BITZER & RS-50 (R442A)

Bitzer says that they do not expect any problems with regard to material compatibility & lubrication of the compressor when operated on RS-50 (R442A). Accordingly, Bitzer states that customers can use a Bitzer reciprocating compressor with RS-50 (R442A), & can provide the calculated performance data of the compressor. Bitzer does not see any particular risks from a technical point of view when operating their reciprocating compressors with RS-50 (R442A).

Bitzer has stated that since RS-50 (R442A) has a similar composition to R407F, the mass flow & discharge temperature will also be similar and, accordingly, RS-50 will occupy the same application retrofit envelope as R407F. A special calculation by Bitzer on RS-50 (R442A) follows.

BITZER is an independent compressor manufacturer & offers their customers the possibility of checking if a retrofit of a R404A system is possible from a technical point of view, & which different details of the system need to be checked for a retrofit. Bitzer will check the application & calculate the expected performance data based on the thermodynamic properties of the refrigerant & the performance of the compressor.

In event of a compressor failure, the decision about the guarantee will always be taken after the compressor has been examined by Bitzer in their facilities.

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REFRIGERANT SOLUTIONS LTD
RS-50
R442A

Compressor Special Calculation

Operating conditions / given values			
Type of system	**Single stage**		
Refrigerant	**R442A***		(Dew point temp.)
Evaporating temperature		-33,0 °C	(1,4 bar(a))
Superheat evaporator	10,0 K		
Superheat suction line	0,0 K		
Superheat int. heat. exch.	0,0 K		
Superheat total		10,0 K	(-23 °C)
Condensing temperature		37,0 °C	(16 bar(a))
Subcooling condenser	0,0 K		
Subcooling int. heat. exch.	0,0 K		
Subcooling external	0,0 K		
Subcooling total		0,0 K	(32,2 °C)
Power supply frequency		50 Hz	

Performance data**	
Compressor type	**2DC-2.2Y-40S**
Cooling capacity, compressor (4 -> 1)	1,9 kW
Cooling capacity, evaporator	**1,9 kW**
Power input	1,5 kW
Current (400 V)	3,3 A
COP / EER	1,30
Condenser capacity	3,4 kW
Refrigerant mass flow	44 kg/h
Discharge gas temp. without cooling	126 °C

* Refrigerant data calculated by Refprop library

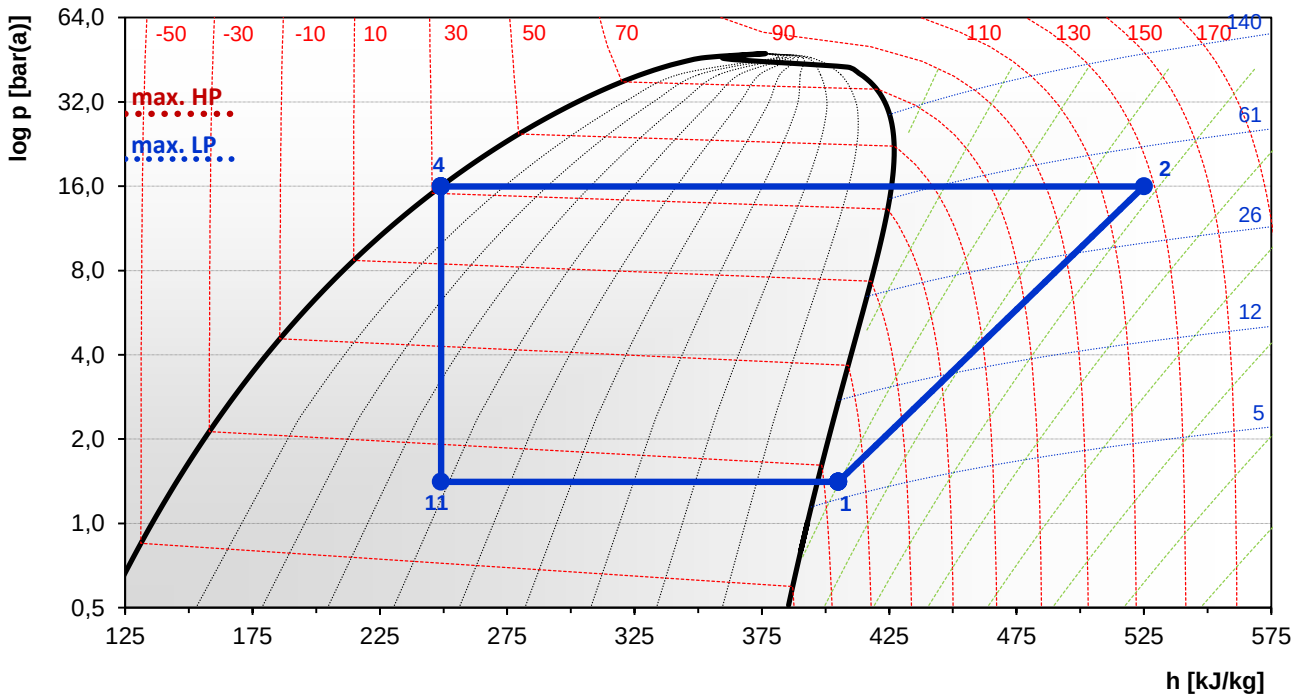
** Listed performance data are based on calculations and measured data. Under worst conditions given values might differ from common tolerances

See additional application-related remarks on page 3.

In case of a compressor failure, the decision on a potential warranty claim remains reserved to a diagnosis and examination of the compressor at the BITZER factory. Design, operation, and monitoring of the system is in the responsibility of the designer or executing company.

Compressor Special Calculation

log p, h - diagram (R442A)



Legend:

1	-> 2:	Compressor(s)
2	-> 4:	Condenser
4	-> 11:	Expansion valve
11	-> 1:	Evaporator

Specific values of R442A:

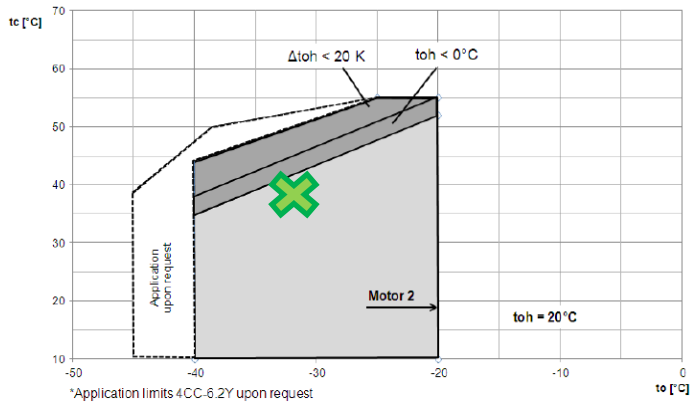
Critical temperature:	82,4	°C
Critical pressure:	47,6	bar(a)
Boiling temperature at 1 bar(a):	-46,7	°C
Isentropic compression index (1 bar(a) / 0 °C):	1,14	

Maximum overpressures of the compressor:

max. HP (high pressure side):	28 bar	⇨	58 °C
max. LP (low pressure side):	19 bar	⇨	41 °C

Application range

R407F VARICOOL 2KC-05.2Y .. 4DC-5.2Y*
Air cooling - direct suction "SL(B)"



*Application limits 4CC-6.2Y upon request

to	Evaporating temperature [°C]
toh	Suction gas temperature [°C]
Δtoh	Suction superheat [K]
tc	Condensing temperature [°C]
	Additional cooling
	Additional cooling & limited suction gas temperature

Application related remarks:

The recommended oil for this application on R442A is our BSE32 (POE).

At the indicated operating point, the discharge gas temperature is 126°C. Therefore, additional cooling is required. Since typical suction gas superheat in supermarket applications is higher than 10 K and the condensing temperature during hot ambient conditions will be higher than 37°C, the "direct suction SL(B)" should be used to protect the compressor from high discharge gas temperatures (see further information on page 10 of the KB-100-6). Moreover, additional cooling and monitoring of the discharge gas temperature (max. 140°C) are required.

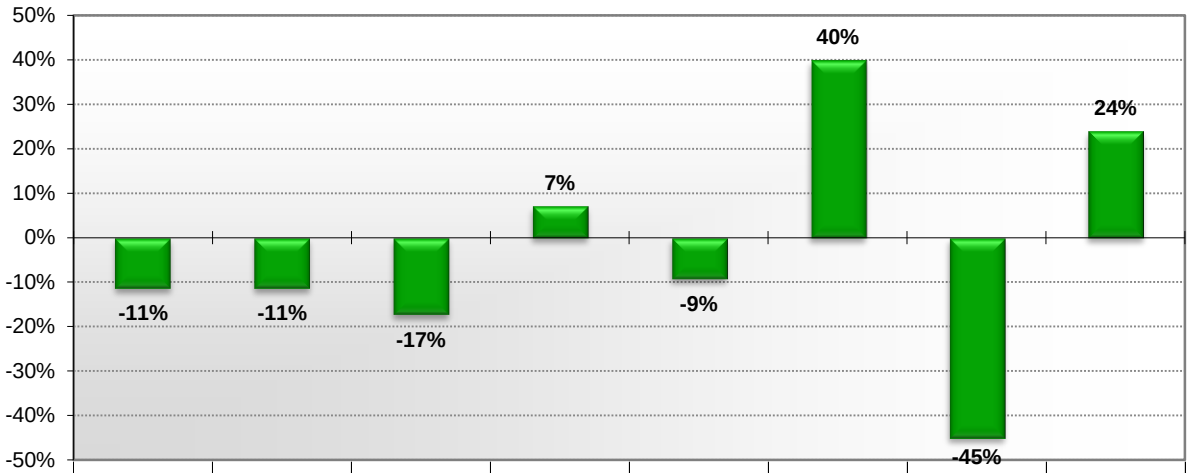
A comparison of the performance data with R442A and R507A can be found on page 4 of this document.

R442A has a similar composition to R407F. Therefore, the application limits for R407F must be considered for every R442A application.

The refrigerant R442A has a pronounced temperature glide. Detailed information with respect to the challenges and specific properties of zeotropic refrigerants can be found in the BITZER Refrigerant Report A-501-17.

Compressor Special Calculation

Comparison of the refrigerants (R442A/R507A) at same operating conditions*



	Cooling capacity, compressor	Cooling capacity, evaporator	Power input	COP / EER	Current (400 V)	Discharge gas temp.**	Mass flow	Pressure ratio
R442A:	1,9 kW	1,9 kW	1,5 kW	1,30	3,3 A	126,2 °C***	44 kg/h	11,34
R507A:	2,2 kW	2,2 kW	1,8 kW	1,21	3,7 A	83,6 °C***	80 kg/h	9,15

* The comparison calcuation is based on theoretical approach, respectively the same input parameters. Different pressure drops and heat transfer properties of the refrigerants are not regarded

** Ratio of the differences (Discharge gas temp. without cooling - Suction gas temp. at compressor inlet)

*** Absolut discharge gas temperature