BAB 6
KESIMPULAN DAN SARAN

6.1. Kesimpulan

Berdasarkan penelitian yang telah dilakukan maka dapat ditarik kesimpulan sebagai berikut :

1. Produk bantalan luncur dengan *surface texture* tidak hanya dapat dibuat dengan *laser texturing*, melainkan mampu menggunakan mesin *CNC 3 axis*.
2. Gambar *3D model* dengan menggunakan *PowerShape 2016* merupakan hasil design dari peneliti yang dibantu dengan peniliti sebelumnya sehingga mampu mewujudkan *3D model* bantalan luncur *surface texture* yang komplek.
3. *Toolpath strategy* yang dibuat dengan perangkat lunak *PowerMill 2016* dalam penelitian ini merupakan *toolpath* yang sesuai untuk mengerjakan produk *surface texturing* bantalan luncur.

6.2. Saran

Setelah penelitian ini selesai hingga menghasilkan produk bantalan luncur *surface texture* maka peneliti memberikan saran apabila dilakukan penelitian selanjutnya berupa :

1. Pemilihan *toolpath strategy* yang lebih optimal untuk mengerjakan *surface texturing* pada produk bantalan luncur
2. Bentuk *surface texture* yang dibuat lebih beragam bentuk untuk dikerjakan menggunakan mesin *CNC milling 3 axis*.
3. Pengerjaan *surface texturing* menggunakan *cutting tools* lebih kecil dari penelitian yang dilakukan saat ini.

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LAMPIRAN

Lampiran 1. Potongan *NC Code Drilling* Diameter 2.0 mm

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N20G40G17G80G49
N30G0G90Z10.
N40T2M6
N50G54G90
N60( Toolpath Name: Drill 2)
N70( Output:)
N80( Units: MM)
N90( Tool Coordinates: Tip)
N100( Tool Number: 2)
N110( Tool Id: Drilling 2)
N120( Coolant: Flood)
N130( Gauge Length: 179,0)
N140( Block:)
N150( MIN X: -15,000)
N160( MIN Y: -16,500)
N170( MIN Z: -29,000)
N180( MAX X: 15,000)
N190( MAX Y: 16,500)
N200( MAX Z: -27,000)
N210( COORDINATE SYSTEM: Active Workplane)
N220( Datum - Tool Tip:)
N230(   X: 0,000)
N240(   Y: 0,000)
N250(   Z: 10,000)
N260( Recommended length: 45,000)
N270( Number of Flutes: 1)
N280( Tool:   Drill)
N290( DIAMETER: 2,000)
N300( TAPER ANGLE: 38,000)
N310( Safety:)
N320( Tool Cutting Moves: Safe No Gouges)
N330( Tool Leads: Safe No Gouges)
N340( Tool Links: Safe No Gouges)
N350( Holder Cutting Moves: Safe No Collisions)
N360( Holder Leads: Safe No Collisions)
N370( Holder Links: Safe No Collisions)
N380( Toolpath: Drilling)
N390( STEPOVER: 5,000)
N400( TOLERANCE:0,010)
N410( RADIAL THICKNESS: 0,000)
N420( AXIAL THICKNESS: 0,000)
N430( Toolpath Stats:)
N440( LENGTH: 1262,781)
N450( TIME: 0/00/41)
N460( LIFTS: 50)
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N510Y-12.
N520G80
N530G83G99X-6.Q40.261Z-30.261R-26.F200
N540Y-6.
N550Y0
N560G80
N570G83G99X0Q40.866Z-30.866R-26.F200
N580Y-6.
N590Y-12.
N600G80
N610G83G99X6.Q40.261Z-30.261R-26.F200
N620G80
N630G83G99X12.Q38.394Z-28.394R-26.F200
N640Y-6.
N650G80
N660G83G99X6.Q40.261Z-30.261R-26.F200
N670Y0
N680G80
N690G83G99X12.Q38.394Z-28.394R-26.F200
N700Y6.
N710Y12.
N720G80
N730G83G99X6.Q40.261Z-30.261R-26.F200
N740Y6.
N750G80
N760G83G99X0Q40.866Z-30.866R-26.F200
N770Y12.
N780G80
N790G83G99X-6.Q40.261Z-30.261R-26.F200
N800Y6.
N810G80
N820G83G99X-12.Q38.394Z-28.394R-26.F200
N830Y12.
N840G80
N850M9
N860G91G28Z0
N870G49H0
N880G28X0Y0
N890M30

Lampiran 2. Potongan *NC Code Finising* Diameter 2.0 mm

%
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N20G40G17G80G49
N30G0G90Z10.
N40T2M6

N50G54G90
N60(Toolpath Name: Finishing)
N70(Output:)
N80(Units: MM)
N90(Tool Coordinates: Tip)
N100(Tool Number: 2)
N110(Tool Id: Boll 3)
N120(Coolant: Flood)
N130(Gauge Length: 158,0)
N140(Block:)
N150(MIN X: -15,000)
N160(MIN Y: -16,500)
N170(MIN Z: -29,000)
N180(MAX X: 15,000)
N190(MAX Y: 16,500)
N200(MAX Z: -27,000)
N210(COORDINATE SYSTEM: Active Workplane)
N220(Datum - Tool Tip:)
N230(X: 0,000)
N240(Y: 0,000)
N250(Z: 10,000)
N260(Recommended length: 21,000)
N270(Number of Flutes: 2)
N280(Tool: Ball Nosed)
N290(DIAMETER: 3,000)
N300(Safety:)
N310(Tool Cutting Moves: Safe No Gouges)
N320(Tool Leads: Safe No Gouges)
N330(Tool Links: Safe No Gouges)
N340(Holder Cutting Moves: Safe No Collisions)
N350(Holder Leads: Safe No Collisions)
N360(Holder Links: Safe No Collisions)
N370(Toolpath: Optimised Constant Z)
N380(STEPOVER: 0,100)
N390(TOLERANCE:0,010)
N400(THICKNESS:0,000)
N410(Toolpath Stats:)
N420(LENGTH: 3011,183)
N430(TIME: 0/06/40)
N440(LIFTS: 25)
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N480X12.254Y-12.963Z-27.782F400
N490X12.487Y-12.866Z-27.672
N500X12.687Y-12.723Z-27.574
N510X12.72Y-12.688Z-27.557
N520X12.883Y-12.454Z-27.476
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N570X12.72Y-11.311Z-27.556

N580X12.654Y-11.248Z-27.589
N590X12.469Y-11.122Z-27.68
N600X12.221Y-11.028Z-27.799
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N640X11.488Y-11.143Z-28.135
N650X11.338Y-11.255Z-28.214
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N670X11.147Y-11.489Z-28.333
N680X11.045Y-11.722Z-28.412
N690X11.02Y-11.855Z-28.439
N700X11.001Y-11.988Z-28.45
N710X11.02Y-12.155Z-28.438
N720X11.039Y-12.254Z-28.419
N730X11.135Y-12.488Z-28.343
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N760X11.487Y-12.854Z-28.135
N770X11.755Y-12.963Z-28.012
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N1300X11.737Y-11.215Z-28.026
N1310X11.582Y-11.285Z-28.112
N1320X11.484Y-11.355Z-28.174
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N1390X11.196Y-12.09Z-28.45
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N1430X11.436Y-12.564Z-28.22
N1440X11.574Y-12.669Z-28.126
N1450X11.718Y-12.737Z-28.041
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N1490X12.255Y-12.736Z-27.782
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Lampiran 3. Potongan *NC Code Drilling* Diameter 4.0 mm

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N40T1M6
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N70( Output:)
N80( Units: MM)
N90( Tool Coordinates: Tip)
N100( Tool Number: 1)
N110( Tool Id: Drill 4)
N120( Coolant: Flood)
N130( Gauge Length: 182,0)
N140( Block:)
N150( MIN X: -15,000)
N160( MIN Y: -16,500)
N170( MIN Z: -29,000)
N180( MAX X: 15,000)
N190( MAX Y: 16,500)
N200( MAX Z: -27,000)
N210( COORDINATE SYSTEM: Active Workplane)
N220( Datum - Tool Tip:)
N230(   X: 0,000)
N240(   Y: 0,000)
N250(   Z: 10,000)
N260( Recommended length: 45,000)
N270( Number of Flutes: 2)
N280( Tool:   Drill)
N290( DIAMETER: 4,000)
N300( TAPER ANGLE: 38,000)
N310( Safety:)
N320( Tool Cutting Moves: Safe No Gouges)
N330( Tool Leads: Safe No Gouges)
N340( Tool Links: Safe No Gouges)
N350( Holder Cutting Moves: Safe No Collisions)
N360( Holder Leads: Safe No Collisions)
N370( Holder Links: Safe No Collisions)
N380( Toolpath: Drilling)
N390( STEPOVER: 5,000)
N400( TOLERANCE:0,010)
N410( RADIAL THICKNESS: 0,000)
N420( AXIAL THICKNESS: 0,000)
N430( Toolpath Stats:)
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N450( TIME: 0/00/26)
N460( LIFTS: 50)
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N510Y-12.
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N550Y0
N560G80
N570G83G99X0Q40.866Z-30.866R-29.483F200
N580Y-6.
N590Y-12.
N600G80
N610G83G99X6.Q40.261Z-30.261R-28.685F200
N620G80
N630G83G99X12.Q38.394Z-28.394R-26.59F200
N640Y-6.
N650G80
N660G83G99X6.Q40.261Z-30.261R-28.685F200
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N680G80
N690G83G99X12.Q38.394Z-28.394R-26.59F200
N700Y6.
N710Y12.
N720G80
N730G83G99X6.Q40.261Z-30.261R-28.685F200
N740Y6.
N750G80
N760G83G99X0Q40.866Z-30.866R-29.483F200
N770Y12.
N780G80
N790G83G99X-6.Q40.261Z-30.261R-28.685F200
N800Y6.
N810G80
N820G83G99X-12.Q38.394Z-28.394R-26.59F200
N830Y12.
N840G80
N850M9
N860G91G28Z0
N870G49H0
N880G28X0Y0
N890M30

Lampiran 4. Potongan *NC Code Finishing* Diameter 4.0 mm

%
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N20G40G17G80G49
N30G0G90Z10.
N40T2M6
N50G54G90

N60(Toolpath Name: Finishing)
N70(Output:)
N80(Units: MM)
N90(Tool Coordinates: Tip)
N100(Tool Number: 2)
N110(Tool Id: Boll 3)
N120(Coolant: Flood)
N130(Gauge Length: 158,0)
N140(Block:)
N150(MIN X: -15,000)
N160(MIN Y: -16,500)
N170(MIN Z: -29,000)
N180(MAX X: 15,000)
N190(MAX Y: 16,500)
N200(MAX Z: -27,000)
N210(COORDINATE SYSTEM: Active Workplane)
N220(Datum - Tool Tip:)
N230(X: 0,000)
N240(Y: 0,000)
N250(Z: 10,000)
N260(Recommended length: 21,000)
N270(Number of Flutes: 2)
N280(Tool: Ball Nosed)
N290(DIAMETER: 4,000)
N300(Safety:)
N310(Tool Cutting Moves: Safe No Gouges)
N320(Tool Leads: Safe No Gouges)
N330(Tool Links: Safe No Gouges)
N340(Holder Cutting Moves: Safe No Collisions)
N350(Holder Leads: Safe No Collisions)
N360(Holder Links: Safe No Collisions)
N370(Toolpath: Optimised Constant Z)
N380(STEPOVER: 0,100)
N390(TOLERANCE:0,010)
N400(THICKNESS:0,000)
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N530X11.222Y-12.602Z-28.242
N540X11.098Y-12.421Z-28.334
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N570X11.015Y-11.855Z-28.429
N580X11.091Y-11.588Z-28.34

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N1050X11.855Y-12.87Z-27.917
N1060X11.658Y-12.809Z-28.008
N1070X11.589Y-12.773Z-28.042
N1080X11.398Y-12.632Z-28.153
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N2140X12.021Y-12.566Z-27.841
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N2250X11.454Y-11.943Z-28.306
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N2270X11.52Y-11.749Z-28.182
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N2330X11.988Y-11.494Z-27.856
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N2350X12.2Y-11.538Z-27.755
N2360X12.294Y-11.589Z-27.709
N2370X12.384Y-11.664Z-27.665
N2380X12.466Y-11.773Z-27.624
N2390X12.508Y-11.882Z-27.604
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N2410X12.515Y-12.046Z-27.6
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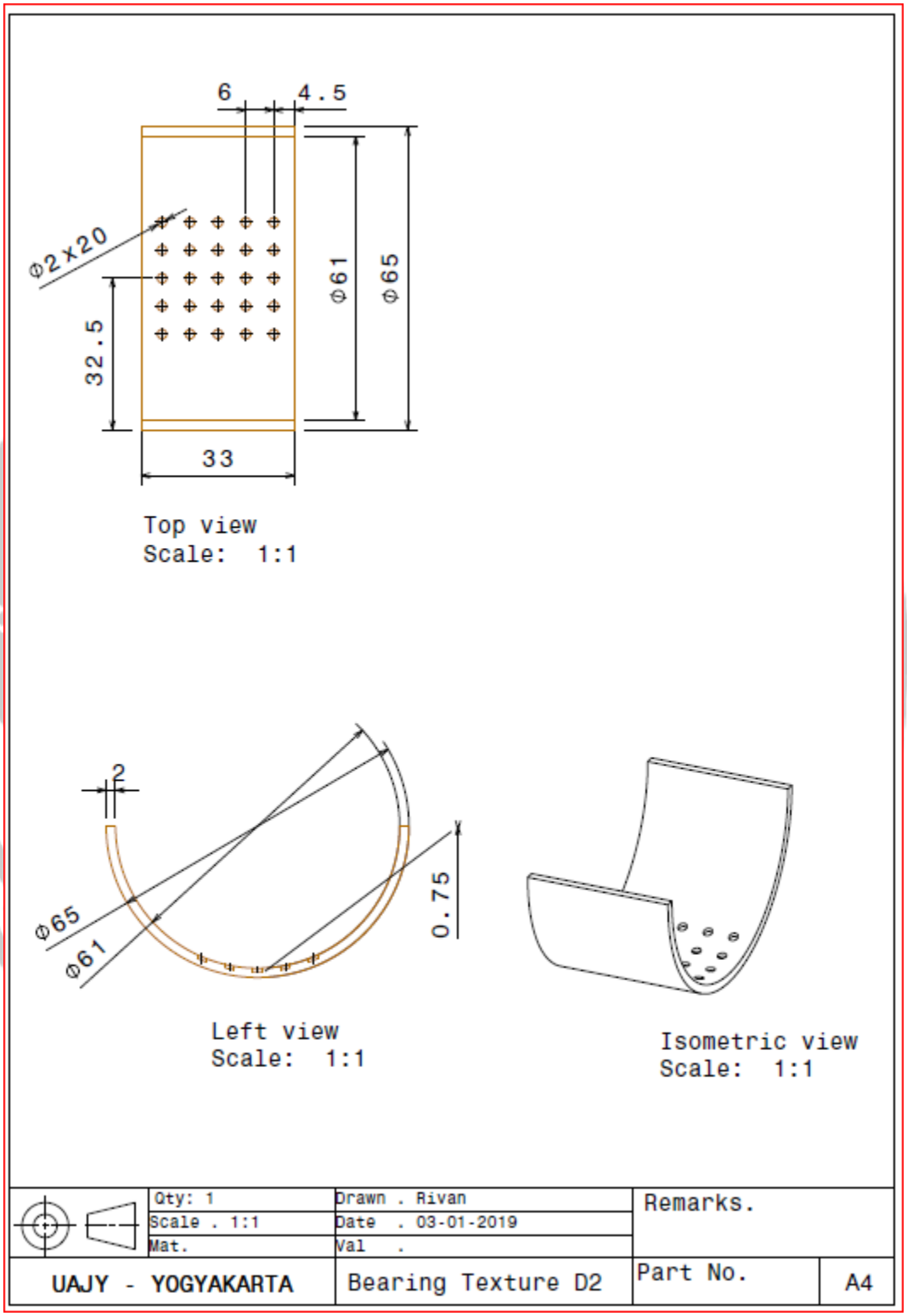
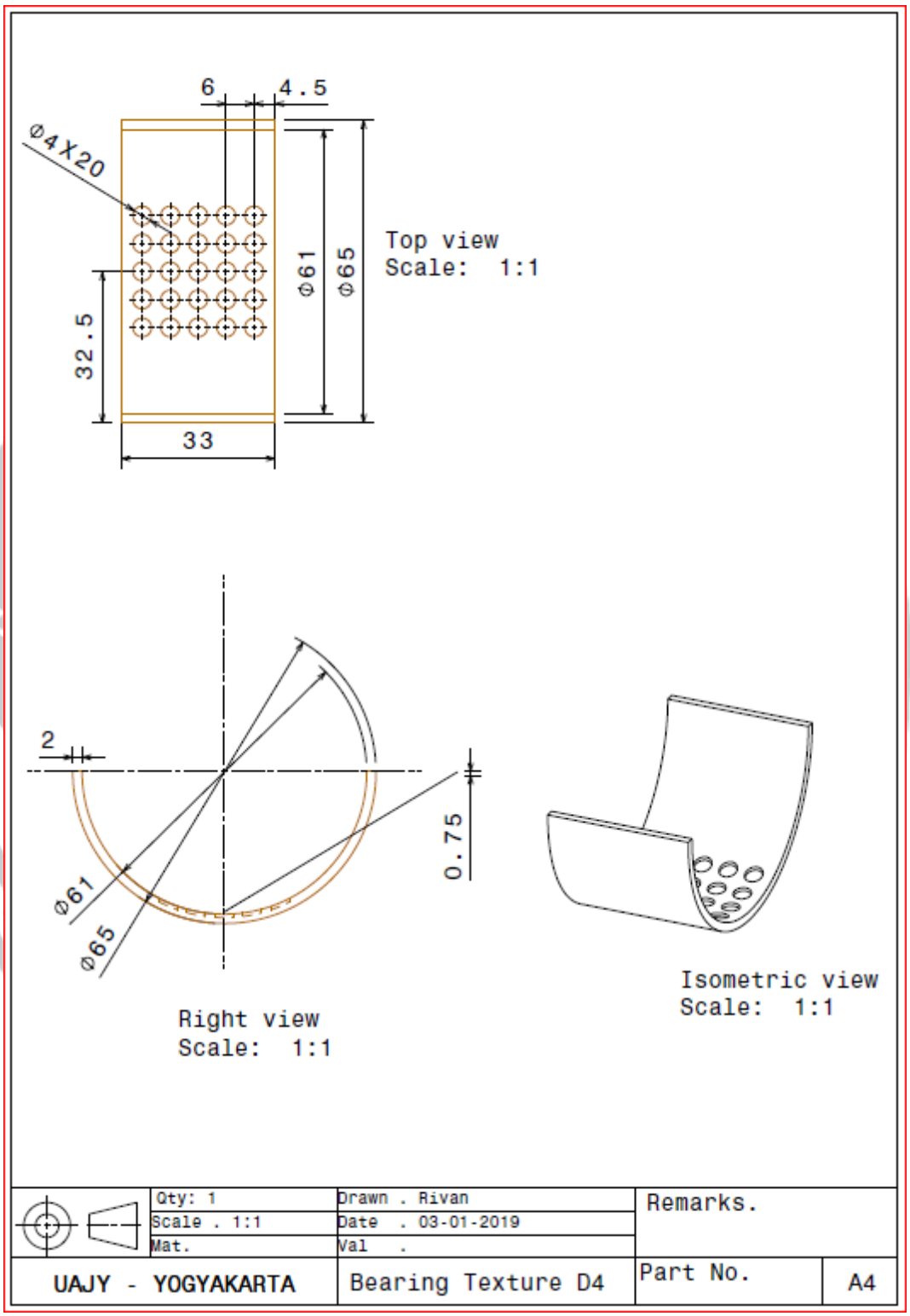
Lampiran 6. *Drafting* Produk *Surface Texture* Bantalan Luncur 2.0 mm



Lampiran 2. *Drafting* Produk *Surface Texture* Bantalan Luncur 4.0 mm



Lampiran 3. *Program Report* PowerMill *Surface Texture* 2.0 mm

CNC MILLING	PROGRAM REPORT	PROGRAM NAME :	PROJECT CODE :
CareSystem		***Dia 2***	***MODIFIKASI***
		PowerMILL	
		E:/Titipan/rivan/PowerMill Fix/Dia 2	

PRODUK NAME	PART NAME	CUSTOMER	PROGRAM	QUANTITY	MATERIAL	DATE	REVISION NR.
						2019-07-02	

NO	PROGRAM NAME	TOOL NAME	Ø	TOOL TYPE	OH	HOLDER	Proses	STRATEGY	n	Vf	THICK.	TOOL OFFSET	TOOL NUMBER	EST. CUT TIME	ACTUAL CUT TIME
1	Drillinng	Drilling 2	2	Drill	45	Boll 8_TSFV 08 00 110 16	Drilling	Drilling	1200	200	0	H	1	0:00:41	
1	Finishing	Boll 2	2	Ball Nosed	21	TSFV 03 00 110 16 BT 40	Finishing	Optimised Constant Z	3500	2000	0	H	2	0:02:31	

NOTE :	SKETCH	TOTAL TIME :	0:03:12	
Reff. X0Y0 : CENTER BLOK		ITEM IS :	NO HOLDER :	
Reff. Z0 :				

ITEM	ACT. DIMENSION	OK / NG
1		
2		
3		
4		
5		

MACHINING TIME		
RUN DNC_PROG.		OPERATOR
START :	WIB	
END :	WIB	
TOTAL :	min	

WORKPIECE CLAMPING SYSTEM	
- VICE	
- EROWA HOLDER	
- JIG / TOP / BOTTOM PLATE	
- ASSY MOULD	
- SIDE CLAMP	

MADE BY	CHECKED BY
Rivan	***Jati***

PAGE NR.		OF	

Lampiran 4. *Program Report* PowerMill *Surface Texture* 4.0 mm

CNC MILLING	PROGRAM REPORT	PROGRAM NAME :	PROJECT CODE :
CareSystem		***Dia 4***	***MODIFIKASI***
		PowerMILL	
		E:/Titipan/rivan/powermill/pmill d=4/pmill d=4	

PRODUK NAME	PART NAME	CUSTOMER	PROGRAM	QUANTITY	MATERIAL	DATE	REVISION NR.
						2019-07-02	

NO	PROGRAM NAME	TOOL NAME	Ø	TOOL TYPE	OH	HOLDER	Proses	STRATEGY	n	Vf	THICK.	TOOL OFFSET	TOOL NUMBER	EST. CUT TIME	ACTUAL CUT TIME
1	Drilling	Drill 4	4	Drill	45	TSFV 03 00 110 16 BT 40	Drilling	Drilling	1200	200	0	H	1	0:00:26	
2	Finishing	Boll 4	4	Ball Nosed	21	TSFV 03 00 110 16 BT 40	Finishing	Optimised Constant Z	3500	2000	0	H	2	0:00:52	
												TOTAL TIME :		0:01:18	

NOTE :	SKETCH	ITEM IS :	NO HOLDER :
Reff. X0Y0 : CENTER BLOK			
Reff. Z0 :			

ITEM	ACT. DIMENSION	OK / NG
1		
2		
3		
4		
5		

MACHINING TIME		
RUN DNC_PROG.		OPERATOR
START :	WIB	
END :	WIB	
TOTAL :	min	

WORKPIECE CLAMPING SYSTEM	
- VICE	
- EROWA HOLDER	
- JIG / TOP / BOTTOM PLATE	
- ASSY MOULD	
- SIDE CLAMP	

MADE BY	CHECKED BY
Rivan	***Jati***
PAGE NR.	OF

Lampiran 9. Pengukuran *Surface Texture* Diameter 2.0 mm

Lampiran 10. Pengukuran *Surface Texture* Diameter 4.0 mm