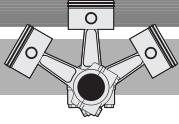


Technische Information Technical Information Information Technique



KT-510-4

Polyolester Oils BSE32 and BSE55 for Recip- rocating Compressors

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1 General

BITZER reciprocating compressors which are intended for use with chlorine free HFC refrigerants (R134a, R404A, R407A/B, R407C, R507A etc.) are charged with a high quality polyolester oil. When factory charged the compressor designation has the supplement "Y" – e. g. 4CC-6.2Y.

Contrary to conventional lubricants, ester oils provide good miscibility with HFC refrigerants and are therefore essential for the operation with these substances. Moreover they have outstanding lubrication characteristics and a favourable viscosity performance (high viscosity index).

Further information concerning the special handling of ester oils and miscibility limits are given in the Technical Informations KT-620 and KT-630.



2 Application ranges

2.1 BSE32

Basic viscosity 32 cSt at 40°C

Refrigerant	Application range	Comments
R134a	– H M (L)	stationary refrigeration and air conditioning plants with condensing temperatures up to 55°C
R404A	– (H) M L	
R407A	– (H) M L	
R407B	– – M L	
R407C	– H M	
R507A	– (H) M L	
R22	– – M L	see special recommendation, chapter 5

2.2 BSE55

Basic viscosity 55 cSt at 40°C

Refrigerant	Application range	Comments
R22	– H M L	see special recommendation, chapter 5
R134a	HH H M (L)	mobile refrigeration and air conditioning plants and stationary systems with condensing temperatures > 55°C
R407C	– H M –	
R410A	– H M (L)	stationary refrigeration and air conditioning plants

Definition of application ranges

- HH high temperature air conditioning (t_o up to 25°C)
- H air conditioning range
- M medium temperature range
- L low temperature range
- () application range less recommended (partly restrictions e.g. L range in case of R134a)

3 Properties of the BITZER ester oils

3.1 Technical data

Oil type	Density at 15°C	Flash point	Pour-point	Kinematic viscosity (cSt)		
	g/ml	°C	°C	20°C	40°C	100°C
BSE32	1,006	243	-48	88,1	31,2	6,0
BSE55	1,010	270	-51	149,4	55,0	8,8

3.2 Miscibility limits

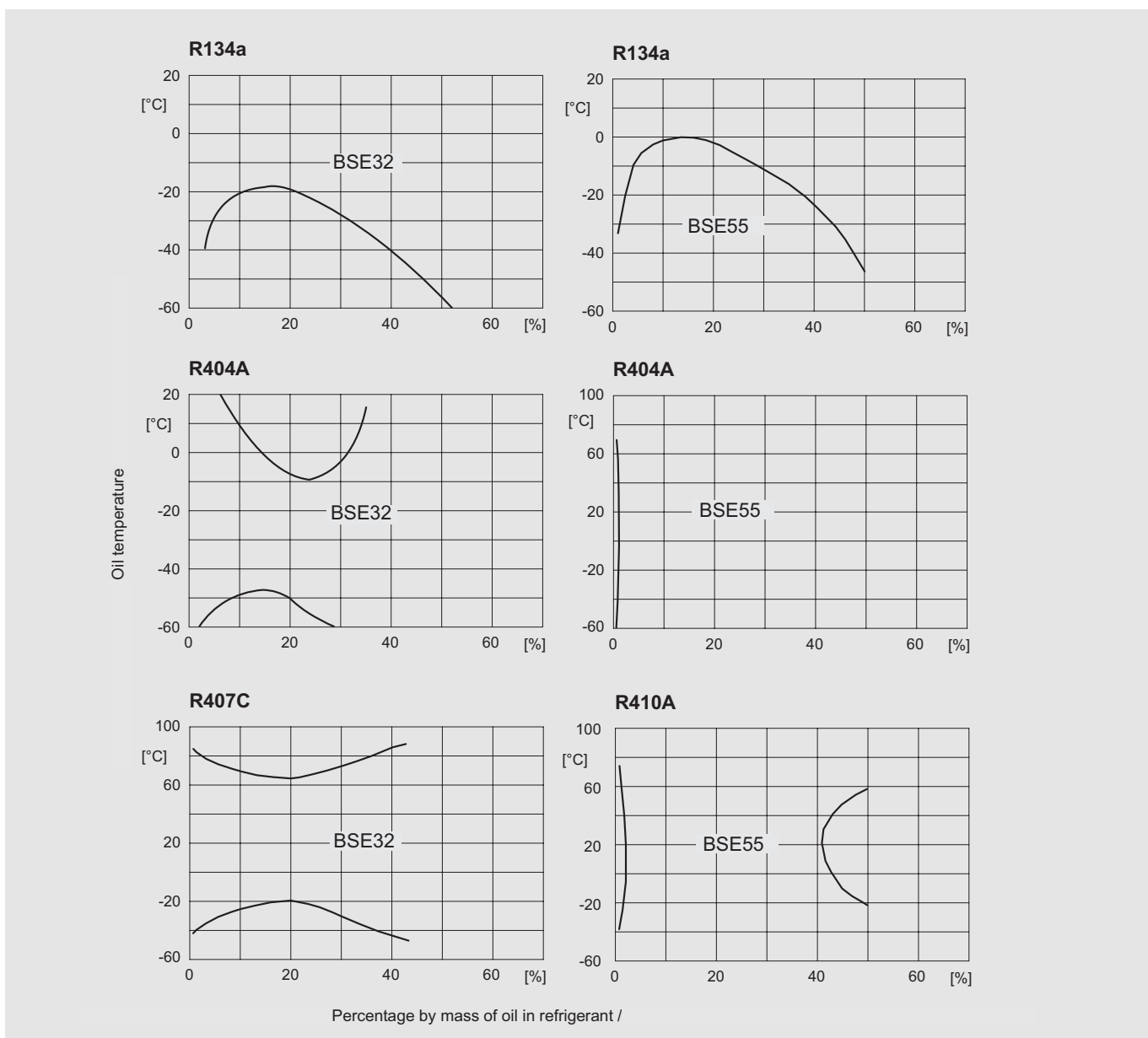


Fig. 1 Miscibility limits
Weight percentage oil in refrigerant

3.3 Refrigerant concentration in oil

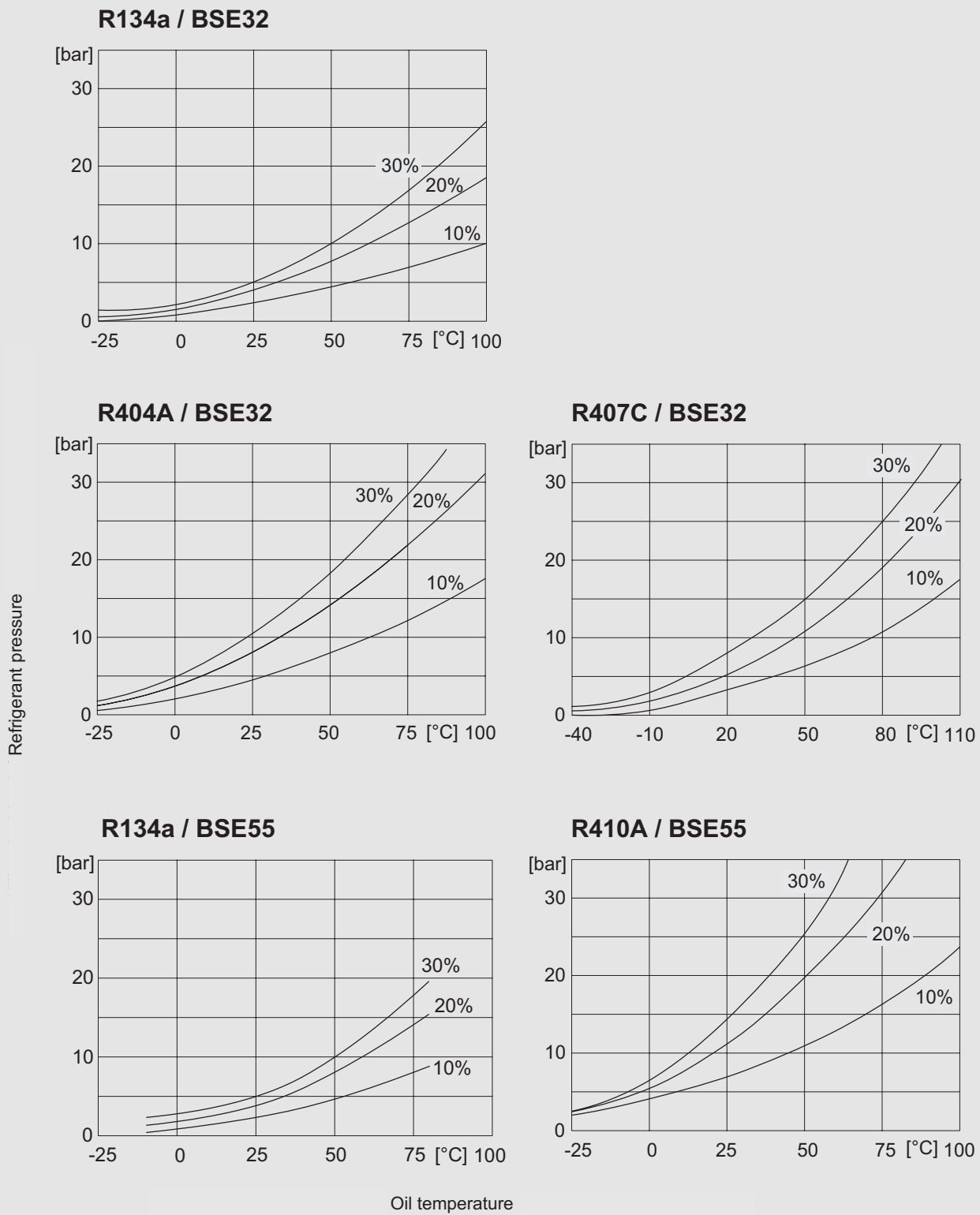


Fig. 2 Refrigerant solution in oil depending on refrigerant pressure and oil (mass %) temperature

4 Alternatives to BITZER ester oils

4.1 BSE32

Supplier	Oil type
Deutsche BP	Castrol Icematic SW 32
CPI	Solest 31-HE
ExxonMobil	EAL Arctic 22 CC EAL Arctic 32
Fuchs	SEZ 32
Shell	Clavus R32
Uniquema	RL 32 H

4.2 BSE55

Supplier	Oil type
Deutsche BP	Castrol Icematic SW 68
CPI	Solest 68
ExxonMobil	EAL Arctic 68
Fuchs	SE 55
Shell	Clavus R68
Uniquema	RL 68 S

The characteristics of the alternative oils listed mainly correspond to the original BSE32 and BSE55 charge. It is also possible to mix these with the original oil, within the respective viscosity group, as long as appropriate own or comparable experience is available for the application concerned. The basic assumption for the use of these alternatives is that the manufacturer or supplier guarantees the product quality and the moisture content (< 50 ppm).

Attention!

Due to the specific formulation of BSE55 with respect to the tribological characteristics, only original oil shall be used for the first charge of the compressor. The alternatives listed above are allowed only in case of service.

5 Use of ester oils with chlorinated (H)CFC refrigerants (R22 etc.)

A trend also exists towards charging compressors with ester oil for plants with (H)CFC refrigerants, to simplify a subsequent conversion to chlorine free refrigerant. Ester oils are generally suitable for such applications, however, a significantly increased risk exists regarding compressor wear and the chemical stability of the system. This applies even though BITZER compressors are constructed with high quality materials such as surface hardened shafts, specially treated bearings, hard chrome plated compression rings and high alloy steel valve reeds.

The argument that the conversion to alternative refrigerants is simplified is only valid with certain restrictions. A qualified conversion requires repeated oil changes due to the unavoidable contamination of the oil with chlorine from the (H)CFC refrigerant.

The use of ester oil in combination with (H)CFC refrigerants should always be considered carefully especially regarding the following points:

- When operating with (H)CFC the quantity of refrigerant dissolved in the ester oil is more than double as with conventional lubricants or when operating with a combination of ester oil and chlorine free HFC. This results in a strong viscosity reduction and the danger of increased wear, especially in cases of high suction pressure and low oil temperature. The starting procedure after a long period of standstill is particularly critical.
- Ester oils are strongly hygroscopic and therefore require a very high degree of dehydration (< 50 ppm) when used with (H)CFC due to the chlorine content; this can only be achieved in practice with a considerable effort. Excessive moisture content leads to hydrolysis and thereby to acid formation with copper plating resulting in damage to the compressor.

- Ester oils have an especially good solubility behaviour with regard to system dirt deposits and therefore increase the danger of damage to the compressor due to loosened dirt.

Resulting requirements

- Operation at air conditioning range (H range) and injection cooling (CIC) with single stage compressors:
 - Use ester oil with a higher basic viscosity (BSE55 instead of BSE32).
- While mounting:
 - Only use tubes and components which are clean and dry inside (free from slag, swarf, rust, and phosphate coatings) and which are delivered with an air tight seal
 - install generously sized drier
 - install suction side cleaning filter
 - handle the oil carefully:
Keep oil dry.
Use oil from originally sealed containers only!
- While commissioning:
 - evacuate to a high-grade vacuum
- Operation:
 - within controlled temperature limits only
 - use a high capacity crankcase heater
 - change the drier after approximately 100 operating hours
- Ensure with plant control:
 - sufficient suction gas superheat
 - avoid short operating periods
 - protect against liquid slugging
 - in certain cases provide a pump down system



Recommendations

- Due to the special risks with ester oils and (H)CFC refrigerant circuits, in the case of compressor damage we reserve the right to assess a guarantee claim according to an individual examination of the compressor in our factory.
- All compressors of the ".2-Generation" can already be used with R134a, R404A, R407A, R407B, R407C and R507A. Hereby the positive characteristics of ester oils are fully exploited. Such a solution should therefore be preferred over an (H)CFC system with ester oil.