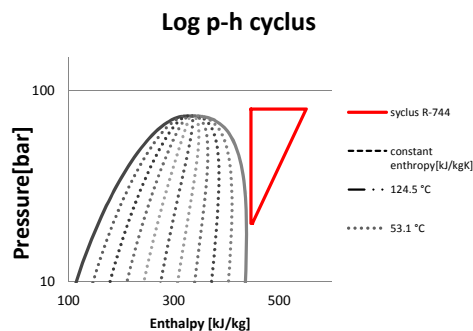


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 3500 rpm
Measured points 29

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					
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			Total Deviation	Total uncertainty	Comment
COP	-	1.1	± 0.01	0.74 %	
Compressor Speed	[rpm]	3500	± 7.00	0.2 %	
Mass flow R744	[kg/h]	2624	± 5.48	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	33.9 %	
Ambient temperature	[°C]	23.8	± 0.44	1.8 %	
Supply power	[kW]	82.7	± 0.40	0.5 %	
Power consumption compressor	[kW]	72.7	± 0.47	0.6 %	
Danfoss VSD efficiency		87.93 %	± 0.00	0.45 %	
Volumetric efficiency		67.6 %	± 0.62 %	0.92 %	
Isentropic efficiency		67.2 %	± 0.32 %	0.47 %	
Oil circulation rate (OCR)		1.4838 %	± 0.319 %	58.00 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	76.6	± 0.35	0.5 %	
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]	79.2	± 0.20	0.3 %	
Temperature, throttle valve, in	[°C]	53.1	± 0.09	0.2 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor					
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			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	20.2	± 0.06	0.3 %	
Inlet temperature	[°C]	-10.2	± -0.12	1.1 %	
Inlet super heat	[K]	9.0	± 0.12	1.3 %	
Outlet pressure	[bar]	80.2	± 0.20	0.3 %	
Outlet temperature	[°C]	124.5	± 0.09	0.07 %	
Pressure ratio	[-]	4.0	± 0.015	0.4 %	
Lubricant return mass flow rate:	[kg/h]	39.5	± 23.27	58.9 %	on/off valve
Temperature, lubricant return:	[°C]	103.1	± 0.48	0.5 %	
Compressor Speed	[rpm]	3500	± 7.00	0.2 %	
Torque	[Nm]	198	± 1.35	0.7 %	
Power consumption	[kW]	72.7	± 0.47	0.6 %	
Massflow R-744	[kg/h]	2624	± 5.48	0.2 %	
Specific volume (suction line)	[m ³ /kg]	0.02	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m ³]	49.4	± 0.07	0.1 %	
Volumetric efficiency	[%]	<u>67.6 %</u>	± 0.62 %	0.92 %	
Isentropic efficiency	[%]	<u>67.2 %</u>	± 0.32 %	0.47 %	

Aircooler						
Gascooler TAG 2				Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	102.7	±	0.41	0.4 %	
Capacity	<i>[kW]</i>	74.9	±	0.34	0.5 %	
Temperature difference R-744	<i>°C</i>	68.5	±	0.09	0.1 %	
Mass flow air	<i>kg/h</i>					
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.2	±	0.00	2.4 %	
Mass flow R744	<i>kg/h</i>	2624	±	5.48	0.2 %	
Inlet temperature		122.1	±			
Outlet temperature		53.54				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Specific heat difference	<i>kJ/kg</i>	-0.6		0.00	0.0 %	
Cooling capacity	<i>kW</i>	-0.5	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	0.1		0.11	127.1 %	
Pressure drop	<i>bar</i>	0.0		0.00	1.9 %	
Mass flow R-744	<i>kg/h</i>	2624	±	5.48	0.2 %	
Temperature difference water	<i>°C</i>	2.4		0.12	4.9 %	
Gascooler 4a						
R744 side				Total Deviation	Total uncertainty	Comment
Inlet temperature	<i>°C</i>	53.5	±	0.08	0.1 %	
Outlet temperature	<i>°C</i>	47.0	±	0.04	0.1 %	
Specific heat difference	<i>kJ/kg</i>	0.02	±	0.00	3.8 %	
Temperature difference	<i>°C</i>	6.5	±	0.09	1.4 %	
Mass flow R744	<i>Kg/h</i>	2624	±	5.48	0.2 %	
Cooling capacity	<i>kW</i>	11.5	±	0.44	3.8 %	
Pressure drop	<i>bar</i>	0.05	±	0.01	16.8 %	
Glycol side						
Specific heat difference	<i>kJ/kg</i>	0.05	±	0.38	692.7 %	
Temperature difference	<i>°C</i>	15.6	±	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	1.6 %	

Gascooler 4b					
R744 side					
Inlet temperature	°C	53.5	±	0.1 %	
Outlet temperature	°C	54.2	±	0.0 %	
Specific heat difference	<i>kJ/kg</i>	1.8	±	33.0 %	
Temperature difference	°C	0.7	±	12.0 %	
Mass flow R744	<i>kg/h</i>	2624	±	0.2 %	
Cooling capacity	<i>kW</i>	0.00	±	33.0 %	
Pressure drop	<i>Bar</i>	0.05	±	5.0 %	
Glycol side					
Specific heat difference	<i>kJ/kg</i>	157.3	±	148.5 %	
Temperature difference	°C	44.8	±	0.4 %	
Mass flow glycol	<i>Kg/h</i>	-1	±	0.1 %	
Cooling capacity	<i>kW</i>	-460	±	0.1 %	
Pressure drop	<i>bar</i>	0.01	±	4.5 %	

IHX					
HP side			Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	1.7	±	0.56	32.6 %
Temperature difference	°C	0.0	±	0.12	858.6 %
Mass flow R744	<i>kg/h</i>	2624	±	5.48	0.2 %
Cooling capacity	<i>kW</i>	1.3	±	0.41	32.6 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.1 %
LP side					
Specific heat difference	<i>kJ/kg</i>	4.4	±	0.44	9.9 %
Temperature difference	°C	44.2	±	0.12	0.3 %
Mass flow R744	<i>Kg/h</i>	2624	±	5.48	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.03	±	0.00	13.3 %
Superheat IHX inlet	<i>[°C]</i>	13.4			

Evaporator 6a					
R744 side			Total Deviation	Total uncertainty	Comment
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>	2624	±	5.48	0.2 %
Heat difference R744	<i>kJ/kg</i>	-201	±	-0.10	0.0 %
Cooling capacity	<i>kW</i>	-146.32	±	-0.07	0.0 %
Pressure drop	<i>bar</i>	0.04	±	0.00	2.2 %
Glycol side					
Specific heat difference	<i>kJ/kg</i>	7.63	±	87	1139.4 %
Temperature difference	°C	2.19	±	0.08	3.5 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	33.9 %
Cooling capacity	<i>kW</i>	0.00	±	1	12649051.4 %
Pressure drop	<i>bar</i>	0.01	±	0.00	5.3 %

Evaporator 6b					
R744 side					
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>	2624	±	5.5	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.03	±	0.00	2.3 %
Glycol side					
Specific heat out	<i>kJ/kg</i>	18951.7	±	66873.1	352.9 %
Temperature difference	°C	3257.3	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	33.9 %
Cooling capacity	<i>kW</i>	0.1	±	0.30	354.5 %
Pressure drop	<i>bar</i>	0.01	±	0.00	5.6 %