 46	-50	•	-45	0	–	–	-35	-5	–	–	–	–
MA 46-68	-50	♦	-45	+5	-50	0	-35	-5	–	–	–	–
MA 68	-50	♦	-45	+10	-50	+5	-35	-5	–	–	–	–
MA 100	-35	•	-35	+10	-45	+10	–	–	–	–	–	–
A 46	-50	•	-60	0	-50	-5	-60	-5	–	–	–	–
A 46-68	-50	♦	-60	+5	-50	0	-60	-5	–	–	–	–
A 68	-50	♦	-60	+10	-50	+5	-60	-5	–	–	–	–
A 100	-35	•	-60	+10	-50	+10	-60	-5	–	–	–	–
A 150	–	–	-60	+15	-50	+10	-60	-5	–	–	–	–
AP 46	-50	♦	-45	+10	-50	0	–	–	–	–	–	–
AP 68	-50	Δ	-45	+15	-50	+10	-35	-5	–	–	–	–
AP 100	-50	♦	-45	+20	-50	+15	–	–	–	–	–	–
MP 46	-50	♦	–	–	–	–	–	–	–	–	–	–
P 68	-50	Δ	-20	+15	-30	+10	–	–	–	–	–	–
P 100	-50	♦	-20	+25	-30	+20	–	–	–	–	–	–
P 150	0	♦	–	–	-10	+25	–	–	–	–	–	–
P 220	+10	♦	–	–	-10	+35	–	–	–	–	–	–
E 46	–	–	Conditional use is possible but general limits have not yet been defined. Before use contact SABROE.						-40	+5	-45	+5
E 68	–	–							-35	+5	-40	+5
E 100		–							-30	+20	-35	+10
E 150	–	–							-20	+20	-25	+10
E 220		–							-10	+35	-15	+15

* HPO and HPC reciprocating compressors must only use oils as indicated in SABROE code no. P100, P150 or P220

Recommendation (Rec.)	
– Not recommended	♦ Rec.
• Useable	Δ Highly Rec.

Selection tables for oil in SABROE refrigerating compressors

Screw compressors type: VMX* - SAB - VMY

SABROE code no.	R 717			R 22					R 12					R 134 a					R 404 A - R507			
	Evap. temp. min. °C	Oil temp. max. °C	Rec	Evaporating temperature min. °C	Evaporating temperature max. °C	Max oil temp. cond. temp. 35 °C °C	Max oil temp. cond. temp. 45 °C °C	Max oil temp. cond. temp. 55 °C °C	Evaporating temperature min. °C	Evaporating temperature max. °C	Max oil temp. cond. temp. 40 °C °C	Max oil temp. cond. temp. 60 °C °C	Max oil temp. cond. temp. 80 °C °C	Evaporating temperature min. °C	Evaporating temperature max. °C	Max oil temp. cond. temp. 40 °C °C	Max oil temp. cond. temp. 60 °C °C	Max oil temp. cond. temp. 75 °C °C	Evaporating temperature min. °C	Evaporating temperature max. °C	Max oil temp. cond. temp. 35 °C °C	Max oil temp. cond. temp. 45 °C °C
M 46	-50	+50	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M 46-68	-50	+50	♦	-35	0	+45	+45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M 68	-50	+50	♦	-35	+5	+50	+50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M 100	-35	+55	•	-20	+10	+50	+50	+50	-30	+5	+50	–	–	–	–	–	–	–	–	–	–	–
M 150	–	–	–	-10	+15	+55	+55	+50	-20	+10	+60	–	–	–	–	–	–	–	–	–	–	–
MA 46	-50	+50	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA 46-68	-50	+50	♦	-45	0	+45	+45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA 68	-50	+50	♦	-45	+5	+50	+50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA 100	-35	+55	•	-35	+10	+55	+55	+50	-45	+5	+50	–	–	–	–	–	–	–	–	–	–	–
A 46	-50	+50	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A 46-68	-50	+50	♦	-60	0	+45	+45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A 68	-50	+50	♦	-60	+5	+50	+50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A 100	-35	+55	•	-60	+10	+55	+55	+50	-50	+5	+50	–	–	–	–	–	–	–	–	–	–	–
A 150	–	–	–	-60	+15	+75	+75	+70	-50	+10	+60	–	–	–	–	–	–	–	–	–	–	–
AP 46	-60	+50	•	-45	+5	+55	+50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
AP 68	-60	+55	Δ	-45	+10	+65	+60	+55	-50	+5	+50	–	–	–	–	–	–	–	–	–	–	–
AP 100	-50	+60	♦	-45	+15	+70	+65	+60	-50	+10	+55	+50	–	–	–	–	–	–	–	–	–	–
MP 46	-50	+60	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
P 68	-60	+60	Δ	-20	+10	+65	+65	+60	-30	+5	+60	+55	–	–	–	–	–	–	–	–	–	–
P 100	-50	+60	♦	-20	+20	+70	+70	+65	-30	+15	+65	+60	–	–	–	–	–	–	–	–	–	–
P 150	–	–	–	-10	+25	+75	+75	+70	-10	+20	+70	+65	+60	–	–	–	–	–	–	–	–	–
P 220	–	–	–	0	+25	–	+80	+80	-10	+35	+80	+75	+70	–	–	–	–	–	–	–	–	–
P 320	–	–	–	–	–	–	–	–	0	+35	–	+80	+75	–	–	–	–	–	–	–	–	–
P 460	–	–	–	–	–	–	–	–	0	+35	–	+85	+80	–	–	–	–	–	–	–	–	–
E 46	–	–	–	Conditional use is possible but general limits have not yet been defined. Before use contact SABROE.										-40	+5	+55	+50	–	-45	+5	+50	+50
E 68	–	–	–											-35	+5	+65	+60	–	-40	+5	+55	+55
E 100	–	–	–											-30	+20	+70	+65	+60	-35	+10	+60	+60
E 150	–	–	–											-20	+20	+75	+70	+65	-25	+10	+70	+70
E 220	–	–	–											-10	+35	+80	+75	+70	-15	+15	+75	+75
E 320	–	–	–											0	+35	–	+80	+75	–	–	–	–

▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲

Recommendation (Rec.)	
– Not recommended	♦ Rec.
• Useable	Δ Highly Rec.

* VMX screw compressors must not use oils with viscosity values below SABROE code no. 100

▲ The stated max. oil temperatures depend on the discharge gas temperature being at least 25 °C higher than the condensing temperature. With HLI-cooling, the oil temperature must be set to be 30 °C above the condensing temperature.

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 1

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40 °C	Viscosity c.St +100 °C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 12 °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Agip Petroli	M 46	Betula	46	42	5.4	39	0.895	192	-40	-56	L 0.5	90	0.03	
	M 68	Betula	68	61	6.8	43	0.898	202	-37	-51	L 0.5	91	0.03	
	AP 46	Betula	S 46	44	6.6	102	0.845	212	-55	<-60	L 1	–	0.08	
	AP 68	Betula	S 68	63	8.4	103	0.847	226	-54	<-60	L 1	–	0.08	
	AP 100	Betula	S 100	95	11.2	104	0.851	230	-51	<-60	L 1	117	0.08	
Aral	M 46	Alur	EE 46	46	6.0	57	0.895	170	-42	-50	1.0	88	0.01	
	M 68	Friga	2	68	7.0	50	0.895	180	-40	-50	1.0	90	0.01	
	M 68	Alur	EE 68	68	7.0	50	0.895	195	-36	-36	1.0	90	0.01	
	M 100	Alur	EE 100	100	9.0	45	0.900	220	-33	-25	1.0	97	0.01	
Avia	M 46	Avilub	FC 46	44	5.7	46	0.888	200	-39	-60	0.5	93	<0.02	
	M 68	Avilub	FC 68	65	7.0	40	0.894	205	-39	-60	0.5	97	<0.02	
	M 100	Avilub	FC 100	95	8.6	35	0.898	215	-36	-60	0.5	96	<0.02	
BP	M 46	Energol	LPT 46	45	–	63	0.896	176	-36	-45	1.5	–	0.05	
	M 46-68	Energol	LPT-F 46	54	5.8	2	0.925	182	-39	<-45	L 1.5	–	<0.05	
	M 68	Energol	LPT 68	68	7.4	57	0.902	183	-33	-42	1.5	–	0.05	
	A 46	Energol	LPS 46	46	–	25	0.864	149	-36	-80	0.5	–	0.04	
	A 68	Energol	LPS 68	67	6.8	19	0.866	161	-27	-80	0.5	–	0.04	
	A 100	Energol	LPS 100	96	8.1	11	0.867	179	-27	-80	0.5	–	0.04	
	P 68	Energol	LPS-PO 68	68	10.1	146	0.840	238	-57	–	0.5	–	0.05	
	P 220	Energol	LPS-PO 220	210	25	150	0.850	265	-42	–	0.5	–	0.05	

ISO VG No.
Oil type

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 2

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40 °C	Viscosity c.St +100 °C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 12 °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Calgon Vestal	M 46-68	Refrigeration Oil	C-4 (R030)	59	6.5	38	0.910	202	-37	-48	L 1.5	86	<0.03	
	M 100	Refrigeration Oil	C-5 (R050)	100	8.6	37	0.925	182	-29	-37	2.5	83	<0.03	
	A 46-68	Zerol	300	57	–	–	0.871	177	-40	-73	3.0	66	<0.05	
Caltex	M 46	Capella Oil	WF 46	46	5.8	43	0.899	208	-42	-51	1.0	76	0.02	
	M 68	Capella Oil	WF 68	65	7.0	46	0.902	213	-36	-51	1.0	77	0.02	
	M 100	Capella Oil	WF 100	97	8.3	24	0.916	229	-33	-40	2.5	88	0.02	
	M 46	Refrigeration Oil	46	42	5.4	40	0.897	188	-33	–	2.5	–	0.02	R717 only
	M 68	Refrigeration Oil	68	64	6.9	43	0.899	200	-30	–	2.5	–	0.02	R717 only
	M 100	Refrigeration Oil	100	93	8.3	40	0.913	210	-27	–	3.0	–	0.02	R717 only
Castrol	M 46-68	Icematic	99	55	5.9	68	0.897	210	-33	-33	2.0	90	0.01	R717 only
	M 46-68	Icematic	299	56	6.9	0	0.916	180	-34	-49	1.0	77	0.01	
	A 68	Icematic	2284	64	6.5	<0	0.866	186	-33	<-60	1.0	73	0.01	
	A 100	Icematic	2285	95	–	<0	0.866	196	-30	<-60	1.0	73	0.01	
	P 68	Icematic	2294	69	10.8	147	0.835	233	-60	-42	0	140	0.01	
Chevron (UK: Gulf Oil)	M 68	Refrigeration Oil	WF	64	6.4	–	0.930	179	-38	-54	1.0	74	–	
	M 68	Eskimo	RC	65	7.2	51	0.898	175	-33	–	–	–	–	
	M 68	(Gulf: Eskimo 68)		65	7.2	51	0.898	175	-33	–	–	–	–	
Chevron Oronite	A 68	Zerol	350	68	6	–	–	190	-42	<-73	–	–	–	
	A 100	Zerol	500	107	7	–	–	200	-35	<-73	–	–	–	

ISO VG No.
Oil type

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 3

Oil Company	SABROE Code no. * See notes	Name of Oil	Viscosity c.St +40°C	Viscosity c.St +100°C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 12 °C	Colour no.	Anilin point °C	Neutral no. mg KOH/g	Notes
CPI Engineering Services Inc.	*M 68	CP 1009-68	69	9.1	100	0.867	226	-40	-	-	118	<0.05	
	*M 100	CP 1009-100	108	10.3	100	0.870	266	-12	-	-	123	<0.05	
	P 68	CP 4600-68	68.5	10.4	140	0.835	268	-51	-	-	>140	<0.05	
	P 100	CP 4600-100	100	13.7	138	0.839	271	-52	-	-	>140	<0.05	
	P 150	CP 4600-150	148	18.2	138	0.845	277	-45	-	-	>140	<0.05	
	P 220	CP 4600-220	217	24.4	141	0.846	279	-43	-	-	>140	<0.05	
	P 320	CP 4600-320	320	33.0	145	0.850	282	-38	-	-	>140	<0.05	
	P320-460	CP 4600-460	392	38.8	147	0.852	285	-37	-	-	>140	<0.05	
	E 100	CP 4214-100	109	13.8	116	0.970	307	-35	-	-	-	<0.05	* For R22 only
	E 150	CP 4214-150	168	20.2	150	1.010	290	-43	-	-	-	<0.10	* For R22 only
	E 320	CP 4214-320	298	32.0	149	1.010	271	-35	-	-	-	<0.15	* For R22 only
DEA	M 46	Triton WF 46	46	5.5	0	0.902	188	-36	<-50	1	88	<0.02	
	M 68	Triton WF 68	68	6.8	20	0.905	198	-30	<-50	1	91	<0.02	
	M 100	Triton WF 100	100	8.4	20	0.906	216	-23	<-50	1	94	<0.02	
	MA 46	Triton MS 46	43	5.7	55	0.907	210	-42	-60	1	67	0.02	* Not for R717
	MA 68	Triton MS 68	64	7.1	56	0.911	225	-36	-51	1.5	72	0.02	* Not for R717
	A 150	Triton S 150	149	12.6	70	0.924	270	-30	<-60	5	-	0.1	* Not for R717
	P 68	Triton A 68	69	10.6	142	0.835	260	-57	<-60	0.5	140	<0.02	
	P 220	Triton A 220	219	25.3	146	0.844	268	-42	<-60	0.5	146	<0.02	

ISO VG No.
Oil type

* Oil with wear reducing additives, which can react with humidity from ammonia and form deposits in the compressor.

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 4

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40 °C	Viscosity c.St +100 °C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 12 °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Elf/ Lub Marine 1)	M 46	Elfrima	NH 46	44,4	6,4	96	0.875	226	-36	–	1.0	102	0.03	R717 only
	M 68	Elfrima	NH 68	67,2	7,9	75	0.887	230	-36	–	1.0	100	0.03	R717 only
	M 46	Elfrima	FR 46	43	5.3	–	0.909	171	-37	-53	1.0	80	0.01	
	M 46-68	Elfrima Friga 1)	FR 68 2	54	6.1	–	0.911	175	-34	-50	1.0	81	0.01	
	M100	Elfrima	FR 100	95	8.8	–	0.927	194	-24	-37	2.0	83	0.01	
	M 150	Elfrima	FR 150	150	9.7	–	0.930	200	-15	-25	2.5	82	0.01	
	MP 46	Barelf	NBT 46	43,5	7.1	125	0.855	180	-48	–	1.0	114	0.01	R717 only
	A 46-68	Barelf	AL 55	55	6.2	27	0.866	194	-27	-70	0.5	60	0.1	
	A 100	Barelf Primeria 1)	AL 100 SG 100	100	7.8	20	0.868	212	-24	-70	0.5	76	0.1	
Esso/Exxon	M 46	Zerice	46	44	6.0	72	0.888	204	-41	-34	2.0	92	<0.01	
	M 68	Zerice	68	65	7.3	63	0.894	224	-37	-34	2.0	96	<0.01	
	M 68	Zero-mar	68	62	7.6	81	0.894	202	-33	-34	–	–	–	
	A 46	Zerice	S 46	48	5.7	28	0.864	172	-36	-65	1.0	70	0.03	
	A 68	Zerice	S 68	64	6.5	15	0.865	186	-33	-65	1.0	73	<0.01	
	A 100	Zerice	S 100	98	8.1	10	0.868	196	-30	-65	1.0	75	<0.01	
	P 68	Zero-pol	S 68	68	10.4	140	0.834	254	-48	–	1.0	130	0.05	
	P 220	Zero-pol	S 220	240	27.2	147	0.834	264	-45	–	1.0	130	0.05	
Fina	M 46	Purfrigol	46	46	5.7	54	0.896	190	-35	-40	1.0	90	0.02	
	M 68	Purfrigol	68	67	7.1	52	0.901	201	-31	-36	1.0	81	0.03	
	M 68	Purfrigol	MP 68	70	6.7	2	0.936	196	-25	-42	1.5	66	0.01	
	A 68	Purfrigol	S 68	69	6.5	<0	0.871	186	-40	<-55	0.5	–	<0.01	
	A 100	Purfrigol	S 100	99	7.8	<0	0.868	194	-26	<-55	1.0	–	<0.01	

ISO VG No.
Oil type

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 5

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40 °C	Viscosity c.St +100 °C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 12 ▪(22) °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Fuchs	M 46	Reniso	KS 46	47	4.3	42	0.895	195	-45	-50	0.5	93	<0.01	
	M 68	Reniso	KC 68	68	6.1	40	0.900	200	-39	-50	0.5	95	<0.01	
	M 100	Reniso	KES 100	105	10.4	38	0.904	220	-33	-50	0.5	96	<0.01	
	MA 46	Reniso	KMH 46	47	5.5	-10	0.871	175	-42	-70	0.5	65	0.02	
	A 46	Reniso	SP 46	47	5.4	-10	0.872	175	-42	-70	0.5	65	0.01	
	A 68	Reniso	SP 68	68	6.1	-20	0.872	190	-33	-70	0.5	70	0.05	
	A 100	Reniso	SP 100	106	9.8	-22	0.872	190	-30	-70	0.5	75	0.05	
Hüls	P 68	Anderol	RCF-P68	65.8	9.8	132	0.837	268	-54		0.5	138	0.15	
Hydro	M 46-68	Polaris	F46	54	5.8	2	0.925	182	-39	<-45	L 1.0	-	<0.05	
	M 68	Polaris	68	68	7.4	57	0.902	183	-33	-42	1.5	-	0.05	
	A 68	Polaris	S 68	67	6.8	19	0.866	171	-27	-80	1.0	-	0.04	
	A 100	Polaris	S 100	96	8.1	11	0.867	189	-27	-80	1.0	-	0.04	
Ipiranga	M 46	Ipigel	46	46.6	5.9	54	0.900	184	-39	-	L 1.5	84	0.02	
	M 46	Ipigel	46-P	45	6.8	107	0.873	234	-24	-	L 1.0	108	0.02	
	M 68	Ipigel	68	67.6	8.0	80	0.904	194	-33	-	L 2.0	89	0.02	
Kuwait Petroleum	M 68	Q8 Stravinsky	C	68	7.3	45	0.898	194	-33	-40	L 2.0	90		* See footnote
	AP 68	Q8 Stravinsky	68	68	9.0	107	0.846	232	-48	-	L 0.5	120	<0.03	
Mobil		Gargoyle												
	M 46-68	Arctic	Oil 300	57	6.5	41	0.900	198	-33	-40	1.0	94	0.05	
	A 68	Arctic	SHC 426	65.1	6.5	16	0.867	176	-36	▪(-50)	0.5	71	<0.05	
	A 100	Arctic	SHC 427	96.8	8.1	13	0.868	195	-32	▪(-45)	0.5	78	<0.05	
	P 68	Arctic	SHC 226	62	10.1	148	0.835	218	-55	-74	<0.5	135	0.01	
	P 100	Arctic	SHC 228	94	13.7	147	0.840	218	-52	-69	<0.5	135	0.03	
	P 220	Arctic	SHC 230	208	25.0	149	0.848	218	-44	-58	<0.5	135	0.03	
	P 320-460	Arctic	SHC 234	400	40.0	150	0.854	260	-43	-52	<0.5	135	0.03	

ISO VG No.
Oil type

* Note: When changing from another oil type (whether mineral or synthetic) Kuwait Petroleum recommends that you rinse the system for approx. 1 week by using Q8 Stravinsky 68 before charging with fresh, new oil.

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 6

Oil Company	SABROE Code no. * See notes	Name of Oil	Viscosity c.St +40 °C	Viscosity c.St +100 °C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 12 °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Nynäs	M 46	Nyfrost 46	46	5.5	20	0.902	188	-36	-37	L 0.5	87	<0.01	R717 only
	M 68	Nyfrost 68	68	6.8	20	0.905	198	-30	-36	L 0.5	92	<0.01	R717 only
	M 100	Nyfrost 100	100	8.4	20	0.906	216	-24	-26	L 0.5	96	<0.01	R717 only
	M 46	Nyreco 46	46	5.5	20	0.902	188	-36	<-50	L 0.5	87	<0.01	
	M 68	Nyreco 68	68	6.8	20	0.905	198	-30	<-50	L 0.5	92	<0.01	
	M 100	Nyreco 100	100	8.4	20	0.906	216	-24	<-50	L 0.5	96	<0.01	
OK Petroleum	M 68	Zero oil 68	65	8.0	75	0.890	210	-33	-39	-	-	-	
Petrobrás Distribuidora	M 46-68	Lubrax Industrial CP-60RH	55	6.2	29	0.909	176	-36	-54	L 1.5	83	<0.01	
	MA 46	Lubrax Industrial CP-46RF	43	5.9	71	0.892	194	-48	-52	L 1.5	70	0.01	
	MA 68	Lubrax industrual CP-68RF	63	7.4	68	0.895	196	-45	-48	1.5	73	0.01	
	MA 100	Lubrax industrual CP-100RF	103	9.6	56	0.902	220	-36	-40	2.0	80	0.01	
Petro-Canada	*M 46-68	Rello 68 A	58	7.9	104	0.866	236	-42	-	0.5	118	0.06	R717 only
Shell	M 46	Clavus Oil 46	46	5.8	45	0.895	181	-36	-30	1.0	-	<0.05	
	M 68	Clavus Oil 68	68	7.2	45	0.898	195	-32	-25	1.0	-	<0.05	
	M 46	Clavus Oil G 46	44	5.6	47	0.889	195	-39	-48	0.5	-	<0.05	
	M 68	Clavus Oil G 68	65	7.0	44	0.894	205	-36	-45	0.5	-	<0.05	
	M 100	Clavus Oil G 100	95	8.6	40	0.898	215	-30	-40	-	-	<0.05	
	MA 46	SD Refrigerator Oil	38	5.0	-	0.870	180	-39	-60	-	-	<0.05	CFC only

ISO VG No.
Oil type

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 7

Oil Company	SABROE Code no. * See notes	Name of Oil	Viscosity c.St +40°C	Viscosity c.St +100°C	Viscosity Index	Specific gravity at +15°C	Flash point COC °C	Pour point °C	Floc point R 12 *(R22) °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Statoil	M 46	Fridge Way 46	44	6.0	72	0.888	204	-41	-34	2.0	92	0.01	
	M 68	Fridge Way 68	65	7.3	63	0.894	224	-37	-34	2.0	96	0.01	
	A 46	Fridge Way S 46	48	5.7	28	0.864	172	-36	-65	1.0	70	0.03	
	A 68	Fridge Way S 68	64	6.5	15	0.866	186	-33	-65	1.0	73	0.01	
	A 100	Fridge Way S 100	95	8.0	10	0.868	196	-30	-65	1.0	75	0.01	
		Comp Way S 100											
Sun oil	M 46	Suniso 3 1/2 GS	43	5.3	15	0.909	171	-37	-45	1.0	79	0.01	
	M 46-68	Suniso 4 GS	55	5.9	24	0.911	175	-34	-48	1.0	81	0.01	
	M 46-68	Suniso 4 SA	57	6.9	68	0.897	210	-33	–	1.5	90	0.01	R717 only
	M 100	Suniso 5 G	94	8.2	10	0.922	190	-28	-27	L 3.0	76	0.01	
	M 150	Suniso 6 GS	143	9.7	–	0.926	194	-23	–	1.5	79	0.01	
Texaco	M 68	Capella WF 68	65	7.2	55	0.912	180	-34	-50	1.0	88	0.03	
	A 46	Refrigeration Oil Low Temp 46	46	5.0	0	0.868	190	-40	*(-64)	–	–	0.01	Not for R717
	A 68	Refrigeration Oil Low Temp 68	68	6.0	0	0.867	202	-30	*(-60)	–	–	0.01	Not for R717
	A 100	Refrigeration Oil Low Temp 100	100	8.0	0	0.865	212	-28	*(-56)	–	–	0.01	Not for R717
	P 68	Capella A 68	68	10.5	142	0.845	254	-51	-65	L 0.5	136	0.13	
	P 220	Capella A 220	219	25.3	146	0.845	268	-42	-60	0.5	142	0.01	

ISO VG No.
Oil type

Oils approved by SABROE for refrigeration CFC/HCFC & R717

No. 8

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40°C	Viscosity c.St +100°C	Viscosity Index	Specific gravity at +15°C	Flash point COC °C	Pour point °C	Floc point R 12 °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Total	M 46	Lunaria	46	46	-	54	0.894	190	-45	-70	1.0	90	0.03	
	M 46-68	Lunaria	S46/68	55	-	18	0.925	178	-36	-41	1.0	76	0.03	
	A 46	Lunaria	K 46	46	6.3	-	0.882	210	-45	-75	L 1.5	-	0.01	
	A 46-68	Lunaria	K 56	56	7.0	-	0.883	220	-40	-75	1.5	-	0.01	
	A 68	Lunaria	K 68	68	7.8	-	0.883	230	-35	-75	L 2.0	-	0.01	

ISO VG No.
Oil type

Oils approved by SABROE for refrigeration HFC

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40°C	Viscosity c.St +100°C	Viscosity Index	Specific gravity at +15°C	Flash point COC °C	Pour point °C	Critical solution temp. R 134a °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
Castrol	E68	Icematic	SW 68	67,3	8.7	101	0.966	260	-39	-43	-	-	0.15	Suitable also for R 12 - 22
	E100	Icematic	SW 100	100	11.4	98	0.967	258	-30	-34	-	-	0.15	
	E150	Icematic	SW 150	150	15.1	99	0.975	260	-29	-31	-	-	0.15	
	E220	Icematic	SW 220	220	19.3	99	0.981	288	-26	-25	-	-	0.15	
CPI Engineering Services Inc	E46	Solest ®	46	50.5	7.0	94	0.925	248	-45	-	-	-	-	For R 22 the CP-4214 range is recommended.
	E68	Solest ®	68	64	8.9	114	0.945	266	-43	-	-	-	-	
	E100	Solest ®	85	92.4	10.6	97	0.950	271	-39	-	-	-	-	
	E100-150	Solest ®	120	131	14.5	111	0.940	254	-36.5	-	-	-	-	
	E220	Solest ®	220	216	20.8	113	0.950	271	-25	-	-	-	-	
	E320-460	Solest ®	370	386	29.2	105	0.955	302	-21	-	-	-	-	
DEA	E46-68	Triton	SE 55	52.5	8.7	143	1.010	284	-51	2	0.5	-	0.03	
	E68-100	Triton	SEZ 80	80	10.4	114	1.006	286	-42	-42	2.0	-	0.01	
	E100-150	Triton	SE 120	118	13.8	114	0 972	293	-33	-40	1.0	-	0.03	
	E150-220	Triton	SE 170	170	17.2	108	0.974	275	-30	-40	0.5	-	0.01	
ELF	E46	Planetelf	ACD 46	45.6	7.3	121	0.980	250	-45	-35	-	-	<0.3	
	E68	Planetelf	ACD 68 M	70.2	9.9	122	0.993	230	-42	-48	-	-	<0.3	
	E100	Planetelf	ACD 100 LT	97.6	12.1	115	1.001	280	-39	-51	-	-	<0.3	
Fuchs	E46-68	Reniso	E46	54.8	7.6	100	0.974	258	-48	-	-	-	<0.1	
	E68	Reniso	E68	67.7	10.2	136	1.053	246	-48	-	-	-	0.09	
	E100	Reniso	E100	100	13.6	137	1.056	260	-36	-	-	-	<0.1	
Hüls	E100	Anderol	RCF-E-100	95.9	10.9	97	0.996	262	-51	-	-	-	-	
	E150	Anderol	RCF-E-170	165	15	91	0.994	260	-45	-	-	-	-	

Oils approved by SABROE for refrigeration HFC

Oil Company	SABROE Code no. * See notes	Name of Oil		Viscosity c.St +40 °C	Viscosity c.St +100 °C	Viscosity Index	Specific gravity at +15 °C	Flash point COC °C	Pour point °C	Floc point R 134a °C	Colour No.	Anilin point °C	Neutral no. mg KOH/g	Notes
ICI	E46	Emkarate	RL411	48.0	7.3	111	0.972	275	-40	-5	-	-	0.02	
	E68	Emkarate	RL375	74.1	10.1	118	0.973	245	-35	-3	-	-	0.02	
	E100	Emkarate	RL100S	100	12.7	122	0.979	260	-36	6	-	-	0.02	
	E150	Emkarate	RL421	134	15.0	114	0.976	265	-37	9	-	-	0.02	
Lubrisol	E46	Lubrikuhl	ISO - 46	44.9	6.9	110	0.983	244	-48	-40	-	-	0.03	
	E68	Lubrikuhl	ISO - 68	68	8.7	100	0.963	255	-42	-30	-	-	0.04	
	E100	Lubrikuhl	ISO - 100	100	10.8	90	0.952	250	-36	-25	-	-	0.04	
	E220	Lubrikuhl	ISO - 220	210	18.5	98	0.972	255	-30	-15	-	-	0.04	
Mobil	E46	Arctic	EAL 46	46.4	6.9	104	0.975	251	-51	-51	L 0.5	-	<0.03	
	E68	Arctic	EAL 68	62.5	8.3	101	0.971	254	-43	-43	L 0.5	-	<0.03	
	E100	Arctic	EAL 100	95.8	10.5	91	0.966	260	-37	-35	L 0.5	-	<0.03	
Sun Oil	E 46	Suniso	SL 46	47.2	7.8	134	1.047	235	-46	-	L 0.5	-	0.01	
	E 68	Suniso	SL 68	70.1	10.4	135	1.053	232	-40	-	L 0.5	-	0.01	
	E 100	Suniso	SL 100	111.5	14.6	134	1.061	241	-34	-	L 0.5	-	0.01	
Texaco	E46	Capella	HFC 46	43.1	6.8	112	0.979	-	-50	-40	L 1.0	-	0.10	
	E68	Capella	HFC 68	62.4	8.4	103	0.973	-	-45	-35	L 1.0	-	0.10	
	E100	Capella	HFC 100	93.1	10.5	93	0.961	-	-36	-30	L 1.0	-	0.10	
	E220	Capella	HFC 220	205	18.4	98	0.982	-	-30	-20	L 1.0	-	0.10	

Oils approved by SABROE for LPG compressors

Oil Company	SABROE Code no. * See notes	Name of Oil	Viscosity			Specific gravity at	Flash point COC	Pour point	Neutral no.	Notes
			c.St +40 °C	c.St +100 °C	Index	+15 °C	°C	°C	mg KOH/g	
Aral	G 150	Primeria LPG 150	145	27.0	200	1.060	275	-48	-	
BP	G 150-220	Energol GCS 180	185	35.0	200	1.057	260	-30	0.52	
Caltex	G 150	Synthetic Gear Lubricant	140		192	1.005	260	-30	0.10	
Castrol	G 150	WM/Alpha SN150	150		182	1.000	-	-39	1.60	
Chevron	G 150-220	LPG Compressor Oil	185	35.0	236	1.090	280	-30	-	
CPI Engineering Services Inc.	G 150	CP 1516-150	153	23.5	196	0.980	260	-34	<0.20	
Elf	G 150	Primeria LPG 150	142	25.7	200	1.060	275	-45	0.18	
Esso/Exxon	G 150-220	Exxcolub LG	185		250	1.060	-	-30	-	
Fina	G 150	Eolan SH150	150		172	1.093	-	-29	<0.10	
Fuchs	G 150	Renodiol PGP150	159		200	1.011	-	-33	0.70	
Mobil	G 150 - 220	Gas Compressor Oil	175	32.3	230	1.056	294	-36	0.14	
Shell	G 150-220	Madrela Oil T	185	35.0	200	1.056	262	-39	0.50	
Texaco	G 150	Synlube CLP150	142	23.4	188	1.002	279	-42	1.50	
Total	G 150	Cortusa SY150	155		195	0.992	260	-36	1.99	

ISO VG No.
Oil type