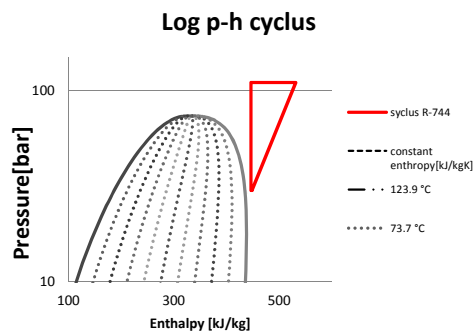


**Experiment no:** 4  
**Date:** 22.05.2012  
**Operator:** Obrist/Roman  
**Mode:** comp.test    2500 rpm  
**Measured points** 34

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	0.80 %	
Compressor Speed	[rpm]	2500	± 5.00	0.2 %	
Mass flow R744	[kg/h]	3065	± 6.25	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	22.6 %	
Ambient temperature	[°C]	19.2	± 0.03	0.1 %	
Supply power	[kW]	80.9	± 0.16	0.2 %	
Power consumption compressor	[kW]	73.1	± 0.33	0.4 %	
Danfoss VSD efficiency		90.33 %	± 0.00	0.45 %	
Volumetric efficiency		72.7 %	± 0.69 %	0.95 %	
Isentropic efficiency		72.5 %	± 0.37 %	0.51 %	
Oil circulation rate (OCR)		1.4147 %	± 0.366 %	58.37 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	72.3	± 0.77	1.1 %	
Cooling capacity	[kW]	12.7	± 0.10	0.8 %	
Pressure, evaporator, inlet	[bar]	33.1	± 0.08 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	109.8	± 0.28	0.3 %	
Temperature, throttle valve, in	[°C]	73.7	± 0.05	0.1 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor					
			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	30.0	± 0.08	0.3 %	
Inlet temperature	[°C]	3.4	± 0.06	1.7 %	
Inlet super heat	[K]	9.0	± 0.06	0.7 %	
Outlet pressure	[bar]	110.7	± 0.28	0.3 %	
Outlet temperature	[°C]	123.9	± 0.07	0.06 %	
Pressure ratio	[-]	3.7	± 0.013	0.4 %	
Lubricant return mass flow rate:	[kg/h]	44.0	± 26.04	59.2 %	on/off valve
Temperature, lubricant return:	[°C]	103.9	± 0.38	0.4 %	
Compressor Speed	[rpm]	2500	± 5.00	0.2 %	
Torque	[Nm]	279	± 1.37	0.5 %	
Power consumption	[kW]	73.1	± 0.33	0.4 %	
Massflow R-744	[kg/h]	3065	± 6.25	0.2 %	
Specific volume (suction line)	[m³/kg]	0.01	± 0.00	0.3 %	
Density CO2 (suction line)	[kg/m³]	75.1	± 0.21	0.3 %	
Volumetric efficiency	[%]	<u>72.7 %</u>	± 0.69 %	0.95 %	
Isentropic efficiency	[%]	<u>72.5 %</u>	± 0.37 %	0.51 %	

Aircooler						
<b>Gascooler TAG 2</b>			<b>Total Deviation</b>	<b>Total uncertainty</b>	<b>Comment</b>	
Specific heat difference	<i>kJ/kg</i>	77.9	±	0.42	0.5 %	
Capacity	<i>[kW]</i>	66.3	±	0.38	0.6 %	
Temperature difference R-744	<i>°C</i>	45.9	±	0.08	0.2 %	
Mass flow air	<i>kg/h</i>	-				
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.2	±	0.01	5.6 %	
Mass flow R744	<i>kg/h</i>	3065	±	6.25	0.2 %	
Inlet temperature		121.7	±			
Outlet temperature		75.79				
			±			
			±			
Watercooler						
<b>Gascooler TAG 3</b>			±			
Specific heat difference	<i>kJ/kg</i>	0.5		0.00	0.0 %	
Cooling capacity	<i>kW</i>	0.4	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	0.5		0.05	10.3 %	
Pressure drop	<i>bar</i>	0.0		0.00	5.7 %	
Mass flow R-744	<i>kg/h</i>	3065	±	6.25	0.2 %	
Temperature difference water	<i>°C</i>	2.0		0.11	5.3 %	
Gascooler 4a						
<b>R744 side</b>			<b>Total Deviation</b>	<b>Total uncertainty</b>	<b>Comment</b>	
Inlet temperature	<i>°C</i>	75.3	±	0.03	0.0 %	
Outlet temperature	<i>°C</i>	59.1	±	0.04	0.1 %	
Specific heat difference	<i>kJ/kg</i>	0.05	±	0.00	1.5 %	
Temperature difference	<i>°C</i>	16.2	±	0.06	0.4 %	
Mass flow R744	<i>Kg/h</i>	3065	±	6.25	0.2 %	
Cooling capacity	<i>kW</i>	40.7	±	0.63	1.5 %	
Pressure drop	<i>bar</i>	0.03	±	0.04	123.7 %	
<b>Glycol side</b>						
Specific heat difference	<i>kJ/kg</i>	0.07	±	0.46	666.6 %	
Temperature difference	<i>°C</i>	19.6	±	0.13	0.7 %	
Mass flow glycol	<i>Kg/h</i>	-4	±	0.00	0.0 %	
Cooling capacity	<i>kW</i>	-0.07	±	0.00	0.2 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	2.3 %	

Gascooler 4b					
<b>R744 side</b>					
Inlte temperature	°C	75.3	±	0.1 %	
Outlet temperature	°C	72.5	±	0.1 %	
Spesific heat difference	<i>kJ/kg</i>	6.6	±	11.6 %	
Temperature difference	°C	2.8	±	3.4 %	
Mass flow R744	<i>kg/h</i>	3065	±	0.2 %	
Cooling capacity	<i>kW</i>	0.00	±	11.7 %	
Pressure drop	<i>Bar</i>	0.05	±	55.1 %	
<b>Glycol side</b>					
Spesific heat difference	<i>kJ/kg</i>	154.4	±	110.3 %	
Temperature difference	°C	43.9	±	0.4 %	
Mass flow glycol	<i>Kg/h</i>	-2	±	0.1 %	
Cooling capacity	<i>kW</i>	-547	±	0.1 %	
Pressure drop	<i>bar</i>	0.01	±	7.2 %	

IHX					
<b>HP side</b>			<b>Total Deviation</b>	<b>Total uncertainty</b>	<b>Comment</b>
Spesific heat difference	<i>kJ/kg</i>	2.3	±	0.56	24.7 %
Temperature difference	°C	0.4	±	0.07	16.8 %
Mass flow R744	<i>kg/h</i>	3065	±	6.25	0.2 %
Cooling capacity	<i>kW</i>	1.9	±	0.48	24.7 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.1 %
<b>LP side</b>					
Spesific heat difference	<i>kJ/kg</i>	38.7	±	0.36	0.9 %
Temperature difference	°C	34.8	±	0.06	0.2 %
Mass flow R744	<i>Kg/h</i>	3065	±	6.25	0.2 %
Cooling capacity	<i>kW</i>	0.5	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.04	±	0.01	18.2 %
Superheat IHX inlet	<i>[°C]</i>	36.2			

Evaporator 6a					
<b>R744 side</b>			<b>Total Deviation</b>	<b>Total uncertainty</b>	<b>Comment</b>
Pressure inlet	<i>bar</i>	33.1	±	0.08	0.25 %
Temperature difference	°C	-4.1	±	0.00	0.0 %
Mass flow R744	<i>kg/h</i>	3065	±	6.25	0.2 %
Heat difference R744	<i>kJ/kg</i>	15	±	0.10	0.6 %
Cooling capacity	<i>kW</i>	12.67	±	0.08	0.6 %
Pressure drop	<i>bar</i>	0.02	±	0.00	3.7 %
<b>Glycol side</b>					
Spesific heat difference	<i>kJ/kg</i>	9.06	±	105	1153.9 %
Temperature difference	°C	2.61	±	0.08	3.2 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	22.6 %
Cooling capacity	<i>kW</i>	0.00	±	1	11474989.5 %
Pressure drop	<i>bar</i>	0.01	±	0.00	7.7 %

Evaporator 6b					
<b>R744 side</b>					
Pressure inlet	<i>bar</i>	33.1	±	0.08	0.25 %
Spesific 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>	3065	±	6.3	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.02	±	0.00	2.7 %
<b>Glycol side</b>					
Spesific heat out	<i>kJ/kg</i>	18944.8	±	66873.0	353.0 %
Temperature difference	°C	3255.3	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	22.6 %
Cooling capacity	<i>kW</i>	0.1	±	0.32	353.7 %
Pressure drop	<i>bar</i>	0.01	±	0.00	5.5 %