

**Lampiran 1
Data air**

Q(L/mnt)	D(mm)	L(m)	Π	rho(air)	Cp	v(viskositas)	v(viskositas dinding)	k	Pr	A(luas Penampang)	A(luas permukaan)
0.25	0.0049	1.1	3.14	1008.2	4178.6	0.0006566	0.0008034	0.6316	4.344	1.88479E-05	0.0169246
0.3	0.0049	1.1	3.14	1008.2	4178.6	0.0006566	0.0008034	0.6316	4.344	1.88479E-05	0.0169246
0.35	0.0049	1.1	3.14	1008.2	4178.6	0.0006566	0.0008034	0.6316	4.344	1.88479E-05	0.0169246
0.4	0.0049	1.1	3.14	1008.2	4178.6	0.0006566	0.0008034	0.6316	4.344	1.88479E-05	0.0169246
0.45	0.0049	1.1	3.14	1008.2	4178.6	0.0006566	0.0008034	0.6316	4.344	1.88479E-05	0.0169246
0.5	0.0049	1.1	3.14	1008.2	4178.6	0.0006566	0.0008034	0.6316	4.344	1.88479E-05	0.0169246

Q(m ³ /s)	v(m/s)	\dot{m}	Re	Thin	Thout	ΔT	Twall	$\Delta T\beta$	Tw-Tb	ΔT_{lmtd}	RePr	d/L	v/v
4.17E-06	0.221069	0.004201	1663.29	40	34,4	5,6	30	37.105	7.105	6,82111164	19,33242	0,164539	0,972146
0.000005	0.265282	0.005041	1995.95	40,06	34,47	5,59	30	37.265	7.265	6,89120611	20,54376	0,164539	0,972146
5.83E-06	0.309496	0.005881	2328.61	40,01	34,5	5,51	30	37.12	7.12	6,89174534	21,62696	0,164539	0,972146
6.67E-06	0.35371	0.006721	2661.27	40,09	34,7	5,39	30	37.145	7.145	7,05513704	22,61134	0,164539	0,972146
7.5E-06	0.397923	0.007562	2993.93	40,11	34,8	5,31	30	37.23	7.23	7,12838639	23,51674	0,164539	0,972146
8.33E-06	0.442137	0.008402	3326.59	40,31	35	5,31	30	37.49	7.49	7,33753388	24,35732	0,164539	0,972146

Q(L/mnt)	Re	q	U lmtd	Nu(t)
0.25	1663,293	98,30017	851,492266	5,751731804
0.3	1995,952	117,7496	1009,59142	6,112127089
0.35	2328,611	135,4085	1160,90919	6,434398767
0.4	2661,269	151,3823	1267,80112	6,727266328
0.45	2993,928	167,7773	1390,66855	6,996638931
0.5	3326,587	186,4193	1501,14359	7,246727973

Data Nano 0,5 %

% nano	Q(L/m nt)	D(m m)	L(m)	Π	rho(air)	Cp(nanofl uid)	v(viskositas as)	v(viskositas dinding)	k	Pr	A(luas Penampang)	A(luas permukaan)
0.005	0.25	0.0049	1.1	3.14	1023.09	4111.665535	0.000682585	0.00083527	0.655885	4.279044204	1.88479E-05	0.016925
0.005	0.3	0.0049	1.1	3.14	1023.09	4111.665535	0.000682585	0.00083527	0.655885	4.279044204	1.88479E-05	0.016925
0.005	0.35	0.0049	1.1	3.14	1023.09	4111.665535	0.000682585	0.00083527	0.655885	4.279044204	1.88479E-05	0.016925
0.005	0.4	0.0049	1.1	3.14	1023.09	4111.665535	0.000682585	0.00083527	0.655885	4.279044204	1.88479E-05	0.016925
0.005	0.45	0.0049	1.1	3.14	1023.09	4111.665535	0.000682585	0.00083527	0.655885	4.279044204	1.88479E-05	0.016925
0.005	0.5	0.0049	1.1	3.14	1023.09	4111.665535	0.000682585	0.00083527	0.655885	4.279044204	1.88479E-05	0.016925

Q(m ³ /s)	v(m/s)	\dot{m}	Re	Thin	Thout	ΔT	Twall	$\Delta T\beta$	Tw-Tb	ΔT_{lmtd}	RePr	d/L	v/v
4.17E-06	0.221069	0.004263	1623.48	40,46	34,4	6,06	30	37,43	7,43	6,998063	19,08084	0,164539	0,972133
0.000005	0.265282	0.005115	1948.17	40,6	34,6	6	30	37,6	7,6	7,18737	20,27642	0,164539	0,972133
5.83E-06	0.309496	0.005968	2272.87	40,61	34,7	5,91	30	37,655	7,655	7,258352	21,34553	0,164539	0,972133
6.67E-06	0.35371	0.00682	2597.56	40,6	34,8	5,8	30	37,7	7,7	7,321032	22,31709	0,164539	0,972133
7.5E-06	0.397923	0.007673	2922.26	40,52	34,7	5,82	30	37,61	7,61	7,223392	23,21071	0,164539	0,972133
8.33E-06	0.442137	0.008525	3246.95	40,22	34,5	5,72	30	37,36	7,36	6,973321	24,04035	0,164539	0,972133

Q(L/mnt)	Re	q	U lmtd	Nu(t)
0.25	1623,476	106,2083	896,731365	5,6768063
0.3	1948,171	126,1881	1037,36136	6,03250686
0.35	2272,866	145,0112	1180,44317	6,350580434
0.4	2597,561	162,6425	1312,63288	6,639632927
0.45	2922,256	183,6037	1501,83392	6,905496521
0.5	3246,951	200,4989	1698,84585	7,152327754

Data nano 0.25 %

% nano	Q(L/m nt)	D(m m)	L(m)	Π	rho(air)	Cp(nanofl uid)	v(viskositas as)	v(viskositas dinding)	k	Pr	A(luas Penampang)	A(luas permukaan)
0.0025	0.25	0.0049	1.1	3.14	1015.6045	4144.888767	0.000669088	0.00081872	0.643743	4.308079854	1.88479E-05	0.016925
0.0025	0.3	0.0049	1.1	3.14	1015.6045	4144.888767	0.000669088	0.00081872	0.643743	4.308079854	1.88479E-05	0.016925
0.0025	0.35	0.0049	1.1	3.14	1015.6045	4144.888767	0.000669088	0.00081872	0.643743	4.308079854	1.88479E-05	0.016925
0.0025	0.4	0.0049	1.1	3.14	1015.6045	4144.888767	0.000669088	0.00081872	0.643743	4.308079854	1.88479E-05	0.016925
0.0025	0.45	0.0049	1.1	3.14	1015.6045	4144.888767	0.000669088	0.00081872	0.643743	4.308079854	1.88479E-05	0.016925
0.0025	0.5	0.0049	1.1	3.14	1015.6045	4144.888767	0.000669088	0.00081872	0.643743	4.308079854	1.88479E-05	0.016925

Q(m ³ /s)	v(m/s)	\dot{m}	Re	Thin	Thout	ΔT	Twall	$\Delta T\beta$	Tw-Tb	ΔT_{lmtd}	RePr	d/L	v/v
4.17E-06	0.221069	0.004232	1644.24	40,61	34,6	6,01	30	37,605	7,605	7,191226	18,84114	0,164539	0,972121
0.000005	0.265282	0.005078	1973.09	40,4	34,6	5,8	30	37,5	7,5	7,110026	20,40844	0,164539	0,97214
5.83E-06	0.309496	0.005924	2301.93	40,35	34,61	5,74	30	37,48	7,48	7,097296	21,48451	0,164539	0,97214
6.67E-06	0.35371	0.006771	2630.78	40,5	34,8	5,7	30	37,65	7,65	7,281932	22,4624	0,164539	0,97214
7.5E-06	0.397923	0.007617	2959.63	40,42	34,9	5,52	30	37,66	7,66	7,316183	23,36183	0,164539	0,97214
8.33E-06	0.442137	0.008463	3288.48	40,29	34,8	5,49	30	37,545	7,545	7,199465	24,19688	0,164539	0,97214

Q(L/mnt)	Re	q	U lmtd	Nu(t)
0.25	1577,588	105,1669	864,087612	5,605422467
0.3	1973,085	122,0775	1014,48564	6,071825543
0.35	2301,933	140,9504	1173,42361	6,391972257
0.4	2630,78	159,9636	1297,94438	6,682908737
0.45	2959,628	174,2761	1407,4562	6,950505177
0.5	3288,475	192,5877	1580,55619	7,198945207