

## LAMPIRAN TABEL

<i>Material of belt</i>	<i>Mass density in kg / m<sup>3</sup></i>
Leather	1000
Convass	1220
Rubber	1140
Balata	1110
Single woven belt	1170
Double woven belt	1250

Tabel 1. 1 Tabel density Belt

**Table 20.3. Standard pitch lengths of V-belts according to IS: 2494-1974.**

<i>Type of belt</i>	<i>Standard pitch lengths of V-belts in mm</i>
<i>A</i>	645, 696, 747, 823, 848, 925, 950, 1001, 1026, 1051, 1102 1128, 1204, 1255, 1331, 1433, 1458, 1509, 1560, 1636, 1661, 1687, 1763, 1814, 1941, 2017, 2068, 2093, 2195, 2322, 2474, 2703, 2880, 3084, 3287, 3693.
<i>B</i>	932, 1008, 1059, 1110, 1212, 1262, 1339, 1415, 1440, 1466, 1567, 1694, 1770, 1821, 1948, 2024, 2101, 2202, 2329, 2507, 2583, 2710, 2888, 3091, 3294, 3701, 4056, 4158, 4437, 4615, 4996, 5377.
<i>C</i>	1275, 1351, 1453, 1580, 1681, 1783, 1834, 1961, 2088, 2113, 2215, 2342, 2494, 2723, 2901, 3104, 3205, 3307, 3459, 3713, 4069, 4171, 4450, 4628, 5009, 5390, 6101, 6863, 7625, 8387, 9149.
<i>D</i>	3127, 3330, 3736, 4092, 4194, 4473, 4651, 5032, 5413, 6124, 6886, 7648, 8410, 9172, 9934, 10 696, 12 220, 13 744, 15 268, 16 792.
<i>E</i>	5426, 6137, 6899, 7661, 8423, 9185, 9947, 10 709, 12 233, 13 757, 15 283, 16 805.

**Note:** The V-belts are also manufactured in non-standard pitch lengths (*i.e.* in oversize and undersize). The standard pitch length belt is designated by grade number 50. The oversize belts are designated by a grade

Tabel 1. 2 Tabel type Length V-Belt

**Table 20.1. Dimensions of standard V-belts according to IS: 2494 – 1974.**

Type of belt	Power ranges in kW	Minimum pitch diameter of pulley (D) mm	Top width (b) mm	Thickness (t) mm	Weight per metre length in newton
A	0.7 – 3.5	75	13	8	1.06
B	2 – 15	125	17	11	1.89
C	7.5 – 75	200	22	14	3.43
D	20 – 150	355	32	19	5.96
E	30 – 350	500	38	23	–

**Table 20.2. Dimensions of standard V-grooved pulleys according to IS : 2494-1974.  
(All dimensions in mm)**

Type of belt	$\gamma$	d	a	c	f	e	No. of sheave grooves (n)	Groove angle (2 $\beta$ ) in degrees
A	11	12	3.3	8.7	10	15	6	32, 34, 38
B	14	15	4.2	10.8	12.5	19	9	32, 34, 38
C	19	20	5.7	14.3	17	25.5	14	34, 36, 38
D	27	28	8.1	19.9	24	37	14	34, 36, 38
E	32	33	9.6	23.4	29	44.5	20	–

Note : Face width (B) = (n – 1) e + 2f

Tabel 1. 3 Tabel dimensi type V- Belt

**Table 14.1. Mechanical properties of steels used for shafts.**

Indian standard designation	Ultimate tensile strength, MPa	Yield strength, MPa
40 C 8	560 - 670	320
45 C 8	610 - 700	350
50 C 4	640 - 760	370
50 C 12	700 Min.	390

When a shaft of high strength is required, then an alloy steel such as nickel, nickel-chromium or chrome-vanadium steel is used.

Tabel 1. 4 Tabel tegangan Material

<i>Material</i>	<i>Steady load</i>	<i>Live load</i>	<i>Shock load</i>
Cast iron	5 to 6	8 to 12	16 to 20
Wrought iron	4	7	10 to 15
Steel	4	8	12 to 16
Soft materials and alloys	6	9	15
Leather	9	12	15
Timber	7	10 to 15	20

Tabel 1. 5 Tabel nilai Keamanan

**Table 27.1. Principal dimensions for radial ball bearings.**

<i>Bearing No.</i>	<i>Bore (mm)</i>	<i>Outside diameter</i>	<i>Width (mm)</i>
200 300	10	30 35	9 11
201 301	12	32 37	10 12
202 302	15	35 42	11 13
203 303 403	17	40 47 62	12 14 17
204 304 404	20	47 52 72	14 14 19
205 305 405	25	52 62 80	15 17 21
206 306 406	30	62 72 90	16 19 23
207 307 407	35	72 80 100	17 21 25
208 308 408	40	80 90 110	18 23 27
209 309 409	45	85 100 120	19 25 29
210 310 410	50	90 110 130	20 27 31
211 311 411	55	100 120 140	21 29 33
212 312 412	60	110 130 150	22 31 35

Tabel 1. 6 Tabel spesifikasi Bearing

**Table 27.2. Values of  $X_0$  and  $Y_0$  for radial bearings.**

S.No.	Type of bearing	Single row bearing		Double row bearing	
		$X_0$	$Y_0$	$X_0$	$Y_0$
1.	Radial contact groove ball bearings	0.60	0.50	0.60	0.50
2.	Self aligning ball or roller bearings and tapered roller bearing	0.50	$0.22 \cot \theta$	1	$0.44 \cot \theta$
3.	Angular contact groove bearings :				
	$\alpha = 15^\circ$	0.50	0.46	1	0.92
	$\alpha = 20^\circ$	0.50	0.42	1	0.84
	$\alpha = 25^\circ$	0.50	0.38	1	0.76
	$\alpha = 30^\circ$	0.50	0.33	1	0.66
	$\alpha = 35^\circ$	0.50	0.29	1	0.58
	$\alpha = 40^\circ$	0.50	0.26	1	0.52
	$\alpha = 45^\circ$	0.50	0.22	1	0.44

Tabel 1. 7 Tabel nilai  $X_0$  &  $Y_0$

**Table 27.4. Values of X and Y for dynamically loaded bearings.**

Type of bearing	Specifications	$\frac{W_A}{W_R} \leq e$		$\frac{W_A}{W_R} > e$		e	
		X	Y	X	Y		
Deep groove ball bearing	$\frac{W_A}{C_0}$ = 0.025 = 0.04 = 0.07 = 0.13 = 0.25 = 0.50	1	0	0.56	2.0	0.22	
					1.8	0.24	
					1.6	0.27	
					1.4	0.31	
					1.2	0.37	
					1.0	0.44	
Angular contact ball bearings	Single row	1	0	0.35	0.57	1.14	
	Two rows in tandem		0	0.35	0.57	1.14	
	Two rows back to back		0.55	0.57	0.93	1.14	
	Double row		0.73	0.62	1.17	0.86	
Self-aligning bearings	Light series : for bores	1	1.3	6.5	2.0	0.50	
	10 – 20 mm		1.7		2.6	0.37	
	25 – 35		2.0		3.1	0.31	
	40 – 45		2.3		3.5	0.28	
	50 – 65		2.4		3.8	0.26	
	70 – 100		2.3		3.5	0.28	
	105 – 110						
	Medium series : for bores	1.0	0.65	1.6	0.63		
	12 mm	1.2	1.9	0.52			
	15 – 20	1.5	2.3	0.43			
	25 – 50	1.6	2.5	0.39			
	55 – 90						
	Spherical roller bearings	For bores :	1	2.1	0.67	3.1	0.32
		25 – 35 mm		2.5		3.7	0.27
40 – 45		2.9		4.4		0.23	
50 – 100		2.6		3.9		0.26	
100 – 200							
Taper roller bearings	For bores :	1	0	0.4	1.60	0.37	
	30 – 40 mm		1.45		0.44		
	45 – 110		1.35		0.41		
	120 – 150						

Tabel 1. 8 Tabel nilai X dan Y

**Table 27.6. Basic static and dynamic capacities of various types of radial ball bearings.**

Bearing No. (1)	Basic capacities in kN							
	Single row deep groove ball bearing		Single row angular contact ball bearing		Double row angular contact ball bearing		Self-aligning ball bearing	
	Static ( $C_0$ ) (2)	Dynamic (C) (3)	Static ( $C_0$ ) (4)	Dynamic (C) (5)	Static ( $C_0$ ) (6)	Dynamic (C) (7)	Static ( $C_0$ ) (8)	Dynamic (C) (9)
200	2.24	4	—	—	4.55	7.35	1.80	5.70
300	3.60	6.3	—	—	—	—	—	—
201	3	5.4	—	—	5.6	8.3	2.0	5.85
301	4.3	7.65	—	—	—	—	3.0	9.15
202	3.55	6.10	3.75	6.30	5.6	8.3	2.16	6
302	5.20	8.80	—	—	9.3	14	3.35	9.3
203	4.4	7.5	4.75	7.8	8.15	11.6	2.8	7.65
303	6.3	10.6	7.2	11.6	12.9	19.3	4.15	11.2
403	11	18	—	—	—	—	—	—
204	6.55	10	6.55	10.4	11	16	3.9	9.8
304	7.65	12.5	8.3	13.7	14	19.3	5.5	14
404	15.6	24	—	—	—	—	—	—
205	7.1	11	7.8	11.6	13.7	17.3	4.25	9.8
305	10.4	16.6	12.5	19.3	20	26.5	7.65	19
405	19	28	—	—	—	—	—	—

Tabel 1. 9 Tabel static & dynamic capacities

**Table 27.5. Values of service factor ( $K_s$ ).**

S.No.	Type of service	Service factor ( $K_s$ ) for radial ball bearings
1.	Uniform and steady load	1.0
2.	Light shock load	1.5
3.	Moderate shock load	2.0
4.	Heavy shock load	2.5
5.	Extreme shock load	3.0

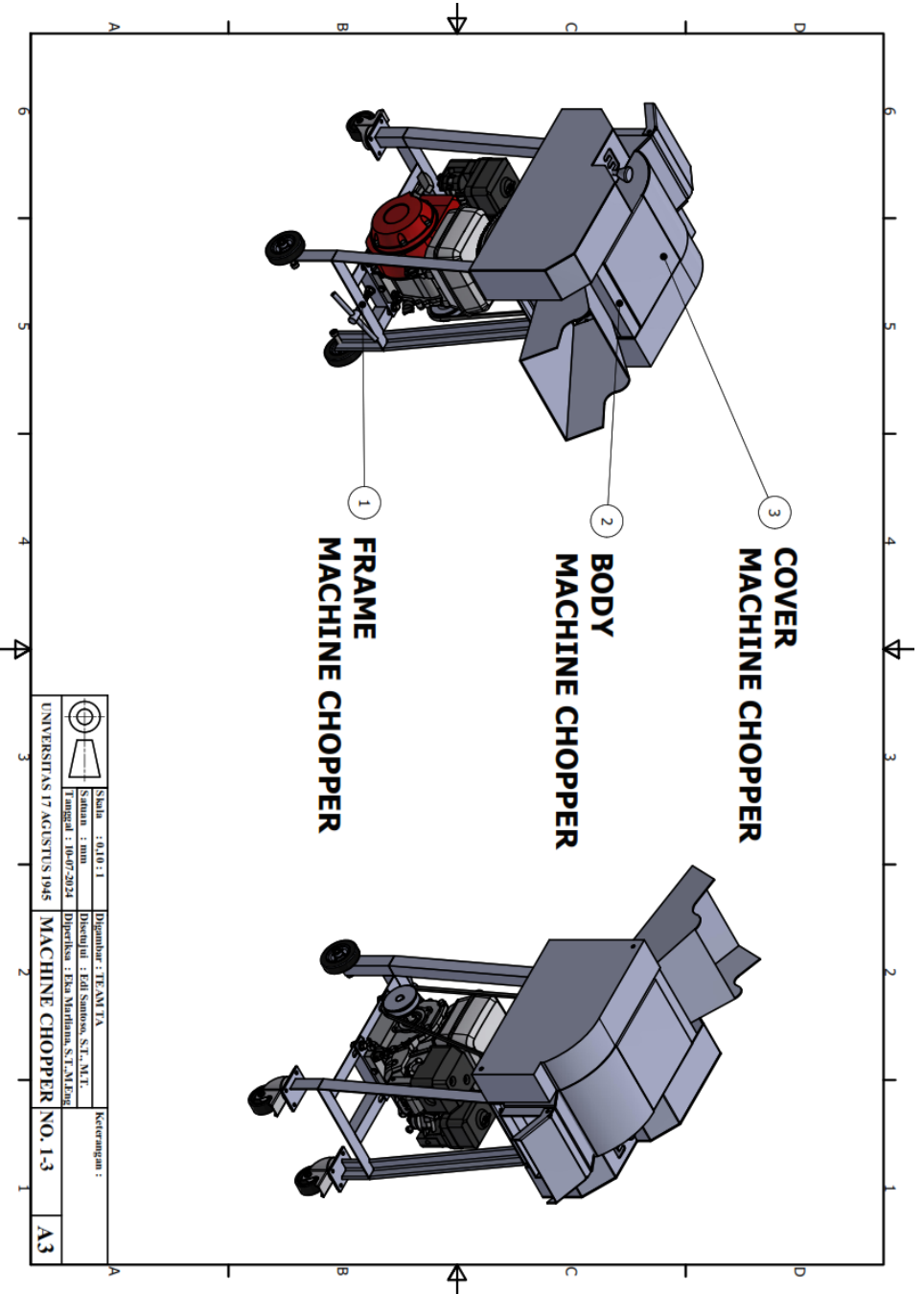
Tabel 1. 10 Tabel nilai service factor

## LAMPIRAN PROSES Pengerjaan

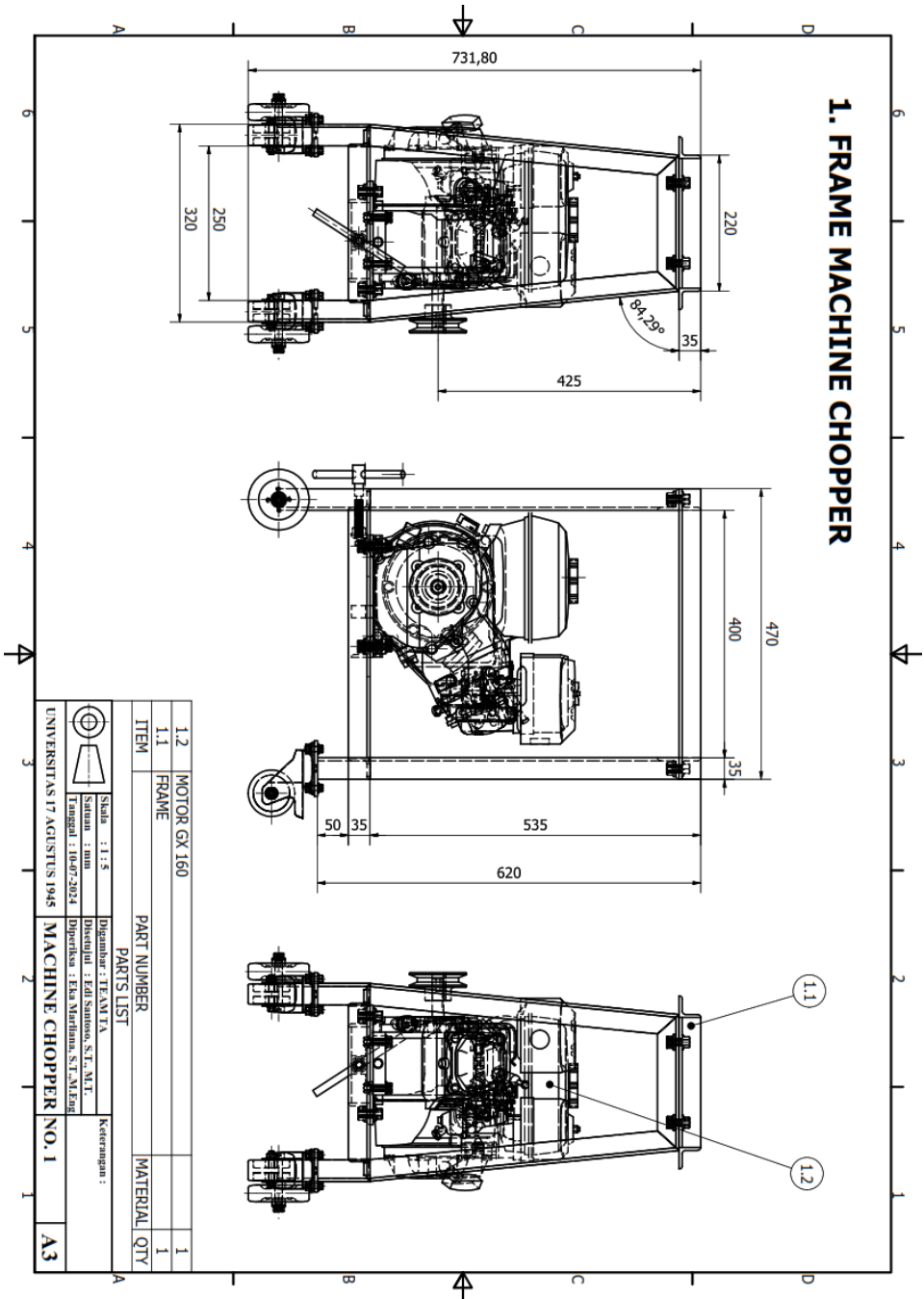


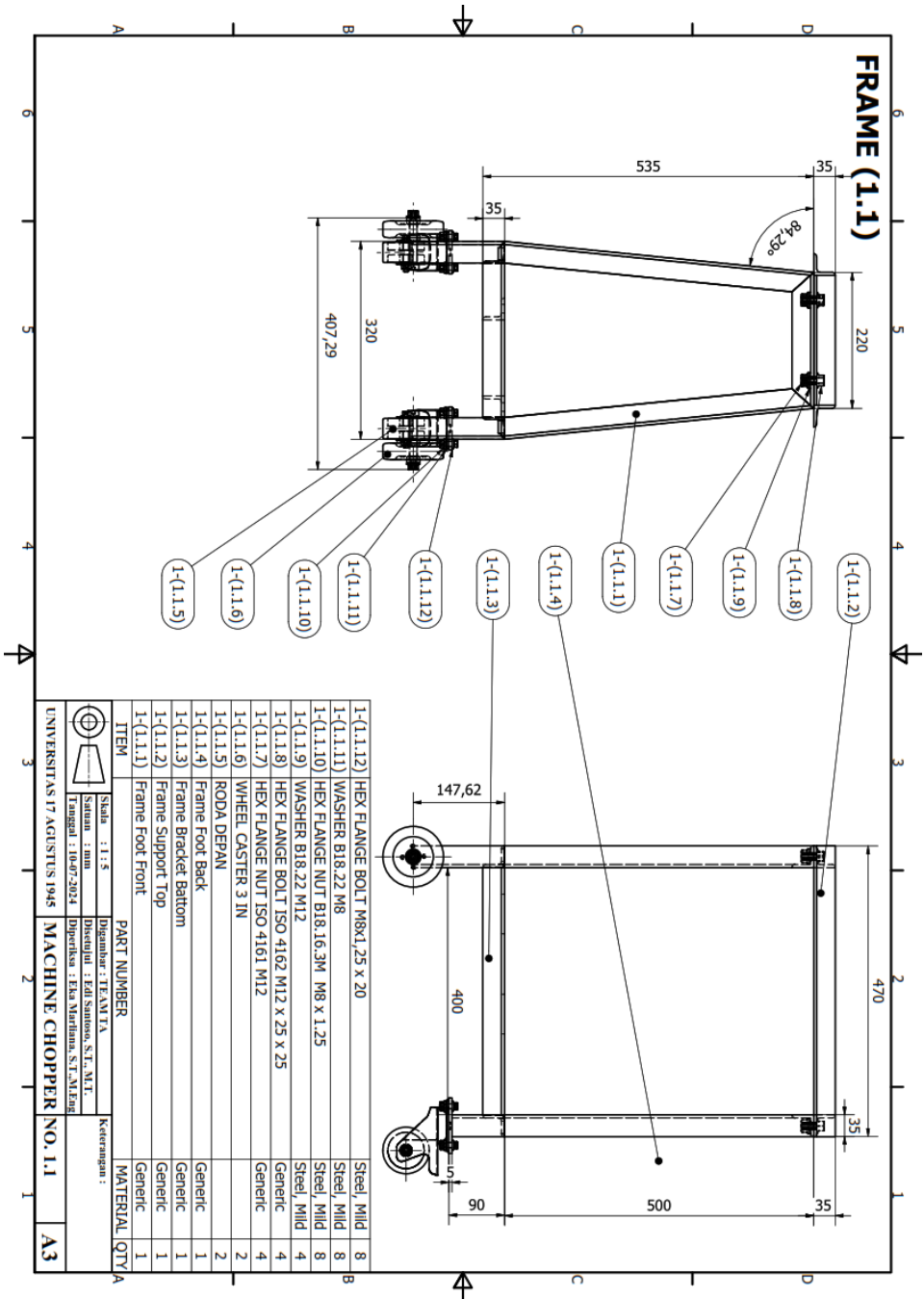
## **LAMPIRAN DESAIN GAMBAR**

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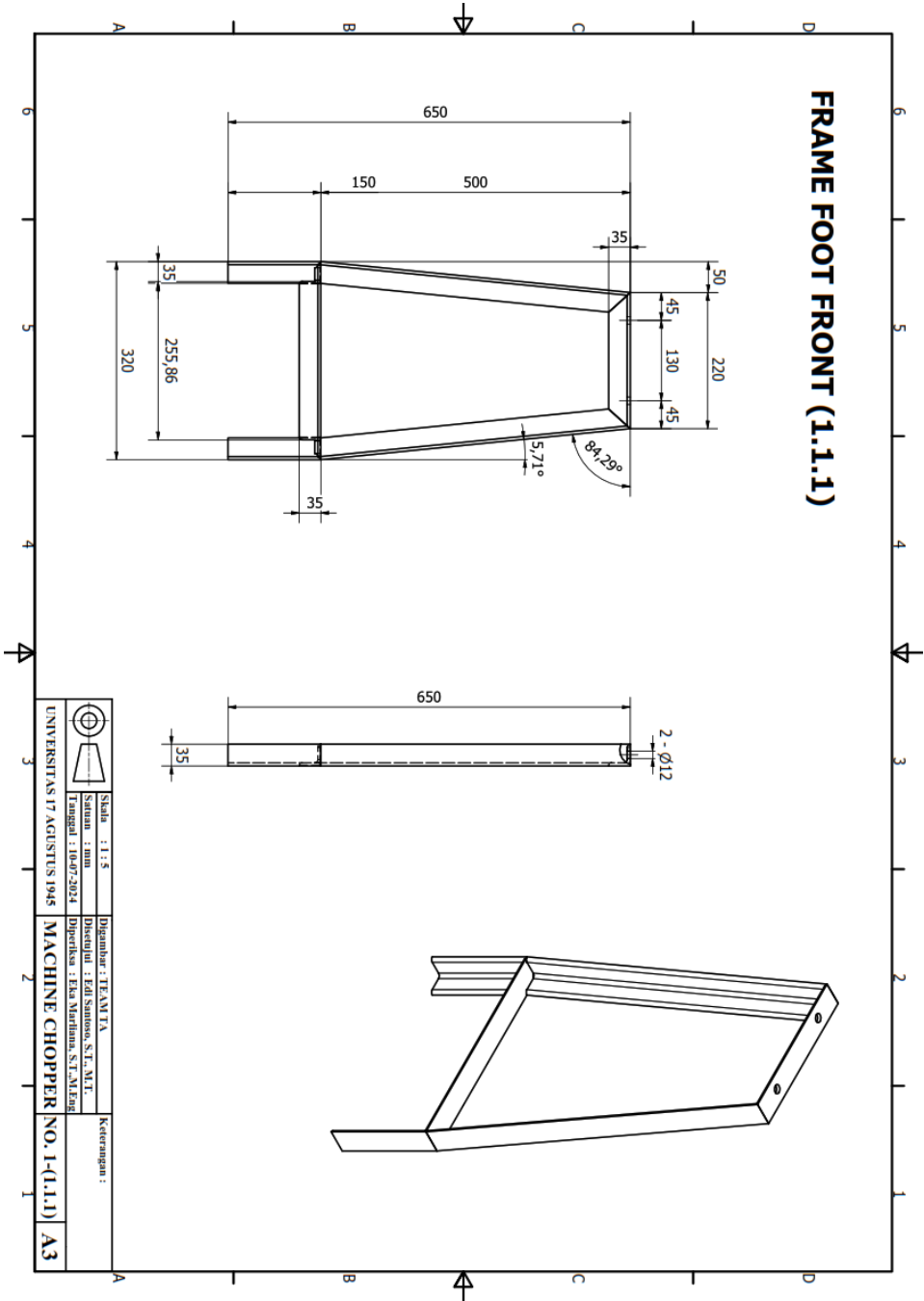



# 1. FRAME MACHINE CHOPPER

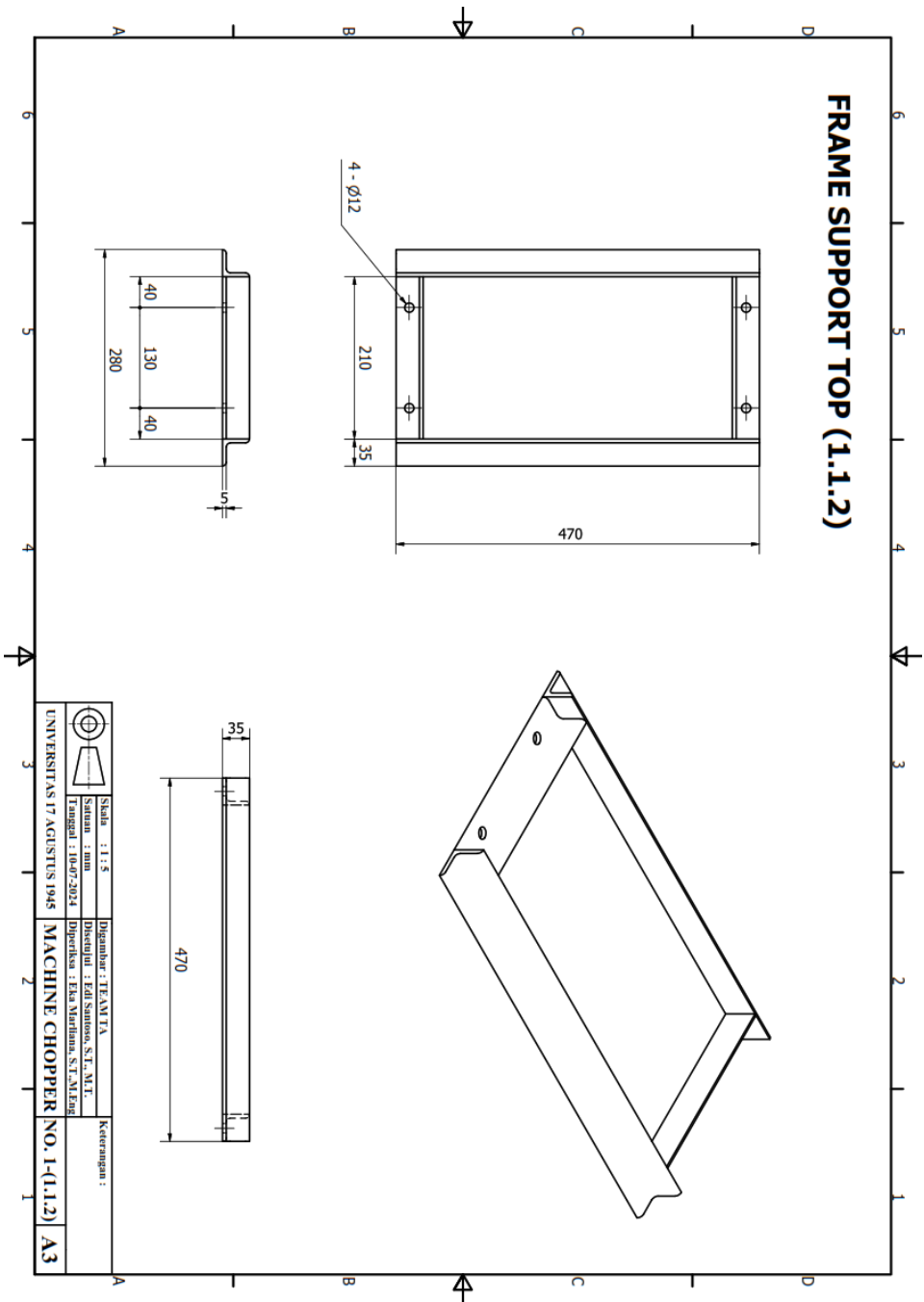




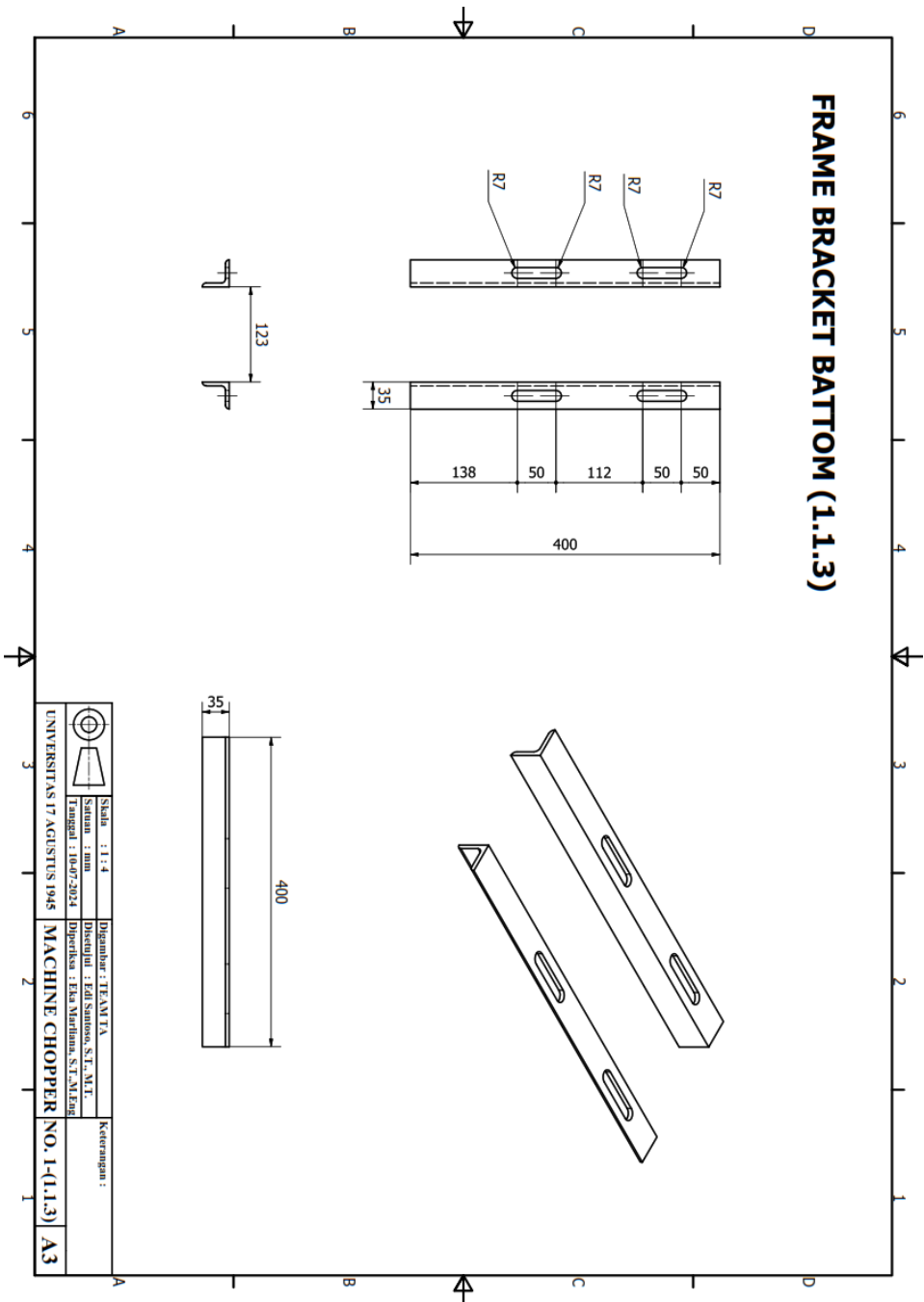
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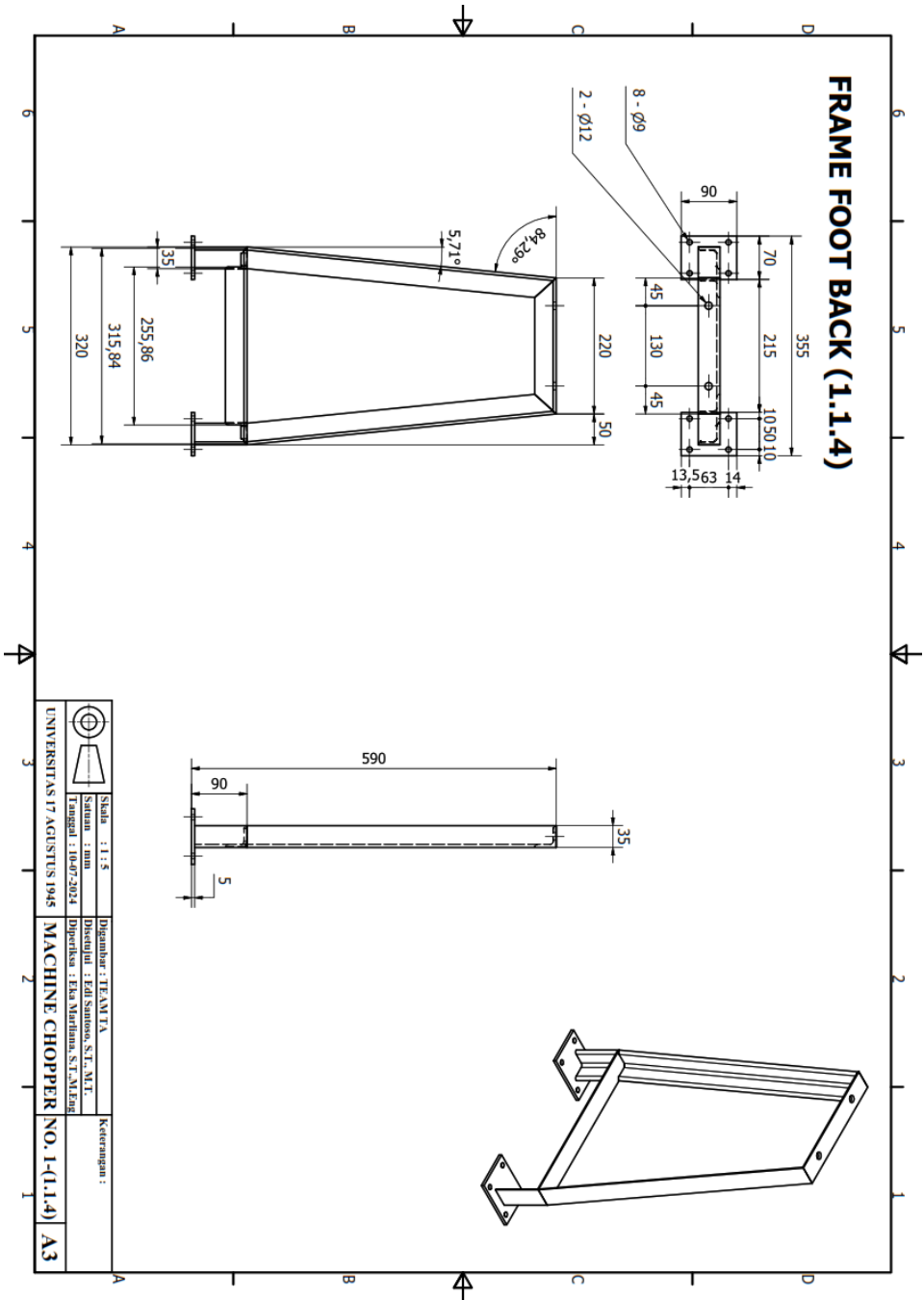


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	Satuan : mm	Dibentol : Edi Santoso, S.T., M.T.	
	Tanggal : 10-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
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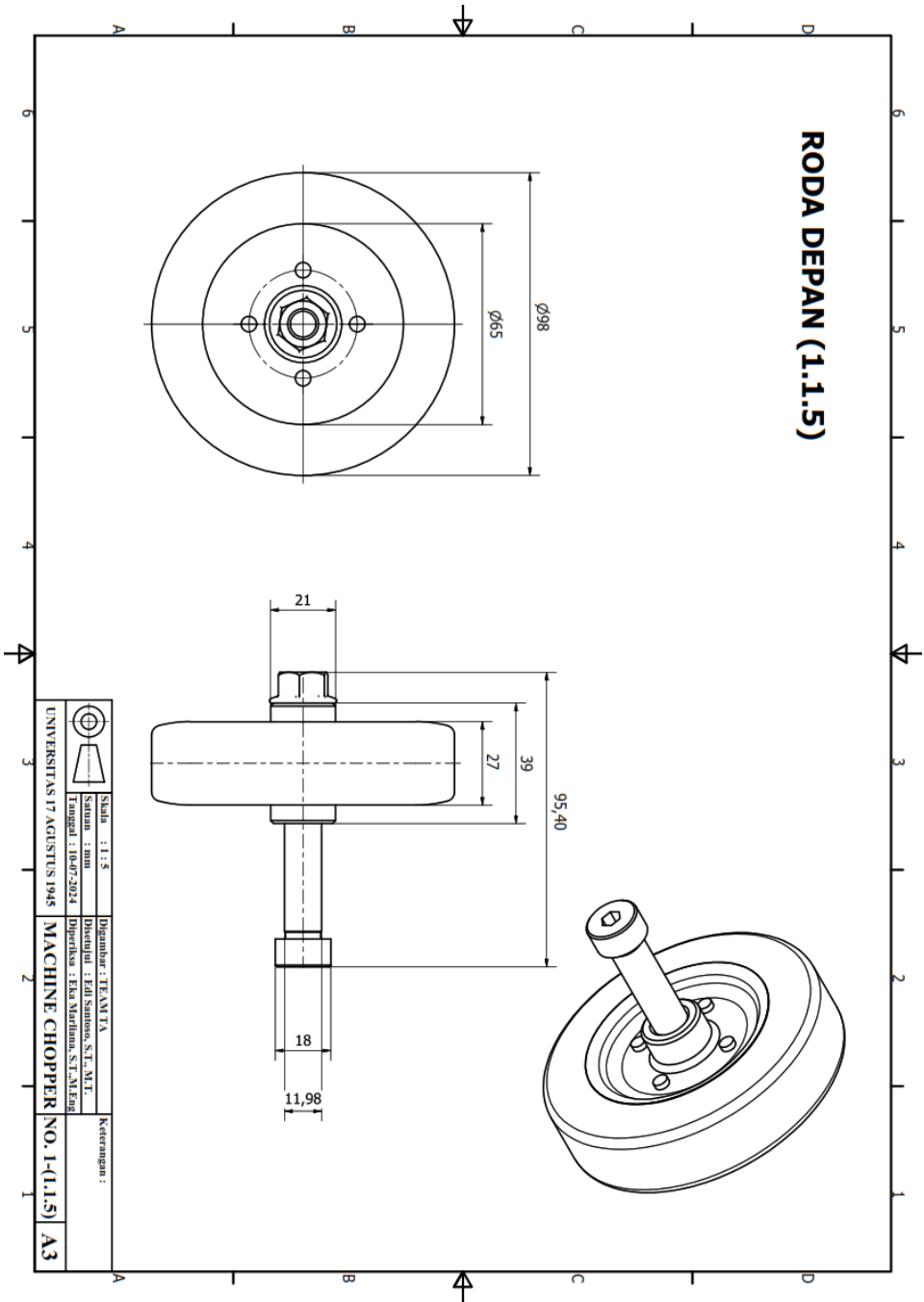


# FRAME BRACKET BATTOM (1.1.3)



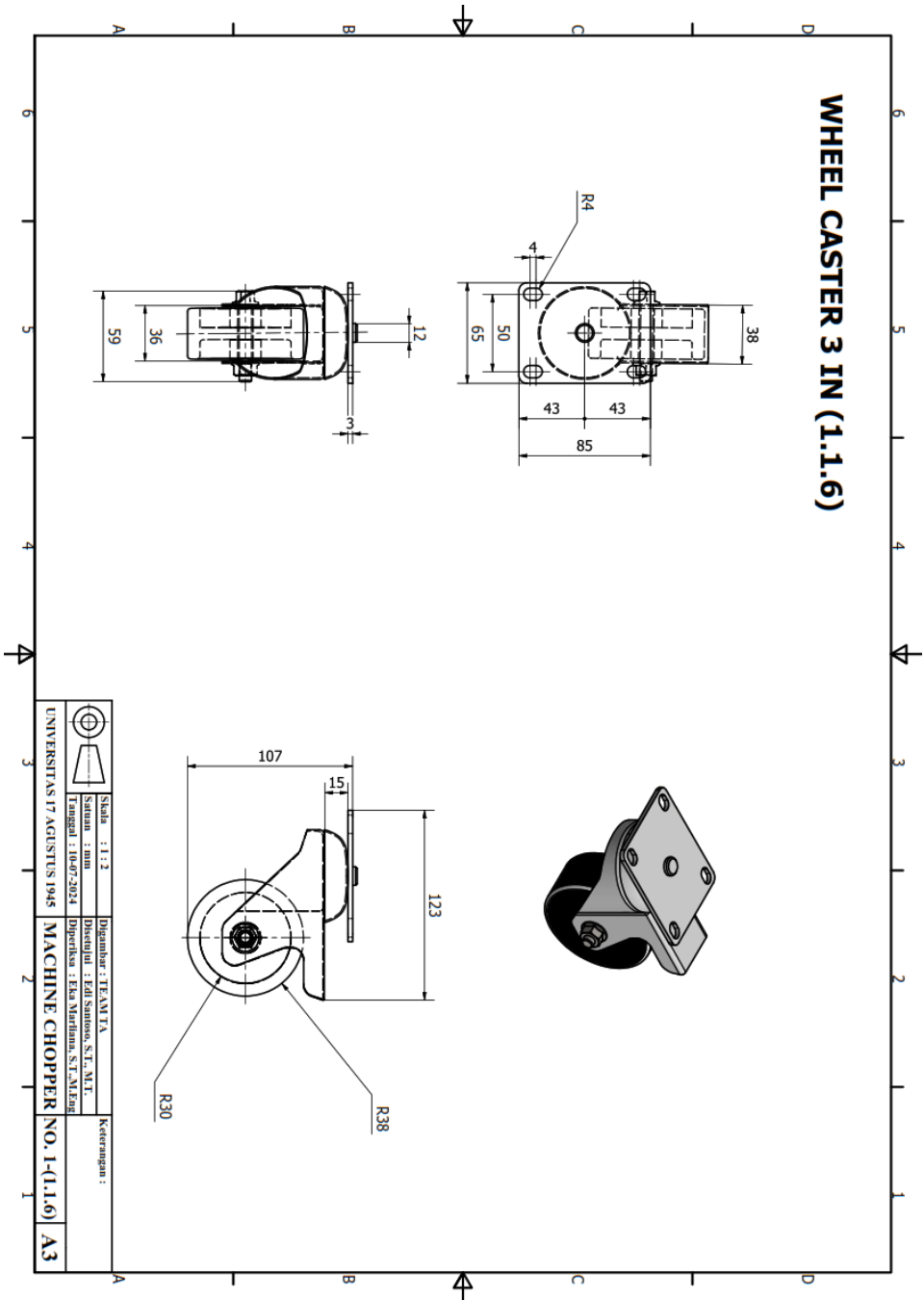


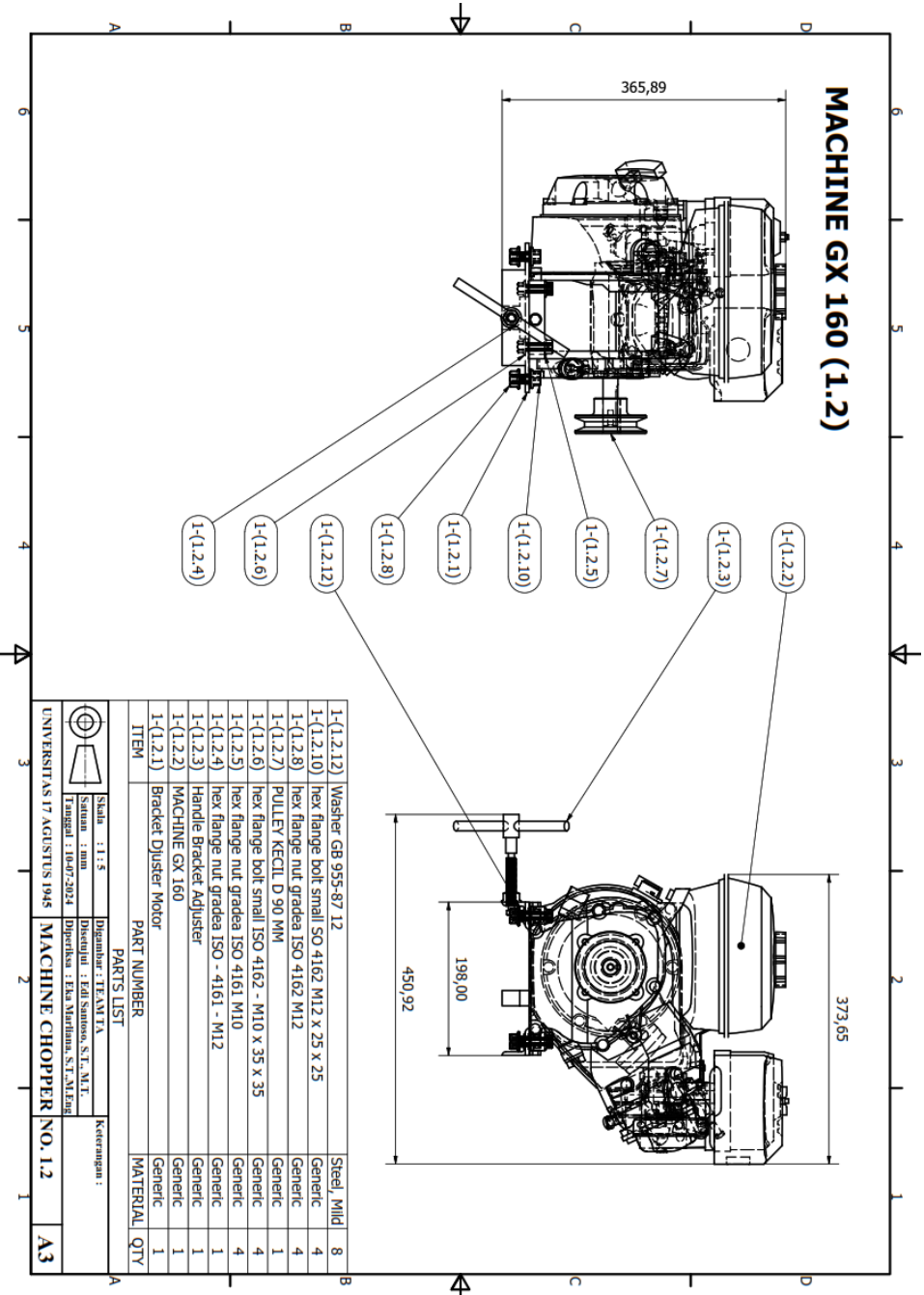
# RODA DEPAN (1.1.5)



	Skala : 1 : 5	Disambar : TEAMTA	Keterangan :
	Satuan : mm	Disebutkan : Edi Santoso, S.T., M.T.	
	Tanggal : 04-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945		<b>MACHINE CHOPPER (NO. 1-(1.1.5))</b>	
		<b>A3</b>	

# WHEEL CASTER 3 IN (1.1.6)



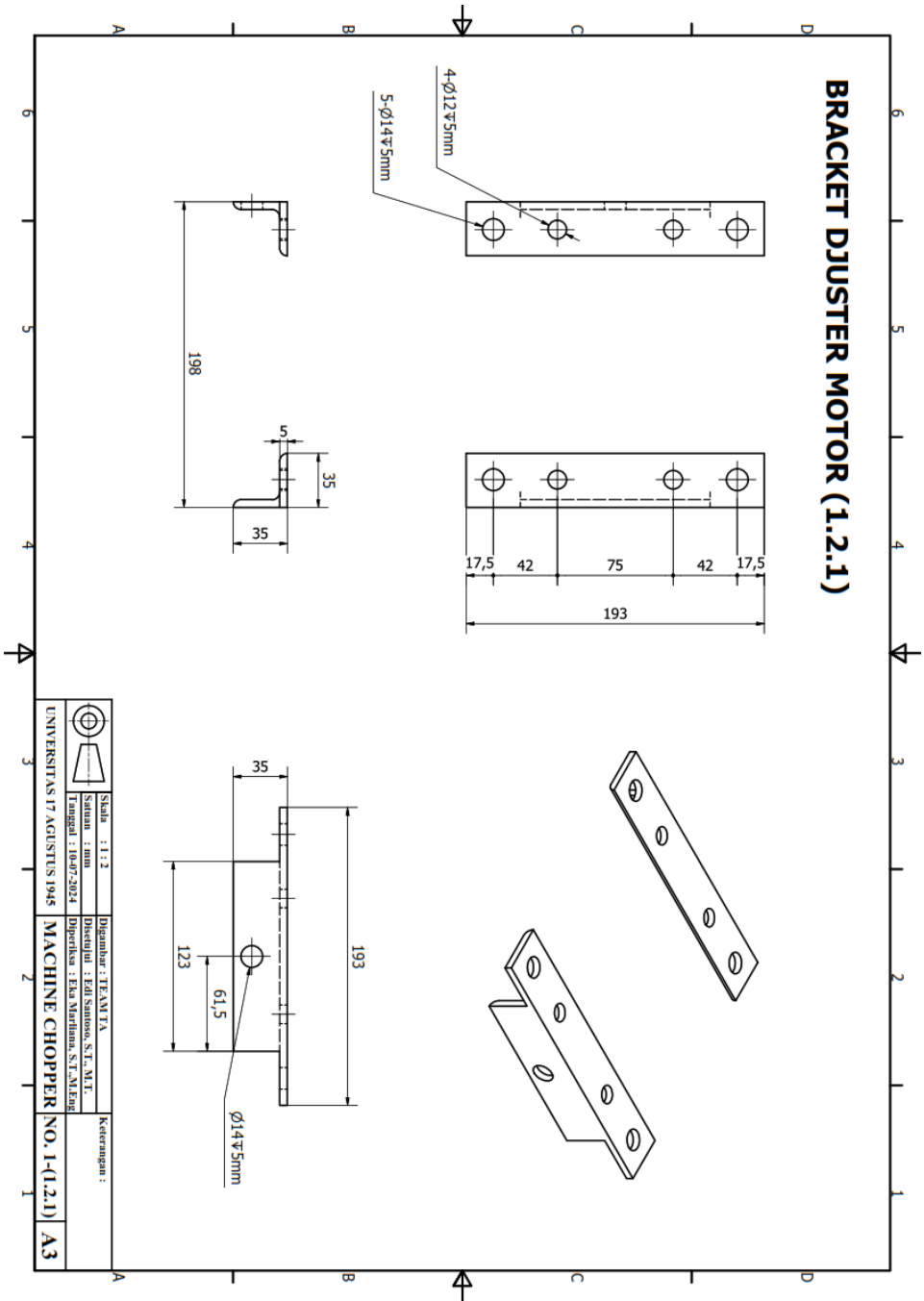


**MACHINE GX 160 (1.2)**

1-(1.2.12)	Washer GB 955-87 12	Steel, Mild	8
1-(1.2.10)	hex flange bolt small SO 4162 M12 x 25 x 25	Generic	4
1-(1.2.8)	hex flange nut gradea ISO 4162 M12	Generic	4
1-(1.2.7)	PULLEY KECLD D 90 MM	Generic	1
1-(1.2.6)	hex flange bolt small ISO 4162 - M10 x 35 x 35	Generic	4
1-(1.2.5)	hex flange nut gradea ISO 4161 M10	Generic	4
1-(1.2.4)	hex flange nut gradea ISO - 4161 - M12	Generic	1
1-(1.2.3)	Handle Bracket Adjuster	Generic	1
1-(1.2.2)	MACHINE GX 160	Generic	1
1-(1.2.1)	Bracket Djuster Motor	Generic	1
ITEM	PART NUMBER	MATERIAL	QTY

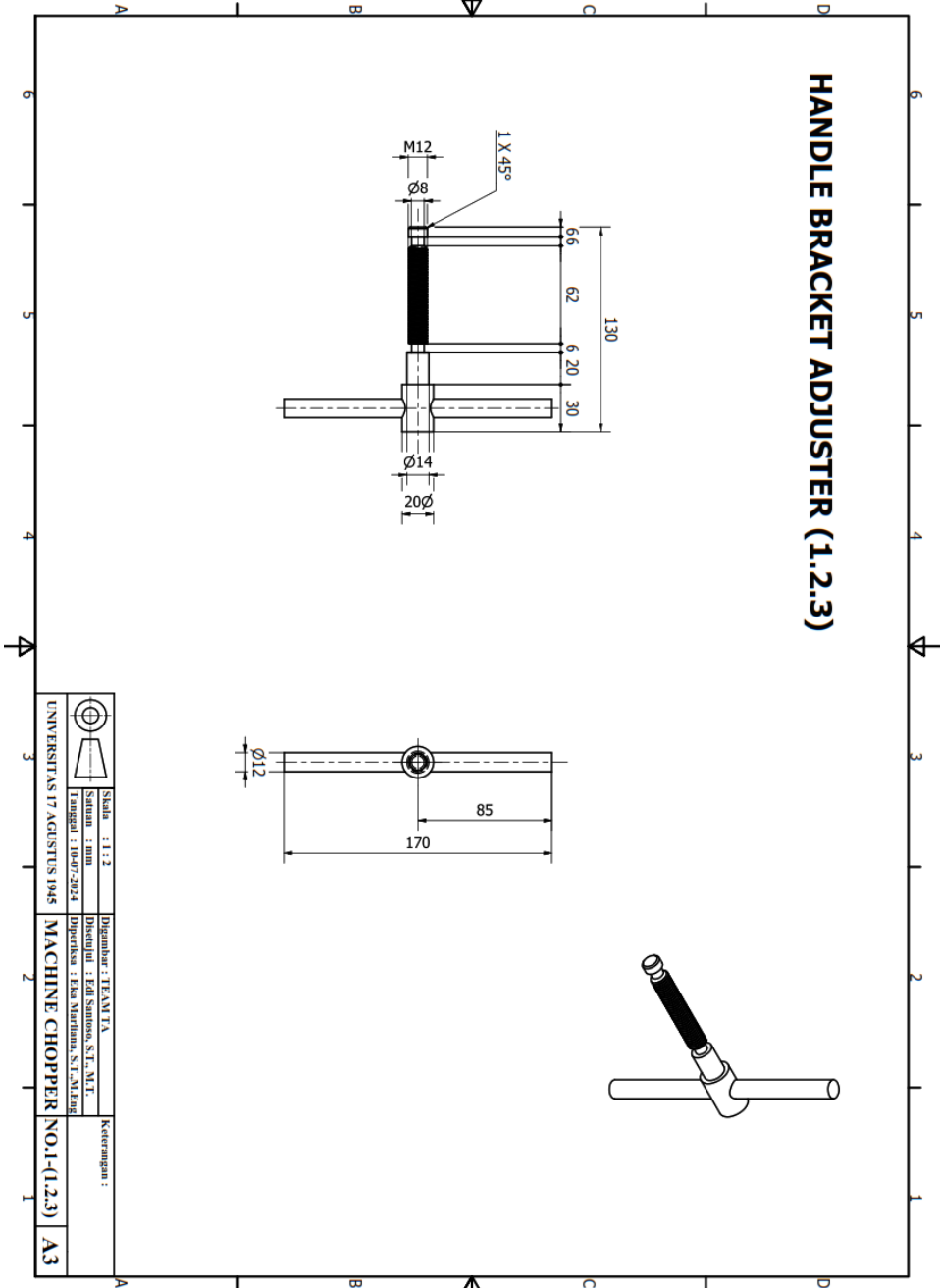
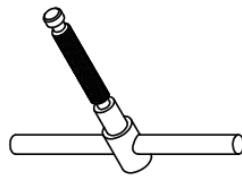
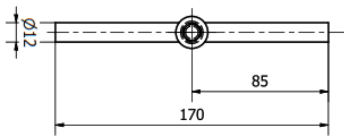
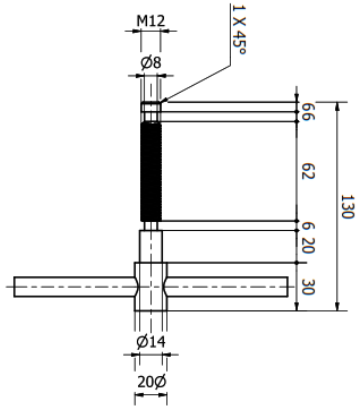
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Satuan : mm	Dibuat di : Edi Samson, S.T., M.T.		
Tanggal : 10-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng		
UNIVERSITAS 17 AGUSTUS 1945	MACHINE CHOPPER NO. 1.2		A3

# BRACKET DJUSTER MOTOR (1.2.1)



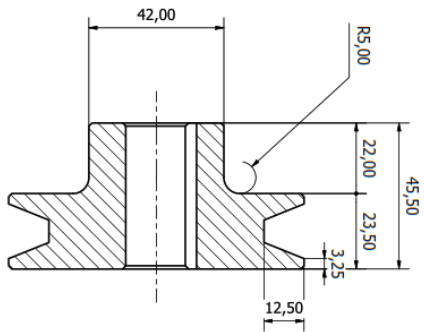
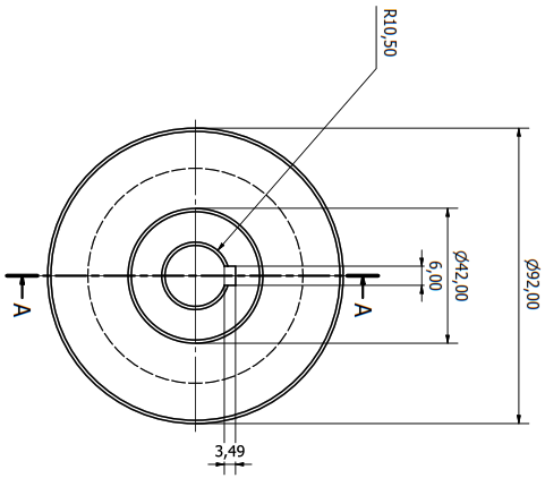
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	Tanggal : 04-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
	UNIVERSITAS 17 AGUSTUS 1945	<b>MACHINE CHOPPER (NO. 1-(1.2.1))</b>	<b>A3</b>

# HANDLE BRACKET ADJUSTER (1.2.3)

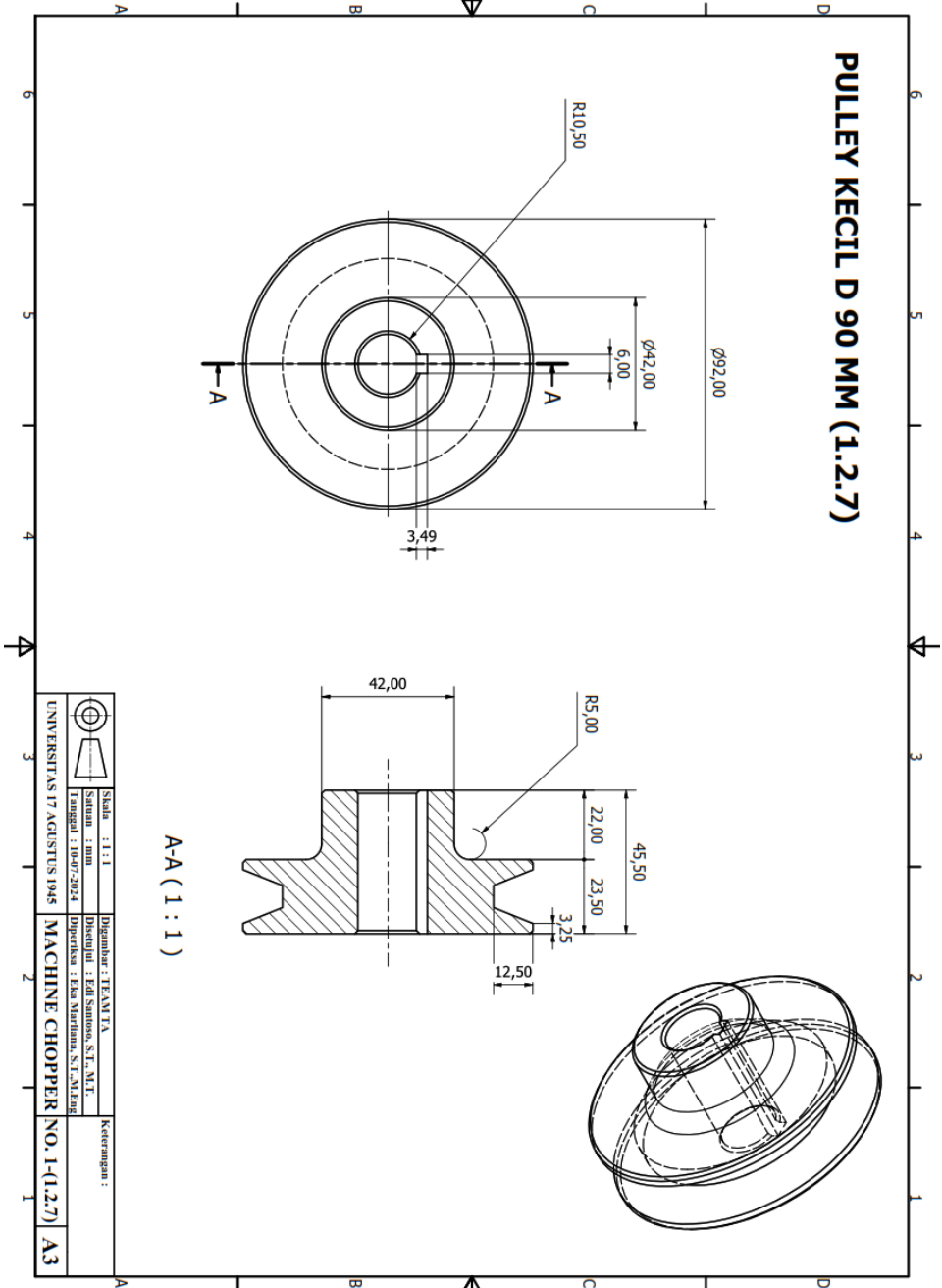
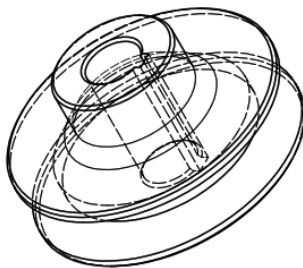


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	Satuan : mm	Dibuat : Edi Santoso, S.T., M.T.	
UNIVERSITAS 17 AGUSTUS 1945	Tanggal : 10-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
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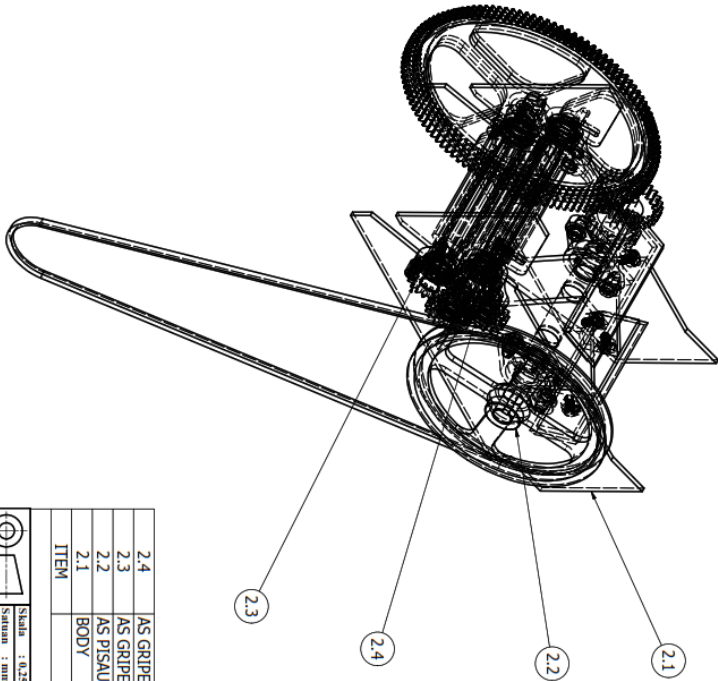
# PULLEY KECIL D 90 MM (1.2.7)



A-A (1 : 1)



## 2. BODY MACHINE CHOPPER



2.4	AS GRIPER 1		1
2.3	AS GRIPER 2		1
2.2	AS PISAU		1
2.1	BODY		1
ITEM	PART NUMBER	MATERIAL	QTY
PARTS LIST			

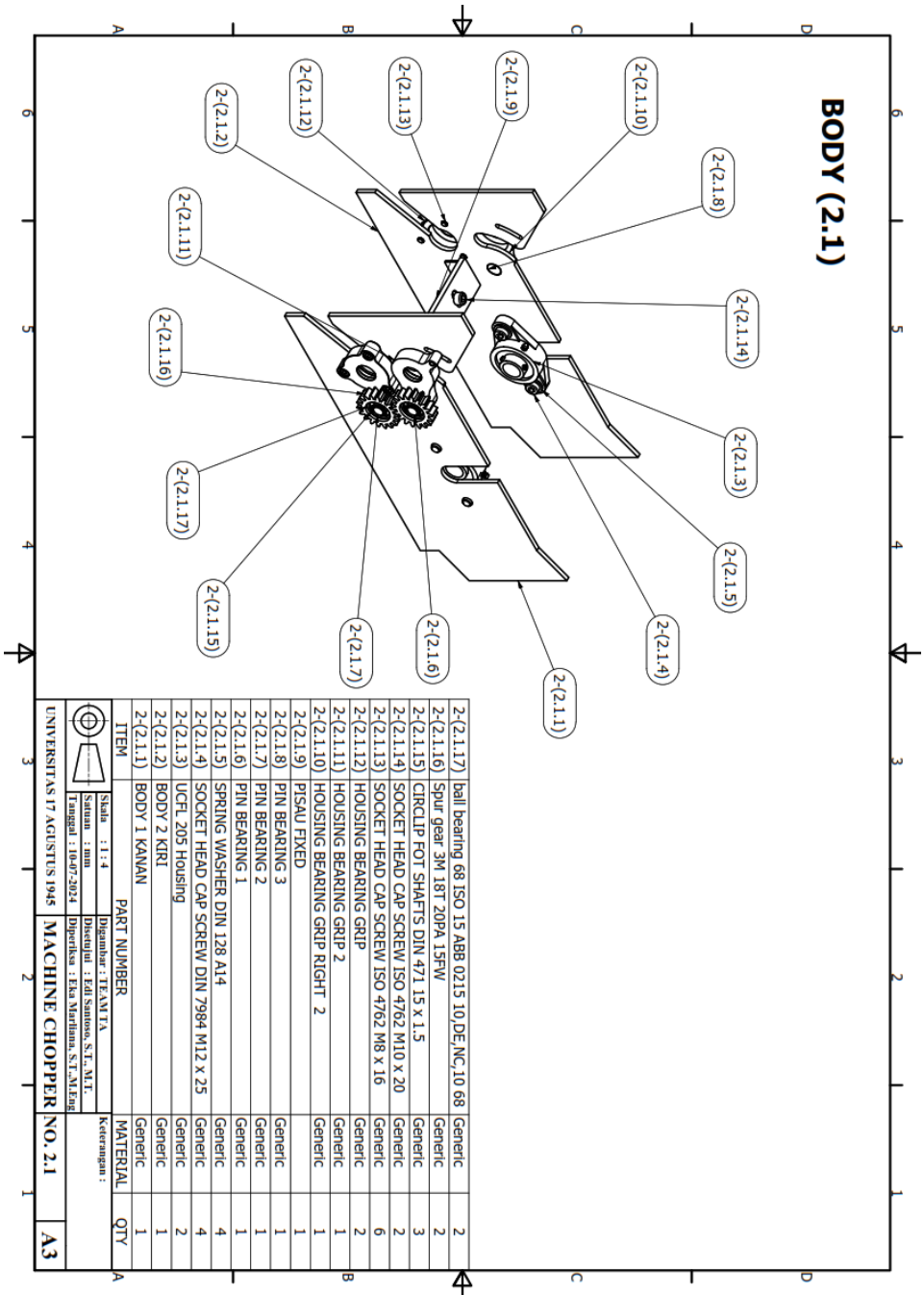


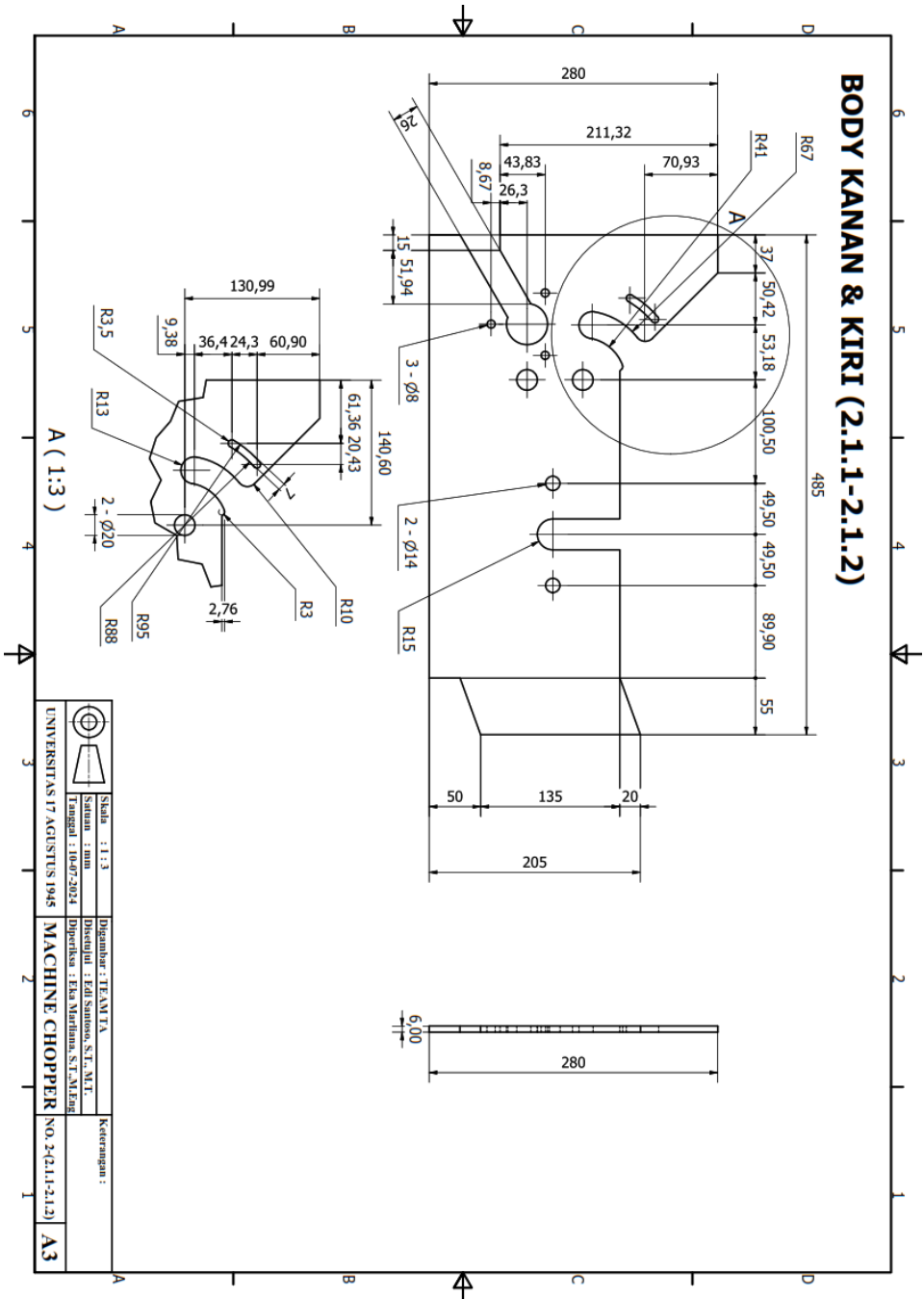
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 Disetujui : Eka Marliana, S.T., M.Eng.  
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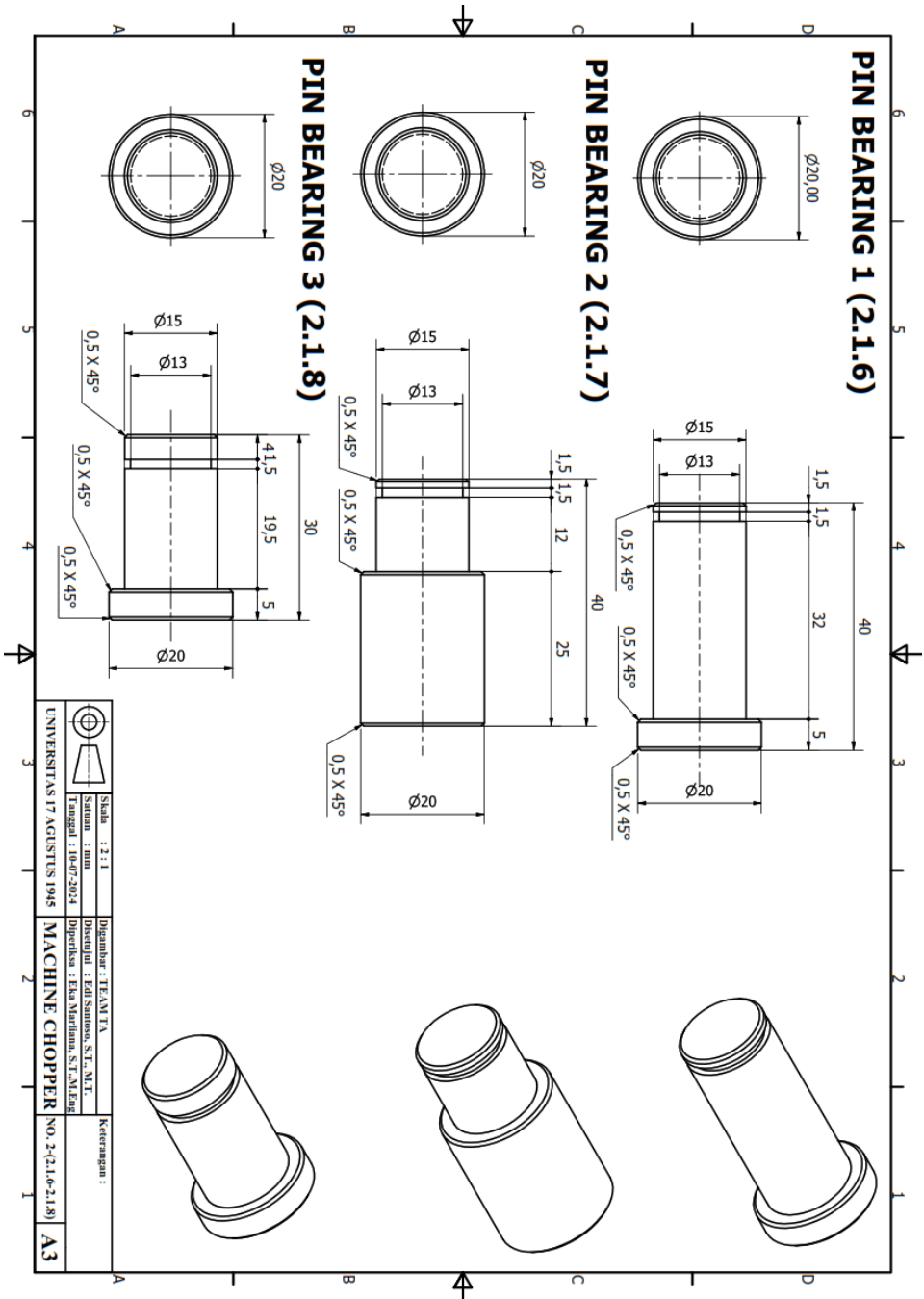
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MACHINE CHOPPER NO. 2

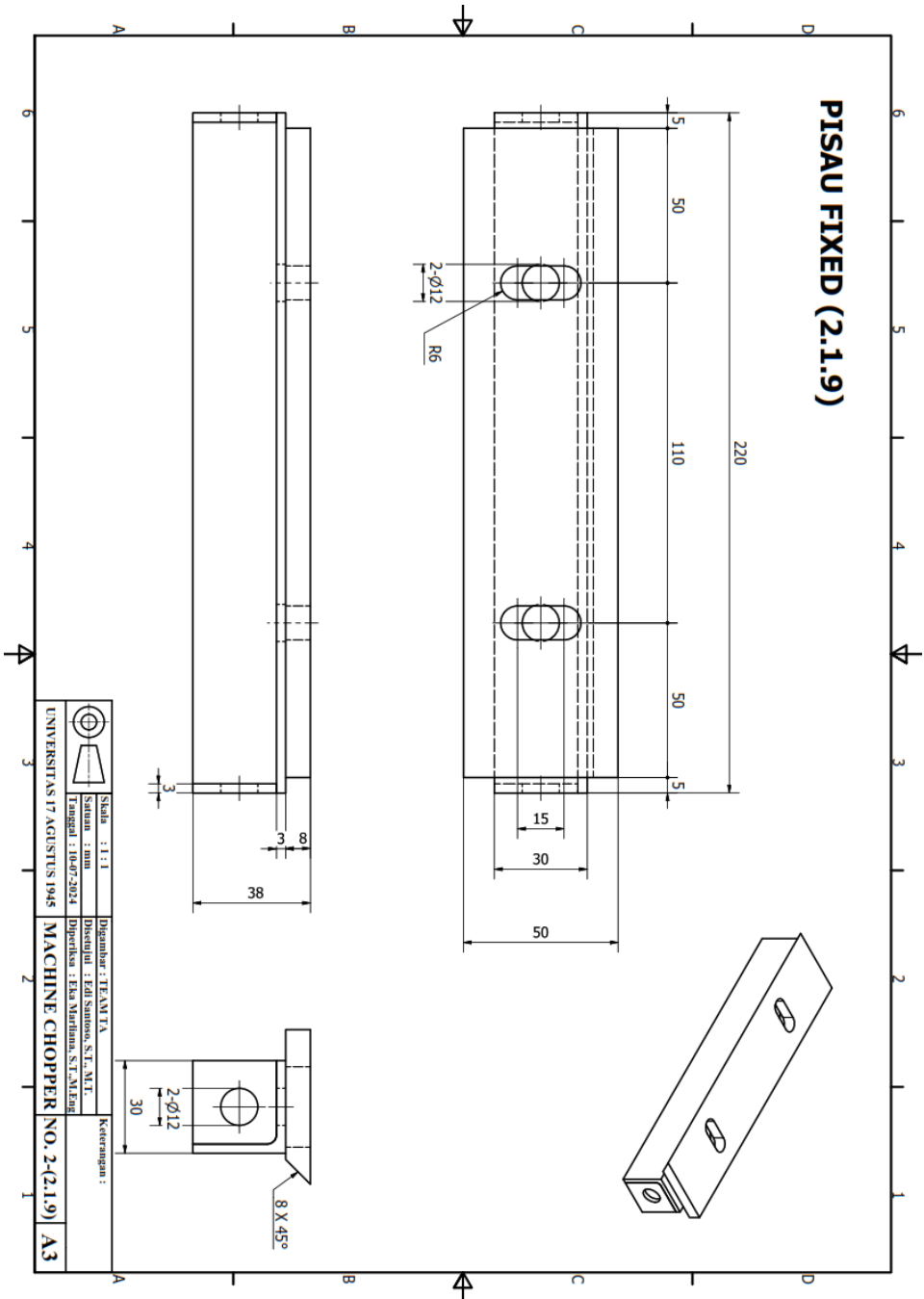
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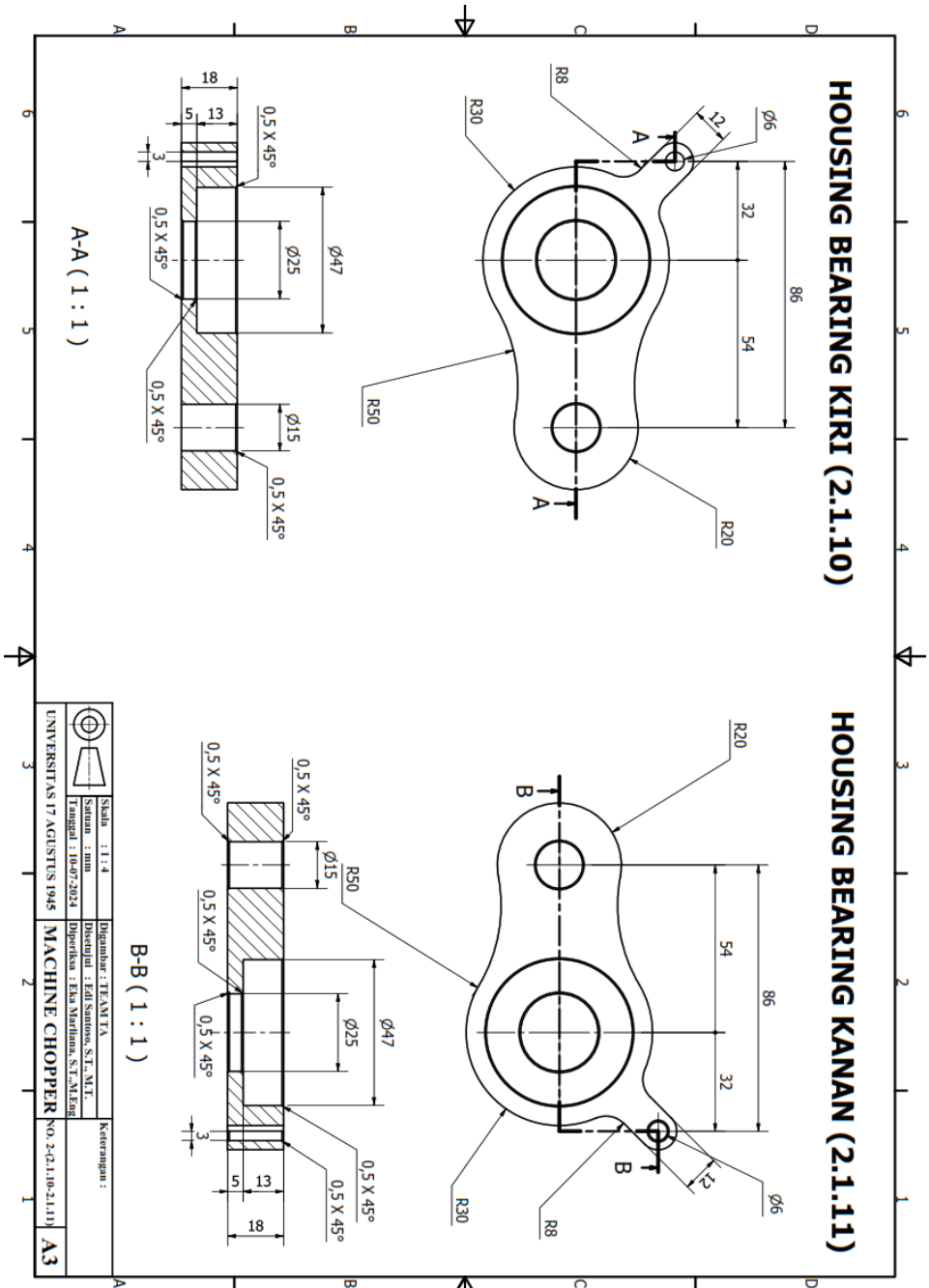






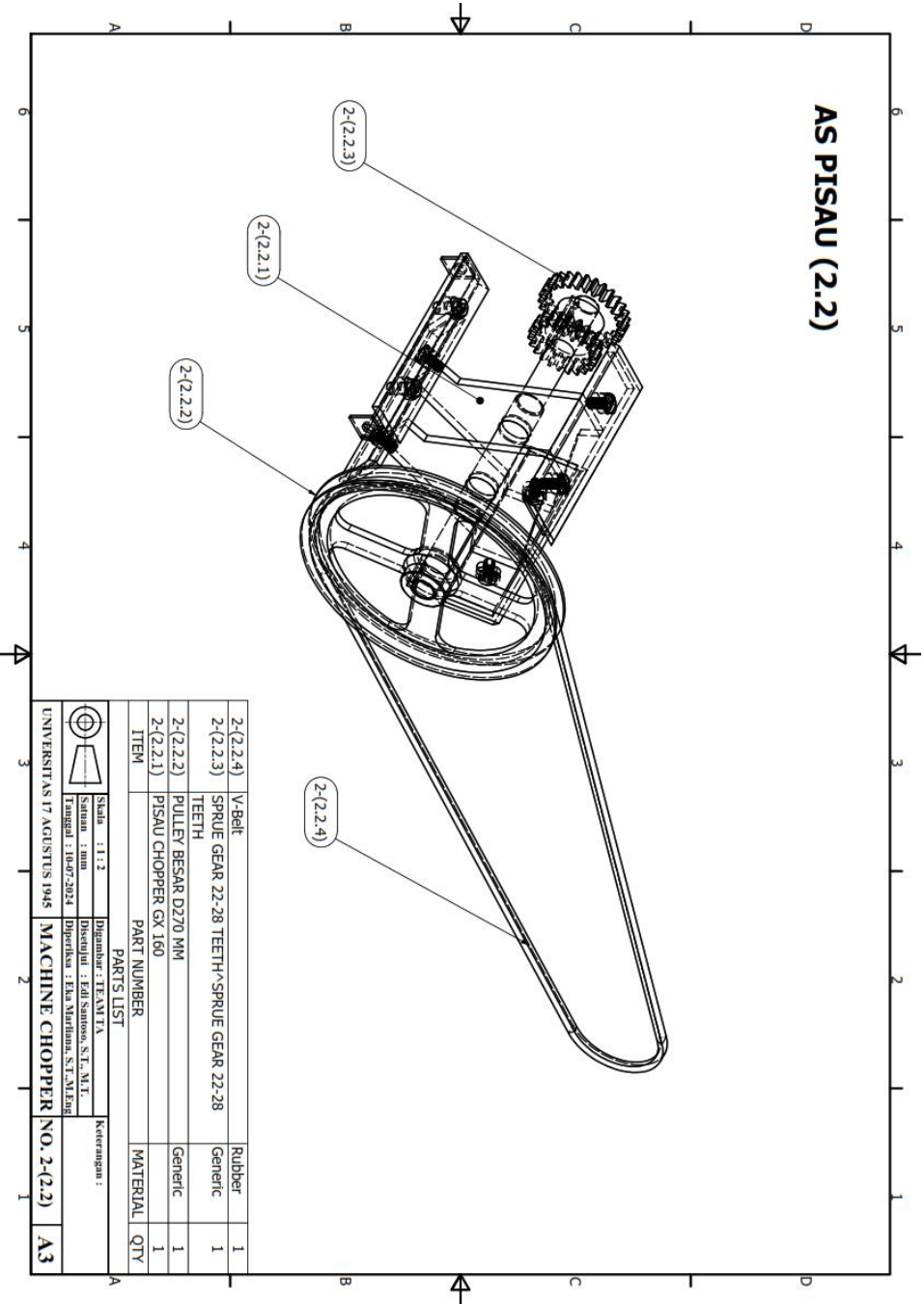
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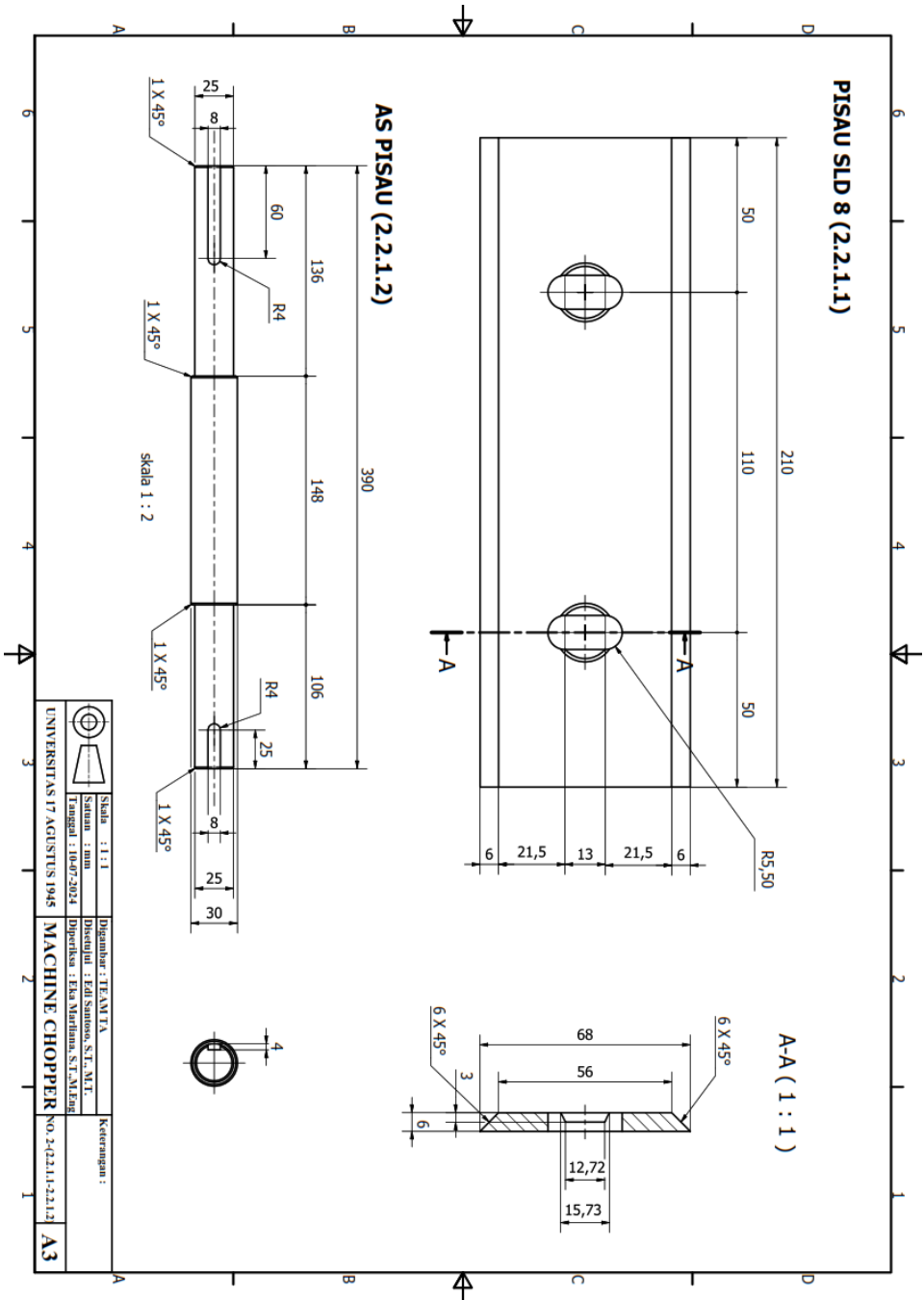


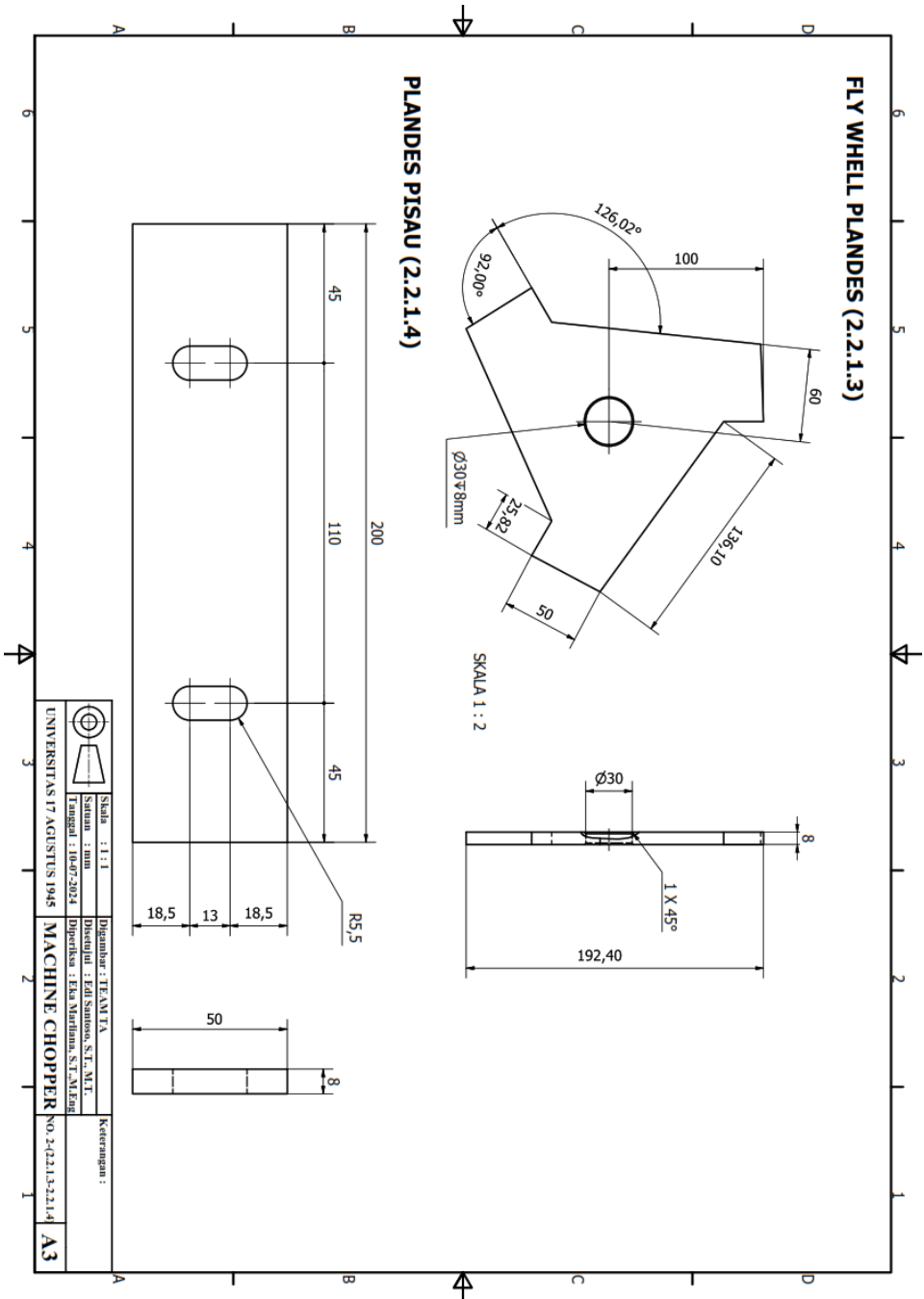


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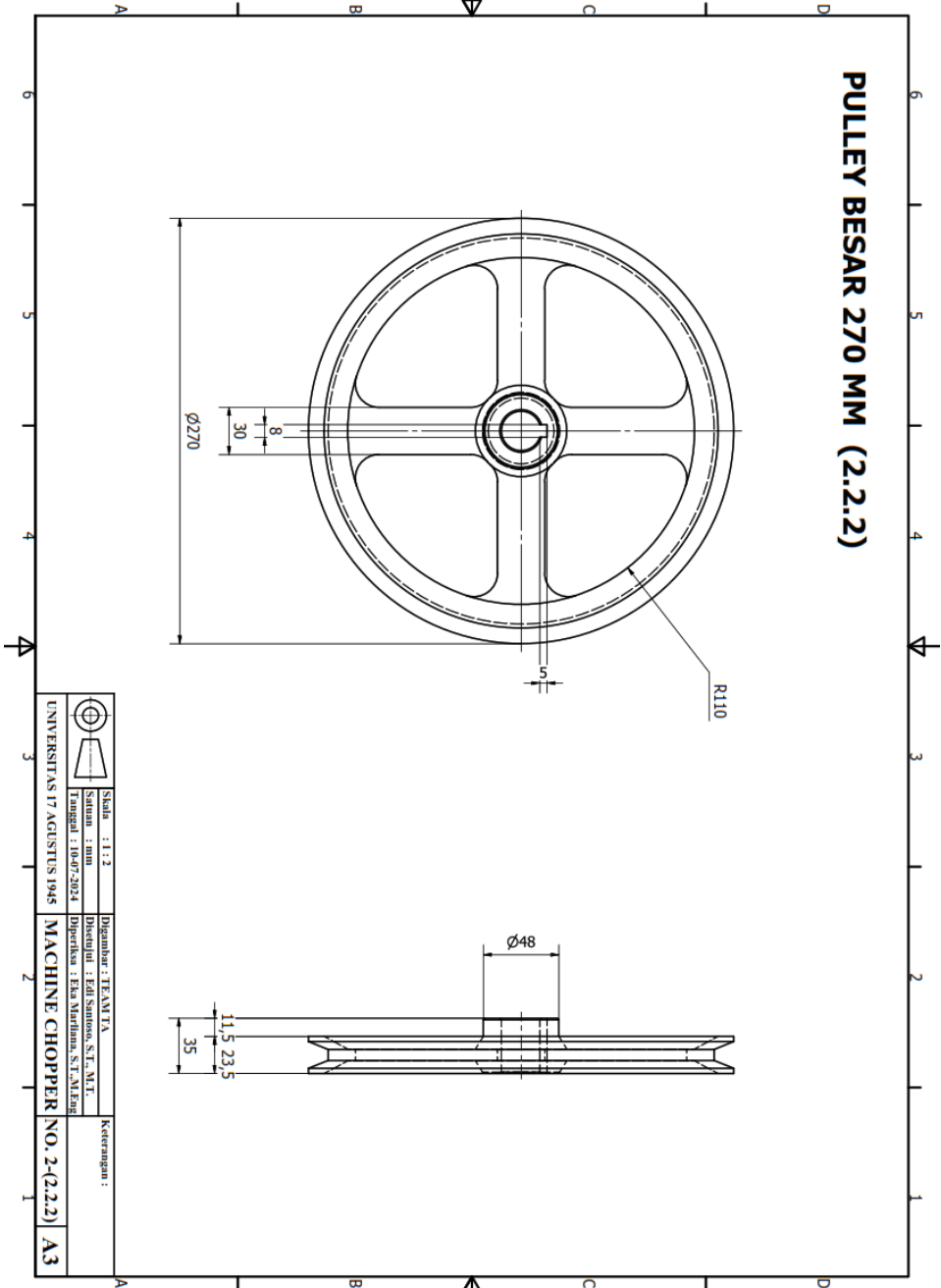
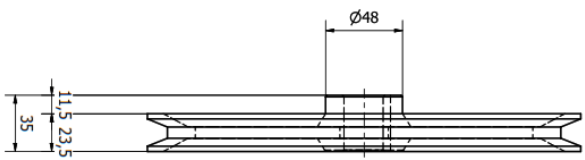
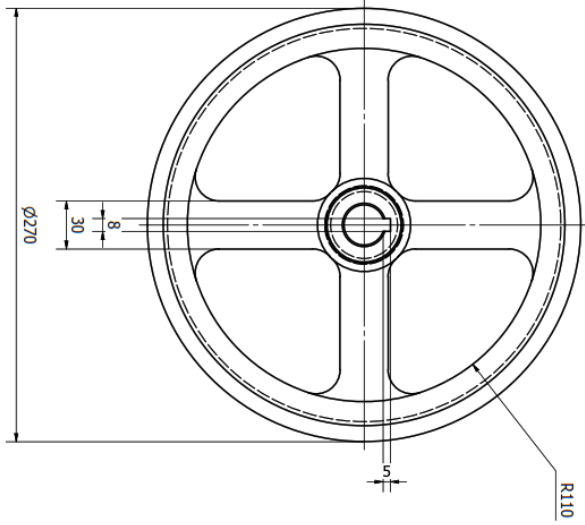


2-(2.2.4)	V-Belt	Rubber	1
2-(2.2.3)	SPRUE GEAR 22-28 TEETH^SPRUE GEAR 22-28 TEETH	Generic	1
2-(2.2.2)	PULLEY BESAR D270 MM	Generic	1
2-(2.2.1)	PISAU CHOPPER GX 160	MATERIAL	QTY
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Satuan : mm		Disain : Edi Santoso, S.T., M.T.	
Tanggal : 10-07-2024		Diperiksa : Eka Marlina, S.T., M.Eng	
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			A3



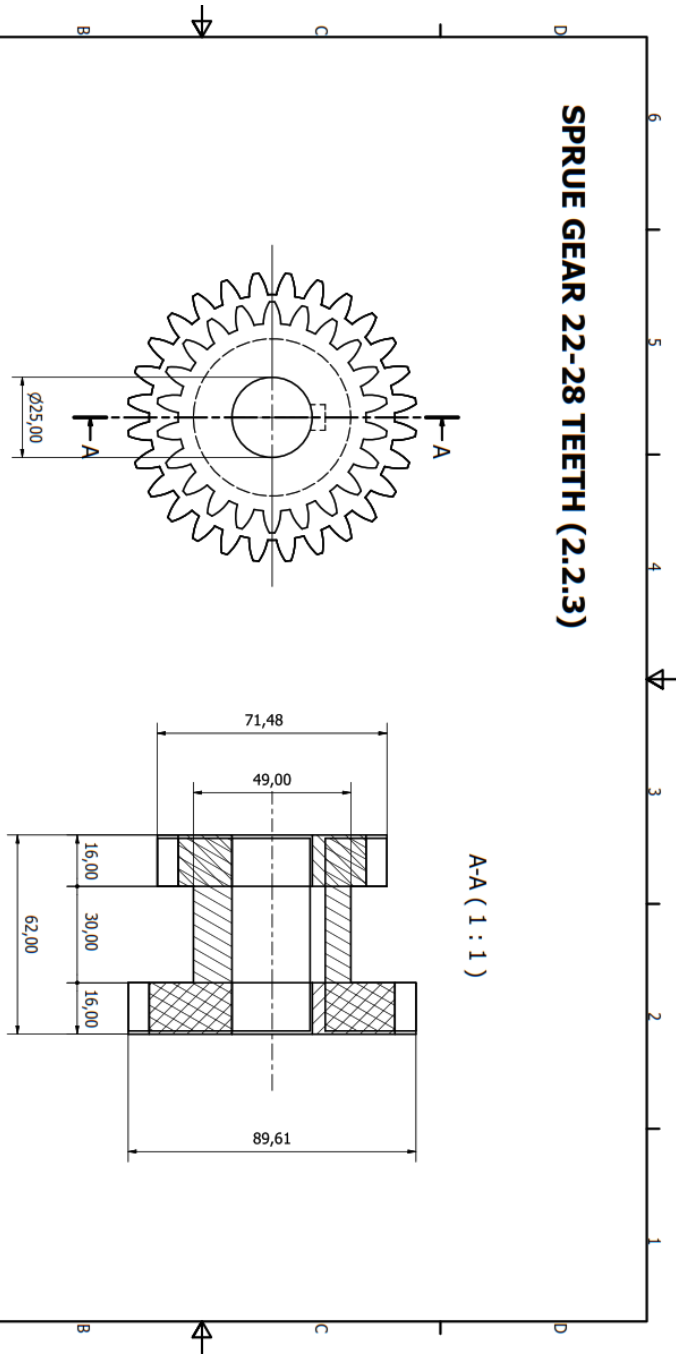


# PULLEY BESAR 270 MM (2.2.2)





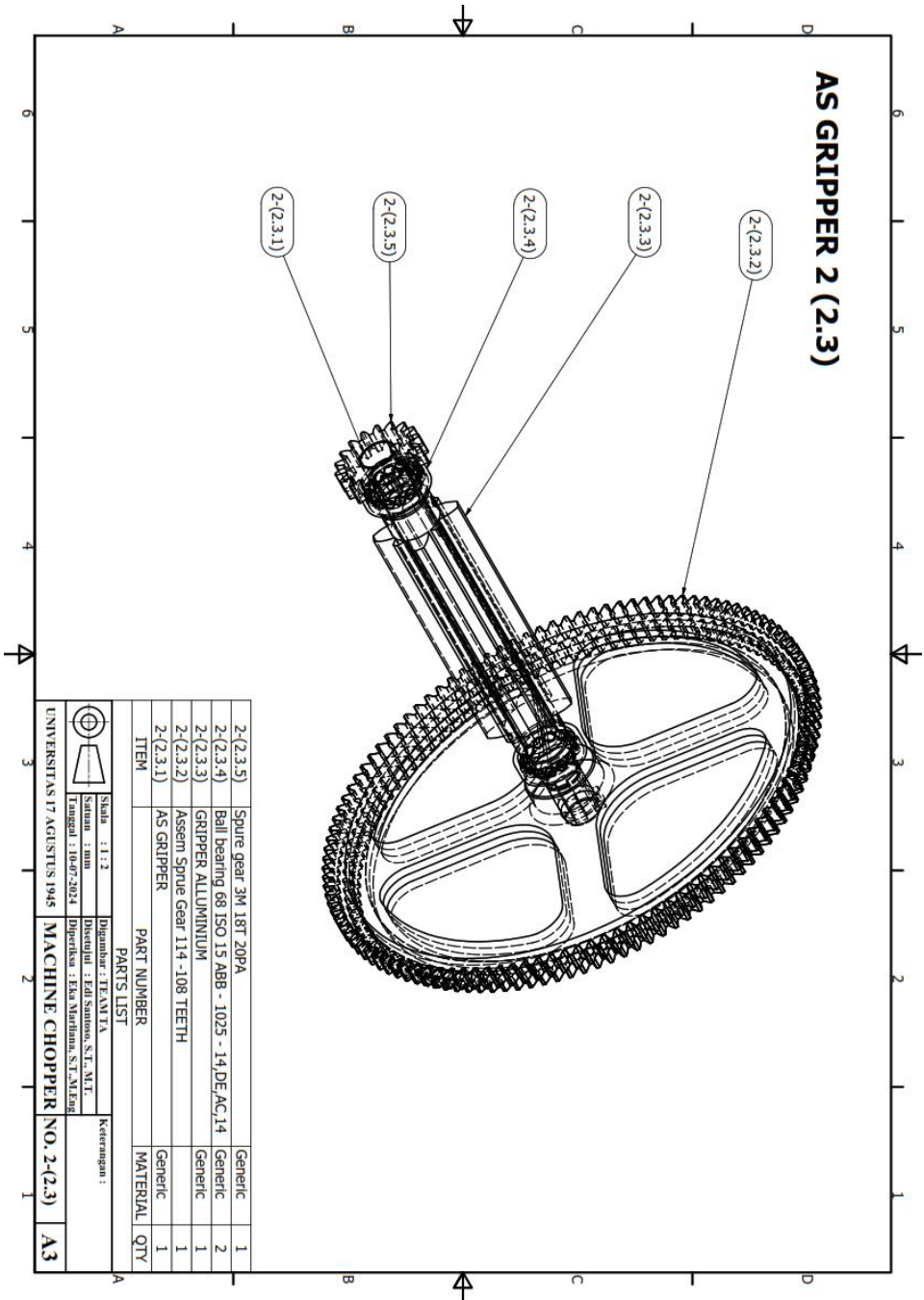
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UNIVERSITAS 17 AGUSTUS 1945	MACHINE CHOPPER NO. 2-(2.2.2)		A3

# SPRUE GEAR 22-28 TEETH (2.2.3)



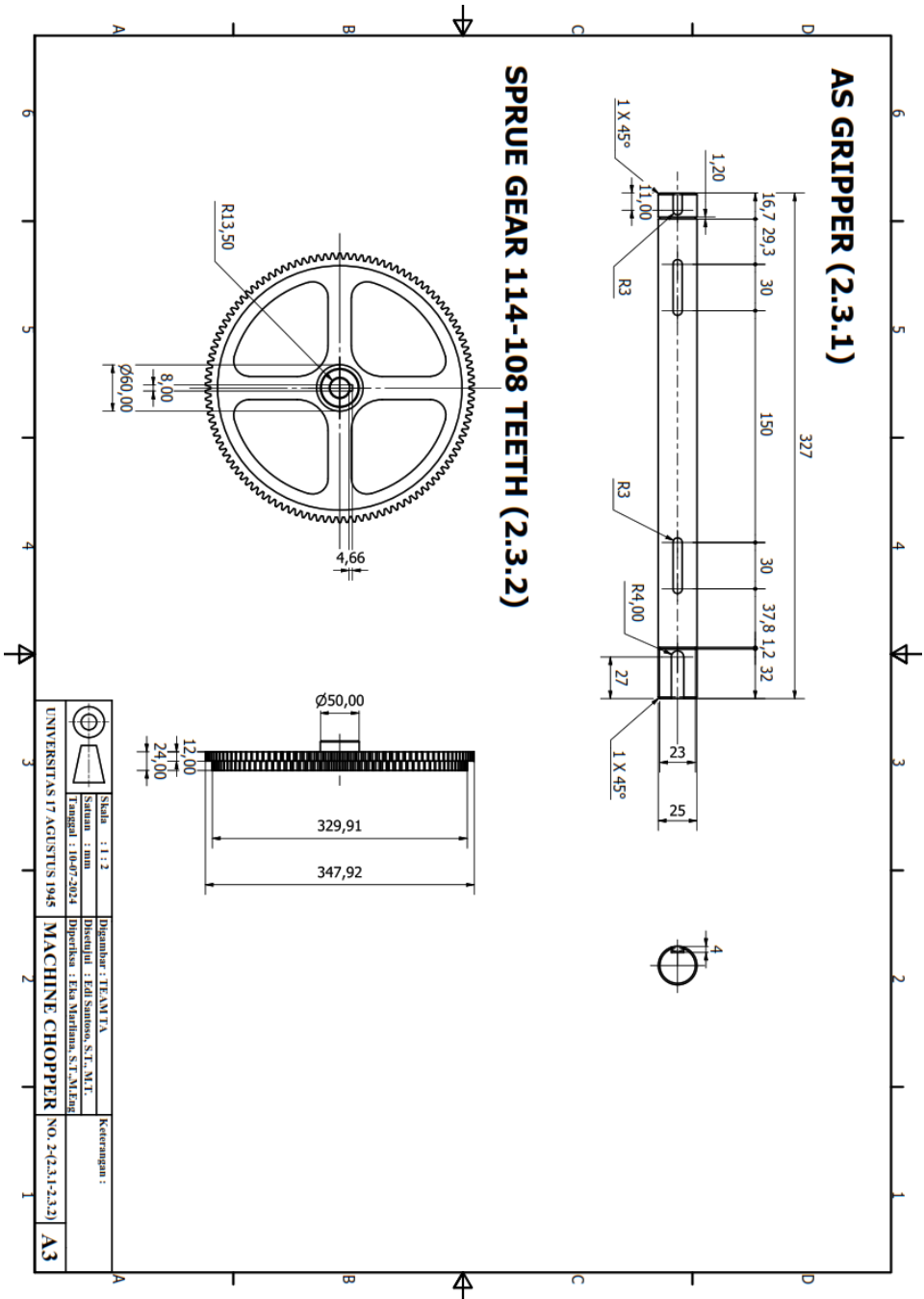
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 Satuan : mm		Disetujui : Edi Santoso, S.T., M.T.		
Tanggal : 10-07-2024		Diperiksa : Eka Marlina, S.T., M.Eng		
UNIVERSITAS 17 AGUSTUS 1945		MACHINE CHOPPER (NO. 2-(2.2.3))		
A3				

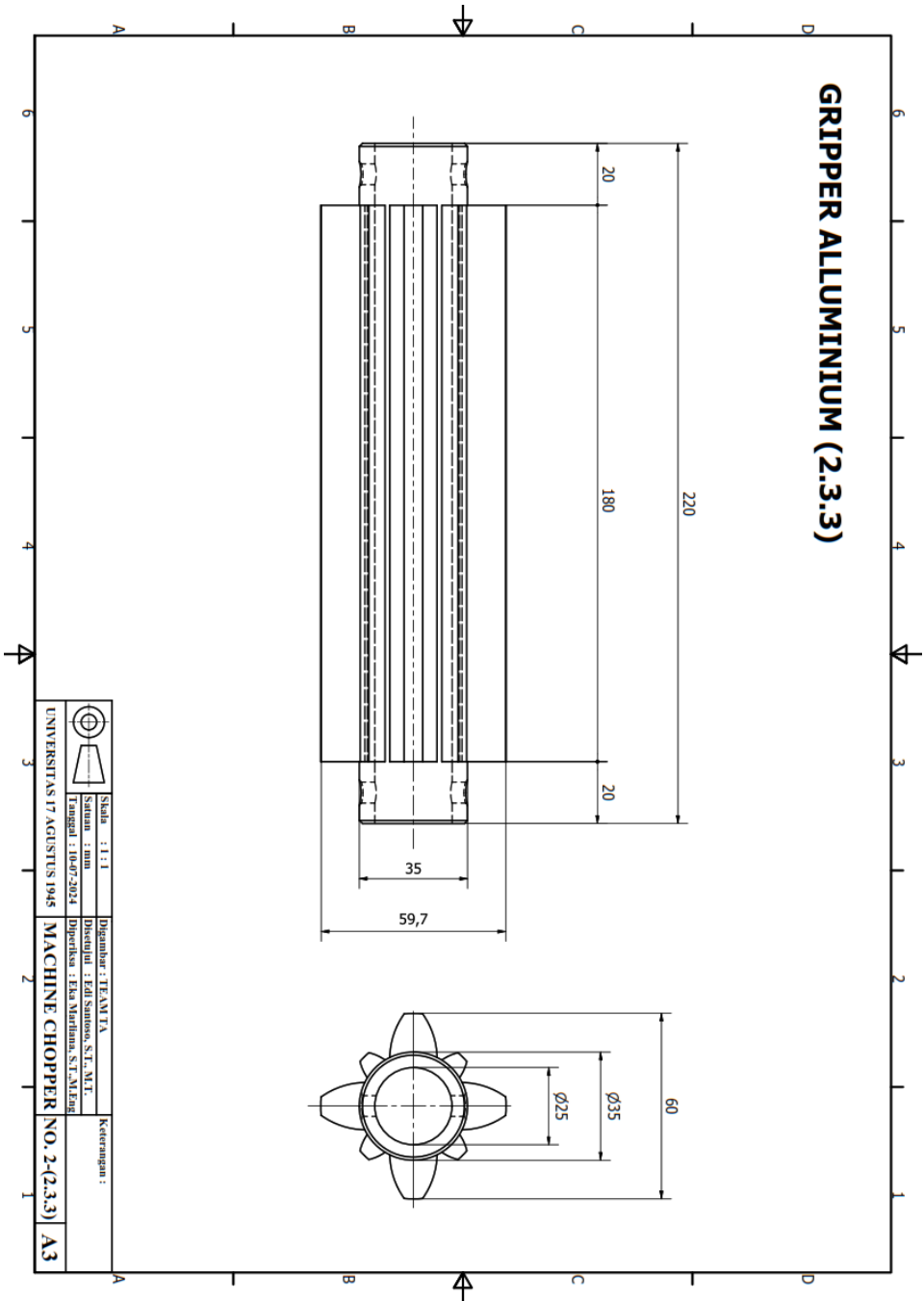


### AS GRIPPER 2 (2.3)

2-(2.3.5)	Spure gear 3M 18T 20PA	Generic	1
2-(2.3.4)	Ball bearing 68 ISO 15 ABB - 1025 - 14 DE AC 14	Generic	2
2-(2.3.3)	GRIPPER ALUMINIUM	Generic	1
2-(2.3.2)	Assen Spure Gear 114 -108 TEETH	Generic	1
2-(2.3.1)	AS GRIPPER	Generic	1
ITEM	PART NUMBER	MATERIAL	QTY
PARTS LIST			
Skala : 1 : 2		Disain : TEANITA	
Satuan : mm		Disain : Edi Santoso, S.T., M.T.	
Tanggal : 10-07-2024		Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945		MACHINE CHOPPER NO. 2-(2.3)	
			A3

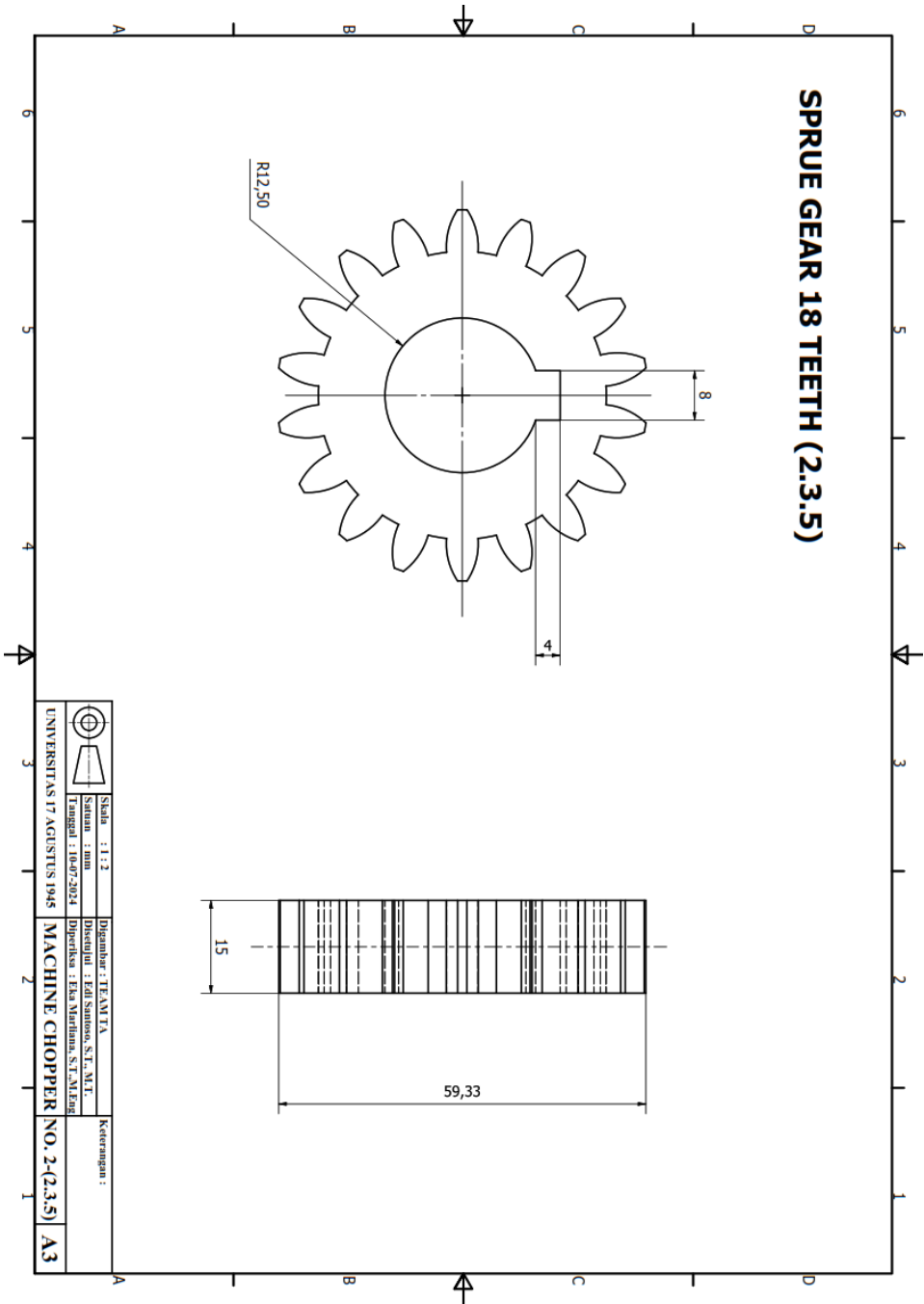


# GRIPPER ALUMINIUM (2.3.3)



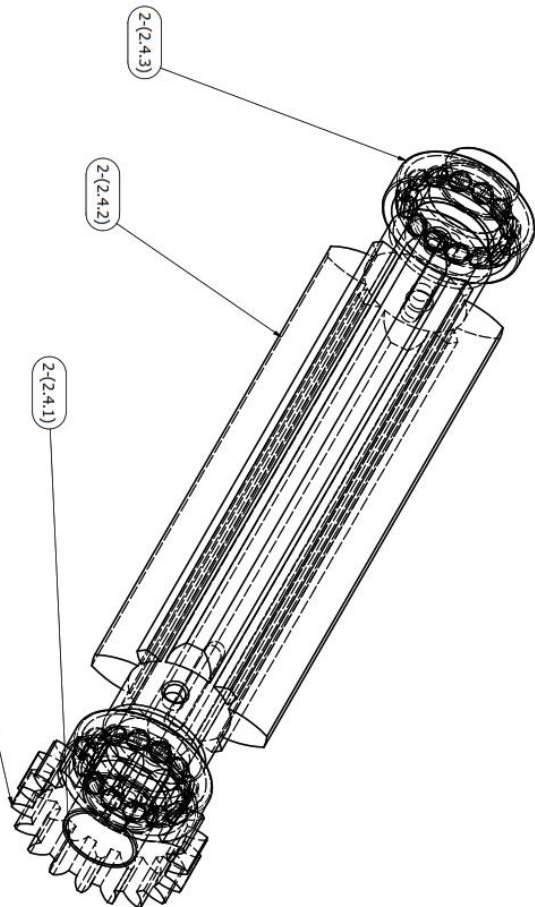
	Skala : 1 : 1	Digambar : TE AMITA	Keterangan :
	Satuan : mm	Disebutkan : Edi Santoso, S.T., M.T.	
Tanggal : 10-07-2024		Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945		<b>MACHINE CHOPPER (NO. 2-(2.3.3))</b>	
		<b>A3</b>	

# SPRUE GEAR 18 TEETH (2.3.5)



	Skala : 1 : 2	Disain oleh : TE ANITA	Keterangan :
	Satuan : mm	Dibuat oleh : Edi Santoso, S.T., M.T.	
	Tanggal : 04-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945		MACHINE CHOPPER (NO. 2(2.3.5)) A3	

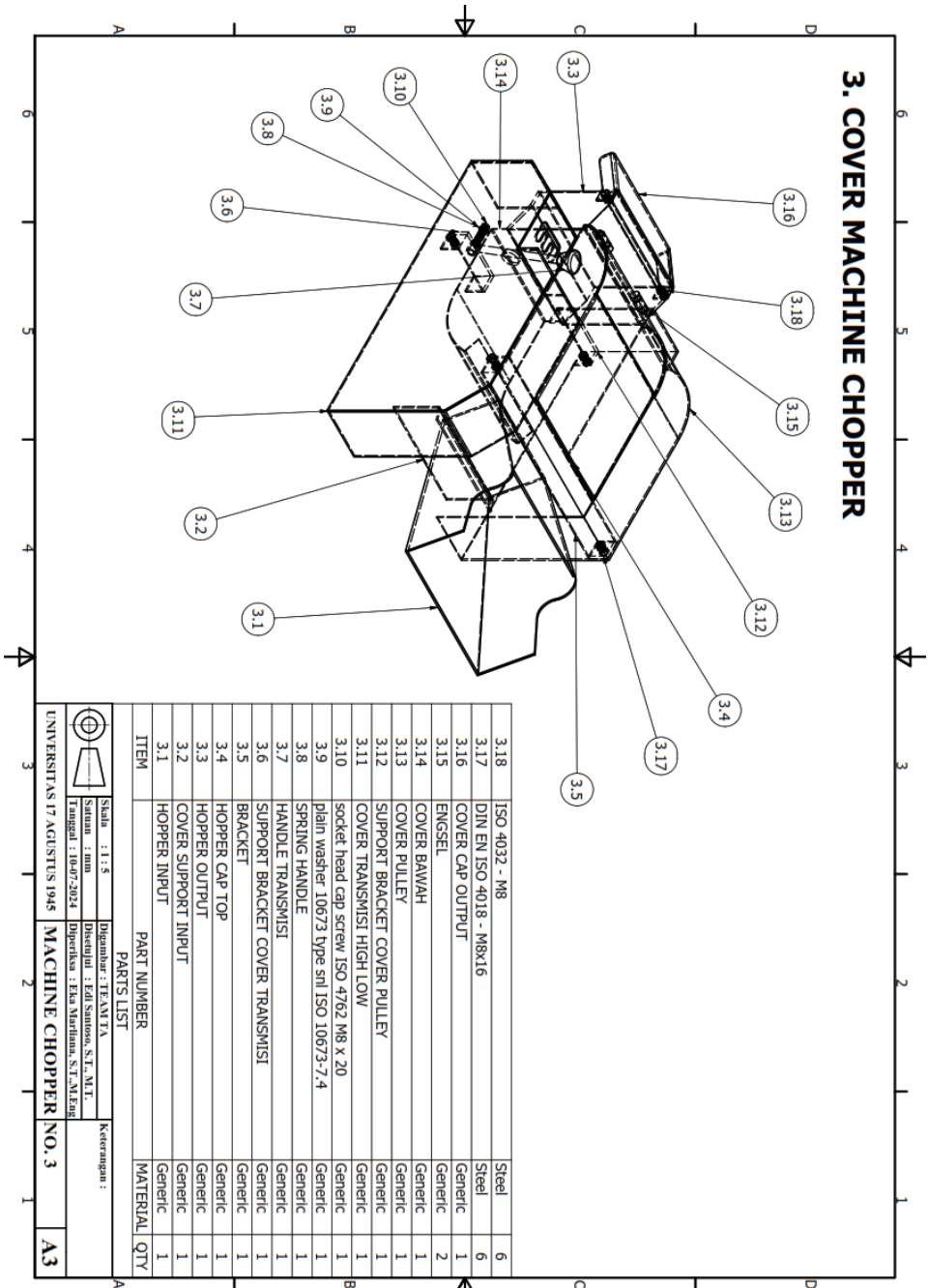
# AS GRIPPER 1 (2.4)



2-(2.4.4)	ISO Spure gear 3M 18T 20PA 15FW	Generic	1
2-(2.4.3)	BALL BEARING 68 ISO 15 ABB 1025 14/DE/AC 14	Generic	2
2-(2.4.2)	GRIPPER ALUMINIUM	Generic	1
2-(2.4.1)	AS GRIPPER	Generic	1
ITEM	PART NUMBER	MATERIAL	QTY
PARTS LIST			
Skala : 1 : 2		Dibambar : TEANITA	
Satuan : mm		Disetujui : Edi Santoso, S.T., M.T.	
Tanggal : 10-07-2024		Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945		MACHINE CHOPPER NO. 2.4	
			A3



### 3. COVER MACHINE CHOPPER

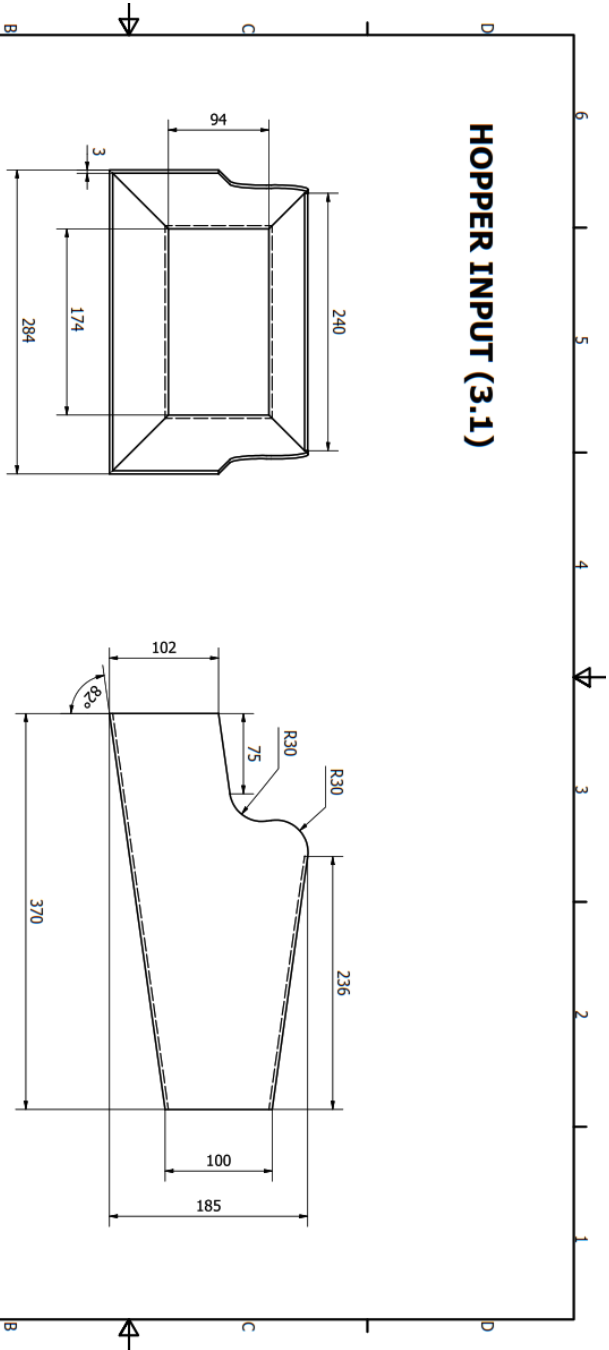




3.18	ISO 4032 - M8	Steel	6
3.17	DIN EN ISO 4018 - M8x16	Steel	6
3.16	COVER CAP OUTPUT	Generic	1
3.15	ENGSEL	Generic	2
3.14	COVER BAWAH	Generic	1
3.13	COVER PULLEY	Generic	1
3.12	SUPPORT BRACKET COVER PULLEY	Generic	1
3.11	COVER TRANSMISI HIGH LOW	Generic	1
3.10	socket head cap screw ISO 4762 M8 X 20	Generic	1
3.9	plain washer 10673 type sm ISO 10673-7.4	Generic	1
3.8	SPRING HANDLE	Generic	1
3.7	HANDLE TRANSMISI	Generic	1
3.6	SUPPORT BRACKET COVER TRANSMISI	Generic	1
3.5	BRACKET	Generic	1
3.4	HOPPER CAP TOP	Generic	1
3.3	HOPPER OUTPUT	Generic	1
3.2	COVER SUPPORT INPUT	Generic	1
3.1	HOPPER INPUT	Generic	1
ITEM	PART NUMBER	MATERIAL	QTY

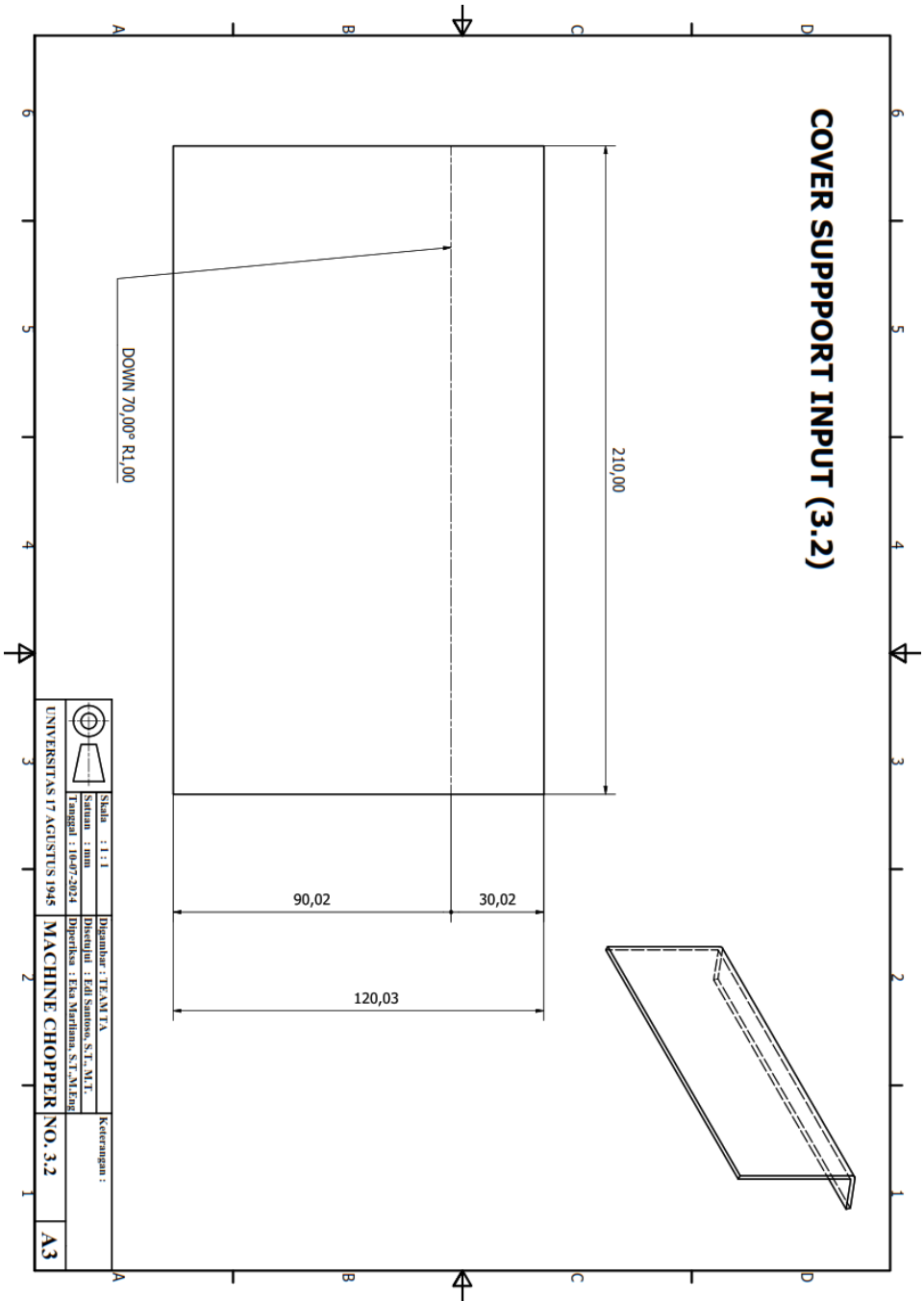
**PARTS LIST**

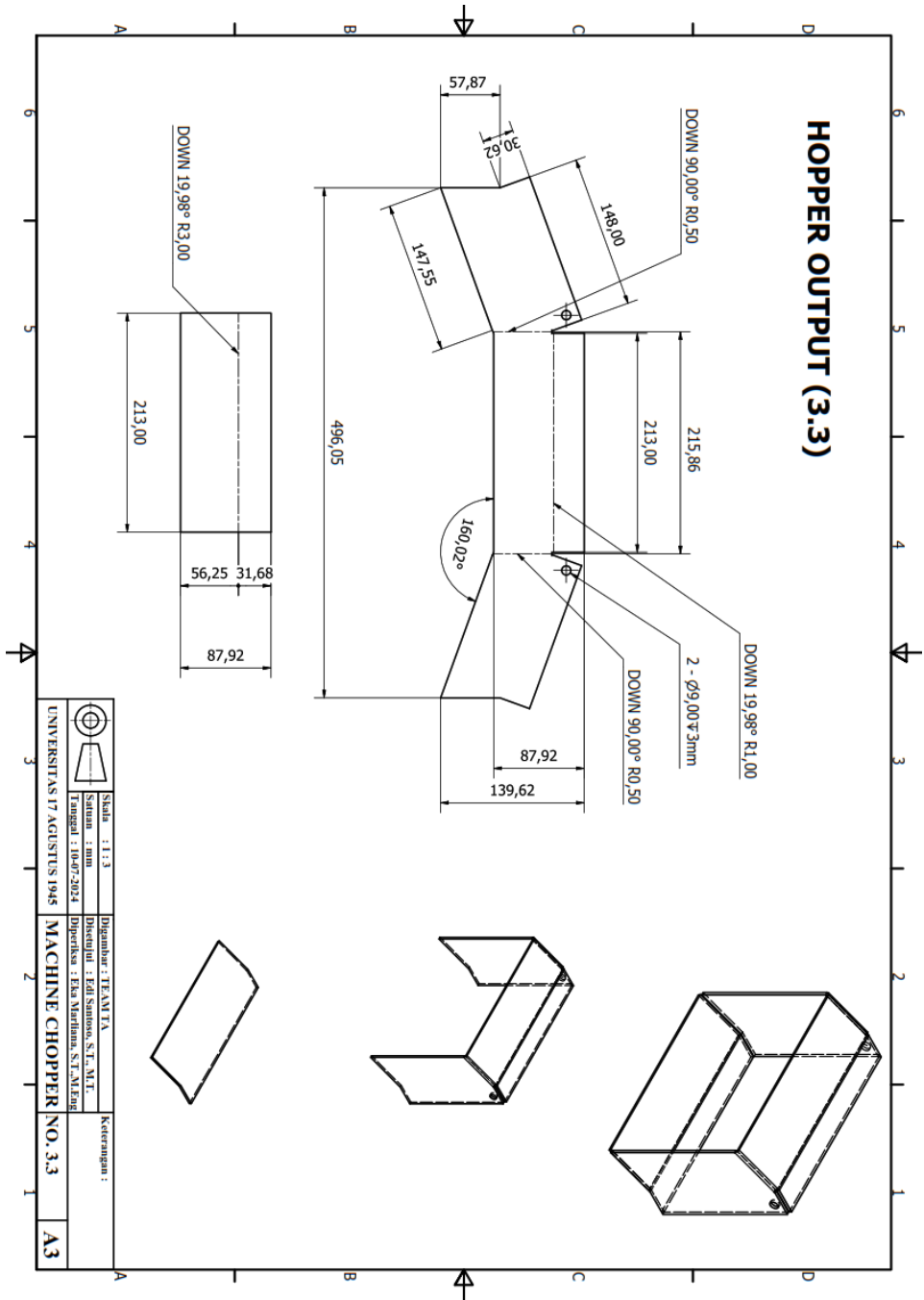
Skala : 1:1.5	Disain: TE AMITA	Kelemangan:
Satuan : mm Tanggal : 10-07-2024	Disetujui : Edi Santoso, S.T., M.T. Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945	<b>MACHINE CHOPPER NO. 3</b>	<b>A3</b>

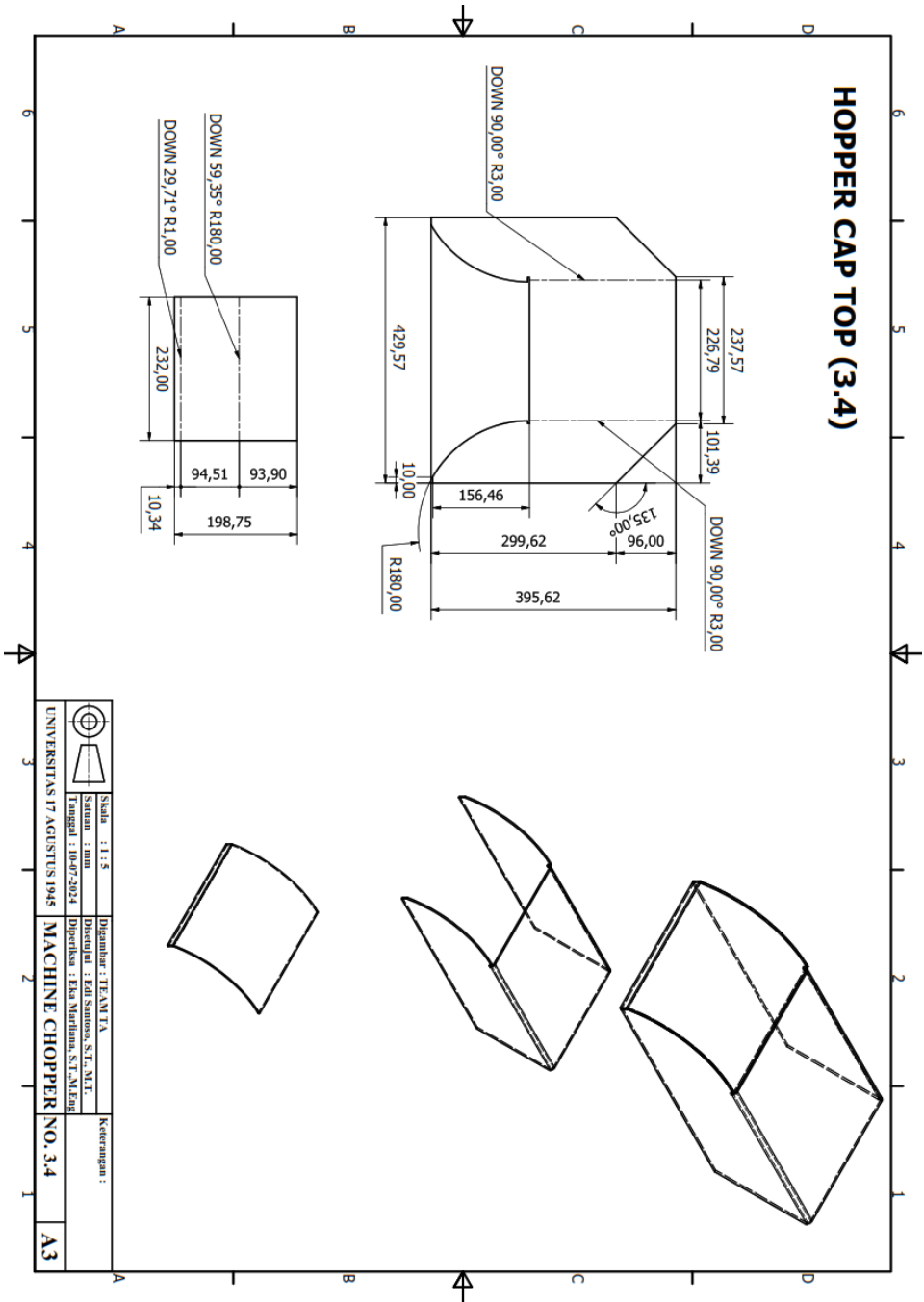
# HOPPER INPUT (3.1)

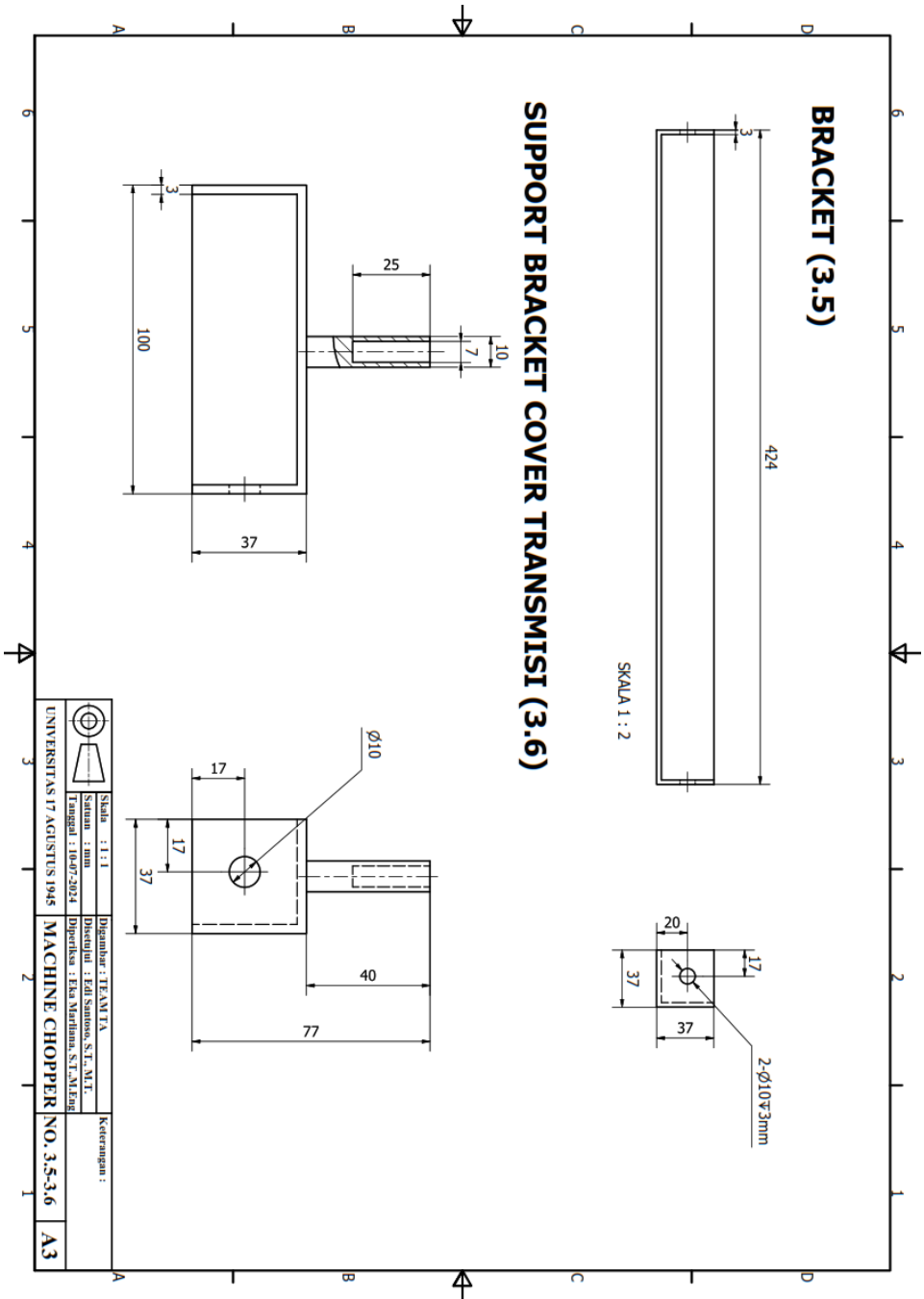


	Skala : 1 : 1.3	Digambar : TEANITA	Keterangan :
	Satuan : mm	Dibuat : Edi Santoso, S.T., M.T.	
	Tanggal : 10-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945	MACHINE CHOPPER NO. 3.1		A3

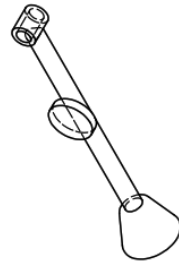
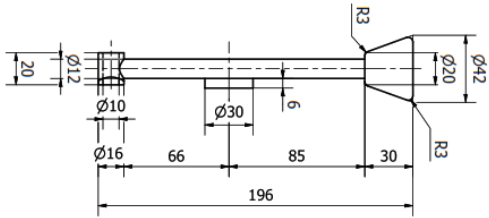




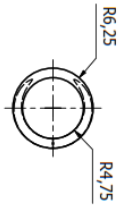




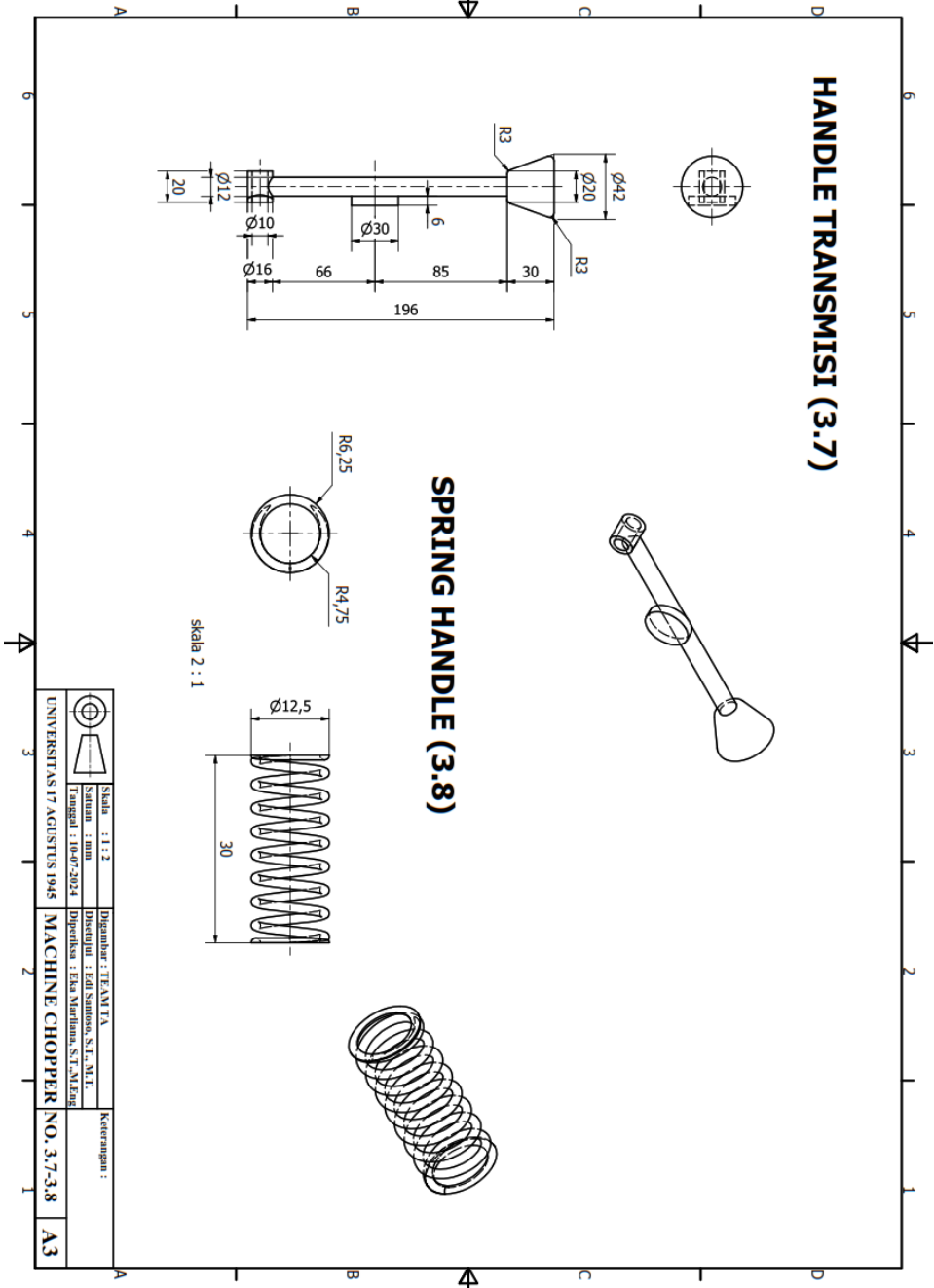
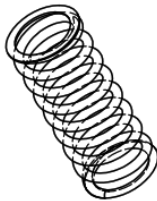
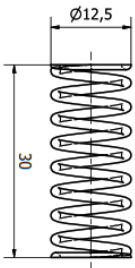
### HANDLE TRANSMISI (3.7)



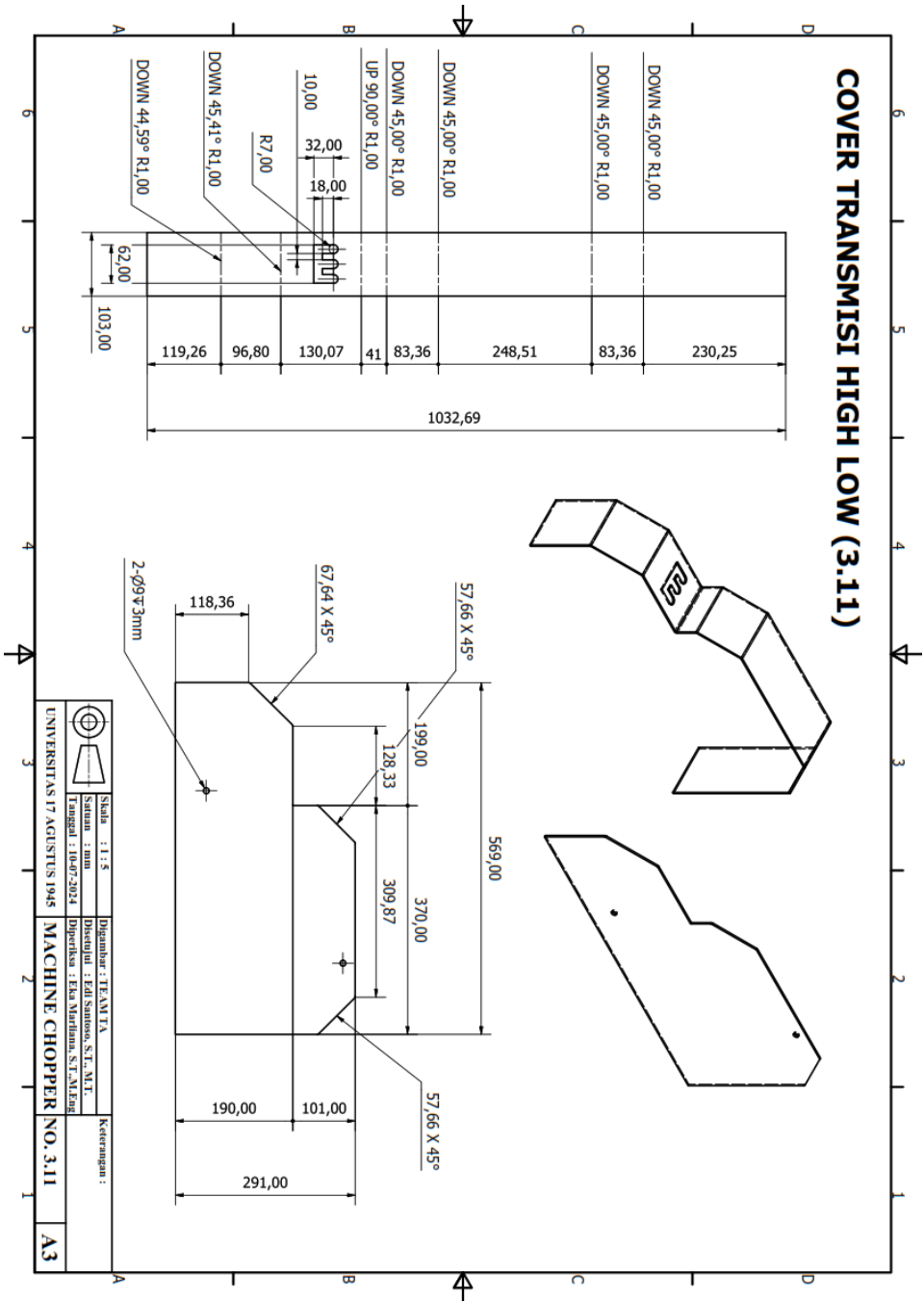
### SPRING HANDLE (3.8)



skala 2 : 1



	Skala : 1 : 2	Dipinjambar : TE ANITA	Keterangan :
	Satuan : mm	Disebutjui : Edi Santoso, S.T., M.T.	
	Tanggal : 10-07-2024	Diperiksa : Eka Marlina, S.T., M.Eng	
UNIVERSITAS 17 AGUSTUS 1945		<b>MACHINE CHOPPER NO. 3.7-3.8</b>	
			<b>A3</b>



# SUPPORT BRACKET COVER PULLEY (3.12)

