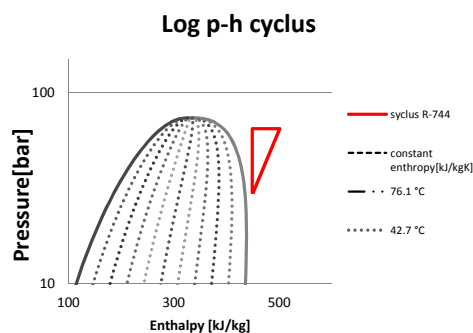


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 1000 rpm
Measured points 100

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	± 0.02	1.65 %	
Compressor Speed	[rpm]	1000	± 2.00	0.2 %	
Mass flow R744	[kg/h]	1276	± 2.60	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	16.1 %	
Ambient temperature	[°C]	20.0	± 0.07	0.4 %	
Supply power	[kW]	20.7	± 0.04	0.2 %	
Power consumption compressor	[kW]	17.9	± 0.19	1.0 %	
Danfoss VSD efficiency		86.70 %	± 0.01	1.06 %	
Volumetric efficiency		76.2 %	± 0.41 %	0.54 %	
Isentropic efficiency		68.4 %	± 0.77 %	1.12 %	
Oil circulation rate (OCR)		0.6405 %	± 0.768 %	70.57 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	18.6	± 0.09	0.5 %	
Cooling capacity	[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	[bar]	62.5	± 0.16 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	64.9	± 0.16	0.3 %	
Temperature, throttle valve, in	[°C]	42.7	± 0.09	0.2 %	
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]	5.0	± 0.04	0.7 %	
Inlet super heat	[K]	10.6	± 0.04	0.3 %	
Outlet pressure	[bar]	64.9	± 0.16	0.3 %	
Outlet temperature	[°C]	76.1	± 0.03	0.03 %	
Pressure ratio	[-]	2.2	± 0.008	0.4 %	
Lubricant return mass flow rate:	[kg/h]	8.2	± 5.84	71.0 %	on/off valve
Temperature, lubricant return:	[°C]	49.9	± 0.66	1.3 %	
Compressor Speed	[rpm]	1000	± 2.00	0.2 %	
Torque	[Nm]	171	± 1.81	1.1 %	
Power consumption	[kW]	17.9	± 0.19	1.0 %	
Massflow R-744	[kg/h]	1276	± 2.60	0.2 %	
Specific volume (suction line)	[m ³ /kg]	0.01	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m ³]	73.9	± 0.08	0.1 %	
Volumetric efficiency	[%]	<u>76.2 %</u>	± 0.41 %	0.54 %	
Isentropic efficiency	[%]	<u>68.4 %</u>	± 0.77 %	1.12 %	

Aircooler						
Gascooler TAG 2			Total Deviation	Total uncertainty	Comment	
Spesific heat difference	<i>kJ/kg</i>	49.6	±	0.46	0.9 %	
Capacity	<i>[kW]</i>	17.6	±	0.17	1.0 %	
Temperature difference R-744	<i>°C</i>	30.6	±	0.17	0.6 %	
Mass flow air	<i>kg/h</i>	-				
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.1	±	0.00	0.9 %	
Mass flow R744	<i>kg/h</i>	1276	±	2.60	0.2 %	
Inlet temperature		74.5	±			
Outlet temperature		43.92				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Spesific heat difference	<i>kJ/kg</i>	0.5		0.00	0.0 %	
Cooling capasity	<i>kW</i>	0.2	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature differenca R-744	<i>°C</i>	0.6		0.24	41.3 %	
Pressure drop	<i>bar</i>	0.0		0.00	1.2 %	
Mass flow R-744	<i>kg/h</i>	1276	±	2.60	0.2 %	
Temperature difference water	<i>°C</i>	2.7		0.11	4.1 %	

Gascooler 4a						
R744 side			Total Deviation	Total uncertainty	Comment	
Inlet temperature	<i>°C</i>	43.3	±	0.17	0.4 %	
Outlet temperature	<i>°C</i>	39.7	±	0.05	0.1 %	
Spesific heat difference	<i>kJ/kg</i>	0.01	±	0.00	9.1 %	
Temperature difference	<i>°C</i>	3.7	±	0.18	4.9 %	
Mass flow R744	<i>Kg/h</i>	1276	±	2.60	0.2 %	
Cooling capasity	<i>kW</i>	2.2	±	0.20	9.1 %	
Pressure drop	<i>bar</i>	0.04	±	0.00	1.4 %	
Glycol side						
Spesific heat difference	<i>kJ/kg</i>	0.05	±	0.38	813.1 %	
Temperature difference	<i>°C</i>	13.3	±	0.11	0.8 %	
Mass flow glycol	<i>Kg/h</i>	-3	±	0.00	0.0 %	
Cooling capasity	<i>kW</i>	-0.04	±	0.00	0.2 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	1.3 %	

Gascooler 4b					
R744 side					
Inlet temperature	°C	43.3	±	0.1 %	
Outlet temperature	°C	43.3	±	0.2 %	
Specific heat difference	<i>kJ/kg</i>	2.5	±	18.7 %	
Temperature difference	°C	0.0	±	1503.3 %	
Mass flow R744	<i>kg/h</i>	1276	±	0.2 %	
Cooling capacity	<i>kW</i>	0.00	±	18.7 %	
Pressure drop	<i>Bar</i>	0.04	±	2.5 %	
Glycol side					
Specific heat difference	<i>kJ/kg</i>	99.3	±	205.2 %	
Temperature difference	°C	28.3	±	0.5 %	
Mass flow glycol	<i>Kg/h</i>	-1	±	0.1 %	
Cooling capacity	<i>kW</i>	-289	±	0.1 %	
Pressure drop	<i>bar</i>	0.01	±	3.8 %	

IHX					
HP side			Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	0.9	±	0.26	30.0 %
Temperature difference	°C	0.2	±	0.13	65.0 %
Mass flow R744	<i>kg/h</i>	1276	±	2.60	0.2 %
Cooling capacity	<i>kW</i>	0.3	±	0.00	0.0 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.0 %
LP side					
Specific heat difference	<i>kJ/kg</i>	33.2	±	0.62	1.9 %
Temperature difference	°C	22.4	±	0.04	0.2 %
Mass flow R744	<i>Kg/h</i>	1276	±	2.60	0.2 %
Cooling capacity	<i>kW</i>	0.1	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.04	±	0.00	3.7 %
Superheat IHX inlet	<i>[°C]</i>	3.8			

Evaporator 6a					
R744 side			Total Deviation	Total uncertainty	Comment
Pressure inlet	<i>bar</i>	62.5	±	0.16	0.25 %
Temperature difference	°C	-4.1	±	0.00	0.0 %
Mass flow R744	<i>kg/h</i>	1276	±	2.60	0.2 %
Heat difference R744	<i>kJ/kg</i>	-205	±	-0.09	0.0 %
Cooling capacity	<i>kW</i>	-72.62	±	-0.03	0.0 %
Pressure drop	<i>bar</i>	0.05	±	0.00	0.9 %
Glycol side					
Specific heat difference	<i>kJ/kg</i>	8.00	±	90	1119.7 %
Temperature difference	°C	2.30	±	0.08	3.5 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	16.1 %
Cooling capacity	<i>kW</i>	0.00	±	2	12661661.3 %
Pressure drop	<i>bar</i>	0.01	±	0.00	2.3 %

Evaporator 6b					
R744 side					
Pressure inlet	<i>bar</i>	62.5	±	0.16	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>	1276	±	2.6	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.05	±	0.00	0.9 %
Glycol side					
Specific heat out	<i>kJ/kg</i>	18945.8	±	66873.0	353.0 %
Temperature difference	°C	3255.6	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	16.1 %
Cooling capacity	<i>kW</i>	0.1	±	0.38	353.3 %
Pressure drop	<i>bar</i>	0.01	±	0.00	3.3 %