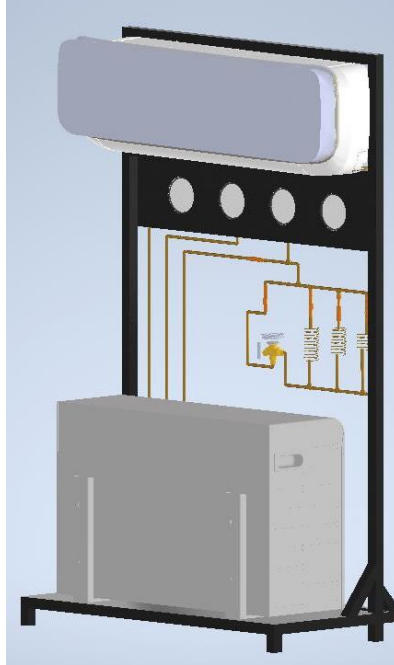


## LAMPIRAN

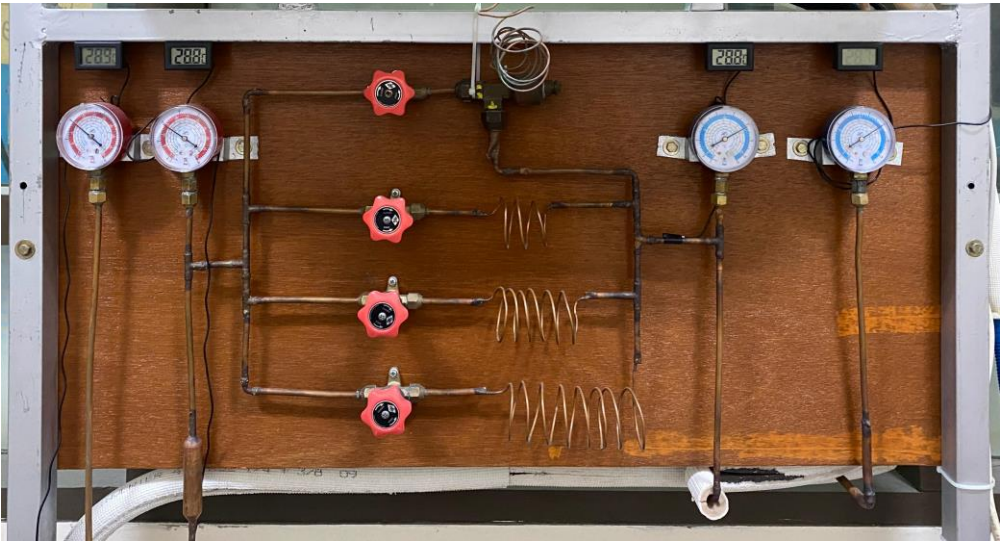
Desain Alat Uji:



Realisasi Alat Uji:



Instalasi Perpipaan Katup Ekspansi:



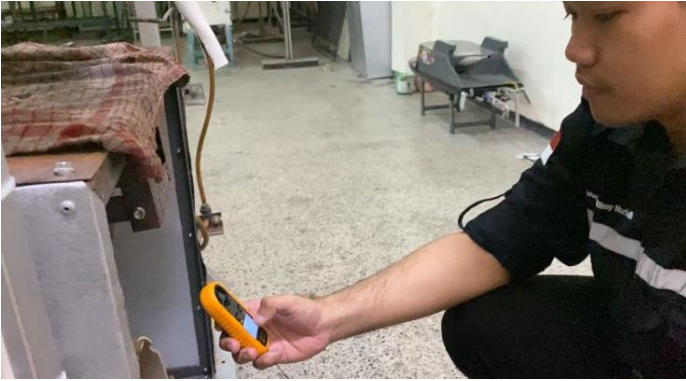
Proses Pembuatan Alat Uji



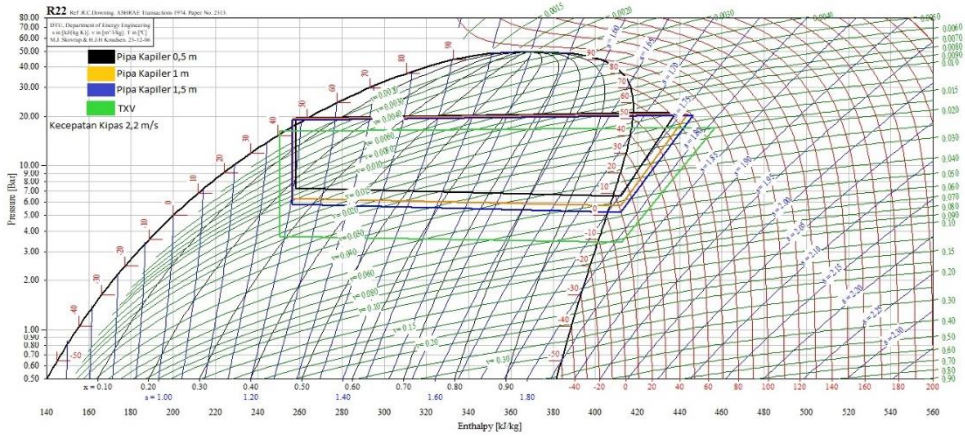


Proses Pengujian dan Pengambilan Data

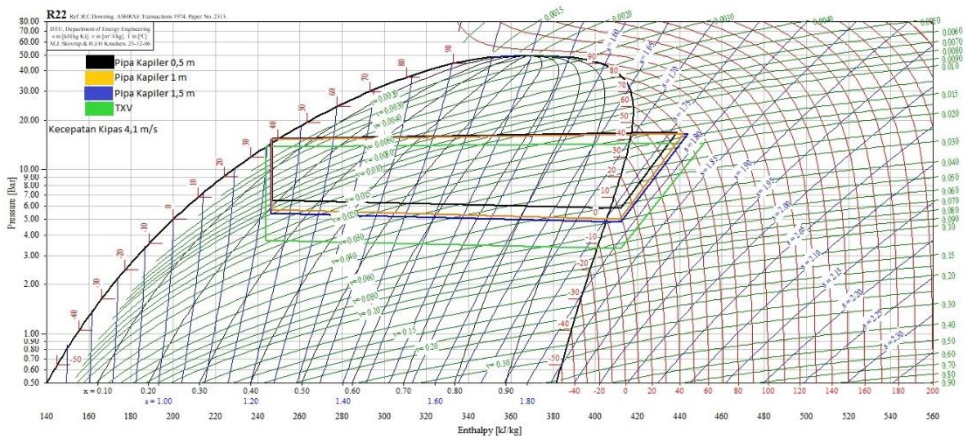




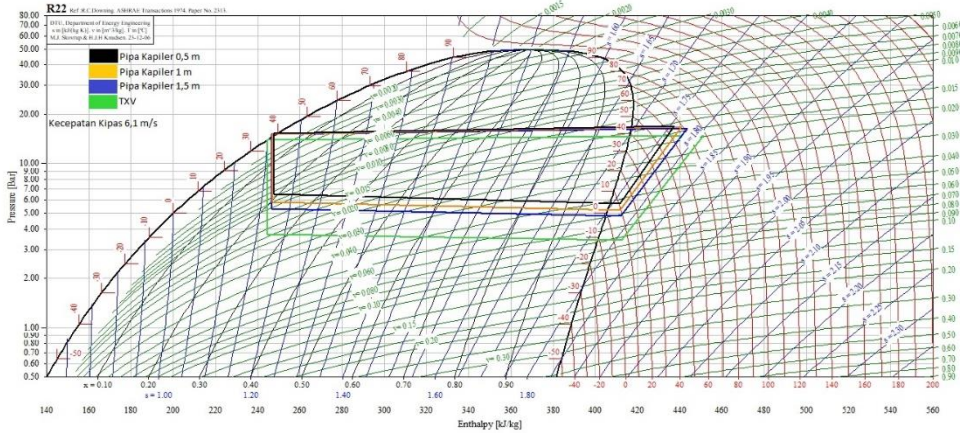
## P-h diagram variasi katup ekspansi dan kecepatan kipas kondensor 2,2 m/s



## P-h diagram variasi katup ekspansi dan kecepatan kipas kondensor 4,1 m/s



## P-h diagram variasi katup ekspansi dan kecepatan kipas kondensor 6,1 m/s



Tabel Termodinamika Refrigeran R-22

Temp °C	Absolute Pressure kPa												Temp °C
	1800 (46.71°C)			1900 (49.03°C)			2000 (51.27°C)			2100 (53.43°C)			
	V	H	S	V	H	S	V	H	S	V	H	S	
50	0.0127	417.1	1.690	0.0119	417.4	1.687	0.0113	417.5	1.683	0.0106	417.6	1.680	50
55	0.0135	425.6	1.716	0.0126	423.7	1.706	0.0116	421.6	1.696	0.0108	419.4	1.686	55
60	0.0140	430.5	1.731	0.0130	428.7	1.721	0.0121	426.9	1.712	0.0113	424.9	1.702	60
65	0.0145	435.2	1.745	0.0135	433.6	1.736	0.0126	431.9	1.727	0.0118	430.1	1.718	65
70	0.0149	439.8	1.758	0.0139	438.3	1.750	0.0130	436.8	1.741	0.0122	435.1	1.733	70
75	0.0154	444.3	1.771	0.0143	442.9	1.763	0.0134	441.5	1.755	0.0126	440.0	1.747	75
80	0.0158	448.8	1.784	0.0147	447.5	1.776	0.0138	446.1	1.768	0.0130	444.7	1.760	80
85	0.0162	453.2	1.796	0.0151	451.9	1.788	0.0142	450.7	1.781	0.0134	449.4	1.773	85
90	0.0166	457.5	1.808	0.0155	456.4	1.801	0.0146	455.2	1.793	0.0137	454.0	1.786	90
95	0.0169	461.9	1.820	0.0159	460.8	1.813	0.0149	459.6	1.806	0.0141	458.5	1.798	95
100	0.0173	466.2	1.832	0.0162	465.1	1.825	0.0153	464.1	1.817	0.0144	463.0	1.811	100
105	0.0177	470.5	1.843	0.0166	469.5	1.836	0.0156	468.5	1.829	0.0148	467.4	1.822	105
110	0.0180	474.7	1.854	0.0170	473.8	1.847	0.0160	472.8	1.841	0.0151	471.8	1.834	110
115	0.0184	479.0	1.866	0.0173	478.1	1.859	0.0163	477.2	1.852	0.0154	476.2	1.845	115
120	0.0188	483.3	1.876	0.0176	482.4	1.870	0.0166	481.5	1.863	0.0157	480.6	1.857	120
125	0.0191	487.5	1.887	0.0180	486.7	1.880	0.0170	485.8	1.874	0.0160	484.9	1.868	125
130	0.0194	491.8	1.898	0.0183	490.9	1.891	0.0173	490.1	1.885	0.0163	489.3	1.878	130
135	0.0198	496.0	1.908	0.0186	495.2	1.902	0.0176	494.4	1.895	0.0166	493.6	1.889	135
140	0.0201	500.3	1.919	0.0190	499.5	1.912	0.0179	498.7	1.906	0.0169	498.0	1.900	140
145	0.0205	504.5	1.929	0.0193	503.8	1.922	0.0182	503.0	1.916	0.0172	502.3	1.910	145
150	0.0208	508.8	1.939	0.0196	508.1	1.932	0.0185	507.3	1.926	0.0175	506.6	1.920	150
155	0.0211	513.0	1.949	0.0199	512.3	1.943	0.0188	511.7	1.936	0.0178	511.0	1.931	155
160	0.0214	517.3	1.959	0.0202	516.6	1.953	0.0191	516.0	1.946	0.0181	515.3	1.941	160
165	0.0218	521.6	1.969	0.0205	520.9	1.962	0.0194	520.3	1.956	0.0184	519.6	1.951	165
170	0.0221	525.9	1.978	0.0208	525.2	1.972	0.0197	524.6	1.966	0.0187	524.0	1.960	170
175	0.0224	530.2	1.988	0.0211	529.5	1.982	0.0200	529.0	1.976	0.0190	528.3	1.970	175
180	0.0227	534.5	1.998	0.0214	533.9	1.991	0.0203	533.3	1.986	0.0192	532.7	1.980	180
185	0.0230	538.8	2.007	0.0217	538.2	2.001	0.0206	537.7	1.995	0.0195	537.1	1.989	185
190	0.0233	543.1	2.017	0.0220	542.6	2.010	0.0209	542.0	2.005	0.0198	541.5	1.999	190
195	0.0236	547.5	2.026	0.0223	546.9	2.020	0.0211	546.4	2.014	0.0201	545.8	2.008	195
200	0.0240	551.8	2.035	0.0226	551.3	2.029	0.0214	550.8	2.023	0.0203	550.2	2.018	200

**Table 1** (continued)  
**DuPont™ Freon® 22 Saturation Properties — Temperature Table**

Temp °C	Pressure [kPa]	Volume [m <sup>3</sup> /kg]		Density [kg/m <sup>3</sup> ]		Enthalpy [kJ/kg]			Entropy [kJ/K-kg]		Temp °C
		Liquid v <sub>l</sub>	Vapour v <sub>g</sub>	Liquid d <sub>l</sub>	Vapour d <sub>g</sub>	Liquid H <sub>l</sub>	Latent H <sub>lg</sub>	Vapour H <sub>g</sub>	Liquid S <sub>l</sub>	Vapour S <sub>g</sub>	
8	640.9	0.0008	0.0368	1254.0	27.150	209.5	198.4	407.9	1.034	1.739	8
9	660.7	0.0008	0.0358	1250.0	27.970	210.7	197.5	408.2	1.038	1.738	9
10	680.9	0.0008	0.0347	1247.0	28.820	211.9	196.7	408.6	1.042	1.737	10
11	701.7	0.0008	0.0337	1243.0	29.690	213.1	195.8	408.9	1.046	1.735	11
12	722.9	0.0008	0.0327	1239.0	30.570	214.3	194.9	409.2	1.051	1.734	12
13	744.5	0.0008	0.0318	1236.0	31.480	215.5	194.0	409.5	1.055	1.733	13
14	766.7	0.0008	0.0309	1232.0	32.410	216.7	193.2	409.9	1.059	1.732	14
15	789.3	0.0008	0.0300	1229.0	33.360	217.9	192.3	410.2	1.063	1.730	15
16	812.4	0.0008	0.0291	1225.0	34.340	219.1	191.4	410.5	1.067	1.729	16
17	836.1	0.0008	0.0283	1221.0	35.340	220.4	190.4	410.8	1.071	1.728	17
18	860.2	0.0008	0.0275	1217.0	36.360	221.6	189.5	411.1	1.076	1.726	18
19	884.8	0.0008	0.0267	1214.0	37.410	222.8	188.6	411.4	1.080	1.725	19
20	910.0	0.0008	0.0260	1210.0	38.480	224.1	187.6	411.7	1.084	1.724	20
21	935.7	0.0008	0.0253	1206.0	39.570	225.3	186.6	411.9	1.088	1.722	21
22	961.9	0.0008	0.0246	1202.0	40.700	226.5	185.7	412.2	1.092	1.721	22
23	988.7	0.0008	0.0239	1198.0	41.850	227.8	184.7	412.5	1.096	1.720	23
24	1016.0	0.0008	0.0232	1195.0	43.030	229.0	183.8	412.8	1.100	1.719	24
25	1044.0	0.0008	0.0226	1191.0	44.230	230.3	182.7	413.0	1.105	1.717	25
26	1072.0	0.0008	0.0220	1187.0	45.470	231.5	181.8	413.3	1.109	1.716	26
27	1101.0	0.0009	0.0214	1183.0	46.730	232.8	180.7	413.5	1.113	1.715	27
28	1131.0	0.0009	0.0208	1179.0	48.020	234.1	179.7	413.8	1.117	1.714	28
29	1161.0	0.0009	0.0203	1175.0	49.350	235.3	178.7	414.0	1.121	1.712	29
30	1192.0	0.0009	0.0197	1171.0	50.700	236.6	177.7	414.3	1.125	1.711	30
31	1223.0	0.0009	0.0192	1167.0	52.090	237.9	176.6	414.5	1.129	1.710	31
32	1255.0	0.0009	0.0187	1163.0	53.520	239.2	175.5	414.7	1.133	1.709	32
33	1288.0	0.0009	0.0182	1158.0	54.970	240.5	174.4	414.9	1.138	1.707	33
34	1321.0	0.0009	0.0177	1154.0	56.460	241.8	173.3	415.1	1.142	1.706	34
35	1355.0	0.0009	0.0172	1150.0	57.990	243.1	172.2	415.3	1.146	1.705	35
36	1389.0	0.0009	0.0168	1146.0	59.550	244.4	171.1	415.5	1.150	1.704	36
37	1424.0	0.0009	0.0164	1142.0	61.150	245.7	170.0	415.7	1.154	1.702	37
38	1460.0	0.0009	0.0159	1137.0	62.790	247.0	168.9	415.9	1.158	1.701	38
39	1497.0	0.0009	0.0155	1133.0	64.470	248.3	167.8	416.1	1.162	1.700	39
40	1534.0	0.0009	0.0151	1129.0	66.190	249.6	166.6	416.2	1.166	1.698	40
41	1571.0	0.0009	0.0147	1124.0	67.960	251.0	165.4	416.4	1.171	1.697	41
42	1610.0	0.0009	0.0143	1120.0	69.780	252.3	164.3	416.6	1.175	1.696	42
43	1649.0	0.0009	0.0140	1115.0	71.610	253.7	163.0	416.7	1.179	1.695	43
44	1689.0	0.0009	0.0136	1111.0	73.510	255.0	161.8	416.8	1.183	1.693	44
45	1729.0	0.0009	0.0133	1106.0	75.460	256.4	160.6	417.0	1.187	1.692	45
46	1770.0	0.0009	0.0129	1101.0	77.450	257.7	159.4	417.1	1.191	1.691	46
47	1812.0	0.0009	0.0126	1097.0	79.500	259.1	158.1	417.2	1.196	1.689	47
48	1855.0	0.0009	0.0123	1092.0	81.590	260.5	156.8	417.3	1.200	1.688	48
49	1899.0	0.0009	0.0119	1087.0	83.740	261.9	155.5	417.4	1.204	1.687	49
50	1943.0	0.0009	0.0116	1082.0	85.950	263.2	154.2	417.4	1.208	1.685	50
51	1988.0	0.0009	0.0113	1077.0	88.220	264.6	152.9	417.5	1.212	1.684	51
52	2033.0	0.0009	0.0110	1072.0	90.540	266.0	151.6	417.6	1.216	1.682	52
53	2080.0	0.0009	0.0108	1067.0	92.930	267.5	150.1	417.6	1.221	1.681	53
54	2127.0	0.0009	0.0105	1062.0	95.380	268.9	148.7	417.6	1.225	1.680	54
55	2175.0	0.0010	0.0102	1057.0	97.900	270.3	147.4	417.7	1.229	1.678	55
56	2224.0	0.0010	0.0100	1052.0	100.500	271.8	145.9	417.7	1.233	1.677	56
57	2274.0	0.0010	0.0097	1047.0	103.100	273.2	144.5	417.7	1.238	1.675	57
58	2324.0	0.0010	0.0094	1041.0	105.900	274.7	142.9	417.6	1.242	1.674	58
59	2375.0	0.0010	0.0092	1036.0	108.700	276.1	141.5	417.6	1.246	1.672	59
60	2427.0	0.0010	0.0090	1030.0	111.600	277.6	139.9	417.5	1.250	1.670	60
61	2480.0	0.0010	0.0087	1025.0	114.600	279.1	138.4	417.5	1.255	1.669	61