

## BAB 6 KESIMPULAN

### 6.1. Kesimpulan

Penelitian mengenai optimasi manufaktur *acetabular cup* untuk mendapatkan waktu proses yang optimum dan nilai *surface roughness* ( $R_a$ )  $< 2.00 \mu\text{m}$  dianggap berhasil dikerjakan. Penelitian ini menggunakan pendekatan metode kombinasi Taguchi—RSM untuk mendapatkan kondisi parameter permesinan optimal sehingga mendapatkan hasil respon yang optimum. Parameter pemotongan yang optimal untuk proses manufaktur *inner acetabular cup* adalah pada kondisi *spindle speed* 8000 rpm; *step over* 0,01 mm; *depth of cut* 0,55 mm; dan *feed rate* 1350 mm/min. Parameter permesinan ini akan menghasilkan nilai  $R_a$  optimum = 0,77  $\mu\text{m}$  dan waktu proses permesinan ( $T_m$ ) = 186.047,9695 sec. Penelitian ini lebih menekankan ke nilai *surface roughness* untuk mencapai standar ASTM ( $\leq 2.00 \mu\text{m}$ ) sehingga parameter permesinan yang dipilih adalah penggunaan parameter permesinan dengan kondisi respon nilai  $R_a$  *inner acetabular cup* optimal.

Optimasi menggunakan kombinasi dari kedua metode ini lebih baik. Hal ini dikarenakan pendekatan ini berhasil mendapatkan nilai *surface roughness* dengan nilai *absolute error* yang lebih rendah dibandingkan penggunaan satu metode saja.

### 6.2. Saran

Penelitian ini dapat dijadikan sebagai acuan untuk pertimbangan pembuatan manufaktur komponen *acetabular cup*. Namun, hasil dari penelitian ini membutuhkan penelitian terkait lebih lanjut dalam melakukan proses optimasi dan penentuan faktor dengan beberapa level yang digunakan sehingga bisa didapatkan parameter pemotongan yang menghasilkan nilai respon lebih optimal dibandingkan dengan penelitian saat ini.

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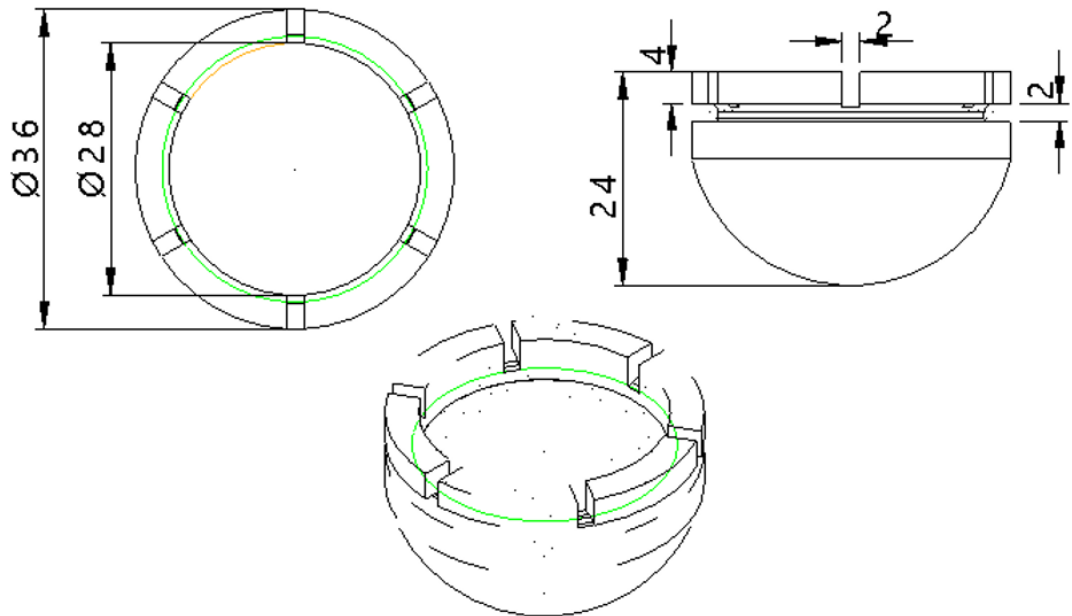
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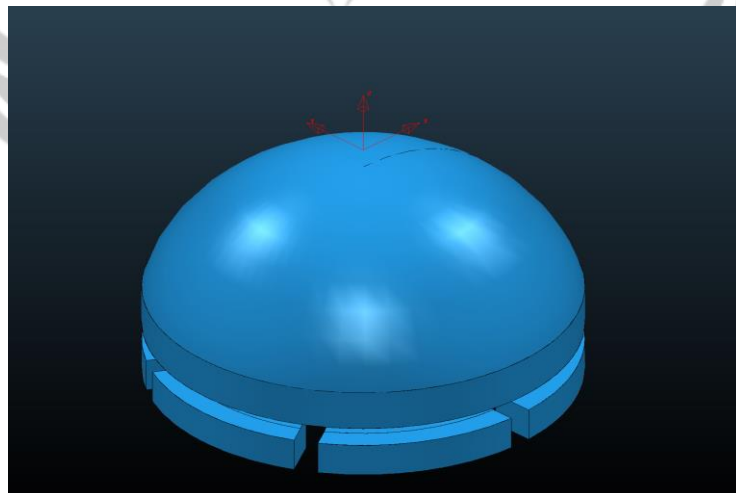


## LAMPIRAN

### Lampiran 1. *Drafting Acetabular Cup 2D*




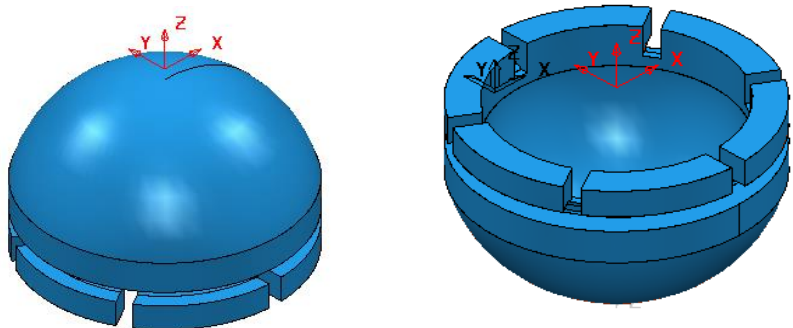
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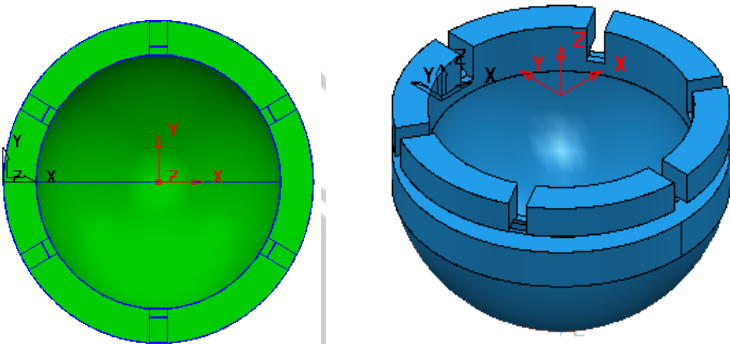
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PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Inner					1	UHMWPE			2019-03-14			
NO	PROGRAM NAME	TOOL NAME	Ø	TOOL TYPE	OH	HOLDER	Proses	STRATEGY	n	Vf	THICK.	TOOL OFFSET	TOOL NUMBER	EST. CUT TIME	ACTUAL CUT TIME
1	ROUGHING 1	EndMil 6	6	End Mill	35	TSPV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7000	1300	0	H	4	0:44:56	01.20.56
NOTE :			SKETCH								TOTAL TIME :		3.52.19	04.54.34	
Reff. X0Y0 : CENTER BLOK											ITEM IS :		NO HOLDER :		
Reff. Z0 : Top															
ITEM	ACT. DIMENSION	OK / NG			WORKPIECE CLAMPING SYSTEM										
1					- VICE										
2					- EROWA HOLDER										
3					- JIG / TOP / BOTTOM PLATE										
4					- ASSY MOULD										
5					- SIDE CLAMP										
MACHINING TIME					MADE BY		CHECKED BY								
RUN DNC_PROG.			OPERATOR												
START : WIB															
END : WIB															
TOTAL : min					J.Wibowo		J.Wibowo								
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Lampiran 4. Program Report Hasil Permesinan 1 Outer


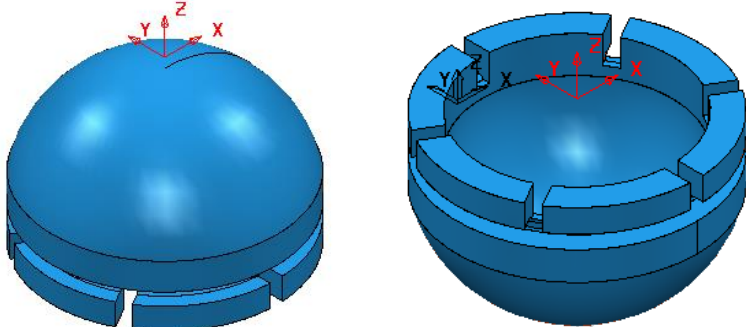
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PRODUK NAME		PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.				
Hip- Joint		Outer					1	UHMWPE			2019-03-14						
NO	PROGRAM NAME	TOOL NAME	Ø	TOOL TYPE	OH	HOLDER	Proses	STRATEGY	n	Vf	THICK.	TOOL OFFSET	TOOL NUMBER	EST. CUT TIME	ACTUAL CUT TIME		
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2	ROUGHING 2_1	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Offset Area Clearance	5300	2000	0,2	H	2	0:06:57	00:07:57		
3	FINISH1_1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset	6000	1300	0	H	3	1:53:27	02:11:02		
4	FINISH 2_1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7000	1300	0	H	4	0:26:42	00:38:44		
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Lampiran 5. Program Report Hasil Permesinan 2 Inner


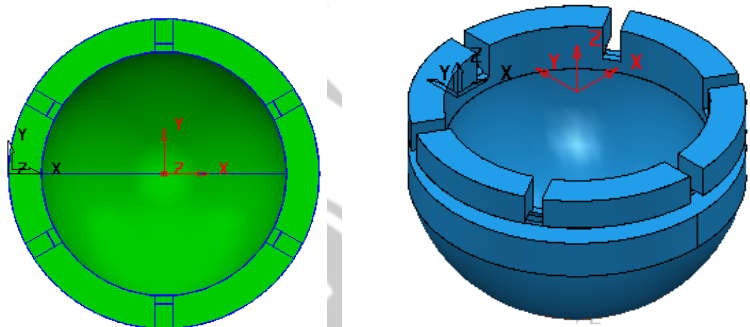
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<b>Machinery Division</b>															<b>2.i</b>			<b>Inner_2</b>			
																					
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PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.							
Hip- Joint			Inner					1	UHMWPE			2019-03-14									
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30						
1	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30						
1	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38						
1	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7000	1350	0	H	4	0:34:54	00.45.12						
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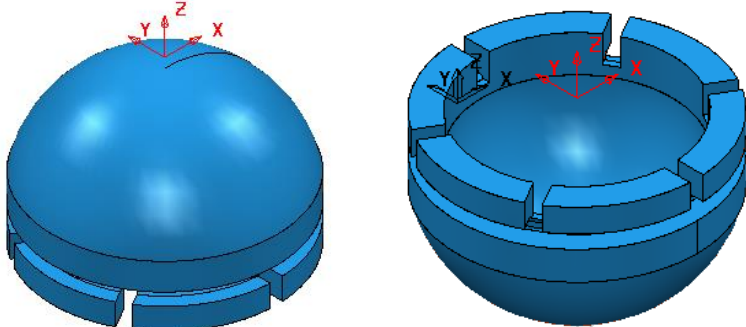
Lampiran 6. Program Report Hasil Permesinan 2 Outer

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Machinery Division									2.o			<b>Outer_2</b>																				
																																
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.																		
Hip- Joint			Outer					1	UHMWPE			2019-03-14																				
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	00.02.42	00.04.42																	
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57																	
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02																	
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7000	1350	0	H	4	0:28:40	00.40.21																	
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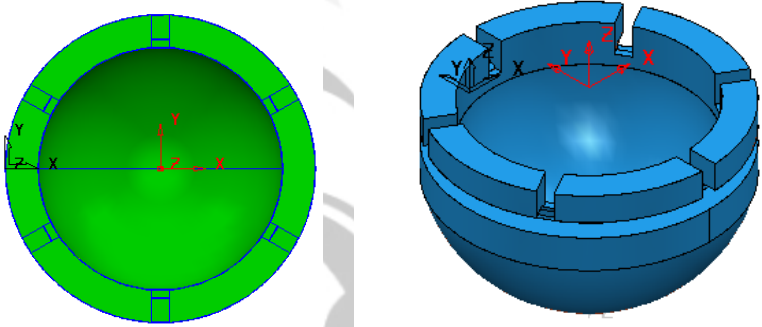
Lampiran 7. Program Report Hasil Permesinan 3 Inner

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PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.																	
Hip- Joint			Inner					1	UHMWPE			2019-03-14																			
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																
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2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30																
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38																
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7000	1400	0	H	4	0:29:59	00.35.00																
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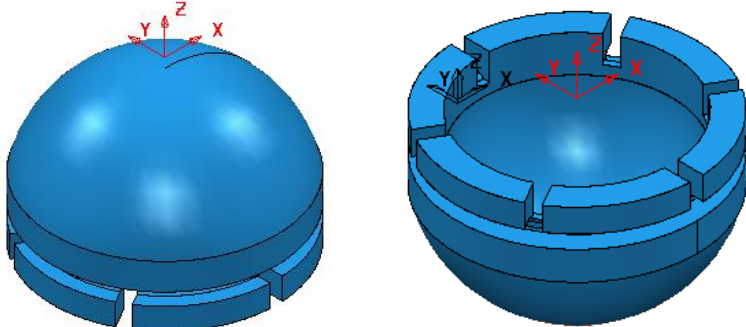
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Hip- Joint			Outer					1	UHMWPE			2019-03-14			
NO	PROGRAM NAME	TOOL NAME	Ø	TOOL TYPE	OH	HOLDER	Proses	STRATEGY	n	Vf	THICK.	TOOL OFFSET	TOOL NUMBER	EST. CUT TIME	ACTUAL CUT TIME
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2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7000	1400	0	H	4	0:16:47	00.20.06
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Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM						
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1			- EROWA HOLDER												
2			- JIG / TOP / BOTTOM PLATE												
3			- ASSY MOULD												
4			- SIDE CLAMP												
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MACHINING TIME			MADE BY			CHECKED BY									
RUN DNC_PROG. OPERATOR															
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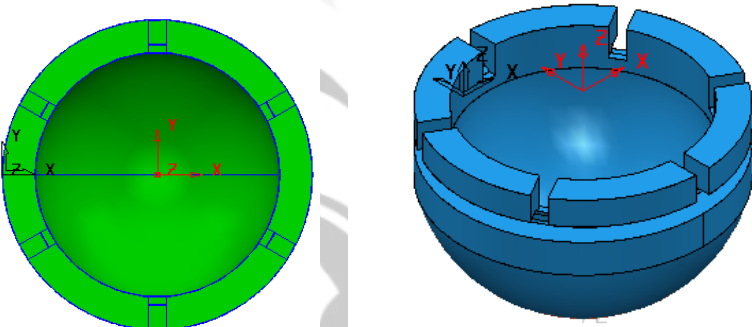
Lampiran 9. Program Report Hasil Permesinan 4 Inner

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												E:/Titipan/cici/out/1B			
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY		MATERIAL		DATE		REVISION NR.	
Hip- Joint			Inner					1		UHMWPE		2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7500	1400	0	H	4	0:41:38	00.50.30
NOTE :			SKETCH												
Ref. X0Y0 : CENTER BLOK  Ref. Z0 : Top															
ITEM	ACT. DIMENSION	OK / NG													
1															
2															
3															
4															
5															
MACHINING TIME															
RUN DNC_PROG.		OPERATOR													
START :	WIB														
END :	WIB														
TOTAL :	min														
			TOTAL TIME :		3.49.01		04.24.08								
			ITEM IS :		NO HOLDER :										
			WORKPIECE CLAMPING SYSTEM												
			- VICE - EROWA HOLDER - JIG / TOP / BOTTOM PLATE - ASSY MOULD - SIDE CLAMP												
			MADE BY		CHECKED BY										
			J.Wibowo		J.Wibowo										
			PAGE NR.		OF										


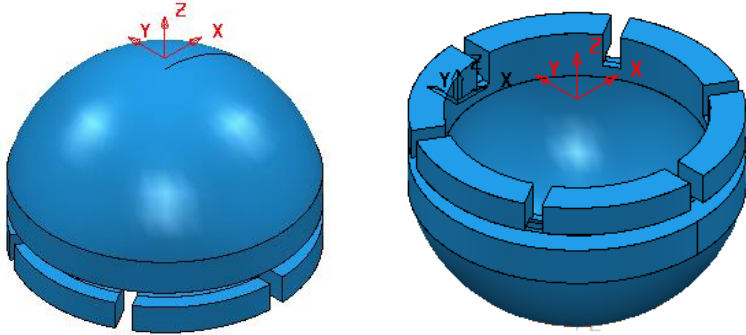
Lampiran 10. Program Report Hasil Permesinan 4 Outer

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									4.o			Outer_4			
												E:/Titipan/cici/out/1B			
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Outer					1	UHMWPE			2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:02:42	00.04.42
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7500	1400	0	H	4	0:23:20	00.33.26
NOTE :			SKETCH						TOTAL TIME :			2.26.26	2.57.07		
Ref. X0Y0 : CENTER BLOK									ITEM IS :			NO HOLDER :			
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM						
ITEM	ACT. DIMENSION	OK / NG	- VICE												
1			- EROWA HOLDER												
2			- JIG / TOP / BOTTOM PLATE												
3			- ASSY MOULD												
4			- SIDE CLAMP												
5															
MACHINING TIME			MADE BY			CHECKED BY									
RUN DNC_PROG.		OPERATOR													
START :	WIB														
END :	WIB														
TOTAL :	min		<u>J.Wibowo</u>			<u>J.Wibowo</u>									
PAGE NR.			OF												


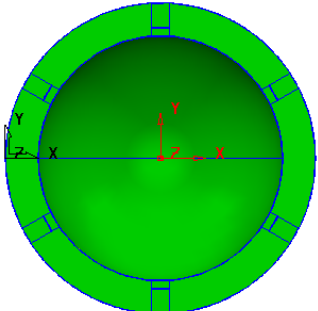
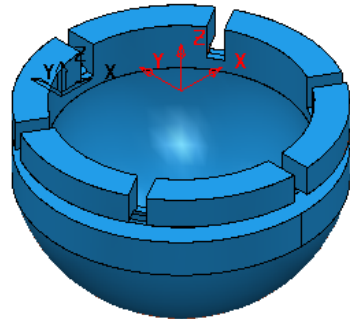
Lampiran 11. Program Report Hasil Permesinan 5 Inner

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :																																										
Machinery Division									5.i			<b>Inner_5</b>																																										
																																																						
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.																																								
Hip- Joint			Inner					1	UHMWPE			2019-03-14																																										
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30																																							
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30																																							
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38																																							
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7500	1300	0	H	4	0:37:40	00.45.10																																							
NOTE :			SKETCH																																																			
Ref. X0Y0 : CENTER BLOK																																																						
Ref. Z0 : Top																																																						
ITEM	ACT. DIMENSION	OK / NG																																																				
1																																																						
2																																																						
3																																																						
4																																																						
5																																																						
MACHINING TIME			<table border="1"> <tr> <th>TOTAL TIME :</th> <td>3.45.03</td> <td>04.18.48</td> </tr> <tr> <th>ITEM IS :</th> <td colspan="2">NO HOLDER :</td> </tr> <tr> <td colspan="3">WORKPIECE CLAMPING SYSTEM</td> </tr> <tr> <td colspan="3">- VICE</td> </tr> <tr> <td colspan="3">- EROWA HOLDER</td> </tr> <tr> <td colspan="3">- JIG / TOP / BOTTOM PLATE</td> </tr> <tr> <td colspan="3">- ASSY MOULD</td> </tr> <tr> <td colspan="3">- SIDE CLAMP</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="2">MADE BY</td> <td>CHECKED BY</td> </tr> <tr> <td colspan="2"> </td> <td> </td> </tr> <tr> <td colspan="2"><u>J.Wibowo</u></td> <td><u>J.Wibowo</u></td> </tr> <tr> <td colspan="2">PAGE NR.</td> <td>OF</td> </tr> </table>													TOTAL TIME :	3.45.03	04.18.48	ITEM IS :	NO HOLDER :		WORKPIECE CLAMPING SYSTEM			- VICE			- EROWA HOLDER			- JIG / TOP / BOTTOM PLATE			- ASSY MOULD			- SIDE CLAMP						MADE BY		CHECKED BY				<u>J.Wibowo</u>		<u>J.Wibowo</u>	PAGE NR.		OF
TOTAL TIME :	3.45.03	04.18.48																																																				
ITEM IS :	NO HOLDER :																																																					
WORKPIECE CLAMPING SYSTEM																																																						
- VICE																																																						
- EROWA HOLDER																																																						
- JIG / TOP / BOTTOM PLATE																																																						
- ASSY MOULD																																																						
- SIDE CLAMP																																																						
MADE BY		CHECKED BY																																																				
<u>J.Wibowo</u>		<u>J.Wibowo</u>																																																				
PAGE NR.		OF																																																				
RUN DNC_PROG.	OPERATOR																																																					
START :	WIB																																																					
END :	WIB																																																					
TOTAL :	min																																																					

Lampiran 12. Program Report Hasil Permesinan 5 Outer


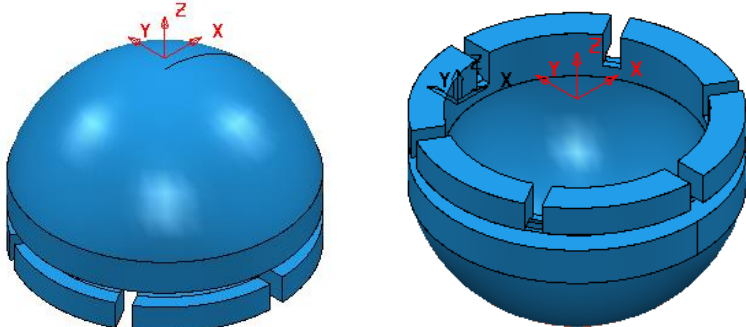
Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :													
Machinery Division									5.0			Outer_5													
												E:/Titipan/cici/out/1B													
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.											
Hip- Joint			Outer					1	UHMWPE			2019-03-14													
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:02:42	00.04.42										
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57										
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02										
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7500	1300	0	H	4	0:29:39	00.48.26										
NOTE :			SKETCH						TOTAL TIME :			2.32.45	3.12.07												
Ref. X0Y0 : CENTER BLOK									ITEM IS :			NO HOLDER :													
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM																
<table border="1"> <thead> <tr> <th>ITEM</th> <th>ACT. DIMENSION</th> <th>OK / NG</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td></tr> </tbody> </table>			ITEM	ACT. DIMENSION	OK / NG	1			2			3			4			5			- VICE				
ITEM	ACT. DIMENSION	OK / NG																							
1																									
2																									
3																									
4																									
5																									
			- EROWA HOLDER																						
			- JIG / TOP / BOTTOM PLATE																						
			- ASSY MOULD																						
			- SIDE CLAMP																						
MACHINING TIME			MADE BY			CHECKED BY																			
RUN DNC_PROG.			OPERATOR																						
START : WIB																									
END : WIB																									
TOTAL : min						<u>J.Wibowo</u> <u>J.Wibowo</u>																			
			PAGE NR.			OF																			

Lampiran 13. Program Report Hasil Permesinan 6 Inner


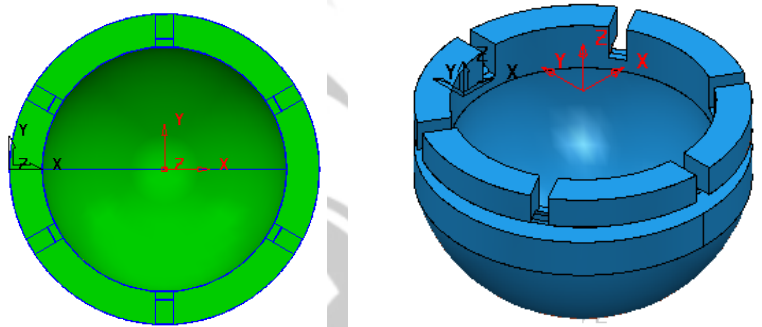
Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									6.i			<b>Inner_6</b>			
															
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Inner					1	UHMWPE			2019-03-14			
NO	PROGRAM NAME	TOOL NAME	Ø	TOOL TYPE	OH	HOLDER	Proses	STRATEGY	n	Vf	THICK.	TOOL OFFSET	TOOL NUMBER	EST. CUT TIME	ACTUAL CUT TIME
1	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7500	1350	0	H	4	0:30:53	00.40.16
NOTE :			SKETCH						TOTAL TIME :			3.38.16	04.13.54		
Ref. X0Y0 : CENTER BLOK			 						ITEM IS :			NO HOLDER :			
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM						
ITEM	ACT. DIMENSION	OK / NG	- VICE												
1			- EROWA HOLDER												
2			- JIG / TOP / BOTTOM PLATE												
3			- ASSY MOULD												
4			- SIDE CLAMP												
5															
MACHINING TIME			MADE BY			CHECKED BY									
RUN DNC_PROG.			OPERATOR												
START : WIB															
END : WIB															
TOTAL : min															
			<u>J.Wibowo</u>			<u>J.Wibowo</u>									
			PAGE NR.			OF									




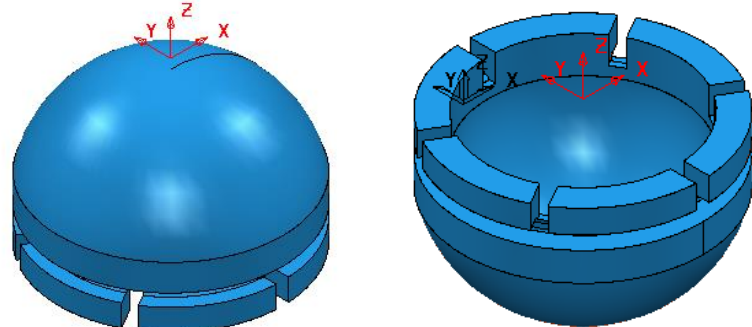
Lampiran 14. Program Report Hasil Permesinan 6 Outer

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :																				
Machinery Division									6.o			Outer_6																				
												E:/Titipan/cici/out/1B																				
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.																		
Hip- Joint			Outer					1	UHMWPE			2019-03-14																				
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:02:42	00.04.42																	
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57																	
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02																	
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	7500	1350	0	H	4	0:17:42	00.23.26																	
NOTE :			SKETCH						TOTAL TIME :			2.20.48	2.47.07																			
Ref. X0Y0 : CENTER BLOK									ITEM IS :			NO HOLDER :																				
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM																							
<table border="1"> <thead> <tr> <th>ITEM</th> <th>ACT. DIMENSION</th> <th>OK / NG</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td></tr> </tbody> </table>			ITEM	ACT. DIMENSION	OK / NG	1			2			3			4			5									- VICE					
ITEM	ACT. DIMENSION	OK / NG																														
1																																
2																																
3																																
4																																
5																																
									- EROWA HOLDER																							
									- JIG / TOP / BOTTOM PLATE																							
									- ASSY MOULD																							
									- SIDE CLAMP																							
MACHINING TIME									MADE BY			CHECKED BY																				
RUN DNC_PROG.					OPERATOR																											
START :			WIB																													
END :			WIB																													
TOTAL :			min																													
									J.Wibowo			J.Wibowo																				
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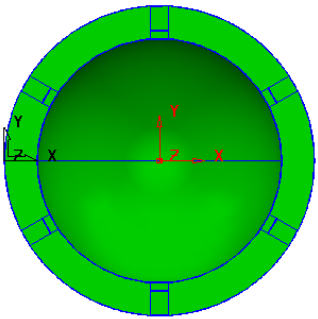
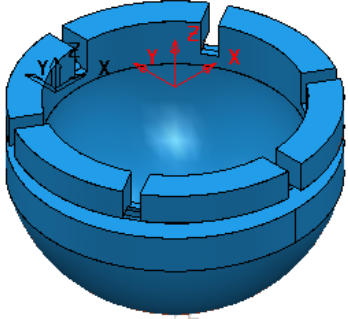
Lampiran 15. Program Report Hasil Permesinan 7 Inner

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									7.i			<b>Inner_7</b>			
									PowerMILL 						
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Inner					1	UHMWPE			2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	8000	1350	0	H	4	0:40:52	00.55.43
NOTE :			SKETCH						TOTAL TIME :		3.48.15	04.29.21			
Ref. X0Y0 : CENTER BLOK									ITEM IS :		NO HOLDER :				
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM						
ITEM	ACT. DIMENSION	OK / NG	- VICE												
1			- EROWA HOLDER												
2			- JIG / TOP / BOTTOM PLATE												
3			- ASSY MOULD												
4			- SIDE CLAMP												
5															
MACHINING TIME			MADE BY		CHECKED BY										
RUN DNC_PROG.	OPERATOR														
START :	WIB														
END :	WIB														
TOTAL :	min		<u>J.Wibowo</u>		<u>J.Wibowo</u>										
			PAGE NR.		OF										


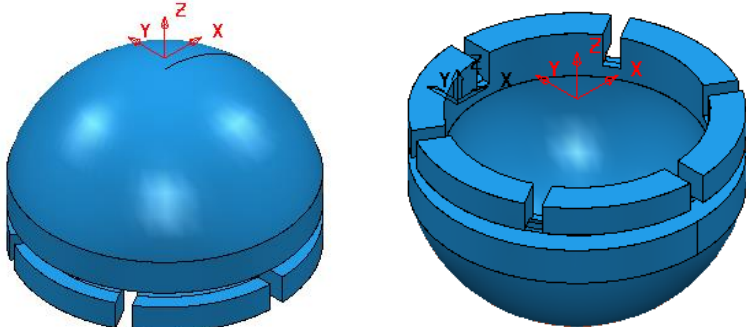
Lampiran 16. Program Report Hasil Permesinan 7 Outer

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									7.o			Outer_7			
									PowerMILL 			E:/Titipan/cici/out/1B			
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Outer					1	UHMWPE			2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:02:42	00.04.42
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	8000	1350	0	H	4	0:25:24	00.55.13
NOTE :			SKETCH						TOTAL TIME :			2.28.30	3.18.54		
Ref. X0Y0 : CENTER BLOK									ITEM IS :			NO HOLDER :			
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM			- VICE			
						- EROWA HOLDER									
						- JIG / TOP / BOTTOM PLATE									
						- ASSY MOULD									
						- SIDE CLAMP									
ITEM			ACT. DIMENSION			OK / NG			MADE BY			CHECKED BY			
1															
2															
3															
4															
5															
MACHINING TIME															
RUN DNC_PROG.			OPERATOR												
START :			WIB												
END :			WIB												
TOTAL :			min												
									PAGE NR.			OF			


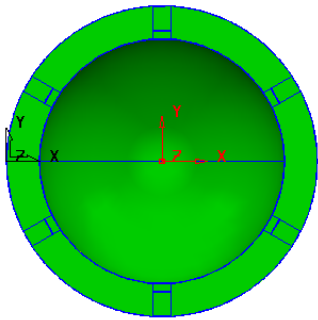
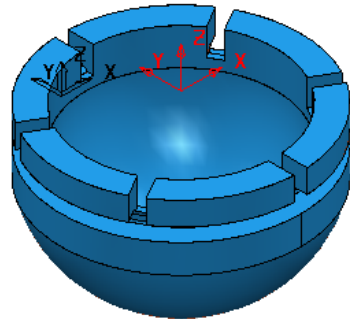
Lampiran 17. Program Report Hasil Permesinan 8 Inner

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									8.i			Inner_8			
												E:/Titipan/cici/out/1B			
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Inner					1	UHMWPE			2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	8000	1400	0	H	4	0:34:45	00.46.43
NOTE :			SKETCH						TOTAL TIME :			3.42.08	04.20.21		
Ref. X0Y0 : CENTER BLOK			 						ITEM IS :			NO HOLDER :			
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM						
									- VICE						
									- EROWA HOLDER						
									- JIG / TOP / BOTTOM PLATE						
									- ASSY MOULD						
									- SIDE CLAMP						
									MADE BY			CHECKED BY			
									<u>J.Wibowo</u>			<u>J.Wibowo</u>			
									PAGE NR.			OF			

Lampiran 18. Program Report Hasil Permesinan 8 Outer

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									8.o			Outer_8			
												E:/Titipan/cici/out/1B			
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Outer					1	UHMWPE			2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:02:42	00.04.42
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:06:57	00.07.57
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	1:53:27	02.11.02
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	8000	1400	0	H	4	0:27:48	00.40.17
NOTE :			SKETCH						TOTAL TIME :			2.30.54	3.03.58		
Ref. X0Y0 : CENTER BLOK									ITEM IS :			NO HOLDER :			
Ref. Z0 : Top									WORKPIECE CLAMPING SYSTEM			- VICE			
						- EROWA HOLDER									
						- JIG / TOP / BOTTOM PLATE									
						- ASSY MOULD									
						- SIDE CLAMP									
MACHINING TIME			MADE BY			CHECKED BY									
RUN DNC_PROG.			OPERATOR												
START : WIB															
END : WIB															
TOTAL : min															
									PAGE NR.			OF			

Lampiran 19. Program Report Hasil Permesinan 9 Inner

Machining CNC			<b><u>PROGRAM REPORT</u></b>						PROGRAM NAME :			PROJECT CODE :			
Machinery Division									9.i			<b>Inner_9</b>			
															
PRODUK NAME			PART NAME		CUSTOMER		PROGRAM	QUANTITY	MATERIAL			DATE		REVISION NR.	
Hip- Joint			Inner					1	UHMWPE			2019-03-14			
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	ROUGHING 1	EndMill 6	6	EndMill	35	TSFV 06 00 110 16	Roughing 1	Model Area Clearance	4200	1200	0,7	H	1	0:04:11	00.05.30
2	ROUGHING 2	Boll 6	4	Ball Nosed	40	D6 SC E3414 5801 0690	Roughing 2	Model Area Clearance	5300	2000	0,2	H	2	0:10:34	00.15.30
3	FINISH1	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 1	3D Offset Finishing	6000	1300	0	H	3	2:52:38	03.12.38
4	FINISH2	Boll 4	2	Ball Nosed	25	Haimer d4 BT 40	Finish 2	Steep and Shallow	8000	1300	0	H	4	0:32:27	00.56.22
NOTE :			SKETCH												
Ref. X0Y0 : CENTER BLOK			 												
Ref. Z0 : Top															
ITEM	ACT. DIMENSION	OK / NG													
1															
2															
3															
4															
5															
MACHINING TIME															
RUN DNC_PROG.		OPERATOR													
START :	WIB														
END :	WIB														
TOTAL :	min														
			TOTAL TIME :		3.39.50		04.30.00								
			ITEM IS :		NO HOLDER :										
			WORKPIECE CLAMPING SYSTEM												
			- VICE - EROWA HOLDER - JIG / TOP / BOTTOM PLATE - ASSY MOULD - SIDE CLAMP												
			MADE BY		CHECKED BY										
			<u>J.Wibowo</u>		<u>J.Wibowo</u>										
			PAGE NR.		OF										

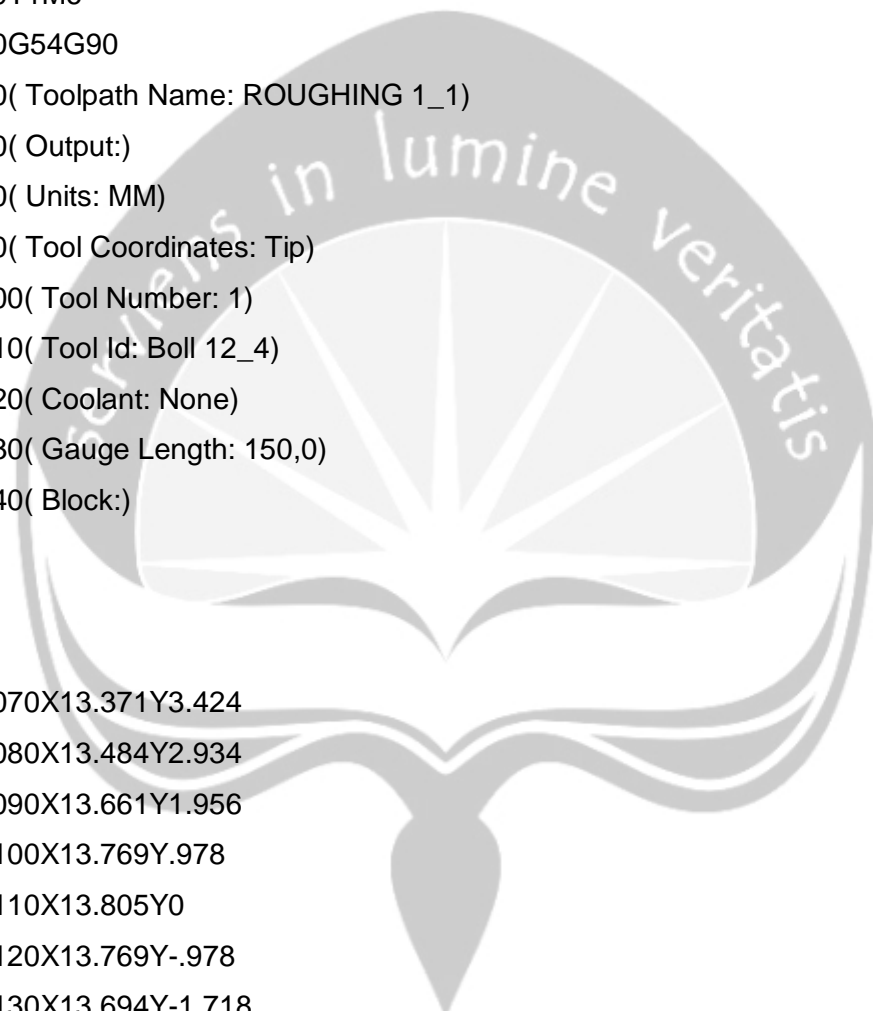


**Lampiran 21 . NC –Code outer pada percobaan 1**

Roughing 1

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T1M6  
N50G54G90  
N60( Toolpath Name: ROUGHING 1\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 1)  
N110( Tool Id: Boll 12\_4)  
N120( Coolant: None)  
N130( Gauge Length: 150,0)  
N140( Block:)  
. . .  
N8070X13.371Y3.424  
N8080X13.484Y2.934  
N8090X13.661Y1.956  
N8100X13.769Y.978  
N8110X13.805Y0  
N8120X13.769Y-.978  
N8130X13.694Y-1.718  
N8140X13.58Y-2.445  
N8150X13.371Y-3.424  
N8160X13.08Y-4.402  
N8170X12.707Y-5.38  
N8180X12.246Y-6.358

.  
.





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N5810X14.183Y-10.736

N5820X13.78Y-11.249

N5830X13.367Y-11.738

N5840X12.921Y-12.227

N5850X12.227Y-12.919

N5860X11.355Y-13.694

N5870X10.736Y-14.183

N5880X10.271Y-14.526

N5890X9.457Y-15.059

N5900G0Z8.5

N5910G91G28Z0

N5920G49H0

N5930G28X0Y0

N5940M30

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T2M6

N50G54G90

N60( Toolpath Name: ROUGHING 2\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 2)

N110( Tool Id: Boll 6)

N120( Coolant: None)

N130( Gauge Length: 130,0)

N140( Block:)

.

.

.

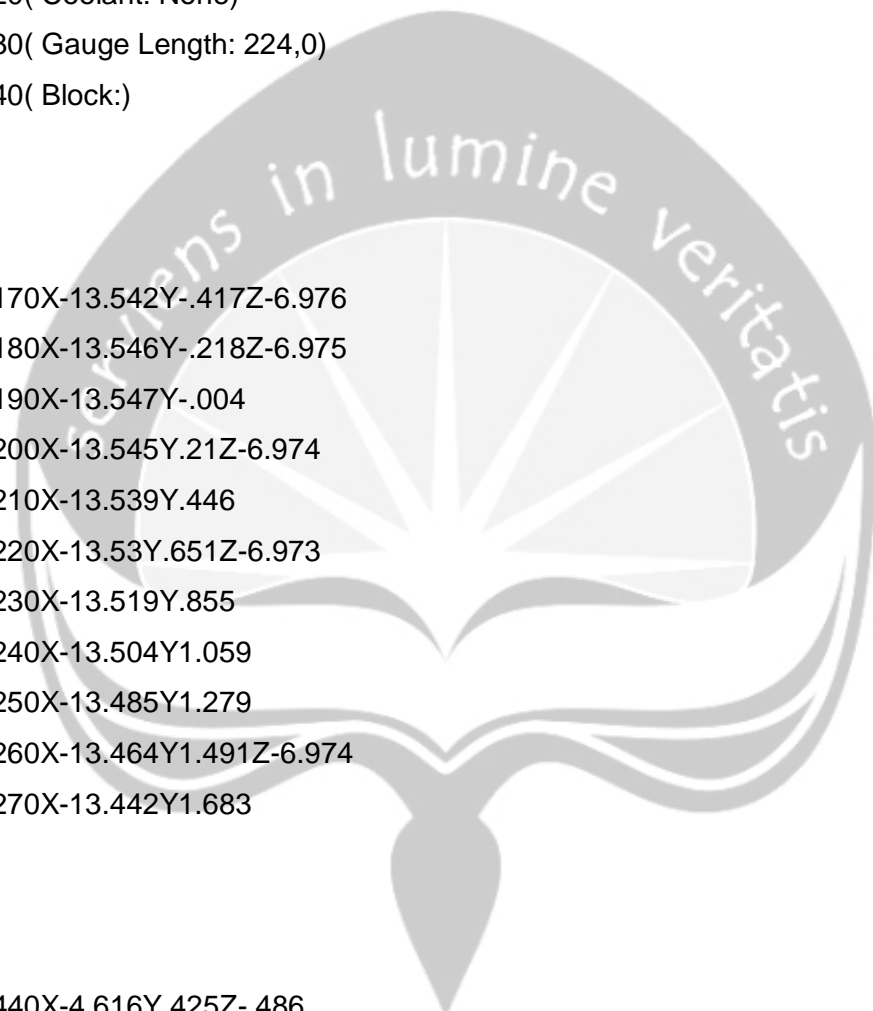
Roughing 2

N2460X13.842Y-5.694  
N2470X13.615Y-6.215  
N2480X13.345Y-6.78  
N2490X13.042Y-7.345  
N2500X12.707Y-7.91  
N2510X12.336Y-8.475  
N2520X11.864Y-9.124  
N2530X11.477Y-9.605  
N2540X10.981Y-10.17  
N2550X10.452Y-10.712  
N2560X9.887Y-11.235  
N2570X9.322Y-11.712  
N2580X8.745Y-12.147  
.  
.  
.  
N4110X-8.757Y-15.702  
N4120X-9.322Y-15.374  
N4130X-9.887Y-15.018  
N4140X-10.17Y-14.827  
N4150X-10.734Y-14.424  
N4160X-11.299Y-13.986  
N4170X-11.621Y-13.715  
N4180G0Z8.5  
N4190G91G28Z0  
N4200G49H0  
N4210G28X0Y0  
N4220M30

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T3M6

Finishing 1

N50G54G90  
N60( Toolpath Name: FINISH1\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 3)  
N110( Tool Id: Boll 4)  
N120( Coolant: None)  
N130( Gauge Length: 224,0)  
N140( Block:)  
. . .  
N4170X-13.542Y-.417Z-6.976  
N4180X-13.546Y-.218Z-6.975  
N4190X-13.547Y-.004  
N4200X-13.545Y.21Z-6.974  
N4210X-13.539Y.446  
N4220X-13.53Y.651Z-6.973  
N4230X-13.519Y.855  
N4240X-13.504Y1.059  
N4250X-13.485Y1.279  
N4260X-13.464Y1.491Z-6.974  
N4270X-13.442Y1.683  
. . .  
N1440X-4.616Y.425Z-.486  
N1450X-4.764Y.439Z-.407  
N1460X-4.91Y.453Z-.326  
N1470X-5.043Y.465Z-.248  
N1480X-5.174Y.478Z-.169  
N1490X-5.246Y.485Z-.124  
N1500G0Z8.5  
N1510G91G28Z0



N1520G49H0  
N1530G28X0Y0  
N1540M30

Finishing 2

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T3M6

N50G54G90

N60( Toolpath Name: FINISH 2\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 3)

N110( Tool Id: Boll 4)

N120( Coolant: None)

N130( Gauge Length: 224,0)

N140( Block:)

.

.

.

N6490X7.197Y-1.123

N6500X7.225Y-.931

N6510X7.247Y-.738

N6520X7.265Y-.544Z-2.913

N6530X7.283Y-.27Z-2.914

N6540X7.289Y-.095

N6550X7.29Y.048

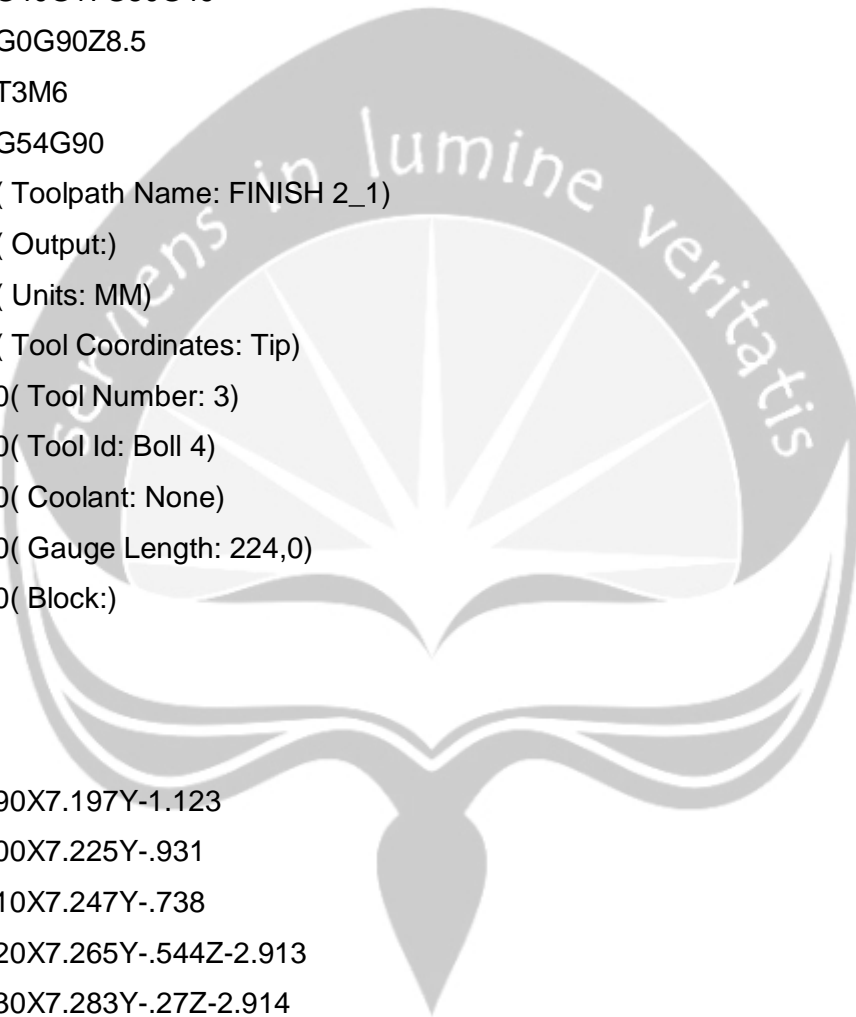
N6560X7.286Y.192

N6570X7.279Y.335Z-2.913

N6580X7.27Y.478

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.  
N5440X18.045Y-4.157Z-12.695  
N5450X18.048Y-4.398Z-12.581  
N5460X18.051Y-4.637Z-12.46  
N5470X18.053Y-4.868Z-12.334  
N5480X18.056Y-5.099Z-12.199  
N5490X18.057Y-5.207Z-12.132  
N5500G0Z8.5  
N5510G91G28Z0  
N5520G49H0  
N5530G28X0Y0  
N5540M30

**Lampiran 22 . NC –Code outer pada percobaan 2**

Roughing 1

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T1M6  
N50G54G90  
N60( Toolpath Name: ROUGHING 1\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 1)  
N110( Tool Id: Boll 12\_4)  
N120( Coolant: None)  
N130( Gauge Length: 150,0)  
N140( Block:)  
.  
.  
.  
N8340G1X-3.003Y17.746

N8350G3X2.939Y-17.756I3.003J-17.746

N8360X13.504Y-11.898I-2.939J17.756

N8370X12.7Y-10.692I-.563J.496

N8380G1X7.901Y-12.321

N8390X7.824Y-12.352

N8400X7.75Y-12.391

N8410X7.219Y-12.716

N8420X6.358Y-13.167

N8430X5.38Y-13.595

N8440X4.402Y-13.944

.

.

.

N5850X12.227Y-12.919

N5860X11.355Y-13.694

N5870X10.736Y-14.183

N5880X10.271Y-14.526

N5890X9.457Y-15.059

N5900G0Z8.5

N5910G91G28Z0

N5920G49H0

N5930G28X0Y0

N5940M30

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T2M6

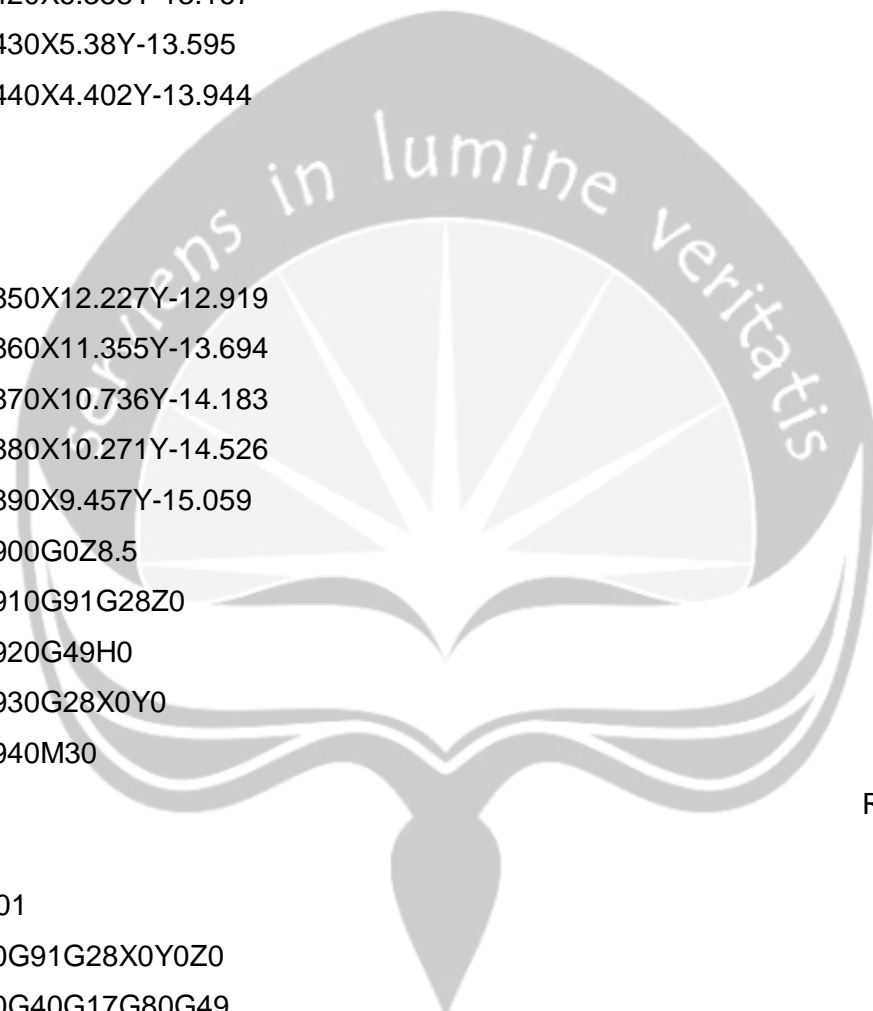
N50G54G90

N60( Toolpath Name: ROUGHING 2\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)



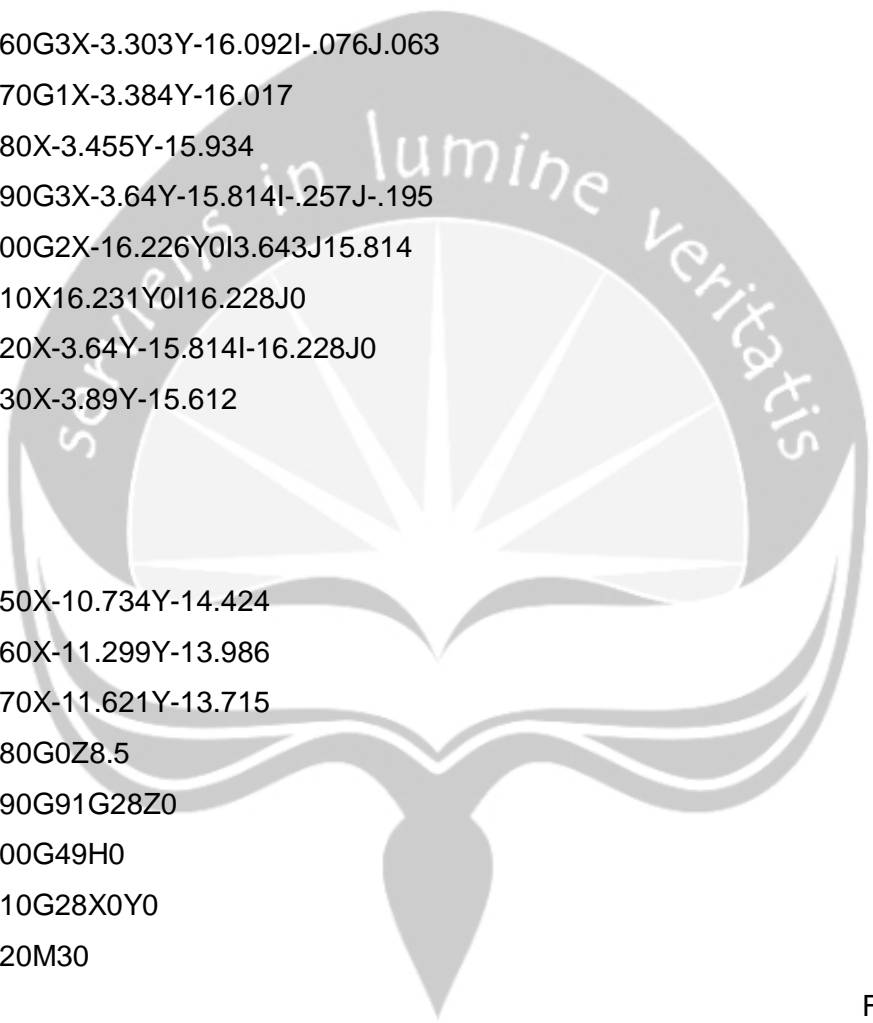
Roughing 2

N100( Tool Number: 2)  
N110( Tool Id: Boll 6)  
N120( Coolant: None)  
N130( Gauge Length: 130,0)  
N140( Block:)

.  
. .  
N2060G3X-3.303Y-16.092I-.076J.063  
N2070G1X-3.384Y-16.017  
N2080X-3.455Y-15.934  
N2090G3X-3.64Y-15.814I-.257J-.195  
N2100G2X-16.226Y0I3.643J15.814  
N2110X16.231Y0I16.228J0  
N2120X-3.64Y-15.814I-16.228J0  
N2130X-3.89Y-15.612

.  
. .  
N4150X-10.734Y-14.424  
N4160X-11.299Y-13.986  
N4170X-11.621Y-13.715  
N4180G0Z8.5  
N4190G91G28Z0  
N4200G49H0  
N4210G28X0Y0  
N4220M30

.  
:  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T3M6  
N50G54G90



Finishing 1

N60( Toolpath Name: FINISH1\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 3)

N110( Tool Id: Boll 4)

N120( Coolant: None)

N130( Gauge Length: 224,0)

N140( Block:)

.

.

.

N3550X12.281Y-1.76

N3560X12.265Y-1.87

N3570X12.235Y-2.056

N3580X12.204Y-2.234

N3590X12.17Y-2.411

N3600X12.134Y-2.588Z-5.957

N3610X12.095Y-2.768

N3620X12.053Y-2.947

N3630X12.008Y-3.126

N3640X11.957Y-3.318Z-5.958

N3650X11.902Y-3.509

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.

N1410X-4.177Y.383Z-.7

N1420X-4.309Y.395Z-.639

N1430X-4.463Y.41Z-.564

N1440X-4.616Y.425Z-.486

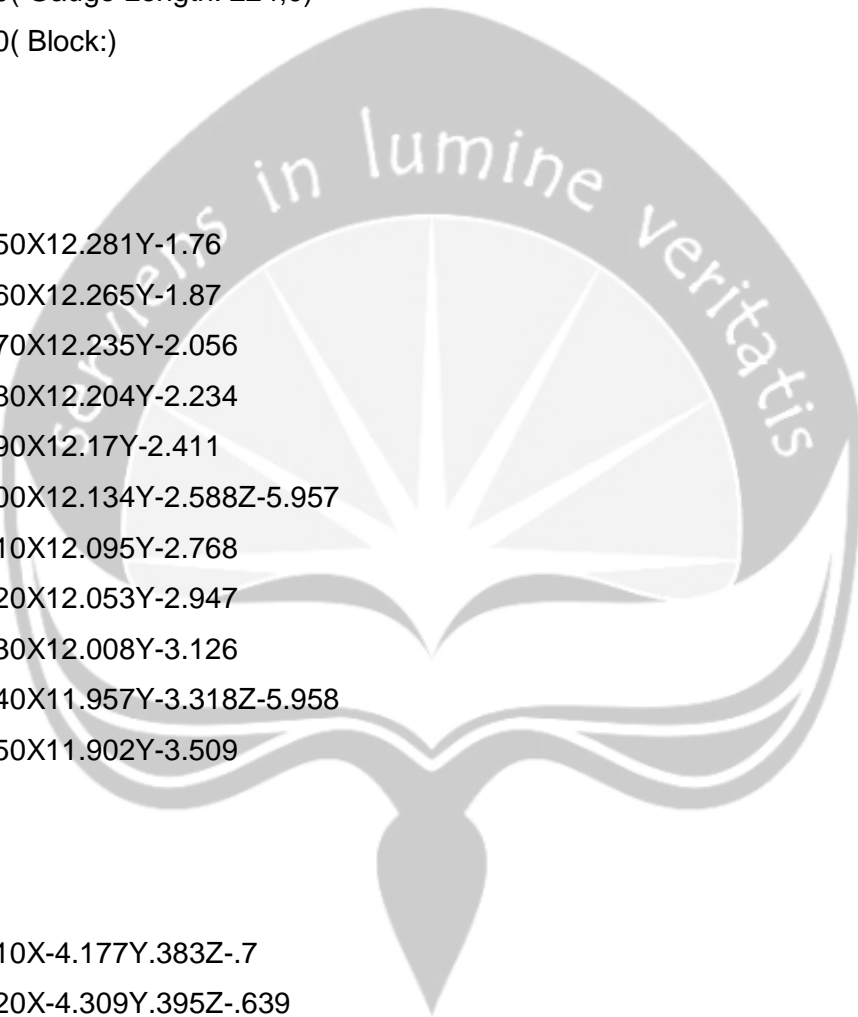
N1450X-4.764Y.439Z-.407

N1460X-4.91Y.453Z-.326

N1470X-5.043Y.465Z-.248

N1480X-5.174Y.478Z-.169

N1490X-5.246Y.485Z-.124





N1500G0Z8.5  
N1510G91G28Z0  
N1520G49H0  
N1530G28X0Y0  
N1540M30

Finishing 2

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T3M6

N50G54G90

N60( Toolpath Name: FINISH2)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 3)

N110( Tool Id: Boll 4)

N120( Coolant: None)

N130( Gauge Length: 224,0)

N140( Block:)

.

.

.

N8410X-1.689Y-1.854

N8420X-1.78Y-1.766

N8430X-1.861Y-1.678

N8440X-1.939Y-1.587

N8450X-1.992Y-1.519

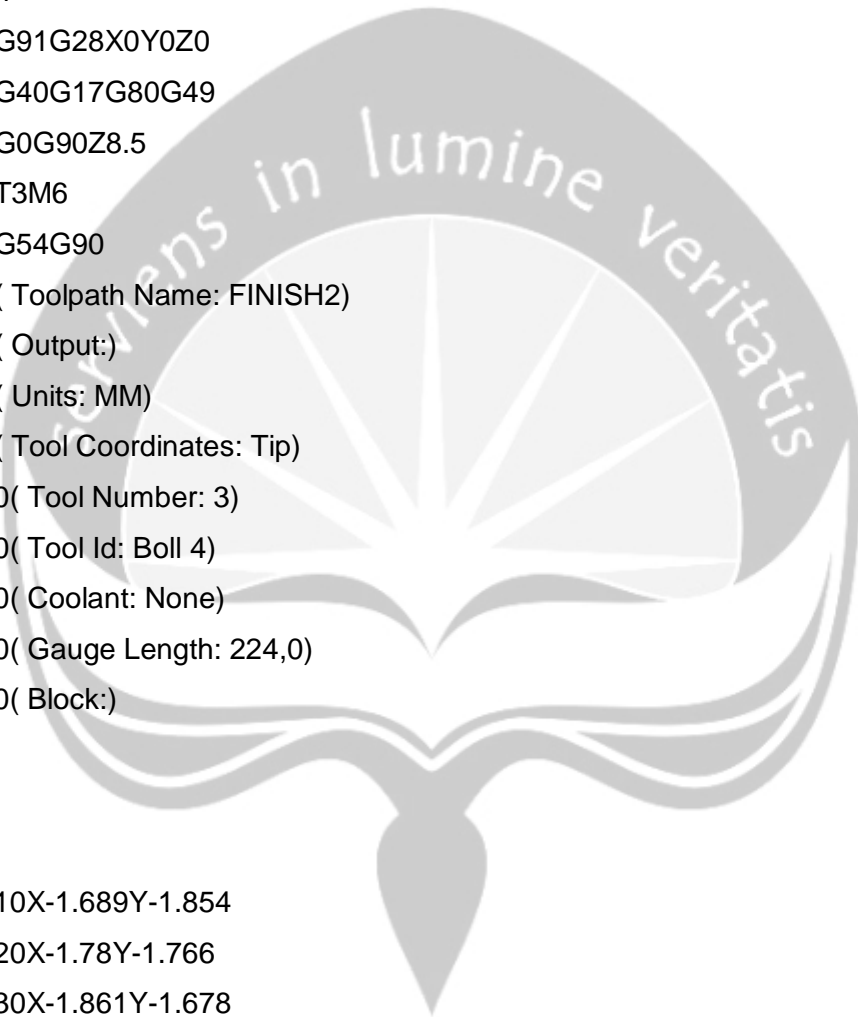
N8460X-2.038Y-1.457

N8470X-2.082Y-1.394

N8480X-2.124Y-1.329

N8490X-2.16Y-1.274

N8500X-2.174Y-1.25



.  
. .  
N5510X1.423Y-4.503Z-.453  
N5520X1.492Y-4.723Z-.326  
N5530X1.561Y-4.943Z-.191  
N5540X1.588Y-5.03Z-.135  
N5550G0Z8.5  
N5560G91G28Z0  
N5570G49H0  
N5580G28X0Y0  
N5590M30

**Lampiran 23 . NC –Code outer pada percobaan 3**

Roughing 1

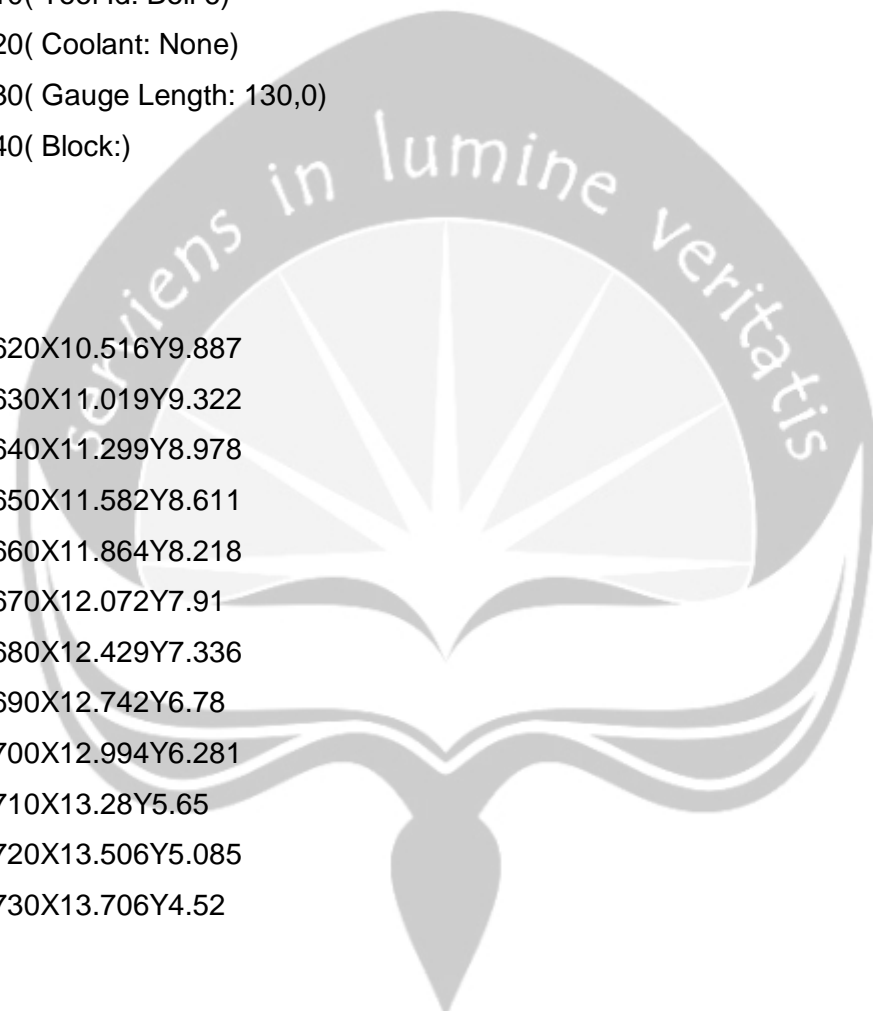
%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T1M6  
N50G54G90  
N60( Toolpath Name: ROUGHING 1\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 1)  
N110( Tool Id: Boll 12\_4)  
N120( Coolant: None)  
N130( Gauge Length: 150,0)  
N140( Block:)  
. . .  
N2610X-9.782Y13.508

N2620X-8.803Y14.164  
N2630X-7.825Y14.729  
N2640X-7.336Y14.976  
N2650X-6.358Y15.42  
N2660X-5.38Y15.784  
N2670X-4.402Y16.086  
N2680X-3.424Y16.324  
N2690X-2.934Y16.417  
N2700X-1.956Y16.564  
N2710X-.978Y16.648  
N2720X0Y16.675  
N2730X.978Y16.648  
N2740X1.956Y16.564  
N2750X2.445Y16.495  
. . .  
N5830X13.367Y-11.738  
N5840X12.921Y-12.227  
N5850X12.227Y-12.919  
N5860X11.355Y-13.694  
N5870X10.736Y-14.183  
N5880X10.271Y-14.526  
N5890X9.457Y-15.059  
N5900G0Z8.5  
N5910G91G28Z0  
N5920G49H0  
N5930G28X0Y0  
N5940M30

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5

Roughing 2

N40T2M6  
N50G54G90  
N60( Toolpath Name: ROUGHING 2\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 2)  
N110( Tool Id: Boll 6)  
N120( Coolant: None)  
N130( Gauge Length: 130,0)  
N140( Block:)  
. . .  
N1620X10.516Y9.887  
N1630X11.019Y9.322  
N1640X11.299Y8.978  
N1650X11.582Y8.611  
N1660X11.864Y8.218  
N1670X12.072Y7.91  
N1680X12.429Y7.336  
N1690X12.742Y6.78  
N1700X12.994Y6.281  
N1710X13.28Y5.65  
N1720X13.506Y5.085  
N1730X13.706Y4.52  
. . .  
N4090X-7.91Y-16.147  
N4100X-8.475Y-15.858  
N4110X-8.757Y-15.702  
N4120X-9.322Y-15.374  
N4130X-9.887Y-15.018  
N4140X-10.17Y-14.827



N4150X-10.734Y-14.424  
N4160X-11.299Y-13.986  
N4170X-11.621Y-13.715  
N4180G0Z8.5  
N4190G91G28Z0  
N4200G49H0  
N4210G28X0Y0  
N4220M30

Finishing 1

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T3M6  
N50G54G90  
N60( Toolpath Name: FINISH1\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 3)  
N110( Tool Id: Boll 4)  
N120( Coolant: None)  
N130( Gauge Length: 224,0)  
N140( Block:)

.  
. .  
.  
N850X-.621Y12.075  
N860X-.486Y12.081  
N870X-.351Y12.086  
N880X-.157Y12.09  
N890X.03Y12.091  
N900X.182Y12.09  
N910X.333Y12.086

N920X.465Y12.082

N930X.598Y12.076

N940X.785Y12.066

N950X.916Y12.056

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N1450X-4.764Y.439Z-.407

N1460X-4.91Y.453Z-.326

N1470X-5.043Y.465Z-.248

N1480X-5.174Y.478Z-.169

N1490X-5.246Y.485Z-.124

N1500G0Z8.5

N1510G91G28Z0

N1520G49H0

N1530G28X0Y0

N1540M30

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T3M6

N50G54G90

N60( Toolpath Name: FINISH2\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 3)

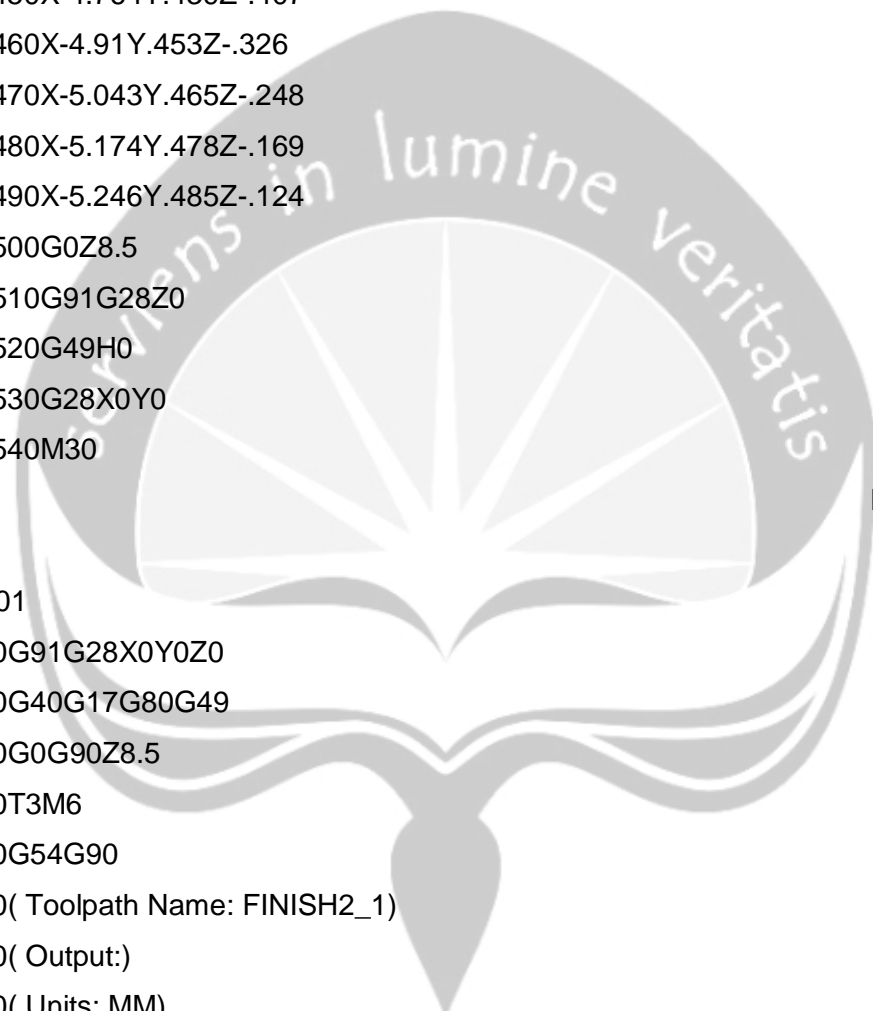
N110( Tool Id: Boll 4)

N120( Coolant: None)

N130( Gauge Length: 224,0)

N140( Block:)

.



Finishing 2

.  
.  
N5400X-3.024Y-.796Z-1.752

N5410X-3.052Y-.674

N5420X-3.075Y-.558

N5430X-3.094Y-.44

N5440X-3.109Y-.323

N5450X-3.12Y-.204

N5460X-3.124Y-.134

N5470X-3.127Y-.07

N5480X-3.126Y.02

N5490X-3.124Y.129

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.  
N3510X-4.455Y-.081Z-.613

N3520X-4.693Y-.085Z-.494

N3530X-4.924Y-.089Z-.371

N3540X-5.154Y-.093Z-.238

N3550X-5.277Y-.095Z-.164

N3560G0Z8.5

N3570G91G28Z0

N3580G49H0

N3590G28X0Y0

N3600M30

**Lampiran 24 . NC –Code outer pada percobaan 4**

Roughing 1

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:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T1M6

N50G54G90

N60( Toolpath Name: ROUGHING 1\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 1)

N110( Tool Id: Boll 12\_4)

N120( Coolant: None)

N130( Gauge Length: 150,0)

N140( Block:)

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.

N8450X3.563Y-14.183

N8460X2.934Y-14.324

N8470X1.956Y-14.488

N8480X.978Y-14.593

N8490X0Y-14.618

N8500X-.978Y-14.593

N8510X-1.956Y-14.488

N8520X-2.934Y-14.324

N8530X-3.561Y-14.183

N8540X-4.402Y-13.944

N8550X-5.135Y-13.694

N8560X-6.279Y-13.205

N8570X-7.223Y-12.716

N8580X-8.017Y-12.227

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.

N5810X14.183Y-10.736

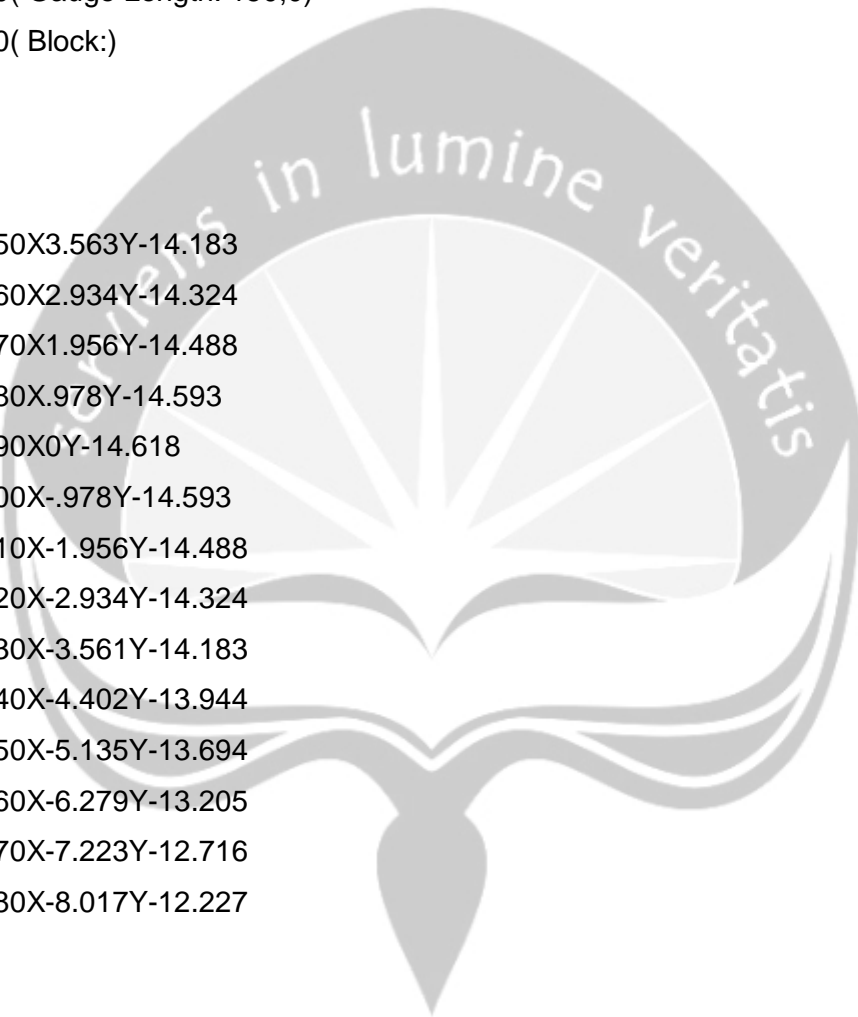
N5820X13.78Y-11.249

N5830X13.367Y-11.738

N5840X12.921Y-12.227

N5850X12.227Y-12.919

N5860X11.355Y-13.694





N5870X10.736Y-14.183  
N5880X10.271Y-14.526  
N5890X9.457Y-15.059  
N5900G0Z8.5  
N5910G91G28Z0  
N5920G49H0  
N5930G28X0Y0  
N5940M30

Roughing 2

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T2M6  
N50G54G90  
N60( Toolpath Name: ROUGHING 2\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 2)  
N110( Tool Id: Boll 6)  
N120( Coolant: None)  
N130( Gauge Length: 130,0)  
N140( Block:)  
. . .  
N7060X13.784Y-1.412  
N7070X13.715Y-1.977  
N7080X13.62Y-2.542  
N7090X13.503Y-3.107  
N7100X13.36Y-3.672  
N7110X13.191Y-4.237  
N7120X12.994Y-4.81

N7130X12.775Y-5.367  
N7140X12.523Y-5.932  
N7150X12.239Y-6.497  
N7160X11.921Y-7.062  
N7170X11.582Y-7.605  
N7180X11.174Y-8.192

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N4130X-9.887Y-15.018  
N4140X-10.17Y-14.827  
N4150X-10.734Y-14.424  
N4160X-11.299Y-13.986  
N4170X-11.621Y-13.715  
N4180G0Z8.5  
N4190G91G28Z0  
N4200G49H0  
N4210G28X0Y0  
N4220M30

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T3M6

N50G54G90

N60( Toolpath Name: FINISH1\_1)

N70( Output:)

N80( Units: MM)

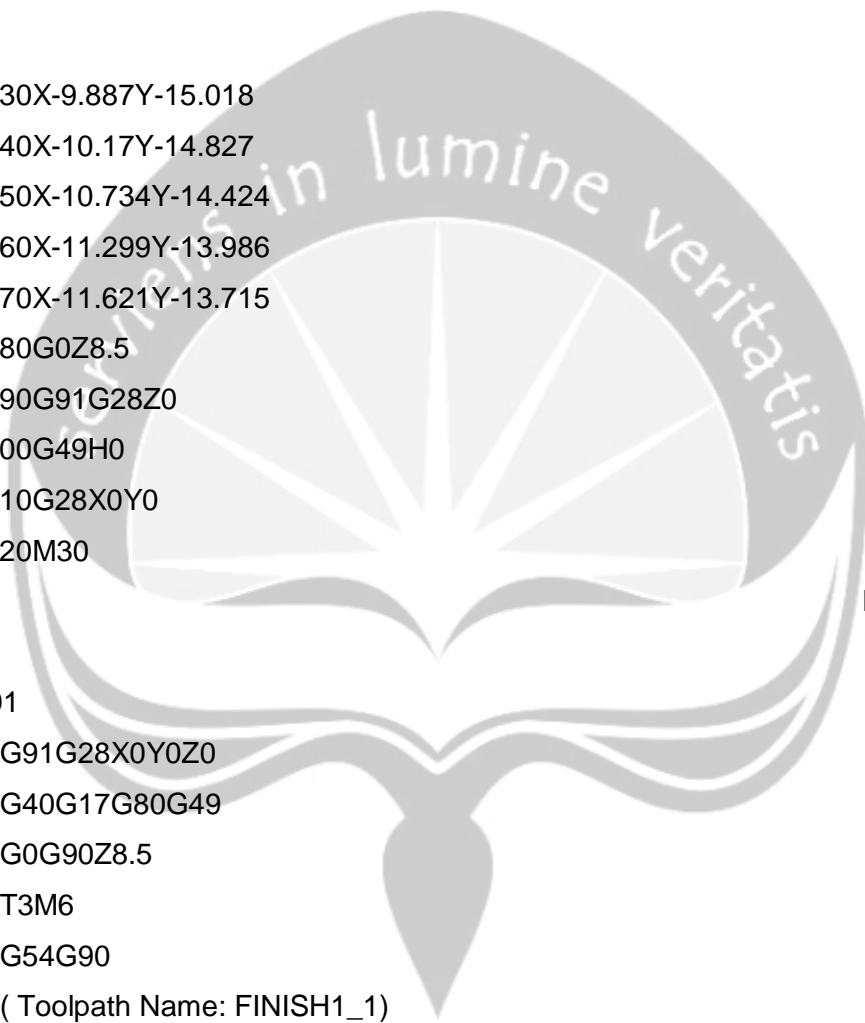
N90( Tool Coordinates: Tip)

N100( Tool Number: 3)

N110( Tool Id: Boll 4)

N120( Coolant: None)

N130( Gauge Length: 224,0)



Finishing 1

N140( Block:)

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N9400X6.158Y-6.038

N9410X6.06Y-6.137

N9420X5.938Y-6.255

N9430X5.814Y-6.371

N9440X5.722Y-6.454Z-3.512

N9450X5.629Y-6.536

N9460X5.484Y-6.658

N9470X5.355Y-6.763

N9480X5.217Y-6.87

N9490X5.148Y-6.922

N9500X5.078Y-6.974

N9510X5.007Y-7.025

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N1450X-4.764Y.439Z-.407

N1460X-4.91Y.453Z-.326

N1470X-5.043Y.465Z-.248

N1480X-5.174Y.478Z-.169

N1490X-5.246Y.485Z-.124

N1500G0Z8.5

N1510G91G28Z0

N1520G49H0

N1530G28X0Y0

N1540M30

%

:0001

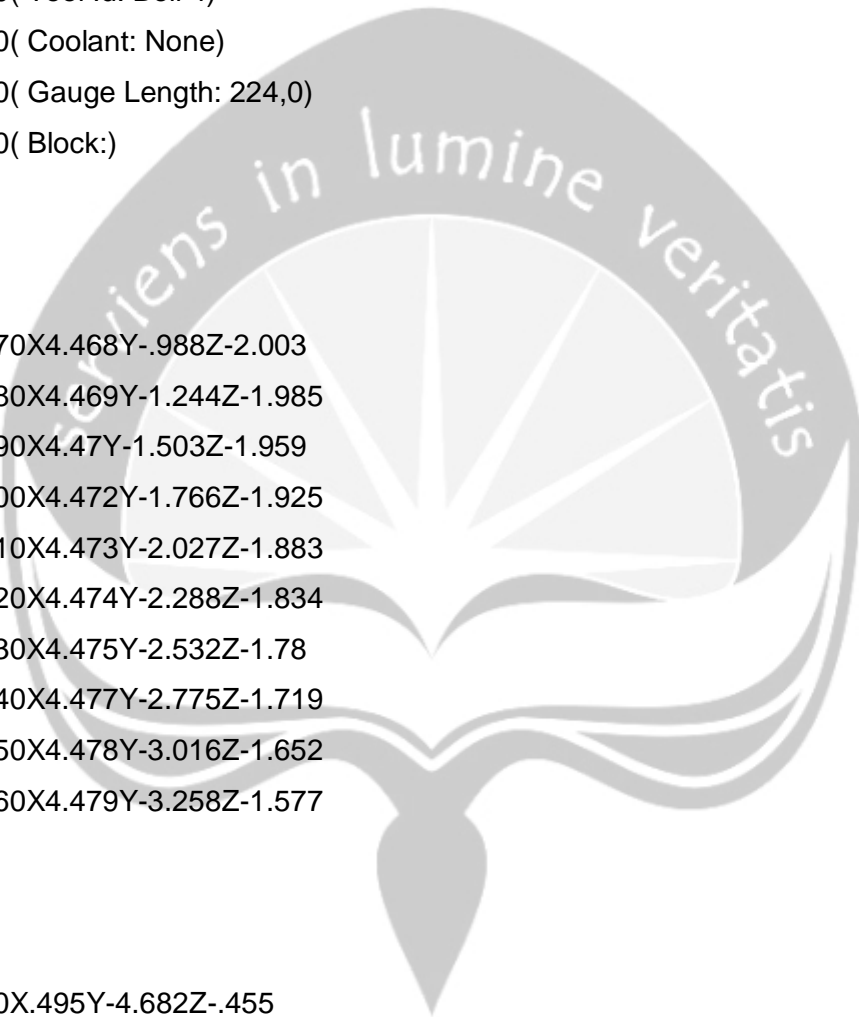
N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

Finishing 2

N40T3M6  
N50G54G90  
N60( Toolpath Name: FINISH2\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 3)  
N110( Tool Id: Boll 4)  
N120( Coolant: None)  
N130( Gauge Length: 224,0)  
N140( Block:)  
. . .  
N5670X4.468Y-.988Z-2.003  
N5680X4.469Y-1.244Z-1.985  
N5690X4.47Y-1.503Z-1.959  
N5700X4.472Y-1.766Z-1.925  
N5710X4.473Y-2.027Z-1.883  
N5720X4.474Y-2.288Z-1.834  
N5730X4.475Y-2.532Z-1.78  
N5740X4.477Y-2.775Z-1.719  
N5750X4.478Y-3.016Z-1.652  
N5760X4.479Y-3.258Z-1.577  
. . .  
N600X.495Y-4.682Z-.455  
N610X.519Y-4.912Z-.328  
N620X.543Y-5.141Z-.193  
N630X.554Y-5.241Z-.131  
N640G0Z8.5  
N650G91G28Z0  
N660G49H0  
N670G28X0Y0



N680M30

**Lampiran 25. NC –Code outer pada percobaan 5**

Roughing 1

%

:0001

N10G91G28X0Y0Z0

N20G40G17G80G49

N30G0G90Z8.5

N40T1M6

N50G54G90

N60( Toolpath Name: ROUGHING 1\_1)

N70( Output:)

N80( Units: MM)

N90( Tool Coordinates: Tip)

N100( Tool Number: 1)

N110( Tool Id: Boll 12\_4)

N120( Coolant: None)

N130( Gauge Length: 150,0)

N140( Block:)

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N220X-2.537Y15.161

N230X-1.956Y15.241

N240X-.978Y15.339

N250X0Y15.369

N260X.978Y15.339

N270X1.467Y15.296

N280X2.517Y15.161

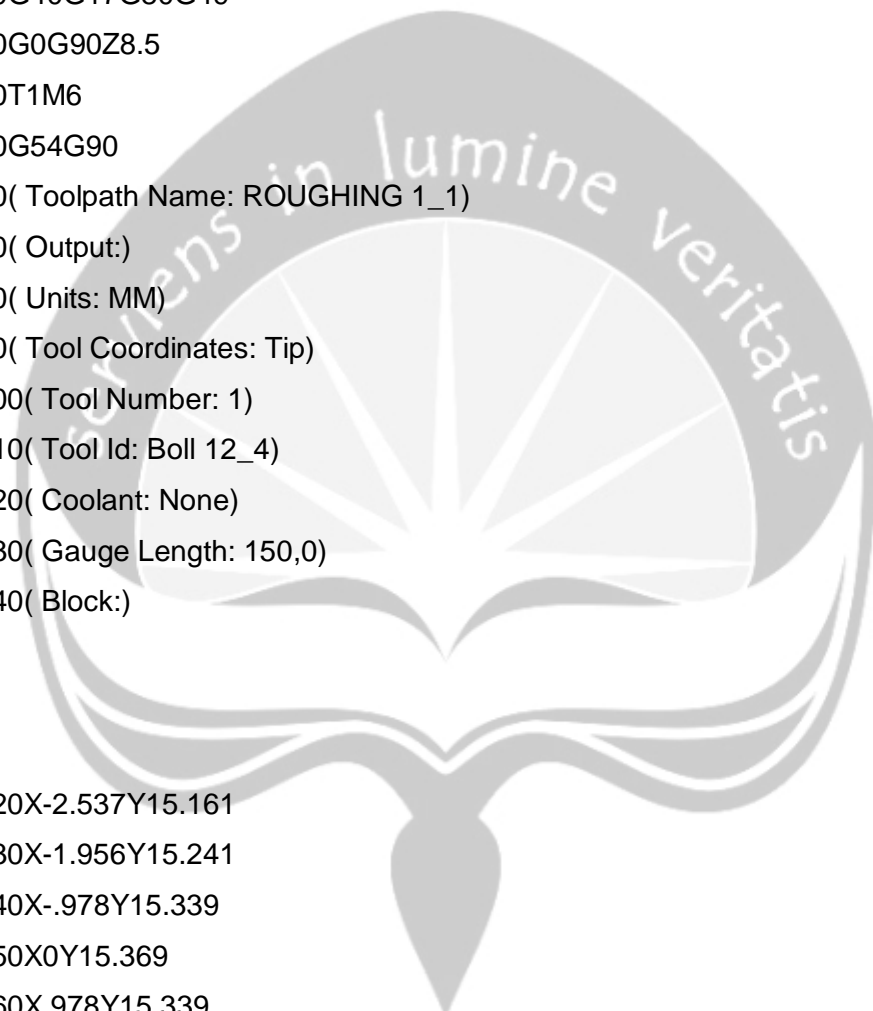
N290X3.424Y14.984

N300X4.402Y14.724

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N5860X11.355Y-13.694  
N5870X10.736Y-14.183  
N5880X10.271Y-14.526  
N5890X9.457Y-15.059  
N5900G0Z8.5  
N5910G91G28Z0  
N5920G49H0  
N5930G28X0Y0  
N5940M30

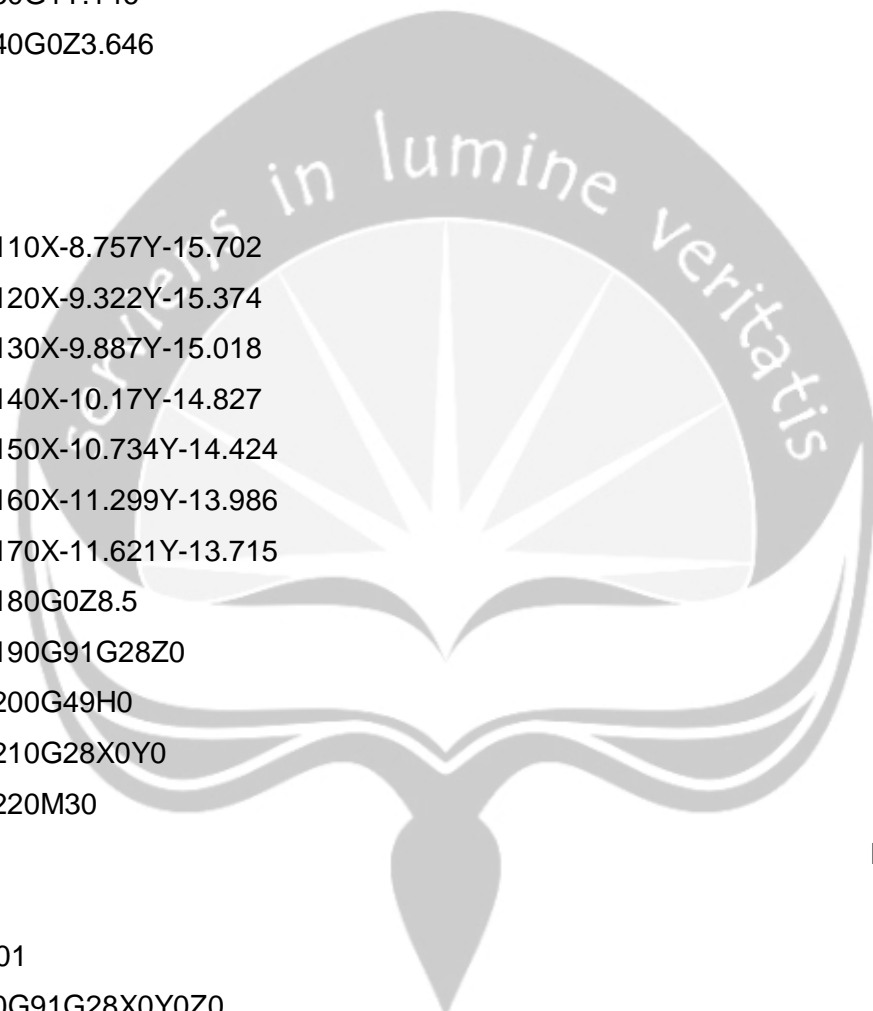
Roughing 2

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T2M6  
N50G54G90  
N60( Toolpath Name: ROUGHING 2\_1)  
N70( Output:)  
N80( Units: MM)  
N90( Tool Coordinates: Tip)  
N100( Tool Number: 2)  
N110( Tool Id: Boll 6)  
N120( Coolant: None)  
N130( Gauge Length: 130,0)  
N140( Block:)  
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.  
N810G1X-14.736Y.747F9999  
N820G0Z-1.354  
N830G1Z-6.624F3000  
N840X-14.726Y.746F2000  
N850G3X-14.62Y.837I.007J.099

N860G1X-14.597Y1.151  
N870G0Z3.646  
N880G1X-14.752Y-.238F9999  
N890G0Z-1.354  
N900G1Z-6.624F3000  
N910X-14.741F2000  
N920G3X-14.642Y-.139I0J.099  
N930G1Y.146  
N940G0Z3.646

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. .  
N4110X-8.757Y-15.702  
N4120X-9.322Y-15.374  
N4130X-9.887Y-15.018  
N4140X-10.17Y-14.827  
N4150X-10.734Y-14.424  
N4160X-11.299Y-13.986  
N4170X-11.621Y-13.715  
N4180G0Z8.5  
N4190G91G28Z0  
N4200G49H0  
N4210G28X0Y0  
N4220M30

%  
:0001  
N10G91G28X0Y0Z0  
N20G40G17G80G49  
N30G0G90Z8.5  
N40T3M6  
N50G54G90  
N60( Toolpath Name: FINISH1\_1)  
N70( Output:)  
N80( Units: MM)



Finishing 1

N90( Tool Coordinates: Tip)  
N100( Tool Number: 3)  
N110( Tool Id: Boll 4)  
N120( Coolant: None)  
N130( Gauge Length: 224,0)  
N140( Block:)

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N7460X6.597Y-1.487  
N7470X6.578Y-1.57  
N7480X6.556Y-1.659Z-2.711  
N7490X6.53Y-1.762  
N7500X6.502Y-1.865  
N7510X6.473Y-1.967  
N7520X6.446Y-2.055  
N7530X6.418Y-2.142Z-2.712  
N7540X6.389Y-2.228  
N7550X6.343Y-2.357  
N7560X6.294Y-2.486

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. .  
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N1440X-4.616Y.425Z-.486  
N1450X-4.764Y.439Z-.407  
N1460X-4.91Y.453Z-.326  
N1470X-5.043Y.465Z-.248  
N1480X-5.174Y.478Z-.169  
N1490X-5.246Y.485Z-.124  
N1500G0Z8.5  
N1510G91G28Z0  
N1520G49H0  
N1530G28X0Y0  
N1540M30

