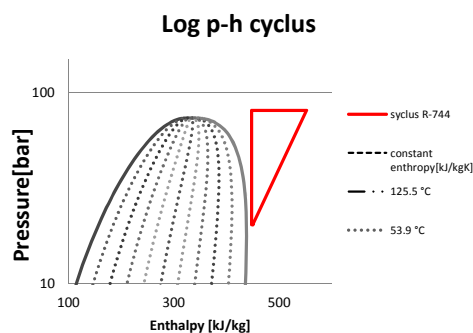


**Experiment no:** 4  
**Date:** 22.05.2012  
**Operator:** Obrist/Roman  
**Mode:** comp.test 3700 rpm  
**Measured points** 34

Components		Description
Compressor		Piston compressor
Gascooler/condenser		Air fan
Gasscooler condenser		Water to sink
Gascooler/condenser	4a/b	Heat to glycol
Internal heat exchanger		
Evaporator	6a/b	R-774/glycol
Separator		
Oil separator		



System performance					
			Total Deviation	Total uncertainty	Comment
COP	-	1.0	± 0.01	0.70 %	
Compressor Speed	[rpm]	3700	± 7.40	0.2 %	
Mass flow R744	[kg/h]	2797	± 6.02	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	25.2 %	
Ambient temperature	[°C]	26.2	± 0.41	1.6 %	
Supply power	[kW]	89.8	± 0.63	0.7 %	
Power consumption compressor	[kW]	80.8	± 0.39	0.5 %	
Danfoss VSD efficiency		89.96 %	± 0.00	0.43 %	
Volumetric efficiency		67.7 %	± 0.55 %	0.81 %	
Isentropic efficiency		64.4 %	± 0.30 %	0.46 %	
Oil circulation rate (OCR)		1.2743 %	± 0.295 %	59.07 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	81.5	± 0.34	0.4 %	
Cooling capacity	[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	[bar]	58.2	± 0.15 0.00	0.3 %	
Pressure, throttle valve, in	[bar]	79.5	± 0.20	0.3 %	
Temperature, throttle valve, in	[°C]	53.9	± 0.07	0.1 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor					
			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	20.4	± 0.05	0.3 %	
Inlet temperature	[°C]	-9.3	± -0.02	0.3 %	
Inlet super heat	[K]	9.6	± 0.02	0.2 %	
Outlet pressure	[bar]	80.7	± 0.20	0.3 %	
Outlet temperature	[°C]	125.5	± 0.04	0.03 %	
Pressure ratio	[-]	4.0	± 0.014	0.4 %	
Lubricant return mass flow rate:	[kg/h]	36.1	± 21.60	59.8 %	on/off valve
Temperature, lubricant return:	[°C]	104.8	± 0.39	0.4 %	
Compressor Speed	[rpm]	3700	± 7.40	0.2 %	
Torque	[Nm]	208	± 1.10	0.5 %	
Power consumption	[kW]	80.8	± 0.39	0.5 %	
Massflow R-744	[kg/h]	2797	± 6.02	0.2 %	
Specific volume (suction line)	[m³/kg]	0.02	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m³]	49.6	± 0.05	0.1 %	
Volumetric efficiency	[%]	<u>67.7 %</u>	± 0.55 %	0.81 %	
Isentropic efficiency	[%]	<u>64.4 %</u>	± 0.30 %	0.46 %	

Aircooler						
<b>Gascooler TAG 2</b>			<b>Total Deviation</b>	<b>Total uncertainty</b>	<b>Comment</b>	
Specific heat difference	<i>kJ/kg</i>	100.8	±	0.44	0.4 %	
Capacity	<i>[kW]</i>	78.3	±	0.38	0.5 %	
Temperature difference R-744	<i>°C</i>	67.7	±	0.12	0.2 %	
Mass flow air	<i>kg/h</i>	-				
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.2	±	0.00	2.0 %	
Mass flow R744	<i>kg/h</i>	2797	±	6.02	0.2 %	
Inlet temperature		123.0	±			
Outlet temperature		55.26				
			±			
			±			
Watercooler						
<b>Gascooler TAG 3</b>			±			
Specific heat difference	<i>kJ/kg</i>	0.4		0.00	0.0 %	
Cooling capacity	<i>kW</i>	0.3	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	0.5		0.16	31.5 %	
Pressure drop	<i>bar</i>	0.0		0.00	1.7 %	
Mass flow R-744	<i>kg/h</i>	2797	±	6.02	0.2 %	
Temperature difference water	<i>°C</i>	2.4		0.12	5.0 %	
Gascooler 4a						
<b>R744 side</b>			<b>Total Deviation</b>	<b>Total uncertainty</b>	<b>Comment</b>	
Inlet temperature	<i>°C</i>	54.8	±	0.11	0.2 %	
Outlet temperature	<i>°C</i>	47.6	±	0.06	0.1 %	
Specific heat difference	<i>kJ/kg</i>	0.02	±	0.00	3.7 %	
Temperature difference	<i>°C</i>	7.1	±	0.12	1.7 %	
Mass flow R744	<i>Kg/h</i>	2797	±	6.02	0.2 %	
Cooling capacity	<i>kW</i>	13.1	±	0.49	3.7 %	
Pressure drop	<i>bar</i>	0.05	±	0.01	11.3 %	
<b>Glycol side</b>						
Specific heat difference	<i>kJ/kg</i>	0.05	±	0.38	709.5 %	
Temperature difference	<i>°C</i>	15.5	±	0.11	0.7 %	
Mass flow glycol	<i>Kg/h</i>	-3	±	0.00	0.1 %	
Cooling capacity	<i>kW</i>	-0.04	±	0.00	0.2 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	1.8 %	

Gascooler 4b							
<b>R744 side</b>							
Inlet temperature	°C	54.8	±	0.1 %			
Outlet temperature	°C	54.7	±	0.1 %			
Specific heat difference	<i>kJ/kg</i>	0.4	±	144.1 %			
Temperature difference	°C	0.1	±	102.3 %			
Mass flow R744	<i>kg/h</i>	2797	±	0.2 %			
Cooling capacity	<i>kW</i>	0.00	±	144.2 %			
Pressure drop	<i>Bar</i>	0.05	±	7.9 %			
<b>Glycol side</b>							
Specific heat difference	<i>kJ/kg</i>	153.1	±	164.7 %			
Temperature difference	°C	43.6	±	0.4 %			
Mass flow glycol	<i>Kg/h</i>	-1	±	0.1 %			
Cooling capacity	<i>kW</i>	-401	±	0.1 %			
Pressure drop	<i>bar</i>	0.01	±	5.0 %			

IHX							
<b>HP side</b>			<b>Total Deviation</b>		<b>Total uncertainty</b>	<b>Comment</b>	
Specific heat difference	<i>kJ/kg</i>	2.1	±	0.52	25.5 %		
Temperature difference	°C	0.1	±	0.09	133.6 %		
Mass flow R744	<i>kg/h</i>	2797	±	6.02	0.2 %		
Cooling capacity	<i>kW</i>	1.6	±	0.41	25.5 %		
Pressure loss	<i>bar</i>	1.8	±	0.00	0.0 %		
			±				
<b>LP side</b>							
Specific heat difference	<i>kJ/kg</i>	5.0	±	0.42	8.3 %		
Temperature difference	°C	43.4	±	0.03	0.1 %		
Mass flow R744	<i>Kg/h</i>	2797	±	6.02	0.2 %		
Cooling capacity	<i>kW</i>	0.1	±	0.00	0.0 %		
Pressure loss	<i>bar</i>	0.03	±	0.00	12.0 %		
Superheat IHX inlet	<i>[°C]</i>	13.4					

Evaporator 6a							
<b>R744 side</b>			<b>Total Deviation</b>		<b>Total uncertainty</b>	<b>Comment</b>	
Pressure inlet	<i>bar</i>	58.2	±	0.15	0.25 %		
Temperature difference	°C	-4.1	±	0.00	0.0 %		
Mass flow R744	<i>kg/h</i>	2797	±	6.02	0.2 %		
Heat difference R744	<i>kJ/kg</i>	-202	±	-0.10	0.0 %		
Cooling capacity	<i>kW</i>	-156.82	±	-0.07	0.0 %		
Pressure drop	<i>bar</i>	0.04	±	0.00	2.2 %		
<b>Glycol side</b>							
Specific heat difference	<i>kJ/kg</i>	7.63	±	87	1138.0 %		
Temperature difference	°C	2.20	±	0.08	3.6 %		
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	25.2 %		
Cooling capacity	<i>kW</i>	0.00	±	1	12798031.8 %		
Pressure drop	<i>bar</i>	0.01	±	0.00	3.7 %		

Evaporator 6b							
<b>R744 side</b>							
Pressure inlet	<i>bar</i>	58.2	±	0.15	0.25 %		
Specific heat to R744	<i>kJ/kg</i>	0.3	±	0.00	0.0 %		
Temperature difference	°C	19.1	±	0.03	0.2 %		
Mass flow R744	<i>kg/h</i>	2797	±	6.0	0.2 %		
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %		
Pressure drop	<i>bar</i>	0.03	±	0.00	1.7 %		
<b>Glycol side</b>							
Specific heat out	<i>kJ/kg</i>	18951.1	±	66873.0	352.9 %		
Temperature difference	°C	3257.1	±	8.19	0.3 %		
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	25.2 %		
Cooling capacity	<i>kW</i>	0.1	±	0.28	353.8 %		
Pressure drop	<i>bar</i>	0.01	±	0.00	6.4 %		