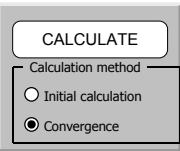
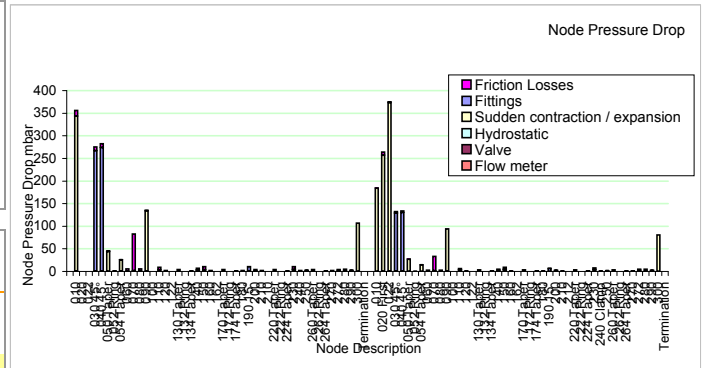


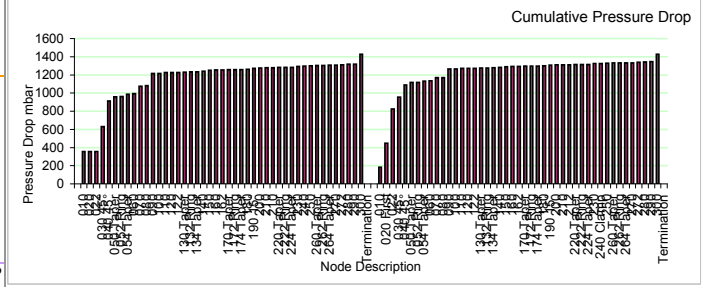
CONVERGENCE ANALYSIS		Pressure	Flow
Calculation method	Converge		Distribution
Convergence at 100%	0.5	Absolute error	0.00%
Error_Converge	0.002%	Error threshold for convergence	2.0%
Error_Target	0.002%	Damping (No convergence at 100%)	40%
Counter	6	New calculated value	30.00%
Max_Count	10	Initial estimate	6.580
Successful Convergence		Used Estimate	6.580
		Next estimate	6.580
Heat Transfer	Error	#DIV/0!	Design Analysis Worksheet



Version Pressure Drop RefProps 150902.xls

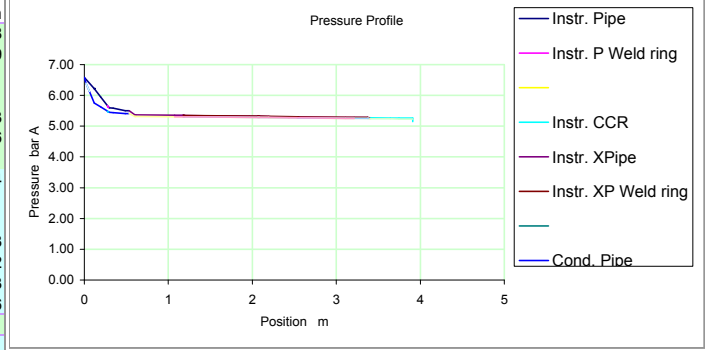


PRESSURE DROP ANALYSIS		Fluid	Fluid	Ambient
Drawing	317111-JLA-700-001-cross-section-for-charles-23.09.2015.PDC	Helium	Helium	24.00 °C
	chimney pipe heat flux			75.20 °F
				297.15 K
Inlet pressure	6.580 bar A	SA	Heat Flux	Vent Flow
Inlet temperature	6.94 K	Helium vessel	17.81 m²	7000 W / m²
Outlet pressure	Target 5.153 bar A	Helium vessel - ID	7.95 m²	7000 W / m²
Outlet pressure	Calculated 5.153 bar A	Oil Assy - Quench SA	4.37 m²	38000 W / m²
Outlet temperature	6.62 K	Coil Assy	19.74 m²	7000 W / m²
Instrument wire	Include	Chimney	3.53 m²	7000 W / m²
		CCR	0.98 m²	7000 W / m²
		Total	54.38 m²	516.1 W



Large Pipe		Total	Inst Conductor
Lead Clamp Instrument	Lead Clamp Instrument		
Area	1068.61 mm²	19722.41	37.95%
Perimeter	140.67 mm		62.05%
Large diameter	37.58 mm	Flow rate	24126 kg / hr
Small diameter	7.195 mm		39445 kg / hr
Width - Large piece	75.0 mm	Outlet pressure	5.153 bar A
Width small piece	36.0 mm	Pressure drop	1.427 bar A
Thickness	1.0 mm	Error	0.00%

Geometry & Pressure Drop		Section	Diam	Inner diam	Flow Paths	Heat Load per path	Length	Vertical Rise / -Fall	Change on Losses	Fittings	Change hydrostatic	Valve Flowmeter	Total mbar	Unit DP mbar / m
Instr. Pipe	Smooth	52.20		1	0.0	0.518	0.499	123.69	539.38	367.67	4.03	1034.77	238.58	
Instr. P Weld ring	Smooth	48.20		1	0.0	0.016	0.016	2.93		43.52	0.12	46.57	188.29	
Instr. CCR	Smooth	82.80		1	0.0	0.513	0.507	7.80		109.35	3.81	120.96	15.21	
Instr. XPipe	Smooth	77.90		1	0.0	2.801	2.787	34.53	10.09	140.91	21.12	206.65	12.33	
Instr. XP Weld ring	Smooth	73.90		1	0.0	0.062	0.062	0.99		16.32	0.47	17.77	15.86	
Cond. Pipe	Smooth	52.50	7.20	2	0.0	0.478	0.459	46.82	257.99	570.31	3.60	878.72	97.84	
Cond. P Weld Ring	Smooth	48.50		2	0.0	0.016	0.016	1.06		26.84	0.12	28.02	68.41	
Cond. P Clamp	Coaxial	37.58		2	0.0	0.040	0.040	7.39		256.58	0.34	264.31	184.71	
Cond. CCR	Smooth	82.80		2	0.0	0.513	0.507	7.20		83.42	3.80	94.42	14.03	
Cond. XPipe	Smooth	77.90		2	0.0	2.395	2.383	16.34	6.45	100.18	17.98	140.94	6.82	
Cond. XP Weld ring	Smooth	73.90		2	0.0	0.062	0.062	0.51		13.46	0.47	14.43	8.23	
Cond. XP Clamp	Smooth	82.80		2	0.0	0.406	0.405	2.87		3.05		5.91	7.06	
Total Instr. Path						3.910	3.870	169.94	549.47	677.77	29.55	1426.73		
Total Cond. Path						3.910	3.870	82.18	264.44	1050.78	29.35	1426.75		





Line number (Typical)	Cryostat	Instr. Pipe 010	Instr. Pipe 020	Instr. Pipe 022	Instr. Pipe 030 45° Elbow	Instr. Pipe 040 45° Elbow	Instr. P W 050 Taper	Instr. P W 052 Ring	Instr. Pipe 054 Taper	Instr. Pipe 060	Instr. Pipe 070 Bellows	Instr. Pipe 080	Instr. Pipe 090 Divergent	Instr. Pipe 100	Instr. Pipe 110	
Description																
Conditions "Two phase" or "gas"	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	
Inlet pressure	bar A 6.580	6.580	6.224	6.224	6.224	5.948	5.666	5.621	5.619	5.593	5.587	5.504	5.498	5.363	5.363	
Outlet pressure	bar A 6.580	6.224	6.224	6.224	5.948	5.666	5.621	5.619	5.593	5.587	5.504	5.498	5.363	5.363	5.354	
Inlet temperature	°C K 6.94	6.94	6.87	6.87	6.87	6.81	6.75	6.74	6.74	6.73	6.73	6.71	6.71	6.67	6.67	
Heat (imposed at outlet)	W 0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Checking data entry	Mixture Temperature Temperature Gas flow rate Liquid flow rate Mass flows	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK	OK OK OK OK OK OK
Section Change	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	
Flow rate	Gas kg / hr Liquid kg / hr Gas g / s Liquid g / s Gas used g / s Liquid used g / s	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	6701.6 6701.6 0.0 0.0	
Inlet temperature	°C K 6.94	-266.21 6.94	-266.21 6.94	-266.28 6.87	-266.28 6.87	-266.28 6.81	-266.40 6.75	-266.41 6.74	-266.41 6.74	-266.42 6.73	-266.42 6.73	-266.44 6.71	-266.44 6.67	-266.48 6.67	-266.48 6.67	
Outlet temperature	°C K 6.94	-266.21 6.94	-266.28 6.87	-266.28 6.87	-266.28 6.81	-266.40 6.75	-266.41 6.74	-266.41 6.74	-266.42 6.73	-266.42 6.73	-266.44 6.71	-266.44 6.67	-266.48 6.67	-266.48 6.67	-266.48 6.67	
GEOMETRY	Length m Vertical rise m Type Number of flow paths Maximum diameter / depth mm Minimum diameter / Width	0.0000 0.0000 Smooth 1 1000.00	0.1179 0.0000 Smooth 1 52.20	0.0000 0.0000 Smooth 1 52.20	0.0783 0.0686 Smooth 1 52.20	0.0783 0.0686 Smooth 1 52.20	0.0075 0.0075 Smooth 1 48.20	0.0081 0.0081 Smooth 1 48.20	0.0075 0.0075 Smooth 1 52.20	0.0473 0.0473 Smooth 1 52.20	0.1419 0.0473 Smooth 1 52.20	0.0473 0.0473 Smooth 1 52.20	0.0690 0.0690 Smooth 1 77.90	0.0000 0.0000 Smooth 1 77.90	0.4730 0.4730 Smooth 1 77.90	
Obstruction	Instr 1 Diam Instr 2 Diam Instr 3 Diam Weld Strip Width - Pair Weld Strip Depth - Pair Conductor width Conductor depth Conductor Support width Conductor Support depth Conductor Support recess	mm mm mm mm mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	11.00 12.00 9.00 mm mm mm mm mm mm	
Obstructed area	mm²	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	
Obstruction perimeter	mm	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	
Free flow area	mm²	2140.08	2140.08	2140.08	2140.08	2140.08	1824.67	1824.67	2140.08	2140.08	2140.08	2140.08	4766.12	4766.12	4766.12	
Free flow perimeter	mm	163.99	163.99	163.99	163.99	163.99	151.42	151.42	163.99	163.99	163.99	163.99	244.73	244.73	244.73	
Flow area mm²	785398.2	1868.3	1868.3	1868.3	1868.3	1868.3	1552.9	1552.9	1868.3	1868.3	1868.3	1868.3	4494.4	4494.4	4494.4	
Perimeter mm	3141.59	264.52	264.52	264.52	264.52	264.52	251.96	251.96	264.52	264.52	264.52	264.52	345.26	345.26	345.26	
Hydraulic diameter mm	1000.0	28.3	28.3	28.3	28.3	28.3	24.7	24.7	28.3	28.3	28.3	28.3	52.1	52.1	52.1	
FITTINGS	Description	Elbow 45° - Std v 45° - Std														
CONTRACTION / EXPANSION LOSSES - NODE INLET	ode upstream effective diameter mm	1000.00	48.77	48.77	48.77	48.77	48.77	44.47	44.47	48.77	48.77	48.77	48.77	75.65	75.65	
Node effective diameter mm	1000.00	48.77	48.77	48.77	48.77	48.77	44.47	44.47	48.77	48.77	48.77	48.77	75.65	75.65	75.65	
Section Change		Contract - Sudden					Contract - Converge		Expand - Divergent				Expand - Divergent			
NODE PRESSURE DROP	Friction Losses mbar	0.00	12.60	0.00	0.00	8.59	8.77	1.40	1.52	0.86	5.46	81.92	5.50	0.80	0.00	
Fittings mbar	0.00	0.00	0.00	0.00	266.19	273.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sudden contraction / expansion mbar	0.00	342.37	0.00	0.00	0.00	0.00	43.52	0.00	25.30	0.00	0.00	0.00	133.60	0.00	0.00	
Hydrostatic mbar	0.00	1.01	0.00	0.00	0.57	0.55	0.06	0.06	0.06	0.37	1.11	0.37	0.53	0.00	3.80	
Valve mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Flow meter mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL NODE PRESSURE DROP (mbar)	0.00	355.98	0.00	0.00	275.35	282.51	44.98	1.59	26.22	5.83	83.02	5.87	134.93	0.00	9.18	
bar	0.000	0.356	0.000	0.000	0.275	0.283	0.045	0.002	0.026	0.006	0.083	0.006	0.135	0.000	0.009	
GAS FLOW REGIME	Viscosity kg / m.s	2.9E-06	2.9E-06	2.8E-06	2.8E-06	2.8E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.6E-06	2.6E-06	
Density kg / m³	87.271	87.271	84.585	84.585	84.585	82.419	80.112	79.736	79.723	79.502	79.453	78.750	78.700	77.539	77.539	
G kg / m².s	8.53	3586.95	3586.95	3586.95	3586.95	3586.95	4315.50	4315.50	3586.95	3586.95	3586.95	3586.95	1491.12	1491.12	1491.12	
Velocity m / s	0.10	41.10	42.41	42.41	42.41	43.52	53.87	54.12	44.99	45.12	45.15	45.55	18.95	19.23	19.23	
Re No	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	
f	0.0076	0.0041	0.0041	0.0041	0.0041	0.0041	0.0040	0.0040	0.0040	0.0040	0.0201	0.0040	0.0043	0.0043	0.0043	
regime	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	
Pressure drop per unit length	mbar per	0.000	106.886	109.654	109.654	109.654	112.017	187.911	188.643	115.134	115.398	577.284	116.309	11.663	11.808	
Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	
FRICTION PRESSURE REGIME	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	
Unit length pressure drop	mbar per	0.000	106.886	109.654	109.654	112.017	187.911	188.643	115.134	115.398	577.284	116.309	11.663	11.808	11.808	
Total pressure drop	bar A mbar	0.000 0.000	0.013 12.602	0.000 0.000	0.000 0.000	0.009 8.586	0.009 8.771	0.001 1.403	0.002 1.523	0.001 0.859	0.005 5.458	0.082 81.917	0.006 5.501	0.001 0.805	0.000 0.000	0.006 5.585
HOMOGENOUS MIXTURE PROPERTIES	Mass fraction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Volume fraction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Mixture viscosity kg / m.s	2.9E-06	2.9E-06	2.8E-06	2.8E-06	2.8E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.6E-06	2.6E-06	2.6E-06	
Mixture density kg / m³	87.27	87.27	84.59	84.59	84.59	82.42	80.11	79.74	79.72	79.50	79.45	78.75	78.70	77.54	77.54	
HYDROSTATIC PRESSURE LOSS	Mixture density	87.27	87.27	84.59	84.59	84.59	82.42	80.11	79.74	79.72	79.50	79.45	78.75	78.70	77.54	
Vertical rise	0.00	0.12	0.00	0.00	0.07	0.07	0.01	0.01	0.01	0.01	0.05	0.14	0.05	0.07	0.00	
Pressure bar A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
mbar	0.00	1.01	0.00	0.00	0.57	0.55	0.06	0.06	0.06	0.37	1.11	0.37	0.53	0.00	3.80	
CONTRACTION / EXPANSION LOSSES - NODE INLET	ode upstream effective diameter mm	1000.00	48.77	48.77	48.77	48.77	48.77	44.47	44.47	48.77	48.77	48.77	48.77	75.65	75.65	
Node effective diameter mm	1000.00	48.77	48.77	48.77	48.77	48.77	44.47	44.47	48.77	48.77	48.77	48.77	75.65	75.65	75.65	
Node upstream flow area mm²	785398.2	785398.2	1868.3	1868.3	1868.3	1868.3	1868.3	1552.9	1552.9	1868.3	1868.3	1868.3	1868.3	4494.4	4494.4	
Node flow area mm²	785398.2	1868.3	1868.3	1868.3	1868.3	1868.3	1552.9	1552.9	1868.3	1868.3	1868.3	1868.3	4494.4	4494.4	4494.4	
Inlet fluid mass velocity kg / m².s	8.5	3587.0	3587.0	3587.0	3587.0	3587.0	4315.5	4315.5	3587.0	3587.0	3587.0	3587.0	1491.1	1491.1	1491.1	
Effective diameter ratio	1.000	0.049	1.000	1.000	1.000	1.000	0.912	1.000	1.097	1.000	1.000	1.000	1.551	1.000	1.000	
Convergent section angle	n-a	Sudden	n-a	n-a	n-a	n-a	32.2	n-a	n-a	n-a	n-a	n-a	n-a	n-a	n-a	
Contraction loss coefficient	n-a	0.464	n-a	n-a	n-a											





Line number (Typical)	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	Instr. XPipe	CCR Instr.	CCR Instr.	CCR Instr.	CCR Instr.	CCR Instr.	CCR
	210	210	220 Taper	222 Ring	224 Taper	230	240	250	260 Taper	262 Ring	264 Taper	270	272	280	290	300	Termination	
Description																		
Conditions "Two phase" or "gas"	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas
Inlet pressure	bar A	5.304	5.302	5.302	5.298	5.297	5.296	5.285	5.283	5.280	5.276	5.276	5.274	5.272	5.268	5.263	5.260	5.153
	mbar A	5304	5302	5302	5298	5297	5296	5285	5283	5280	5276	5276	5274	5272	5268	5263	5260	5153
Outlet pressure	bar A	5.302	5.302	5.298	5.297	5.296	5.285	5.283	5.280	5.276	5.276	5.274	5.272	5.268	5.263	5.260	5.153	
	mbar A	5302	5302	5298	5297	5296	5285	5283	5280	5276	5276	5274	5272	5268	5263	5260	5153	
Inlet temperature	°C																	
	K	6.66	6.66	6.66	6.66	6.66	6.66	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.62
Heat (imposed at outlet)	W	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Checking data entry	Mixture	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Temperature	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Temperature	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Gas flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Liquid flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Mass flows	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Section Change	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Flow rate	Gas kg / hr																	
	Liquid kg / hr																	
	Gas g / s																	
	Gas used g / s	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6	6701.6
	Liquid used g / s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inlet temperature	°C	-266.49	-266.49	-266.49	-266.49	-266.49	-266.49	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.53
	K	6.66	6.66	6.66	6.66	6.66	6.66	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.62
Outlet temperature	°C	-266.49	-266.49	-266.49	-266.49	-266.49	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.50	-266.53
	K	6.66	6.66	6.66	6.66	6.66	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.62
GEOMETRY	Length m	0.1000	0.0000	0.0075	0.0081	0.0075	0.5538	0.1000	0.1628	0.0075	0.0081	0.0075	0.0000	0.2479	0.1000	0.1653	0.0000	
	Vertical rise m	0.0997	0.0000	0.0074	0.0080	0.0074	0.5471	0.0987	0.1603	0.0074	0.0080	0.0074	0.0000	0.2447	0.0987	0.1631	0.0000	
	Type	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	
	Number of flow paths	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Maximum diameter / depth mm	77.90	77.90	73.90	73.90	77.90	77.90	77.90	77.90	73.90	73.90	77.90	82.80	82.80	82.80	82.80	545.00	
	Minimum diameter / Width																	
Obstruction	Instr 1 Diam mm	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	
	Instr 2 Diam mm	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	
	Instr 3 Diam mm	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	
	Weld Strip Width - Pair mm																	
	Weld Strip Depth - Pair mm																	
	Conductor width mm																	
	Conductor depth mm																	
	Conductor Support width mm																	
	Conductor Support depth mm																	
	Conductor Support recess mm																	
	Obstructed area mm²	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	271.75	
	Obstruction perimeter mm	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	100.53	
	Free flow area mm²	4766.12	4766.12	4289.22	4289.22	4766.12	4766.12	4766.12	4289.22	4289.22	4766.12	4766.12	5384.56	5384.56	5384.56	5384.56	5384.56	#####
	Free flow perimeter mm	244.73	244.73	232.16	232.16	244.73	244.73	244.73	232.16	232.16	244.73	260.12	260.12	260.12	260.12	260.12	260.12	1712.17
	Flow area mm²	4494.4	4494.4	4017.5	4017.5	4494.4	4494.4	4494.4	4494.4	4017.5	4017.5	4494.4	5112.8	5112.8	5112.8	5112.8	5112.8	233011.1
	Perimeter mm	345.26	345.26	332.69	332.69	345.26	345.26	345.26	345.26	332.69	332.69	345.26	360.65	360.65	360.65	360.65	360.65	1812.70
	Hydraulic diameter mm	52.1	52.1	48.3	48.3	52.1	52.1	52.1	48.3	48.3	52.1	56.7	56.7	56.7	56.7	56.7	56.7	514.2
FITTINGS	Description																	
CONTRACTION / EXPANSION LOSSES -	Node upstream effective diameter mm	75.65	75.65	75.65	71.52	71.52	75.65	75.65	75.65	75.65	71.52	71.52	75.65	80.68	80.68	80.68	80.68	
	Node effective diameter mm	75.65	75.65	71.52	71.52	75.65	75.65	75.65	75.65	71.52	71.52	75.65	80.68	80.68	80.68	80.68	80.68	544.68
	Section Change			Contract - Converge	Expand - Divergent					Contract - Converge	Expand - Divergent	Expand - Sudden						Expand - Sudden
NODE PRESSURE DROP	Friction Losses mbar	1.19	0.00	0.12	0.13	0.09	6.58	1.19	1.94	0.12	0.13	0.09	0.00	2.12	4.27	1.41	0.00	
	Fittings mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Sudden contraction / expansion mbar	0.00	0.00	4.09	0.00	1.47	0.00	0.00	0.00	4.10	0.00	1.48	2.12	0.00	0.00	0.00	0.00	107.23
	Hydrostatic mbar	0.75	0.00	0.06	0.06	0.06	4.13	0.74	1.21	0.06	0.06	0.06	0.00	1.84	0.74	1.23	0.00	
	Valve mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Flow meter mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL NODE PRESSURE DROP	DR(mbar)	1.94	0.00	4.26	0.19	1.62	10.71	1.93	3.15	4.27	0.19	1.62	2.12	3.96	5.02	2.64	107.23	
	bar	0.002	0.000	0.004	0.000	0.002	0.011	0.002	0.003	0.004	0.000	0.002	0.002	0.004	0.005	0.003	0.107	
GAS FLOW REGIME	Viscosity kg / m.s	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	
	Density kg / m³	77.019	77.002	77.002	76.964	76.963	76.948	76.854	76.837	76.810	76.772	76.770	76.756	76.738	76.703	76.658	76.635	
	G kg / m².s	1491.12	1491.12	1668.12	1668.12	1491.12	1491.12	1491.12	1668.12	1668.12	1491.12	1491.12	1310.75	1310.75	1310.75	1310.75	28.76	
	Velocity m / s	19.36	19.36	21.66	21.67	19.37	19.38	19.40	19.41	21.72	21.73	19.42	17.08	17.08	17.09	17.10	0.38	
	Re No	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
	f	0.0043	0.0043	0.0042	0.0042	0.0043	0.0043	0.0043	0.0043	0.0042	0.0042	0.0043	0.0043	0.0043	0.0216	0.0043	0.0065	
	regime	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	
	Pressure drop per unit length mbar per	11.874	11.876	15.874	15.880	11.881	11.883	11.885	11.897	15.907	15.913	11.906	8					



Line number (Typical)	Cryostat	Cond. Pipe 010	Cond. Pipe 020 First Clamp	Cond. Pipe 022	Cond. Pipe 030 45° Elbow	Cond. Pipe 040 45° Elbow	Cond. Pipe 050 Taper	Cond. Pipe 052 Ring	Cond. Pipe 054 Taper	Cond. Pipe 060	Cond. Pipe 070 Bellows	Cond. Pipe 080	Cond. Pipe 090 Divergent	Cond. Pipe 100	Cond. Pipe 110	Cond. Pipe 120	
Description																	
Conditions "Two phase" or "gas"	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	
Inlet pressure bar A	6.580	6.580	6.395	6.131	5.755	5.623	5.489	5.462	5.461	5.447	5.444	5.411	5.409	5.314	5.314	5.308	
Inlet pressure mbar A	6580	6580	6395	6131	5755	5623	5489	5462	5461	5447	5444	5411	5409	5314	5314	5308	
Outlet pressure bar A	6.580	6.395	6.131	5.755	5.623	5.489	5.462	5.461	5.447	5.444	5.411	5.409	5.314	5.314	5.308	5.306	
Outlet pressure mbar A	6580	6395	6131	5755	5623	5489	5462	5461	5447	5444	5411	5409	5314	5314	5308	5306	
Inlet temperature °C	6.94	6.94	6.91	6.85	6.77	6.74	6.71	6.70	6.70	6.70	6.70	6.69	6.69	6.66	6.66	6.66	
Inlet temperature K	279.09	279.09	279.06	279.00	278.92	278.89	278.86	278.85	278.85	278.85	278.85	278.84	278.84	278.82	278.82	278.82	
Heat (imposed at outlet) W	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Checking data entry	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Temperature	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Temperature	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Gas flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Liquid flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Mass flows	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Section Change	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	Error
Flow rate																	
Gas kg / hr																	
Liquid kg / hr																	
Gas g / s	10956.9																
Liquid g / s																	
Gas used g / s	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9
Liquid used g / s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inlet temperature °C	-266.21	-266.21	-266.24	-266.30	-266.38	-266.44	-266.48	-266.49	-266.49	-266.49	-266.49	-266.48	-266.46	-266.44	-266.42	-266.41	-266.41
Inlet temperature K	6.94	6.94	6.91	6.85	6.77	6.74	6.71	6.70	6.70	6.70	6.70	6.69	6.69	6.66	6.66	6.66	6.66
Outlet temperature °C	-266.21	-266.24	-266.30	-266.38	-266.44	-266.44	-266.45	-266.45	-266.45	-266.45	-266.45	-266.44	-266.42	-266.40	-266.39	-266.39	-266.39
Outlet temperature K	6.94	6.91	6.85	6.77	6.74	6.71	6.70	6.70	6.70	6.70	6.69	6.69	6.66	6.66	6.66	6.66	6.66
GEOMETRY																	
Length m	0.000	0.0200	0.0400	0.0579	0.0783	0.0783	0.0075	0.0081	0.0075	0.0473	0.1419	0.0473	0.0690	0.0000	0.4730	0.1000	
Vertical rise m	0.000	0.0200	0.0400	0.0579	0.0686	0.0686	0.0075	0.0081	0.0075	0.0473	0.1419	0.0473	0.0690	0.0000	0.4730	0.1000	
Type	Smooth	Smooth	Coaxial	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	
Number of flow paths	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Maximum diameter / depth mm	1000.00	52.50	37.58	52.50	52.50	52.50	48.50	48.50	52.50	52.50	52.50	52.50	77.90	77.90	77.90	82.80	
Minimum diameter / Width			7.20														
Obstruction																	
Instr 1 Diam mm																	
Instr 2 Diam mm																	
Instr 3 Diam mm																	
Weld Strip Width - Pair mm																	
Weld Strip Depth - Pair mm																	
Conductor width mm		20.00		20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Conductor depth mm		4.00		4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Conductor Support width mm																	
Conductor Support depth mm																	
Conductor Support recess mm																	
Obstructed area mm²		160.00	0.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	255.00
Obstruction perimeter mm		96.00	0.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00	96.00
Free flow area mm²		4329.51	2137.22	4329.51	4329.51	4329.51	3694.91	3694.91	4329.51	4329.51	4329.51	4329.51	9532.24	9532.24	9532.24	10769.13	
Free flow perimeter mm		329.87	281.34	329.87	329.87	329.87	304.73	304.73	329.87	329.87	329.87	329.87	489.46	489.46	489.46	520.25	
Flow area mm²	785398.2	4169.5	2137.2	4169.5	4169.5	4169.5	3534.9	3534.9	4169.5	4169.5	4169.5	4169.5	9372.2	9372.2	9372.2	10514.1	
Perimeter mm	3141.59	425.87	281.34	425.87	425.87	425.87	400.73	400.73	425.87	425.87	425.87	425.87	585.46	585.46	585.46	844.25	
Hydraulic diameter mm	1000.0	39.2	30.4	39.2	39.2	39.2	35.3	35.3	39.2	39.2	39.2	39.2	64.0	64.0	64.0	49.8	
FITTINGS																	
Description																	
CONTRACTION / EXPANSION LOSSES																	
ode upstream effective diameter mm	1000.00	1000.00	72.86	52.17	72.86	72.86	72.86	67.09	67.09	72.86	72.86	72.86	72.86	109.24	109.24	109.24	
Node effective diameter mm	1000.00	72.86	52.17	72.86	72.86	72.86	67.09	67.09	72.86	72.86	72.86	72.86	109.24	109.24	109.24	115.70	
Section Change		Contract - Sudden	Contract - Sudden	Expand - Sudden			Contract - Converge	Expand - Divergent				Expand - Divergent				Contract - Sudden	
NODE PRESSURE DROP																	
Friction Losses mbar	0.00	0.82	7.39	2.47	3.44	3.48	0.51	0.55	0.34	2.13	32.00	2.14	0.41	0.00	2.83	0.67	
Fittings mbar	0.00	0.00	0.00	0.00	128.12	129.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sudden contraction / expansion mbar	0.00	183.82	256.58	372.29	0.00	0.00	26.84	0.00	14.20	0.00	0.00	0.00	93.42	0.00	0.00	0.00	
Hydrostatic mbar	0.00	0.17	0.34	0.48	0.54	0.54	0.06	0.06	0.06	0.36	1.09	0.36	0.53	0.00	3.58	0.76	
Valve mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Flow meter mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL NODE PRESSURE DROP mbar	0.00	184.81	264.31	375.24	132.10	133.89	27.40	0.61	14.59	2.50	33.09	2.50	94.36	0.00	6.41	1.43	
TOTAL NODE PRESSURE DROP bar	0.000	0.185	0.264	0.375	0.132	0.134	0.027	0.001	0.015	0.002	0.033	0.003	0.094	0.000	0.006	0.001	
GAS FLOW REGIME																	
Viscosity kg / m.s	2.9E-06	2.9E-06	2.8E-06	2.8E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	
Density kg / m³	87.271	87.271	85.892	83.861	80.852	79.756	78.624	78.389	78.384	78.259	78.237	77.952	77.931	77.111	77.111	77.054	
G kg / m².s	13.95	2627.86	5126.70	2627.86	2627.86	2627.86	3099.63	3099.63	2627.86	2627.86	2627.86	2627.86	1169.08	1169.08	1169.08	1042.11	
Velocity m / s	0.16	30.11	59.69	31.34	32.50	32.95	39.42	39.54	33.53	33.58	33.59	33.71	15.00	15.16	15.16	13.52	
Re No	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
f	0.0067	0.0041	0.0037	0.0041	0.0040	0.0040	0.0039	0.0039	0.0040	0.0040	0.0040	0.0040	0.0043	0.0043	0.0043	0.0047	
regime	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	
Pressure drop per unit length mbar per	0.000																



Line number (Typical)	Cond. X122	Cond. X130 Taper	Cond. X132 Ring	Cond. X134 Taper	Cond. X140	Cond. X150	Cond. X160	Cond. X162	Cond. X170 Taper	Cond. X172 Ring	Cond. X174 Taper	Cond. X180	Cond. X190 15° Mitre	Cond. X200	Cond. X210	Cond. X212
Description																
Conditions "Two phase" or "gas"	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas
Inlet pressure	bar A 5.306	5.306	5.303	5.303	5.302	5.297	5.288	5.287	5.287	5.283	5.283	5.282	5.280	5.273	5.270	5.269
Outlet pressure	mbar A 5.306	5.303	5.303	5.302	5.297	5.288	5.287	5.287	5.283	5.283	5.282	5.280	5.273	5.270	5.269	5.269
Inlet temperature	°C 6.66	6.66	6.66	6.66	6.66	6.66	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65
Heat (imposed at outlet)	W 0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Checking data entry	Mixture OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Temperature	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Gas flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Liquid flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Mass flows	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Section Change	Error	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	Error	Error	OK	Error	Error
Flow rate	Gas Kg / hr	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9
Liquid Kg / hr	Gas g / s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gas used g / s	Liquid used g / s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inlet temperature	°C -268.49	-268.49	-268.49	-268.49	-268.49	-268.49	-268.50	-268.50	-268.50	-268.50	-268.50	-268.50	-268.50	-268.50	-268.50	-268.50
Outlet temperature	K 6.66	6.66	6.66	6.66	6.66	6.66	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65
GEOMETRY	Length m 0.0000	0.0075	0.0081	0.0075	0.2627	0.5000	0.1033	0.0000	0.0075	0.0081	0.0075	0.1061	0.0241	0.2162	0.1000	0.0000
Vertical rise m	0.0000	0.0075	0.0081	0.0075	0.2627	0.5000	0.1033	0.0000	0.0075	0.0081	0.0075	0.1061	0.0240	0.2138	0.0997	0.0000
Type	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
Number of flow paths	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Maximum diameter / depth mm	77.90	73.90	73.90	77.90	77.90	77.90	77.90	77.90	73.90	73.90	77.90	82.80	77.90	77.90	82.80	77.90
Minimum diameter / Width																
Obstruction	Instr 1 Diam mm															
Instr 2 Diam mm																
Instr 3 Diam mm																
Weld Strip Width - Pair mm					10.00	10.00	10.00									
Weld Strip Depth - Pair mm					2.00	2.00	2.00									
Conductor width mm	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Conductor depth mm	4.00	4.00	4.00	4.00	4.00	12.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Conductor Support width mm																
Conductor Support depth mm																
Conductor Support recess mm																
Obstructed area mm²	160.00	160.00	160.00	160.00	240.00	560.00	400.00	320.00	320.00	320.00	320.00	399.00	320.00	320.00	399.00	320.00
Obstruction perimeter mm	96.00	96.00	96.00	96.00	152.00	184.00	168.00	112.00	112.00	112.00	112.00	340.00	112.00	112.00	340.00	112.00
Free flow area mm²	9532.24	8578.45	8578.45	9532.24	9532.24	9532.24	9532.24	9532.24	8578.45	8578.45	9532.24	8578.45	10769.13	9532.24	10769.13	9532.24
Free flow perimeter mm	489.46	464.33	464.33	489.46	489.46	489.46	489.46	489.46	464.33	464.33	489.46	520.25	489.46	489.46	520.25	489.46
Flow area mm²	9372.2	8418.4	8418.4	9372.2	9292.2	8972.2	9132.2	9212.2	8258.4	8258.4	9212.2	10370.1	9212.2	9212.2	10370.1	9212.2
Perimeter mm	585.46	560.33	560.33	585.46	641.46	673.46	657.46	601.46	576.33	576.33	601.46	860.25	601.46	601.46	860.25	601.46
Hydraulic diameter mm	64.0	60.1	60.1	64.0	57.9	53.3	55.6	61.3	57.3	57.3	61.3	48.2	61.3	61.3	48.2	61.3
FITTINGS	Description Mitre 15°															
CONTRACTION / EXPANSION LOSSES -	ode upstream effective diameter mm															
Node effective diameter mm	115.70	109.24	103.53	103.53	109.24	108.77	106.88	107.83	108.30	102.54	102.54	108.30	114.91	108.30	108.30	114.91
Section Change	Expand - Sudden	Contract - Converge	Expand - Divergent	Contract - Sudden	Contract - Sudden	Expand - Sudden	Expand - Sudden	Expand - Sudden	Expand - Sudden	Contract - Converge	Expand - Divergent	Contract - Sudden	Expand - Sudden	Expand - Sudden	Contract - Sudden	Expand - Sudden
NODE PRESSURE DROP	Friction Losses mbar	0.00	0.06	0.06	0.04	1.81	4.07	0.77	0.00	0.06	0.07	0.05	0.76	0.16	1.41	0.72
Fittings mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00
Sudden contraction / expansion mbar	0.00	3.20	0.00	1.14	0.88	1.01	0.03	0.01	3.41	0.00	1.23	0.00	0.00	0.00	0.00	0.00
Hydrostatic mbar	0.00	0.06	0.06	0.06	1.98	3.77	0.78	0.00	0.06	0.06	0.06	0.80	0.18	1.61	0.75	0.00
Valve mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow meter mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL NODE PRESSURE DROP (mbar)	0.00	3.31	0.12	1.24	4.67	8.85	1.58	0.01	3.53	0.13	1.33	1.56	6.78	3.02	1.47	0.00
bar	0.000	0.003	0.000	0.001	0.005	0.009	0.002	0.000	0.004	0.000	0.001	0.002	0.007	0.003	0.001	0.000
GAS FLOW REGIME	Viscosity kg / m.s	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06
Density kg / m³	77.042	77.042	77.013	77.012	77.001	76.960	76.882	76.868	76.868	76.837	76.836	76.824	76.811	76.751	76.724	76.711
G kg / m².s	1169.08	1301.53	1301.53	1169.08	1179.14	1221.20	1199.80	1326.75	1326.75	1189.38	1189.38	1056.58	1189.38	1189.38	1189.38	1189.38
Velocity m / s	15.17	16.89	16.90	15.18	15.31	15.87	15.61	15.47	17.26	17.27	15.48	13.75	15.48	15.50	13.77	15.50
Re No	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
f	0.0043	0.0043	0.0043	0.0043	0.0044	0.0045	0.0044	0.0044	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043
regime	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent
Pressure drop per unit length mbar per	5.988	7.822	7.824	5.990	6.890	8.138	7.495	6.534	8.598	8.601	6.536	7.168	6.538	6.542	7.176	6.545
Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent
FRICITION PRESSURE	Unit length pressure drop mbar per	5.988	7.822	7.824	5.990	6.890	8.138	7.495	6.534	8.598	8.601	6.536	7.168	6.538	6.542	7.176
Total pressure drop bar A	0.000	0.000	0.000	0.000	0.002	0.004	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
mbar	0.000	0.058	0.063	0.045	1.810	4.069	0.774	0.000	0.064	0.069	0.049	0.761	0.158	1.414	0.718	0.000
HOMOGENOUS MIXTURE PROPERTIES	Mass fraction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Volume fraction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Mixture viscosity kg / m.s	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06
Mixture density kg / m³	77.04	77.04	77.01	77.01	77.00	76.96	76.88	76.87	76.87	76.84	76.84	76.82	76.81	76.75	76.72	76.71
HYDROSTATIC PRESSURE LOSS	Mixture density	77.04	77.04	77.01	77.01	77.00	76.96	76.88	76.87	76.84	76.84	76.82	76.81	76.75	76.72	76.71
Vertical rise	0.00	0.01	0.01	0.01	0.01	0.26	0.50	0.10	0.00	0.01	0.01	0.11	0.02	0.21	0.10	0.00
Pressure bar A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
mbar	0.00	0.06	0.06	0.06	1.98	3.77	0.78	0.00	0.06	0.06	0.06	0.80	0.18	1.61	0.75	0.00



Line number (Typical)	Cond. XP 220 Taper	Cond. XP 222 Ring	Cond. XP 224 Taper	Cond. XP 230	Cond. XP 240 Clamp	Cond. XP 250	Cond. XP 260 Taper	Cond. XP 262 Ring	Cond. XP 264 Taper	Cond. CCI 270	Cond. CCI 272	Cond. CCI 280	Cond. CCI 290	Cond. CCI 300	CCR Termination		
Description																	
Conditions "Two phase" or "gas"	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas		
Inlet pressure	bar A 5.269	5.265	5.265	5.264	5.256	5.255	5.252	5.249	5.249	5.247	5.246	5.241	5.236	5.234	5.153		
Outlet pressure	mbar A 5.265	5.265	5.264	5.256	5.255	5.252	5.249	5.249	5.247	5.246	5.241	5.236	5.234	5.153	5.153		
Inlet temperature	°C 6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.62		
Heat (imposed at outlet)	W 0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Checking data entry	Mixture OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK		
Temperature	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK		
Gas flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK		
Liquid flow rate	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK		
Mass flows	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK		
Section Change	OK	OK	OK	OK	Error	Error	OK	OK	OK	OK	OK	OK	OK	OK	OK		
Flow rate	Gas kg / hr 10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9	10956.9		
Liquid kg / hr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Gas used g / s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Liquid used g / s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Inlet temperature	°C -268.50	-268.50	-268.50	-268.50	-268.50	-268.50	-268.50	-268.51	-268.51	-268.51	-268.51	-268.51	-268.51	-268.51	-268.53		
Outlet temperature	K 6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.62		
GEOMETRY	Length m 0.0075	0.0081	0.0075	0.5538	0.1000	0.1628	0.0075	0.0081	0.0075	0.0000	0.2479	0.1000	0.1653	0.0000	0.0000		
Vertical rise m	0.0074	0.0080	0.0074	0.5471	0.0987	0.1603	0.0074	0.0080	0.0074	0.0000	0.2447	0.0987	0.1631	0.0000	0.0000		
Type	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth		
Number of flow paths	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
Maximum diameter / depth mm	73.90	73.90	77.90	77.90	82.80	77.90	73.90	73.90	77.90	82.80	82.80	82.80	82.80	545.00			
Minimum diameter / Width																	
Obstruction	Instr 1 Diam mm mm	Instr 2 Diam mm mm	Instr 3 Diam mm mm	Weld Strip Width - Pair mm mm	Weld Strip Depth - Pair mm mm	Conductor width mm 20.00	Conductor depth mm 8.00	Conductor Support width mm 50.80	Conductor Support depth mm 9.50	Conductor Support recess mm 4.00	Obstructed area mm² 320.00	Obstruction perimeter mm 112.00	Free flow area mm² 8578.45	Free flow perimeter mm 464.33	Flow area mm² 8258.4	Perimeter mm 576.33	Hydraulic diameter mm 57.3
FITTINGS	Description																
CONTRACTION / EXPANSION LOSSES -	Node upstream effective diameter mm																
Node effective diameter mm	108.30	102.54	102.54	108.30	108.30	114.91	108.30	102.54	102.54	108.30	115.34	110.81	110.81	110.81	110.81		
Section Change	Contract - Converge	Expand - Divergent	Expand - Divergent	Contract - Sudden	Expand - Sudden	Contract - Sudden	Contract - Converge	Expand - Divergent	Expand - Sudden	Contract - Sudden	Expand - Sudden	Contract - Sudden	Expand - Sudden	Contract - Sudden	Expand - Sudden		
NODE PRESSURE DROP	Friction Losses mbar 0.06	0.07	0.05	3.63	0.72	1.07	0.06	0.06	0.04	0.00	1.95	3.94	1.30	0.00	0.00		
Sudden contraction / expansion mbar	3.42	0.00	1.23	0.00	0.00	0.00	3.43	0.00	1.23	1.30	1.12	0.00	0.00	81.01	0.00		
Hydrostatic mbar	0.06	0.06	0.06	4.11	0.74	1.20	0.06	0.06	0.06	0.00	1.84	0.74	1.22	0.00	0.00		
Valve mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Flow meter mbar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL NODE PRESSURE DROP (mbar)	3.54	0.13	1.33	7.74	1.46	2.27	3.55	0.12	1.33	1.30	4.91	4.68	2.53	81.01	0.00		
GAS FLOW REGIME	Viscosity kg / m.s 2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06		
Density kg / m³	76.711	76.680	76.679	76.667	76.599	76.586	76.566	76.535	76.534	76.522	76.510	76.467	76.426	76.403	76.403		
G kg / m².s	1326.75	1326.75	1189.38	1189.38	1056.58	1189.38	1326.75	1326.75	1189.38	1048.59	1136.14	1136.14	1136.14	23.54	23.54		
Velocity m / s	17.30	17.30	15.51	15.51	13.79	15.53	17.33	17.34	15.54	13.70	14.85	14.86	14.87	0.31	0.31		
Re No	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####		
f	0.0043	0.0043	0.0043	0.0043	0.0048	0.0043	0.0043	0.0041	0.0042	0.0043	0.0046	0.0232	0.0046	0.0068	0.0068		
regime	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent	Turbulent		
Pressure drop per unit length mbar per	8.613	8.615	6.547	6.548	7.185	6.554	8.626	7.159	5.486	4.039	7.880	39.417	7.887	0.000	0.000		
FRICITION PRESSURE	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent	Gas Turbulent		
Unit length pressure drop mbar per	8.613	8.615	6.547	6.548	7.185	6.554	8.626	7.159	5.486	4.039	7.880	39.417	7.887	0.000	0.000		
Total pressure drop	0.000	0.000	0.000	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.002	0.004	0.001	0.000	0.000		
HOMOGENOUS MIXTURE PROPERTIES	Mass fraction 100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		
Volume fraction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		
Mixture viscosity kg / m.s	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06	2.6E-06		
Mixture density kg / m³	76.71	76.68	76.68	76.67	76.60	76.59	76.57	76.53	76.53	76.52	76.51	76.47	76.43	76.40	76.40		
HYDROSTATIC PRESSURE LOSS	Mixture density 76.71	76.68	76.68	76.67	76.60	76.59	76.57	76.53	76.53	76.52	76.51	76.47	76.43	76.40	76.40		
Vertical rise	0.01	0.01	0.01	0.55	0.10	0.16	0.01	0.01	0.01	0.00	0.24	0.10	0.16	0.00	0.00		
Pressure bar A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
mbar	0.06	0.06	0.06	4.11	0.74	1.20	0.06	0.06	0.06	0.00	1.84	0.74	1.22	0.00	0.00		
CONTRACTION / EXPANSION LOSSES -	Node upstream effective diameter mm																
Node effective diameter mm	108.30	102.54	102.54	108.30	108.30	114.91	108.30	102.54	102.54	108.30	115.34	110.81	110.81	110.81	110.81		
Node upstream flow area mm²	9212.2	8258.4	8258.4	9212.2	9212.2	10370.1	9212.2	8258.4	8258.4	9212.2	10449.1	9643.9	9643.9	9643.9	9643.9		
Node flow area mm²	8258.4	8258.4	9212.2	9212.2	10370.1	9212.2	8258.4	8258.4	9212.2	10449.1	9643.9	9643.9	9643.9	465440.6	465440.6		
Inlet fluid mass velocity kg / m².s	1326.7	1326.7	1189.4	1189.4	1056.6	1189.4	1326.7	1189.4	1048.6	1136.1	1136.1	1136.1	1136.1	23.5	23.5		
Effective diameter ratio	0.947	1.000	1.056	1.000	1.061	0.943	0.947	1.000	1.056	1.065	0.961	1.000	1.000	6.947	6.947		
Convergent section angle	42.2	n-a	n-a	n-a	Sudden	n-a	42.2	n-a	n-a	n-a	Sudden	n-a	n-a	n-a	n-a		
Contraction loss coefficient	0.030	n-a	n-a	n-a	0.018	n-a	0.030	n-a	n-a	n-a	0.013	n-a	n-a	n-a	n-a		
Contraction loss mbar	3.42	n-a	n-a	n-a	n-a	0.00	3.43	n-a	n-a	n-a	1.12	n-a	n-a	n-a	n-a		
Divergent section angle	n-a	n-a	42.20	n-a	n-a	Sudden	n-a	n-a	42.20	Sudden	n-a	n-a	n-a	Sudden	Sudden		
Expansion loss coefficient	n-a	n-a	1.00	n-a	n-a	1.00	n-a	n-a	1.00	1.00	n-a	n-a	n-a	n-a	1.00		
Expansion loss mbar	n-a	n-a	1.23	n-a	0.00	n-a	n-a	n-a	1.23	1.30	n-a	n-a	n-a	81.01	81.01		
Total section change losses mbar	3.42	0.00	1.23	0.00	0.00	0.00	3.43	0.00	1.23	1.30	1.12	0.00	0.00	81.01	81.01		
FITTINGS - VELOCITY HEAD LOSS (Fitting)	Velocity Head Loss Index																
Velocity head loss	Average velocity m / s																
Additional frictional loss mbar	bar																