

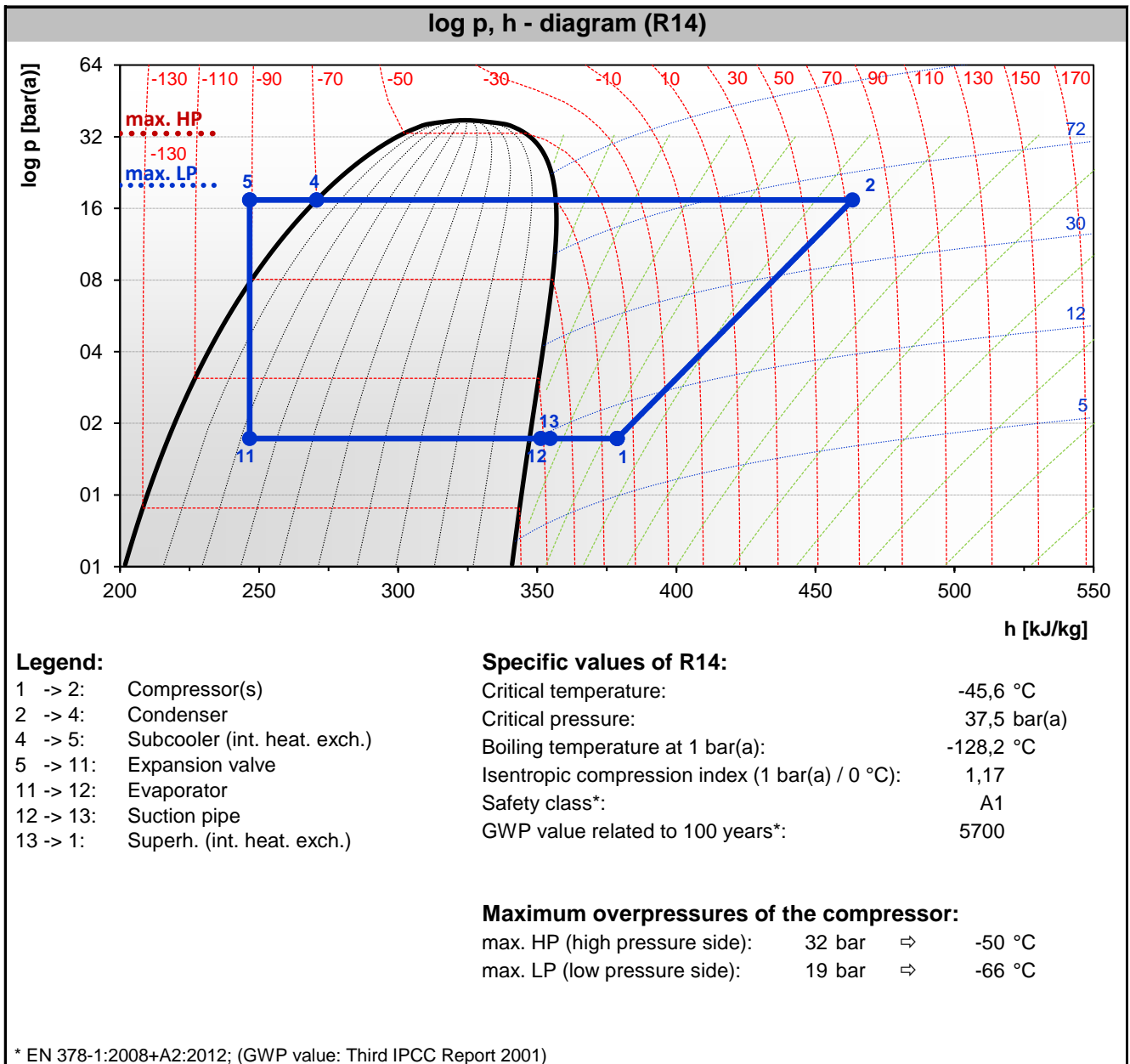
# Compressor Special Calculation



Operating conditions / given values			
<b>Type of system</b>	<b>Single stage</b>		
<b>Refrigerant</b>	<b>R14*</b>		
Evaporating temperature	-120,0 °C	(1,7 bar(a))	
Superheat evaporator	8,0 K		
Superheat suction line	7,0 K		
Superheat int. heat. exch.	45,0 K		
<b>Superheat total</b>	<b>60,0 K</b>	<b>(-60 °C)</b>	
Condensing temperature	-70,0 °C	(17,3 bar(a))	
Subcooling condenser	0,0 K		
Subcooling int. heat. exch.	20,8 K		
Subcooling external	0,0 K		
<b>Subcooling total</b>	<b>20,8 K</b>	<b>(-90,8 °C)</b>	
Power supply frequency	50 Hz		
Performance data**			
<b>Compressor model</b>	<b>4FES-3Y</b>		
Cooling capacity, compressor (4 -> 1)	3,3 kW		
<b>Cooling capacity, evaporator</b>	<b>3,2 kW</b>		
Power input	2,5 kW		
Current (400 V)	5,3 A		
COP / EER	1,24		
Condenser capacity	5,8 kW		
Refrigerant mass flow	108 kg/h		
Discharge gas temp. without cooling	73 °C		
<p>* Refrigerant data calculated by Refprop library</p> <p>** Listed performance data are based on calculations and measured data. Under worst conditions given values might differ from common tolerances</p>			

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



**Application range**

Not defined  
so far



## Application related remarks:

Due to the high mass flow when operating the compressor with R14, bearing bushes and other mechanical components of the compressor will work under a higher stress than when operating with standard refrigerants.

We recommend to use a heat exchanger between the suction line of the R14 system and the liquid line of the system used in the medium stage in order to ensure the minimum allowed suction temperature of  $-60^{\circ}\text{C}$ .

In order to reduce the risk of difficulties associated with the oil return from the evaporator, a highly efficient coalescent oil separator is recommended to limit the amount of oil circulating in the system.

With respect to the cast iron used for the compressor housing, please keep in mind that the minimum suction gas temperature must not fall below  $-60^{\circ}\text{C}$ .

Due to the high temperature difference between discharge gas and condensing temperature, BITZER recommends to install a desuperheater in order to reduce the thermal stress on the cascade heat exchanger. Thereby, the required cooling capacity of the upper stage is reduced and simultaneously, the overall system efficiency is increased.

When heated up to ambient temperature, R14 will generate relatively high pressures levels. This has to be taken into consideration e.g. by using additional pressure vessels or a stillstand cooling unit.

# Compressor Special Calculation



Comparison of the refrigerants (R14/R245fa) at same operating conditions\*

	0%	0%	0%	0%	0%	0%	0%	0%
	Cooling capacity, compressor	Cooling capacity, evaporator	Power input	COP / EER	Current (400 V)	Discharge gas temp.**	Mass flow	Pressure ratio
<b>R14:</b>	3,3 kW	3,2 kW	2,5 kW	1,24	5,3 A	73,4 °C***	108 kg/h	10,05
<b>R245fa:</b>	#WERT!	#WERT!	#WERT!	#WERT!	#WERT!	#WERT!	#WERT!	#WERT!

\* The comparison calculation 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