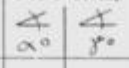


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Lampiran 1
Tabel Perhitungan

Tabel 1 Kecepatan potong proses bubut rata dan proses bubut ulir untuk pahat HSS ((Widarto, Teknik Pemesinan Untuk Sekolah Menengah Kejuruan , 2008)

Workpiece material	Tensile strength in kp/mm ²	Tool	Cutting angle clearance/top 		Feed in mm/rev.				Coolant and Lubricant		
					0,1	0,2	0,4	0,8	Roughing	Finishing	
					cutting speed v m/min						
Steel St 34, St 37, St 42	up to 50,	SS S ₁	8 5	14 10		60 280	45 236	34 200	34 170	E	E or P
St 50, St 60	50...70	SS S ₁	8 5	14 10	240	44 205	32 175	24 145		E	E or P
St 70	70...85	SS S ₁	8 5	14 10	200	32 170	24 132	18 108		E	E or P
Cast steel	50...70	SS S ₁	8 5	10 6	118	34 100	25 85	19 71		E	dry
Alloyed steel	85...100	SS S ₁	8 5	10 6	150	24 118	17 95	12 75		E	E or P
Mn-Steel, Cr-Ni-steel, Cr-Mo-steel	100...140	SS S ₁	8 5	6 6	95	16 75	11 60	8 50		E	E or P
other alloyed steels	140...180	SS S ₁	8 5	6 6	60	9,5 48	6 38		32	E	E or P
Tool steel	150...180	SS S ₁	8 5	6 6	50	40 32	32 27		27	E	Colza oil or P
C. I. 20, C. I. 25	hardness Brinell 200...250	SS H ₁	8 5	0 0	106	90 75	63 63			dry or E	dry
Copper alloys	hardness Brinell 80...120	SS G ₁	8 5	0 6		125 600	85 530	55 450	400	dry, E or L	dry
Cast bronze		SS G ₁	8 5	0 6	355	63 280	53 236	43 200		E or L	dry
Light alloys aluminium		SS G ₁	12 12	30 30	400 1320	300 1120	200 960	118 850		E or P soap spirit	E or P soap spirit
Aluminium alloys (11...13%Si)		SS G ₁	12 12	18 18	100 224	67 190	45 160	30 140		E	Oil S II or P
Magnesium alloys*		SS G ₁	8 5	6 6	1000 1800	900 1500	800 1250	750 1060		dry or with non-combustible oil	dry or with non-combustible oil
Platics and hard rubber		SS G ₁	12 12	10 10	300	280	250	224		dry	dry
Bakelite, Novotext, Pertinax hard plastic		SS G ₁	12 12	14 14	280	212	170	132		dry	dry

Tabel 2 Kecepatan potong untuk proses frais untuk pasangan benda kerja dan pisau HSS (Sumbodo, 2008)

Bahan	Cutter HSS		Cutter Karbida	
	Halus	kasar	Halus	kasar
Baja Perkakas	75 - 100	25 - 45	185 - 230	110 - 140
Baja Karbon Rendah	70 - 90	25 - 40	170 - 215	90 - 120
Baja karbon Menengah	60 - 85	20 - 40	140 - 185	75 - 110
Besi Cor Kelabu	40 - 45	25 - 30	110 - 140	60 - 75
Kuningan	85 - 110	45 - 70	185 - 215	120 - 150
Alumunium	70 - 110	30 - 45	140 - 215	60 - 90

Tabel 3 Kecepatan pemakanan (*feeding*) perigi untuk HSS (Sumbodo, 2008)

pisau	feed/tooth (mm)
spiral (slab) mill (up to 30° helix angle of tooth)	0,1 ÷ 0,25
spiral mill (30 + 00° helix angle)	0,05 ÷ 0,2
face mill and shell end mill	0,1 ÷ 0,5
end mill	0,1 ÷ 0,25
saw	0,05 ÷ 0,1
slotting cutter	0,05 ÷ 0,15
form cutter	0,05 ÷ 0,2

Tabel 4 Data material, kecepatan potong, sudut mata bor HSS, dan cairan pendingin proses gudi (Widarto, Teknik Pemesinan Untuk Sekolah Menengah Kejuruan , 2008)

MATERIAL	CUTTING SPEEDS 1.		POINT ANGLE	LIP CLEARANCE	COOLANTS	
	(METERS/MINUTE) (FEET/MINUTE)	MPM				FPM
Aluminum And Alloys	61.00 - 91.50		200 - 300	90 - 130 deg	12 - 15 deg	Kerosene/Kerosene & Lard Oil/ Soluble Oil
Armor Plate	12.20 - 18.25		40 - 50	135 - 140 deg	6 - 9 deg	Light Machine Oil
Brass	61.00 - 91.50		200 - 300	118 - 118 deg	12 - 15 deg	Dry/ Soluble Oil/Kerosene/Lard Oil
Bronze	61.00 - 91.50		200 - 300	110 - 118 deg	12 - 15 deg	Dry/ Soluble Oil/Mineral Oil/Lard Oil
Bronze, High Tensile	21.35 - 45.75		70 - 150	100 - 110 deg	12 - 15 deg	Dry/ Soluble Oil/Mineral Oil/Lard Oil
Cast Iron, Soft	30.50 - 45.75		100 - 150	90 - 100 deg	12 - 15 deg	Air Jet Dry/ Soluble Oil
Cast Iron, Medium	21.35 - 30.50		70 - 100	100 - 110 deg	12 - 15 deg	Air Jet Dry/ Soluble Oil
Cast Iron, Hard	21.35 - 30.50		70 - 100	100 - 118 deg	8 - 12 deg	Air Jet Dry/ Soluble Oil
Cast Iron, Chilled	9.15 - 12.20		30 - 40	118 - 135 deg	5 - 9 deg	Air Jet Dry/ Soluble Oil
Copper	61.00 - 91.50		200 - 300	100 - 118 deg	12 - 15 deg	Air Jet Dry/ Soluble Oil
Copper Graphite Alloy (Carbon Drills)	18.30 - 21.35		40 - 70	**_**	**_**	Soluble Oil/Dry/Mineral Oil/Kerosene
Glass (Carbon Drills)	6.10 - 9.15		20 - 30	**_**	**_**	Soluble Oil/Dry/Mineral Oil/Kerosene
Iron, Malleable	15.25 - 27.45		50 - 90	90 - 100 deg	12 - 15 deg	Light Machine Oil
Magnesium And Alloys	76.25 - 122.0		250 - 400	70 - 118 deg	12 - 15 deg	Soluble Oil
Monel Nickel	4.15 - 15.28		30 - 50	118 - 125 deg	10 - 12 deg	Compressed Air/Mineral Oil
Nickel Alloys	12.20 - 18.30		40 - 60	135 - 140 deg	5 - 7 deg	Lard Oil/Soluble Oil
Plastic, Hot Set	30.50 - 91.50		100 - 300	60 - 90 deg	10 - 12 deg	Lard Oil/Soluble Oil
Plastic, Cold Set	30.50 - 91.50		100 - 300	118 - 135 deg	12 - 20 deg	Soap Solution
Steel, Low Carbon, 0.2-0.3ct	24.40 - 33.55		80 - 110	110 - 118 deg	7 - 9 deg	Soap Solution
Steel, Medium Carbon 0.4-0.5c	21.35 - 24.40		70 - 80	118 - 125 deg	7 - 9 deg	Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil
Steel (High Carbon 1.2c)	15.25 - 18.30		50 - 60	118 - 145 deg	7 - 9 deg	Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil
Steel, Forged	15.25 - 18.30		50 - 60	118 - 145 deg	7 - 12 deg	Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil
Steel, Alloy	15.25 - 21.35		50 - 70	118 - 125 deg	10 - 12 deg	Mineral Lard Oil
Steel, Alloy 300 To 400 Brinell	6.10 - 9.15		20 - 30	130 - 140 deg	7 - 10 deg	Soluble Oil
Steel, Stainless, Free Machining	9.15 - 24.40		30 - 80	110 - 118 deg	8 - 12 deg	Soluble Oil
Steel, Stainless, Hard	4.57 - 15.25		15 - 50	118 - 135 deg	6 - 8 deg	Soluble Oil
Steel, Manganese	3.66 - 4.57		12 - 15	140 - 150 deg	7 - 10 deg	Soluble Oil
Stone (Carbide Drills)	7.63 - 9.15		25 - 30	**_**	**_**	Water Solution
Wood	91.50 - 122.2		300 - 400	60 - 70 deg	10 - 15 deg	Dry

Tabel 5 Putaran mata bor dan gerak makan pada beberapa jenis bahan

MATERIAL AND CUTTING SPEED (FT PER MINUTE)											
Diameter of drill (in.)	Aluminum	Brass & Bronze	Cast iron	Mild steel 0.2-0.3 carbon (LOW)	Steel 0.4-0.5 carbon (MED)	Tool steel 1.2 carbon and drop forgings	Conn. rod molybdenum steel	3.5 nickel steel	Stainless steel and monel metal	Malleable iron	Feed per revolution (in.)
	300	200	100	150	80	80	55	80	80	85	
Revolutions per minute											
1/16.....	18,336	12,224	8,112	6,724	4,883	3,888	3,404	3,978	3,056	5,192	0.0015
1/8.....	9,168	6,112	3,056	3,362	2,444	1,834	1,702	1,988	1,528	2,596	0.002-0.003
3/16.....	6,108	4,072	2,036	2,242	1,630	1,222	1,120	1,324	1,018	1,734	0.004
1/4.....	4,684	3,056	1,528	1,661	1,222	917	851	994	784	1,288	0.005
5/16.....	3,888	2,444	1,222	1,344	978	733	672	794	611	1,038	0.005
3/8.....	3,054	2,036	1,018	1,121	815	611	560	662	509	867	0.006
7/16.....	2,622	1,748	874	921	699	524	481	568	437	742	0.007
1/2.....	2,292	1,528	784	840	611	459	420	487	382	649	0.008
9/16.....	2,037	1,358	678	747	543	407	373	441	340	577	0.008
5/8.....	1,838	1,224	612	673	489	367	337	398	308	520	0.009
11/16.....	1,685	1,110	555	611	444	333	300	360	273	472	0.009
3/4.....	1,524	1,018	508	559	405	308	279	330	254	433	0.010
13/16.....	1,422	948	474	521	379	285	261	308	237	403	0.010
7/8.....	1,314	878	438	482	349	262	241	285	218	371	0.011
15/16.....	1,221	814	407	448	320	244	224	265	204	346	0.012
1.....	1,148	764	382	420	305	229	210	258	191	325	0.013
1 1/16.....	1,077	718	369	395	287	218	197	233	180	305	0.013
1 1/8.....	1,020	680	340	374	272	204	187	221	170	288	0.014
1 3/16.....	968	644	322	354	258	193	177	209	161	274	0.014
1 1/4.....	918	612	308	337	245	183	168	199	153	260	0.015
1 5/16.....	873	582	291	320	233	175	160	189	145	248	0.015
1 3/8.....	834	555	278	308	222	167	153	180	139	236	0.015
1 7/16.....	796	530	265	292	212	159	146	172	133	225	0.015
1 1/2.....	762	508	254	279	204	153	140	165	127	216	0.015
1 9/16.....	732	488	244	268	195	146	134	158	122	207	0.016
1 5/8.....	702	468	234	267	188	141	129	152	117	201	0.016
1 11/16.....	678	452	226	249	181	136	124	147	113	192	0.016
1 3/4.....	654	436	218	240	175	131	120	142	109	186	0.016
1 13/16.....	630	420	210	231	168	126	118	137	105	179	0.016
1 7/8.....	612	408	204	224	163	122	112	133	102	173	0.016
1 15/16.....	591	394	197	218	158	118	108	128	99	168	0.016
2.....	573	382	191	210	153	115	105	124	96	162	0.016

1. Rotational speed value for carbide twist drills are 200 to 300 percent higher than H.S.S.

Lampiran II Dokumentasi



Gambar 1 Proses pengetapan



Gambar 3 Proses fraisudukan pisau



Gambar 2 Proses perakitan



Gambar 4 Proses *bore head*



Gambar 5 Proses bubut



Gambar 7 Proses pengelasan



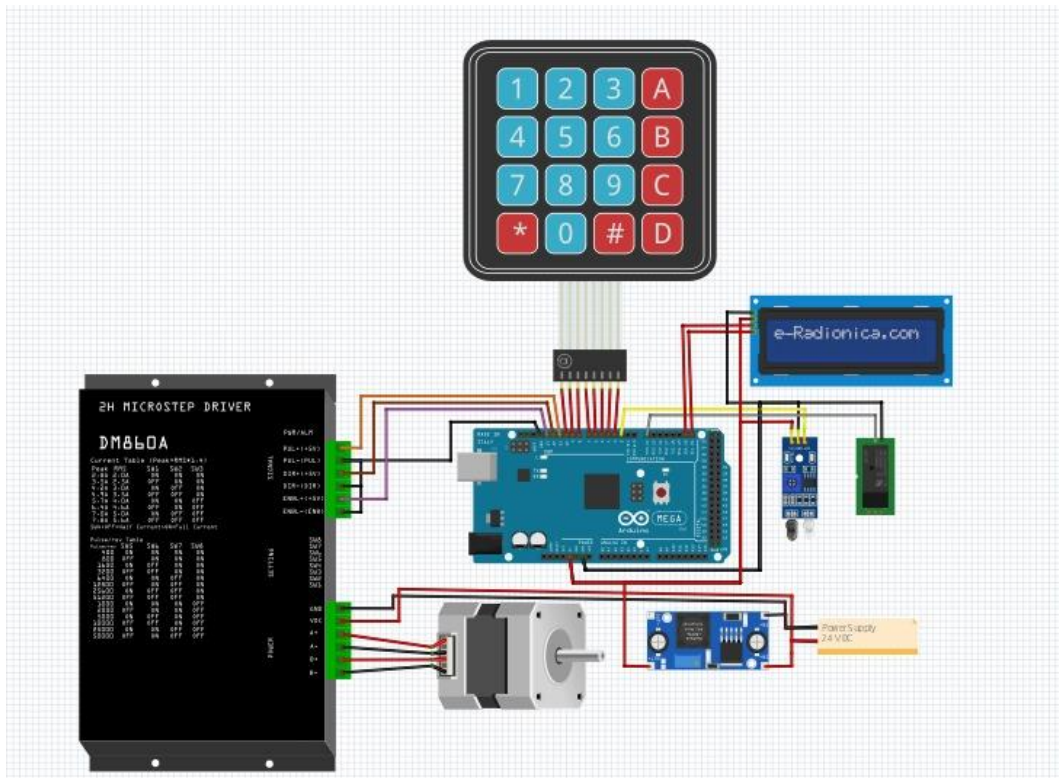
Gambar 6 Proses pengefraisan *toolpost*

Lampiran III
Jadwal Tugas Akhir

Lampiran IV
Bill Of Material


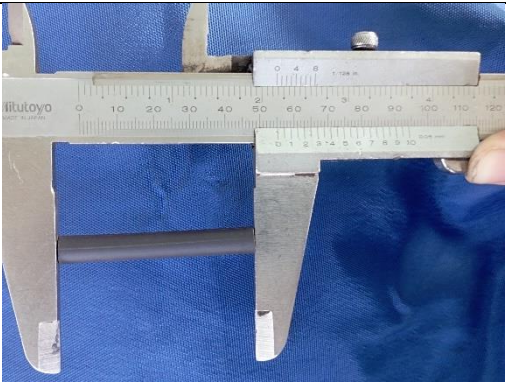
Lampiran V

Wiring Elektrikal

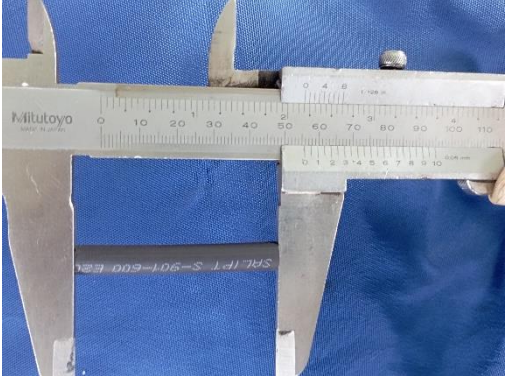
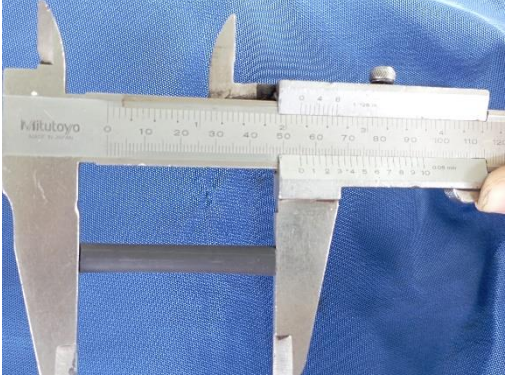



Lampiran VI
Hasil Pemotongan


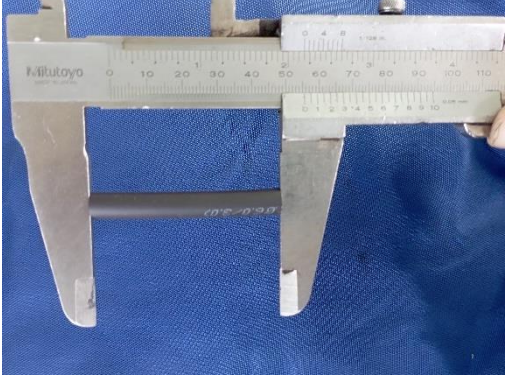
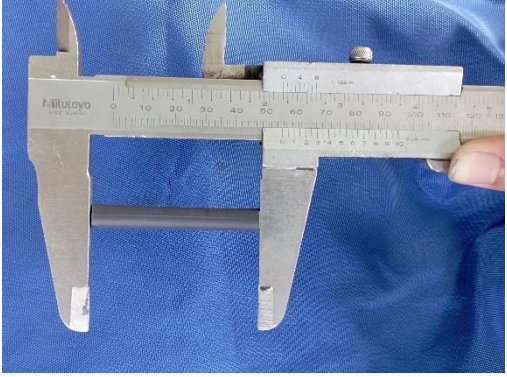
Tabel 6 Hasil Pemotongan

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
1	56	 A photograph showing a vernier caliper measuring a metal rod. The main scale is marked in millimeters from 0 to 100. The vernier scale is marked from 0 to 10. The rod is held between the jaws of the caliper, and the measurement is 56 mm. The brand name 'Mitutoyo' is visible on the main scale.
2	55	 A photograph showing a vernier caliper measuring a metal rod. The main scale is marked in millimeters from 0 to 120. The vernier scale is marked from 0 to 10. The rod is held between the jaws of the caliper, and the measurement is 55 mm. The brand name 'Mitutoyo' is visible on the main scale.




Tabel 6 Hasil Pemotongan (lanjutan)

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
3	55,60	
4	55,20	
5	54,30	

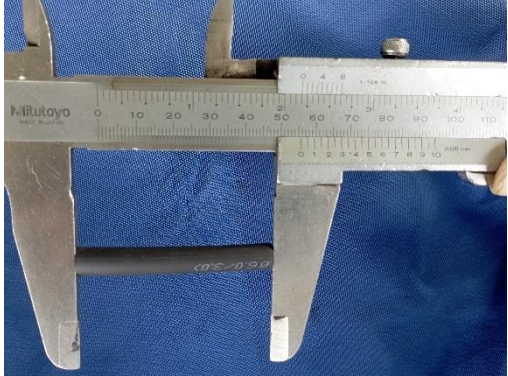


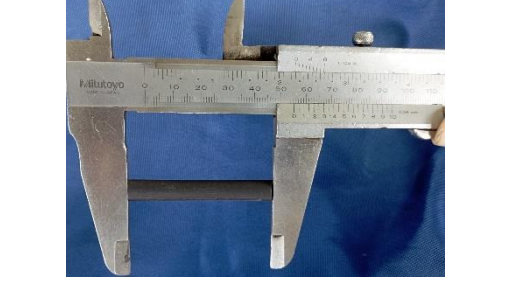
Tabel 6 Hasil Pemotongan (lanjutan)

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
6	55,35	
7	55,50	
8	55,50	




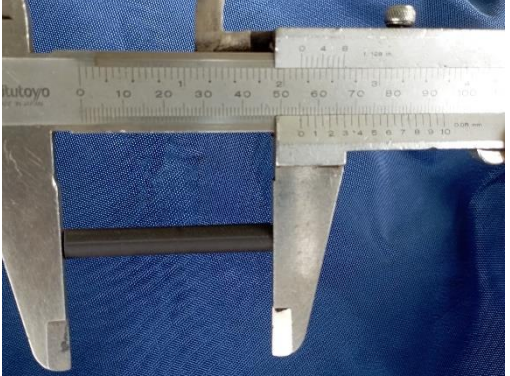
Tabel 6 Hasil Pemotongan (lanjutan)

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
9	55	
10	55	
11	55,40	


Tabel 6 Hasil Pemotongan (lanjutan)

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
12	55,70	
13	55,90	
14	55,80	
15	55,20	

Tabel 6 Hasil Pemotongan (lanjutan)

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
16	55,55	
17	55	
18	56	
19	55,30	

Tabel 6 Hasil Pemotongan (lanjutan)

Pemotongan ke-	Panjang Pemotongan (mm)	Visual
20	55,50	

Lampiran VII
Biodata Penulis

BIODATA PENULIS



Nama : Qoni'ah Royhanah
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Motto : من لم يذق مر التعلم ساعة, تجرع ذل الجهل طول حياته

Riwayat Pendidikan:

1. SD Negeri 03 Kesugihan : Tahun 2009-2015
2. SMP Negeri 2 Maos : Tahun 2015-2018
3. SMK Negeri 2 Cilacap : Tahun 2018-2021