

## BIODATA PENULIS



Penulis dilahirkan di Banyuwangi, 12 Desember 1993, merupakan anak kedua dari 3 bersaudara. Penulis telah menempuh pendidikan formal yaitu di SDN 06 Banyuwangi, SMP 02 Harapan Banyuwangi dan SMK/STM Muhammadiyah 02 Banyuwangi. Setelah lulus dari SMK/STM tahun 2012 penulis diterima bekerja di AHASS

Berkah Jaya Motor selama 3 tahun. Pada tahun 2015 penulis bekerja di PT. Istana Tiara Surabaya hingga saat ini. Penulis mendaftar dan diterima di Jurusan Teknik Mesin FT-UM Surabaya pada tahun 2015 dan terdaftar dengan NRP. 2015.1331.031

## Lampiran 1. Mechanical Properties ST 60

Equivalent grade :

[DIN 17100 ST 60-2 steel plate/sheet](#) is in DIN 17100 standard. The comparison of steel grades is: DIN 17100:1990 ST 60-2, DIN17100 ST60-2, NFA 35-501 A60-2,BS1449,UNI7070 FE 590.

ST 60-2 DIN 17100	Comparison of steel grades	
	DIN 17100:1990	FE 590-2
	DIN17100	ST60-2
	NFA 35-501	A60-2
	BS1449	-
	UNI7070	FE 590

### [ST 60-2 steel Chemical analysis -% by mass\\*](#)

Main chemical composition in DIN 17100 ST 60-2 steel : Phosphorus max 0.045, Silicon max 0.045, please refer to the flowing table:

Chemical elements	C≤ 16mm max	C>16mm max	Si max	Mn max	P max.	S max.	N max
ST 60-2	-	-	-	-	0.045	0.045	0.012

### [ST 60-2 steel Mechanical properties](#)

DIN 17100 ST 60-2 is general Construction steels, The different thickness with different yield strength, tensile strength and fracture elongation. More detailed information about DIN 17100 ST 60-2 steel Mechanical Properties , please refer to the following table:

thickness	Yield Strength ReH [N/mm2] transv.min.	Tensile Strength Rm [N/mm2] transv.	Fracture Elongation[%]transv. min.	Notch Impact Energy1)Ch Vcomplete samplelongitud. min [J]
t ≤ 16mm t > 16mm	335 325			-
t < 3mm t ≥ 3mm		590-770 570-710		
Up to 1.5mm			7	
1.51-2.00mm			8	
2.01-2.50mm			9	
2.51-2.99mm			10	
≥ 3mm			14	

## Lampiran 2. Mechanical Properties ST 37

DIN 17100 St 37-2 steel equivalent grade:

St 37-2 DIN 17100 Material #:1.0037	Comparison of steel grades	
	EN 10025	S235JR
	NFA 35-501	E 24-2
	UNI 7070	Fe 360 B
	BS 4360	40 A
	ASTM	A 283 C – A 570 Gr. 33

St 37-2 steel plate/sheet is in DIN 17100 standard, the material number is 1.0037. The equivalent grade of St 37-2 steel are EN 10025 EN 10025, NFA 35-501 E 24-2, UNI 7070 Fe 360 B, BS 4360 40 A, ASTM A 283 C – A 570 Gr. 33. DIN 17100 St 37-2 steel chemical composition %:

Main chemical composition in DIN 17100 St 37-2 steel is carbon max 0.17, manganese max 1.40, phosphorus max 0.045, sulphur max 0.045. More detailed information about DIN 17100 St 37-2 steel, please refer to the down table:

Chemical elements	C≤ 16mm max	C>16mm max	Si max	Mn max	P max.	S max.
%,by mass	0.17	0.17	–	1.40	0.045	0.045

DIN 17100 St 37-2 steel mechanical property:

thickness	Yield Strength $R_{eH}$ [N/mm <sup>2</sup> ] transv.min.	Tensile Strength $R_m$ [N/mm <sup>2</sup> ] transv.	Fracture Elongation[%] transv. min.	Notch Impact Energy <sup>1</sup> ) $Ch$ Vcomplete samplelongitud. min [J]
t ≤ 16mm t > 16mm	235 225			Degree: 0 AV: 27J
t < 3mm t ≥ 3mm		360-510 340-470		
Up to 1.5mm 1.51-2.00mm 2.01-2.50mm 2.51-2.99mm ≥ 3mm			16 17 18 19 24	

### Lampiran 3. Mechanical Properties ASTM A36

#### ASTM A36 Steel, bar

Categories: [Metal](#), [Ferrous Metal](#), [ASTM Steel](#), [Carbon Steel](#), [Low Carbon Steel](#)

Material Notes: Steel for general structural purposes including bridges and buildings.

Key Words: UNS K02600

Vendors: No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English
Density	7.85 g/cc	0.284 lb/in <sup>3</sup>
Mechanical Properties	Metric	English
Tensile Strength, Ultimate	400 - 550 MPa	58000 - 79800 psi
Tensile Strength, Yield	250 MPa	36300 psi
Elongation at Break	20 %	20 %
	23 %	23 %
Modulus of Elasticity	200 GPa	29000 ksi
Compressive Yield Strength	152 MPa	22000 psi
Bulk Modulus	160 GPa	23200 ksi
Poissons Ratio	0.26	0.26
Shear Modulus	79.3 GPa	11500 ksi
Component Elements Properties	Metric	English
Carbon, C	0.29 %	0.29 %
Copper, Cu	>= 0.20 %	>= 0.20 %
Iron, Fe	98 %	98 %
Manganese, Mn	0.80 - 1.2 %	0.80 - 1.2 %
Phosphorous, P	0.040 %	0.040 %
Silicon, Si	0.15 - 0.40 %	0.15 - 0.40 %
Sulfur, S	0.050 %	0.050 %

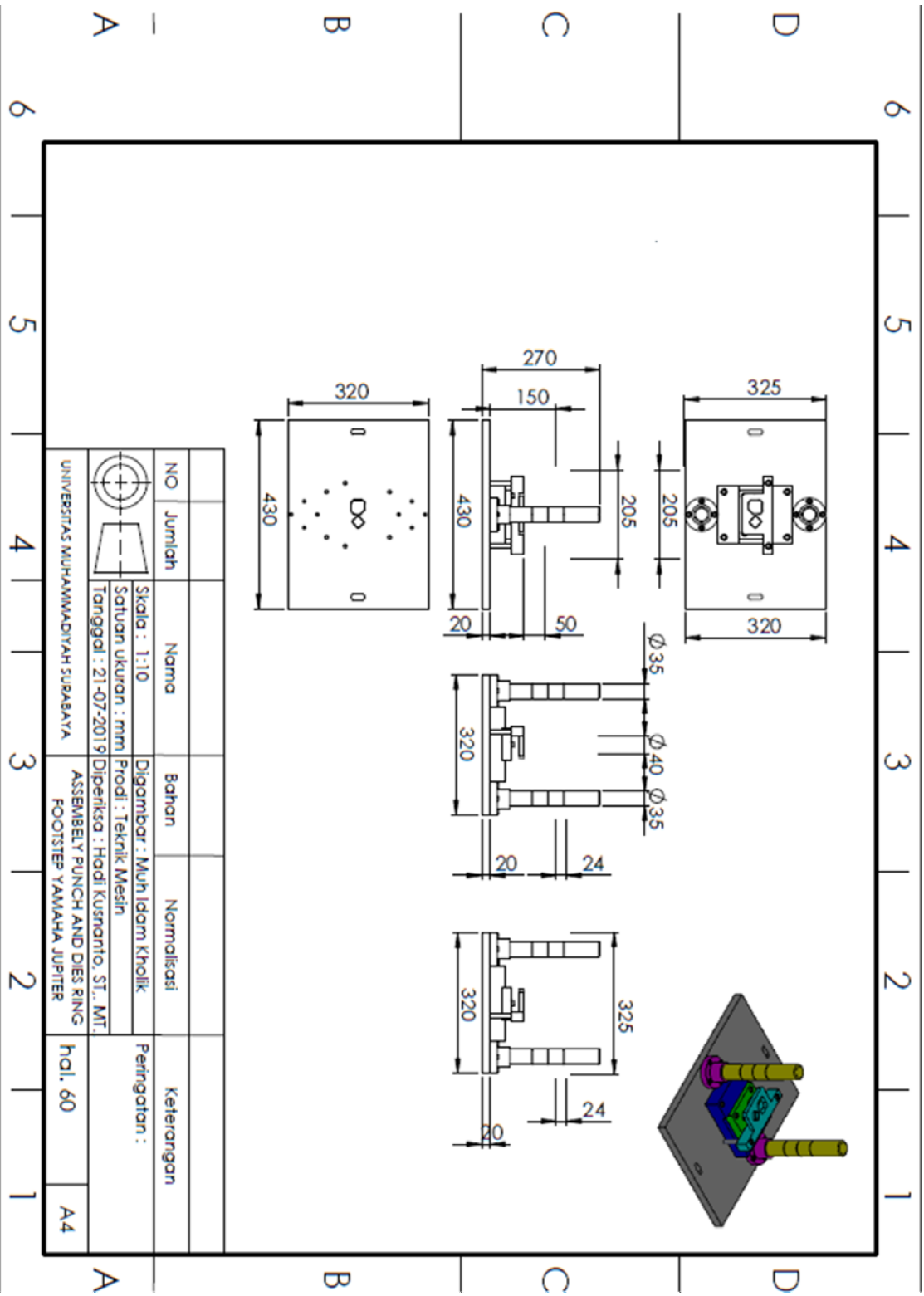
### Lampiran 4. Mechanical Properties SLD/SKD 11

#### Applications in cold work dies

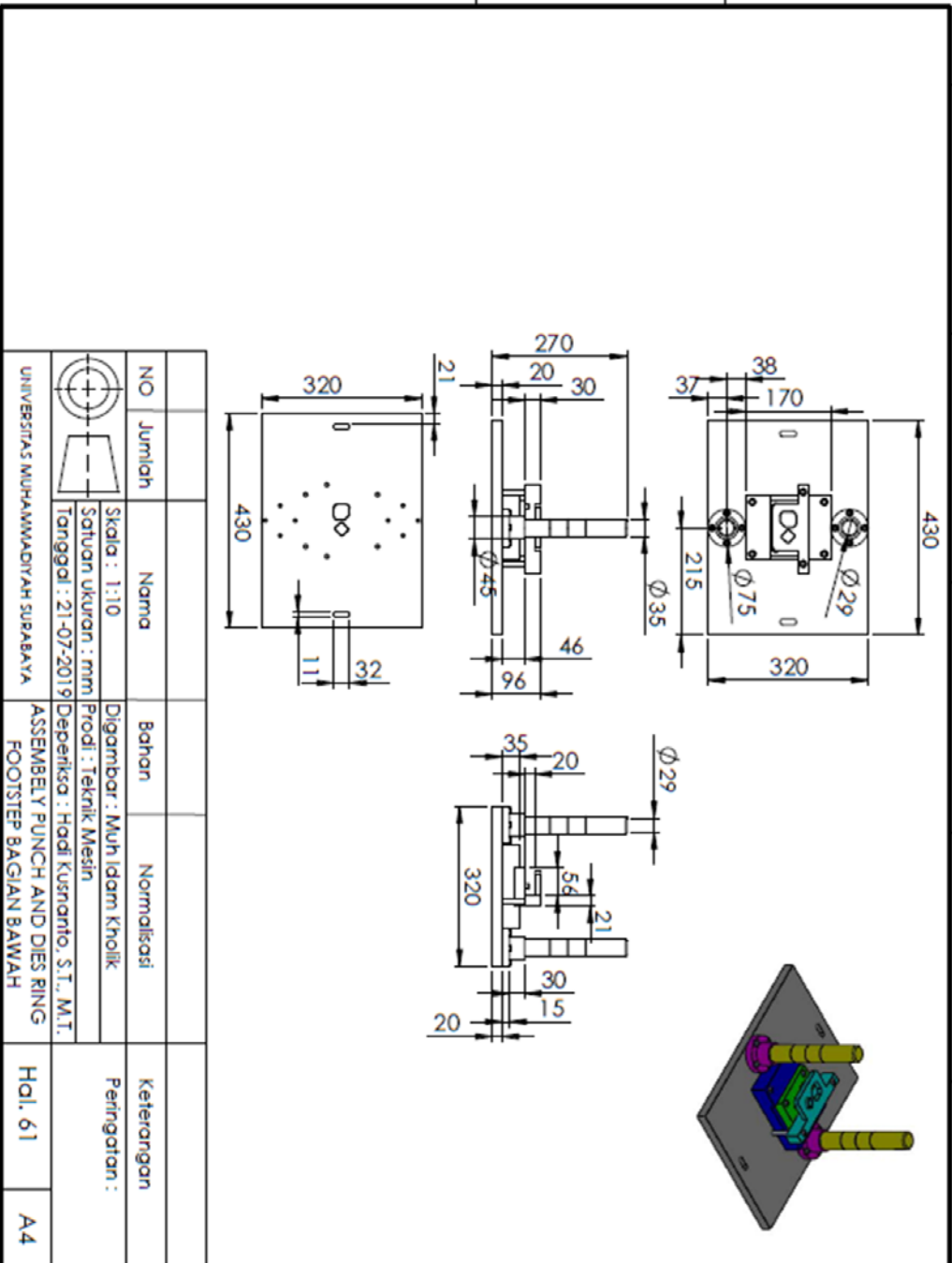
Application	Standard hardness (HRC)	Recommended YSS steel				
		For general use	For mass production use			
			For abrasion resistance	For impact resistance		
For plastic forming	Trimming die	For sheet use	55-60	SLD, SLD-MAGIC, ARK1	YXM1, HAP40	YXR3, YXR7
		For heavy plate use	50-55	DAC, DM		
	Cold hobbing die	55-60	SLD, SLD-MAGIC	YXM1		
	Drawing die	57-62	SLD, YXM1	HAP40		
Machine tooling	Shearing blade (straight tooth)	For sheet service	55-60	SLD, SLD-MAGIC, ARK1	YXM1, YXR7	YXR3
		For medium plate	53-58	SLD, SLD-MAGIC, ARK1, ACDB		YXR33
		For heavy plate	48-53	DM, ACDB		
	Rotary shear slitters	54-60	SLD, SLD-MAGIC, ARK1	YXM1, HAP40		
	Billet shear	Thicknesses 50mm and under	50-55	DM, ACDB		
		Thicknesses over 50mm	48-53	DAC, DM, ACDB		
	Gauges	60-64	SGT, ACB37, YCS3			

#### Physical properties

Grade	Thermal expansion coefficient x10 <sup>-6</sup> /C 20-200°C	Thermal conductivity W/(m·K) 20°C	Young's modulus GPa
SLD-MAGIC	12.2	16.5	209
SLD	11.2	20.6	211
SGT	13.6	23.3	201
YCS3	14.3	25.9	207
YXM1	11.2	21.0	216
YXR3	11.3	18.7	212
HAP40	10.3	19.3	227



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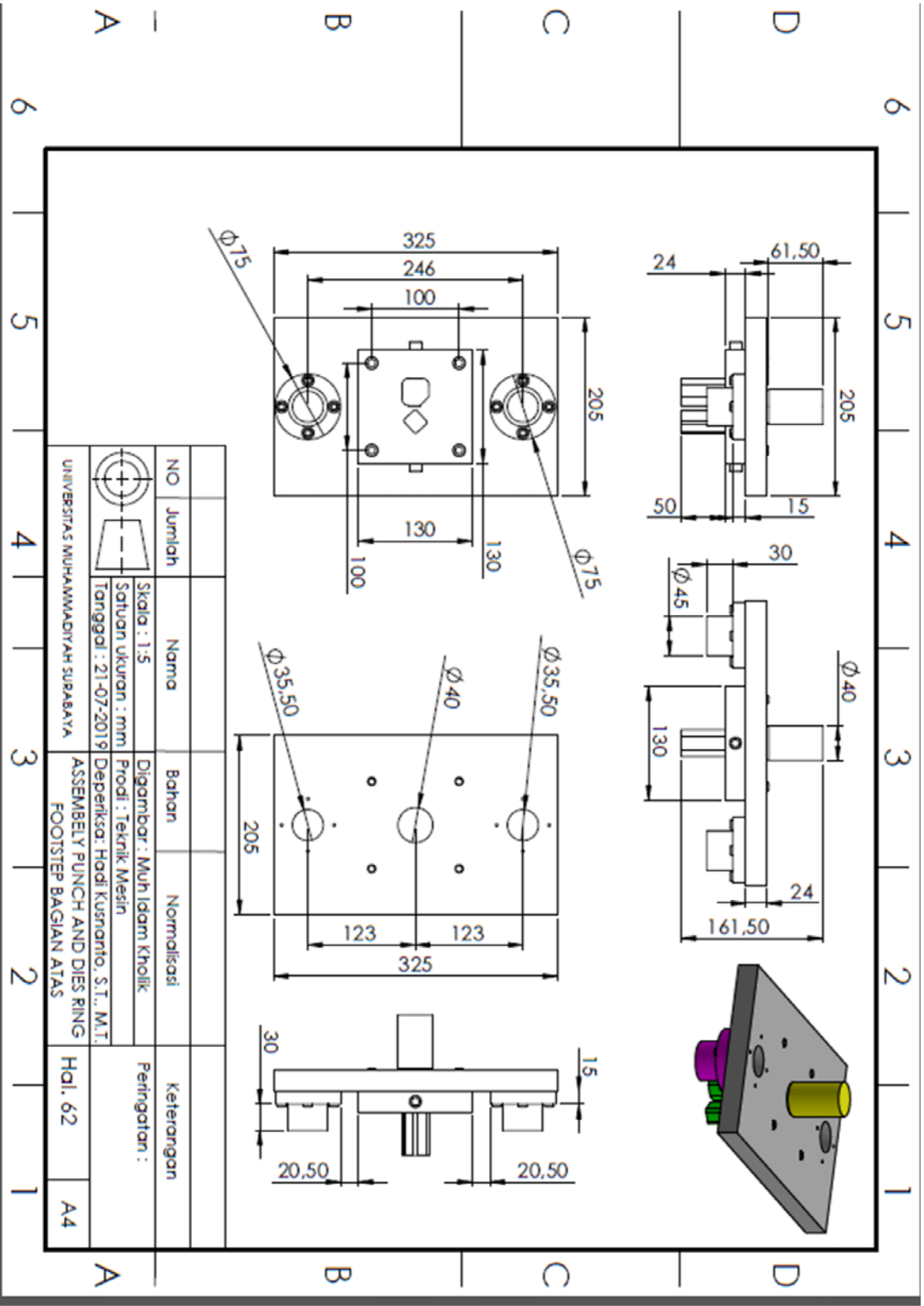
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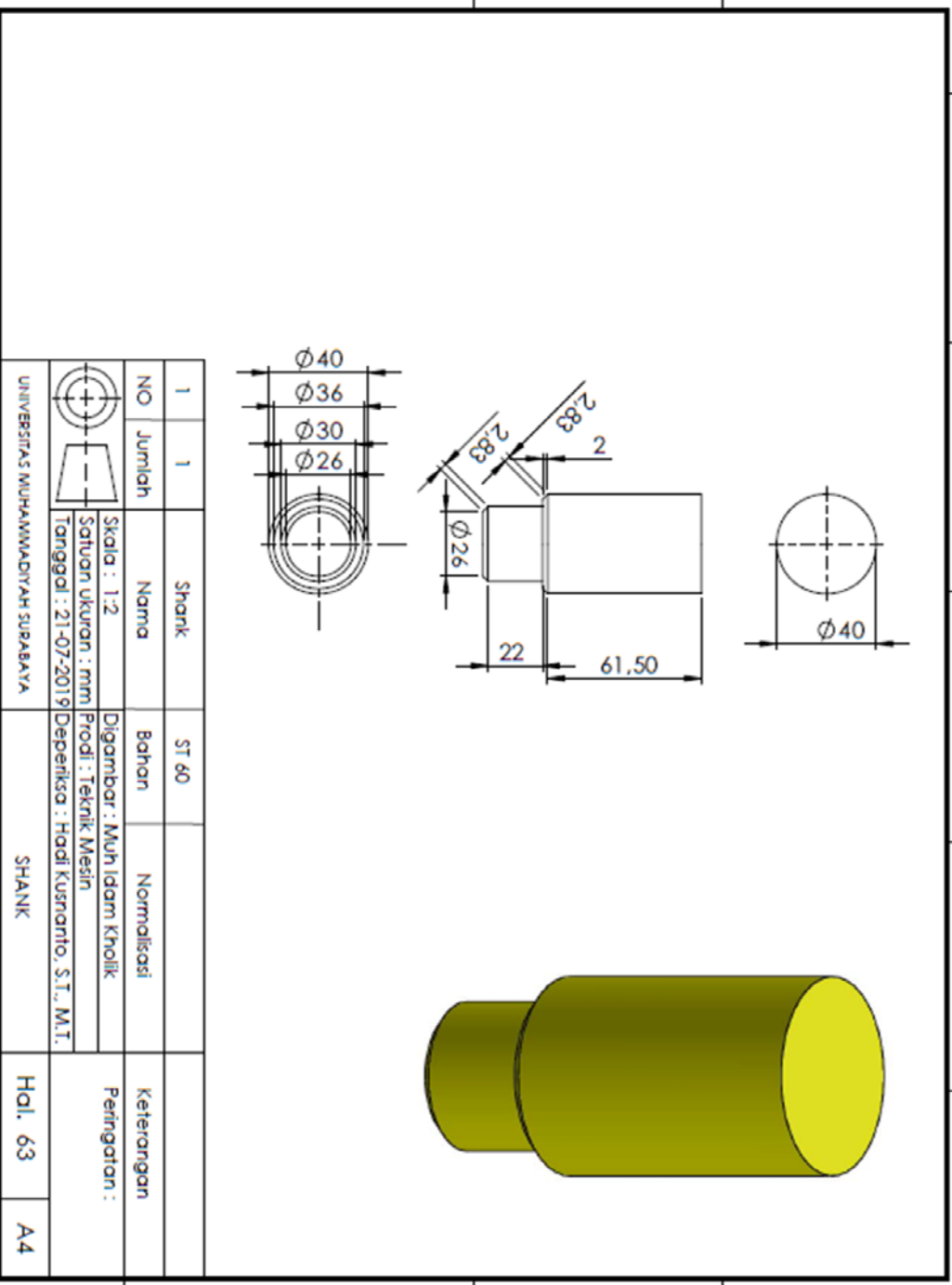
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NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:5	Digambar : Muh Idam Khoik		Peringatan : Hal. 62 A4
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depeniksa: Hadi Kusnanto, S.T., M.T.		
		UNIVERSITAS MUHAMMADIYAH SURABAYA		ASSEMBLY PUNCH AND DIES RING FOOTSTEP BAGIAN ATAS	

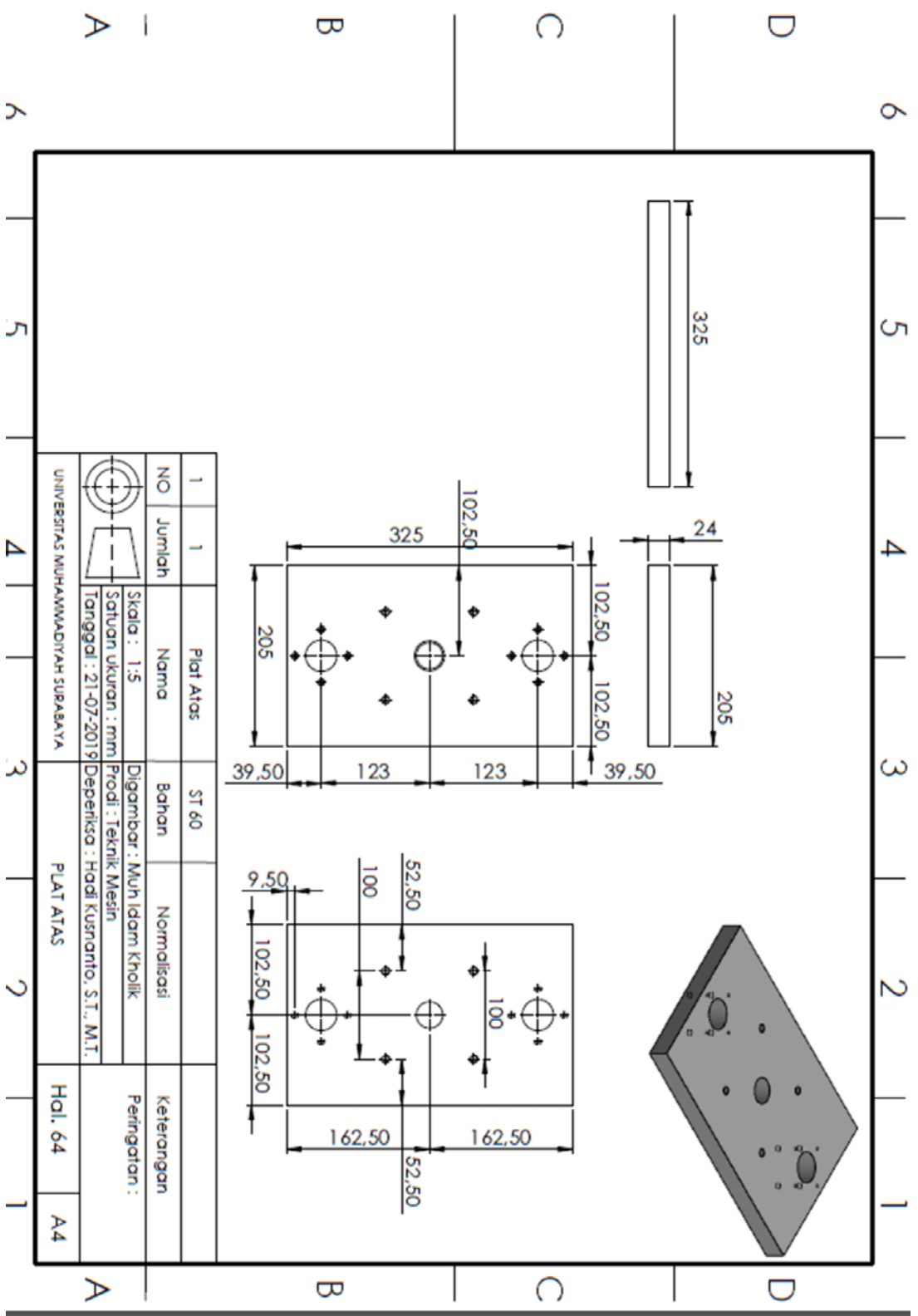


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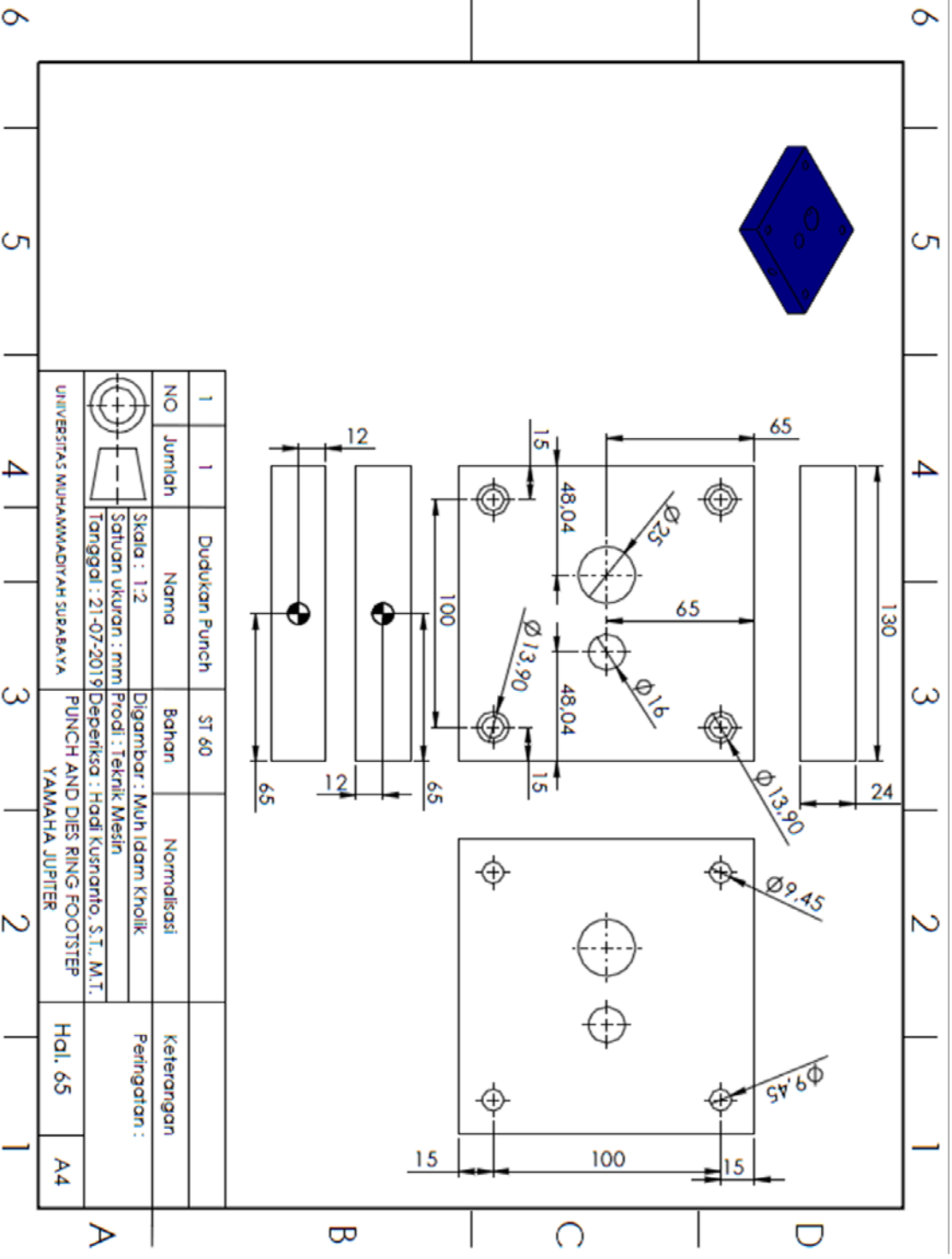




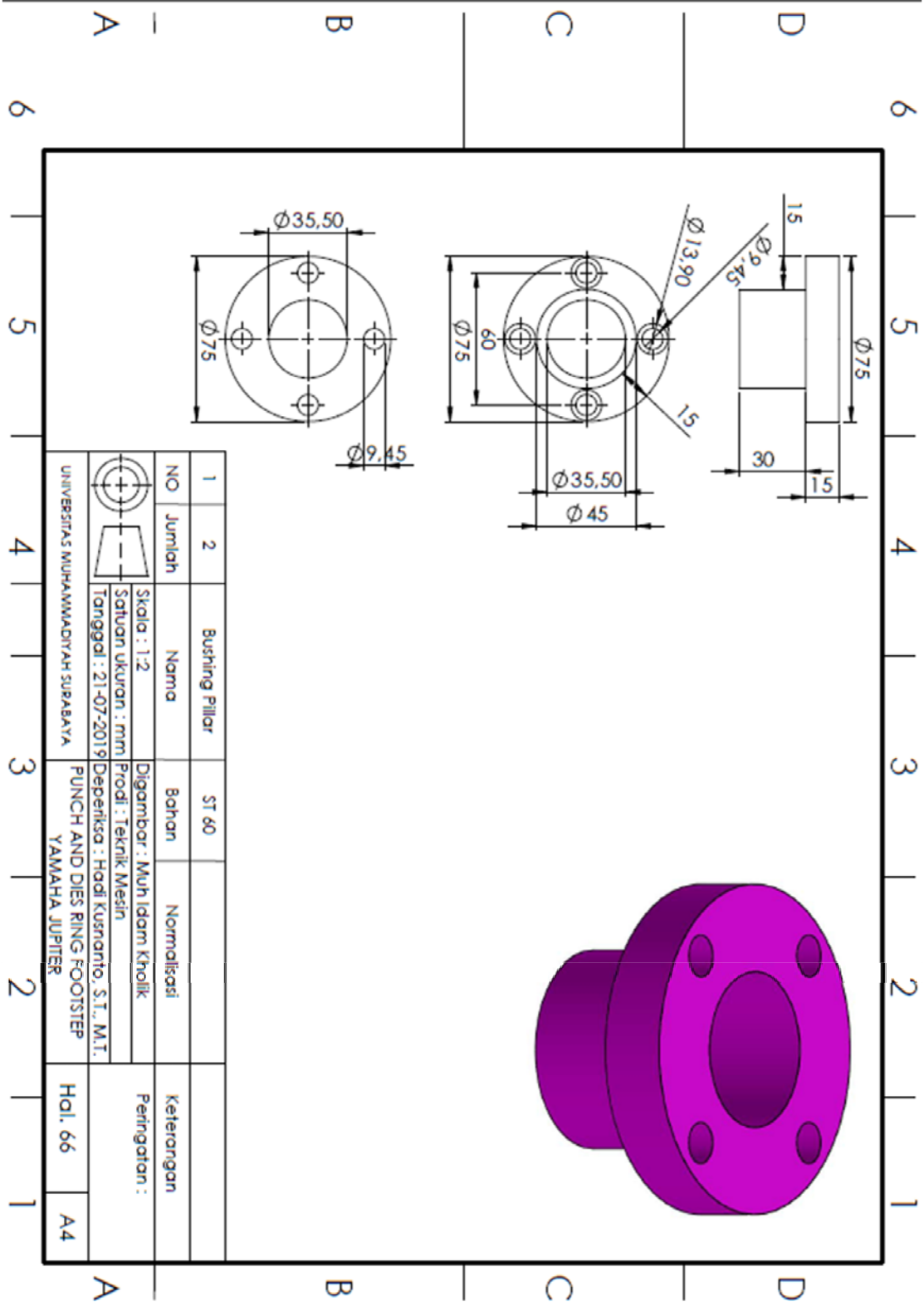
1	1	Plat Atas	ST 60		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:5	Digambar : Muh Idam Khoik		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depenisa : Hadi Kusanto, S.T., M.T.		
UNIVERSITAS MUHAMMADIYAH SURABAYA			PLAT ATAS		Hql. 64
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1	1	Dudukan Punch	ST 60		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:2	Digambar : Muh Idam Khoik		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depertisa : Hadi Kusanto, S.T., M.T.		
UNIVERSITAS MUHAMMADIYAH SURABAYA			PUNCH AND DIES RING FOOTSTEP		Hdl. 65
			YAMAHA JUPITER		A4



1	2	Bushing Pillar	ST 60		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:2	Digambar : Muh Idam Khoik		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depertisa : Hadi Kusnanto, S.T., M.T.		
UNIVERSITAS MUHAMMADIYAH SURABAYA			PUNCH AND DIES RING FOOTSTEP		Hal. 66
			YAMAHA JUPITER		A4

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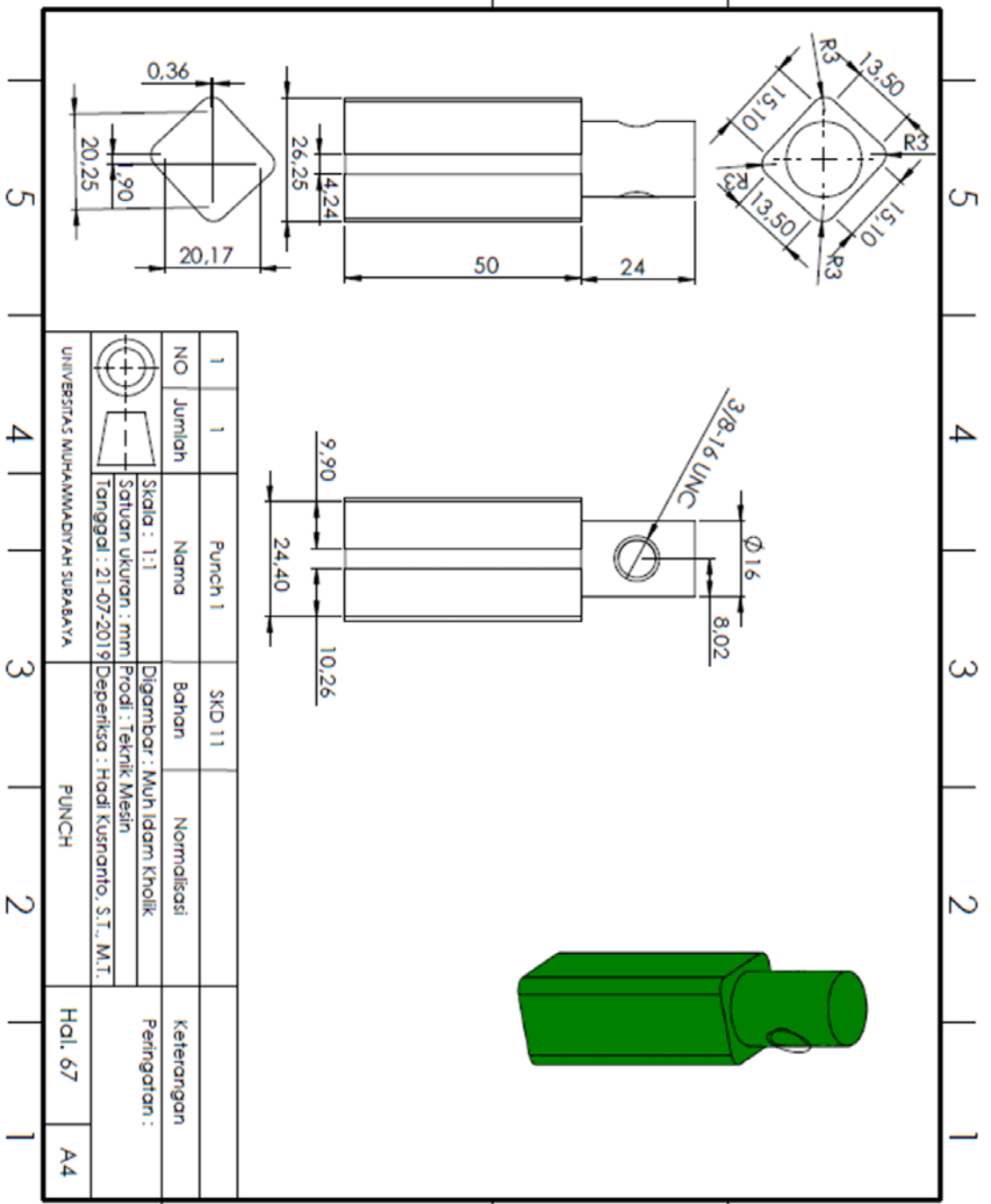
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1	1	Punch 1	SKD 11		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:1	Digambar : Muh Idam Khoik		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depesitka : Hadi Kusnanto, S.T., M.T.		
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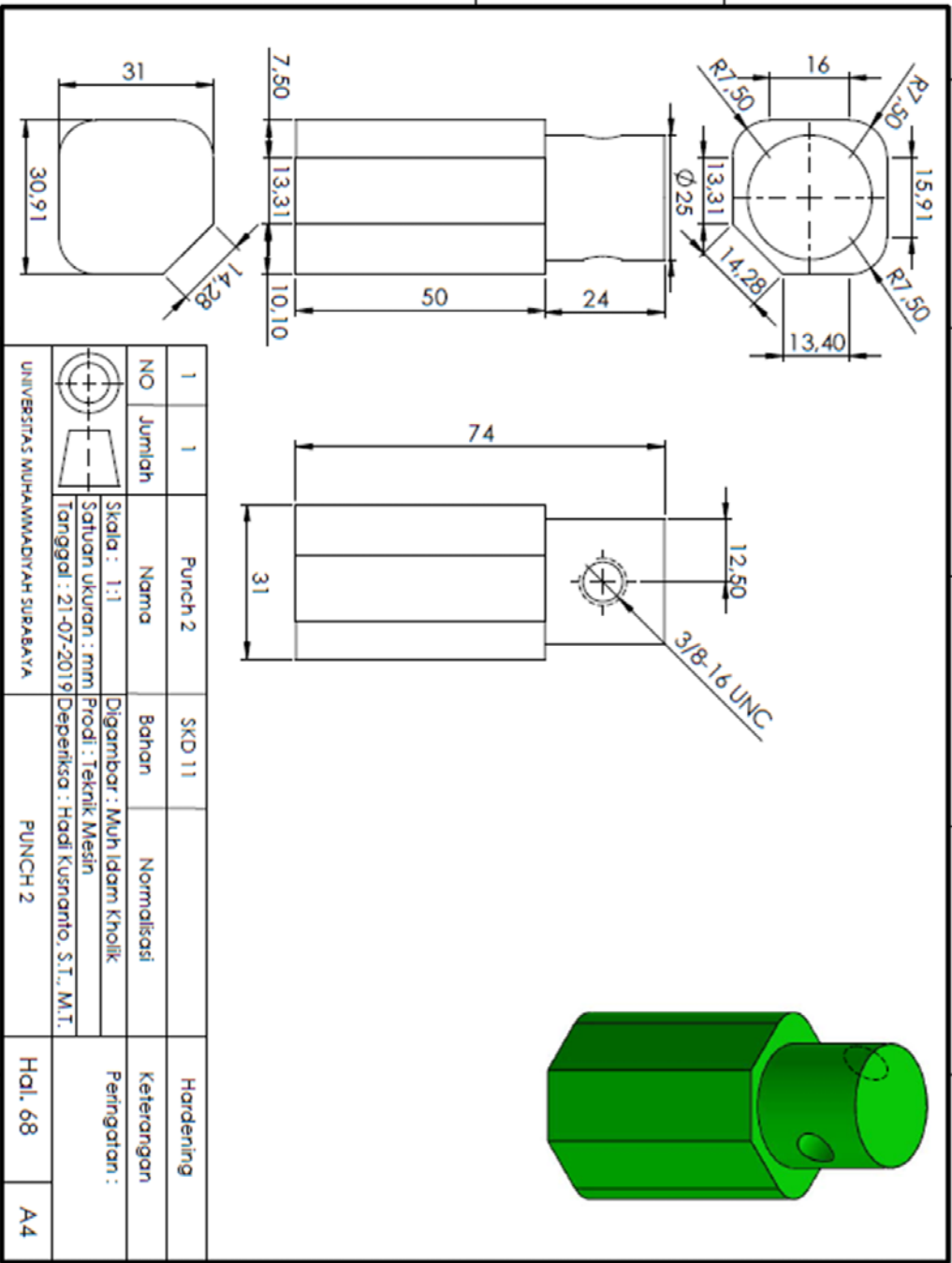
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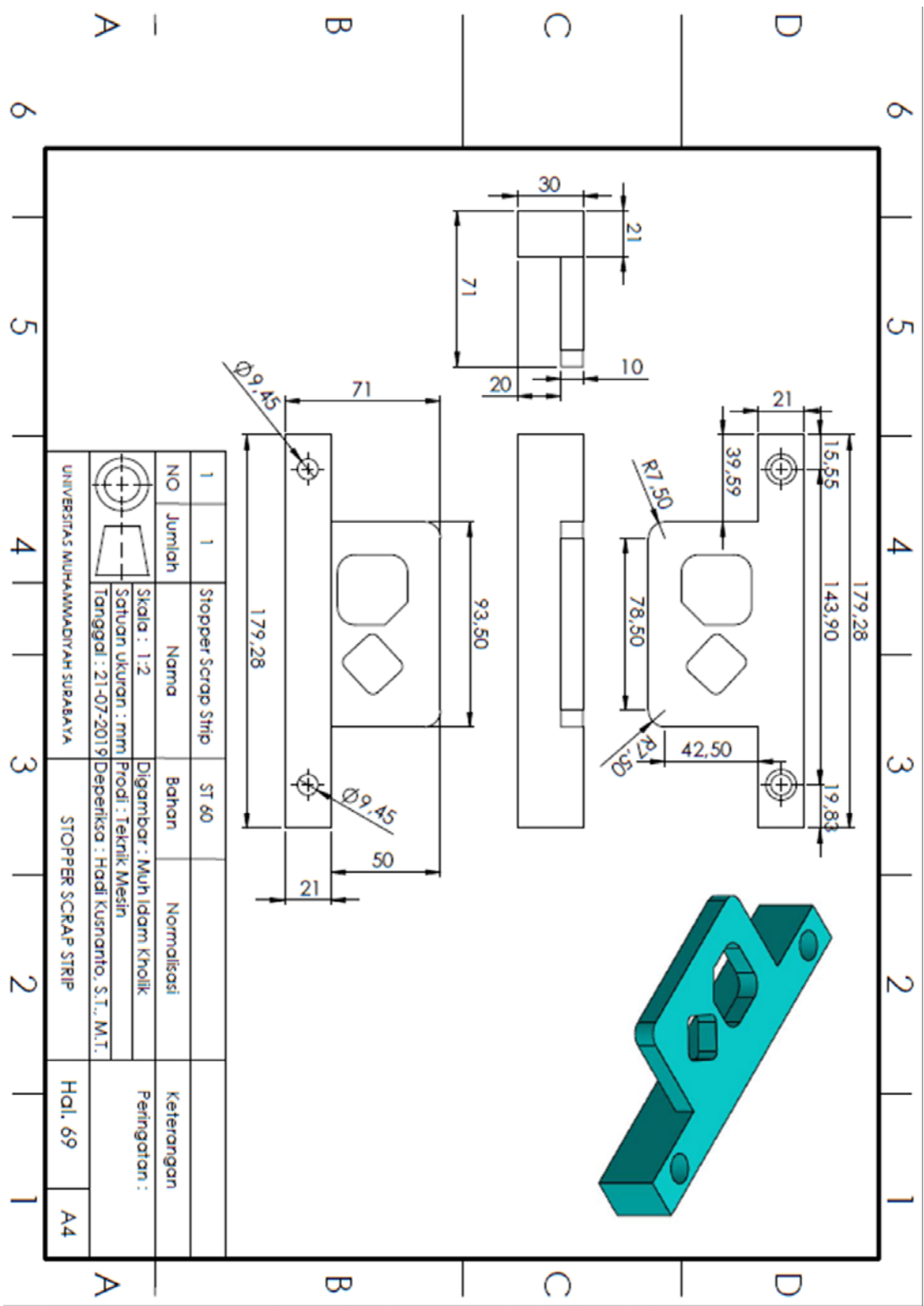
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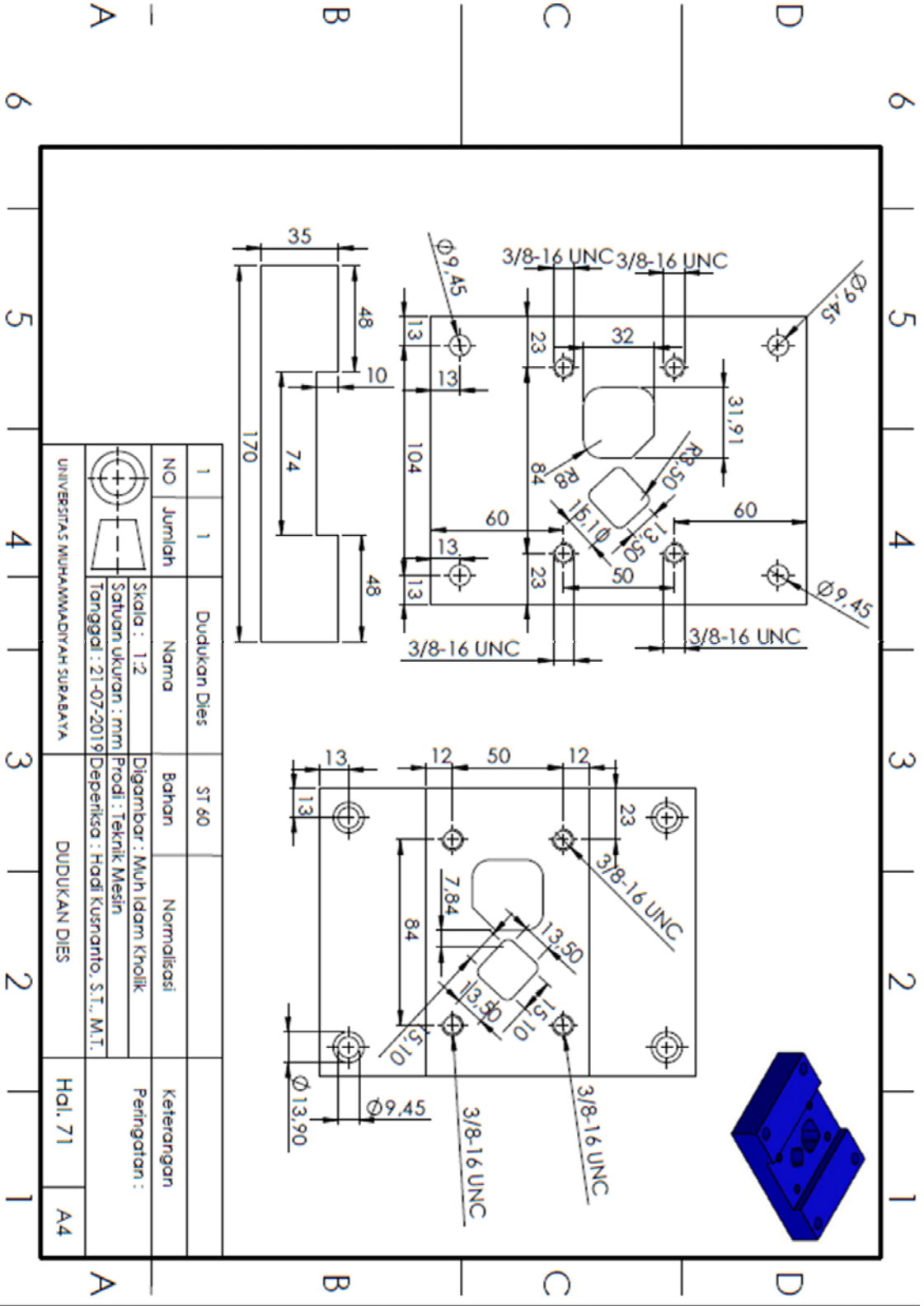
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A B C D A B C D



1	1	Stopper Scrap Strip	ST 60		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:2	Digambar : Muh Idam Khoilk		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Deperiksa : Hadi Kusnanto, S.T., M.T.		
UNIVERSITAS NUHUMANADITYAH SURABAYA			STOPPER SCRAP STRIP		Hal. 69
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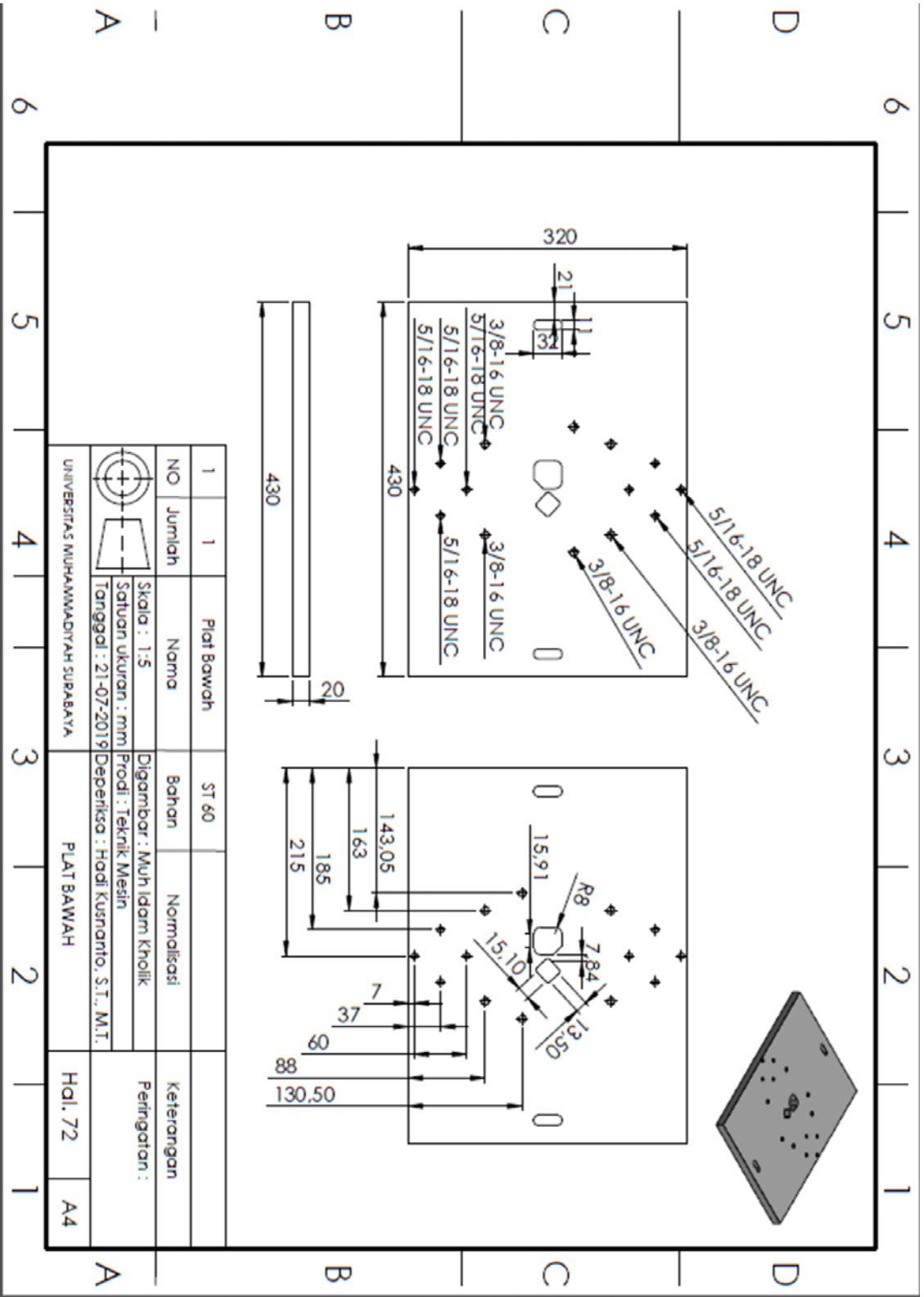




1	1	Dudukan Dies	ST 60		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:2	Digambar : Muh Idam Khoilk		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depenliso : Hadi Kusnanto, S.T., M.T.		
UNIVERSITAS MUHAMMADIYAH SURABAYA			DUDUKAN DIES	Hql. 71	A4

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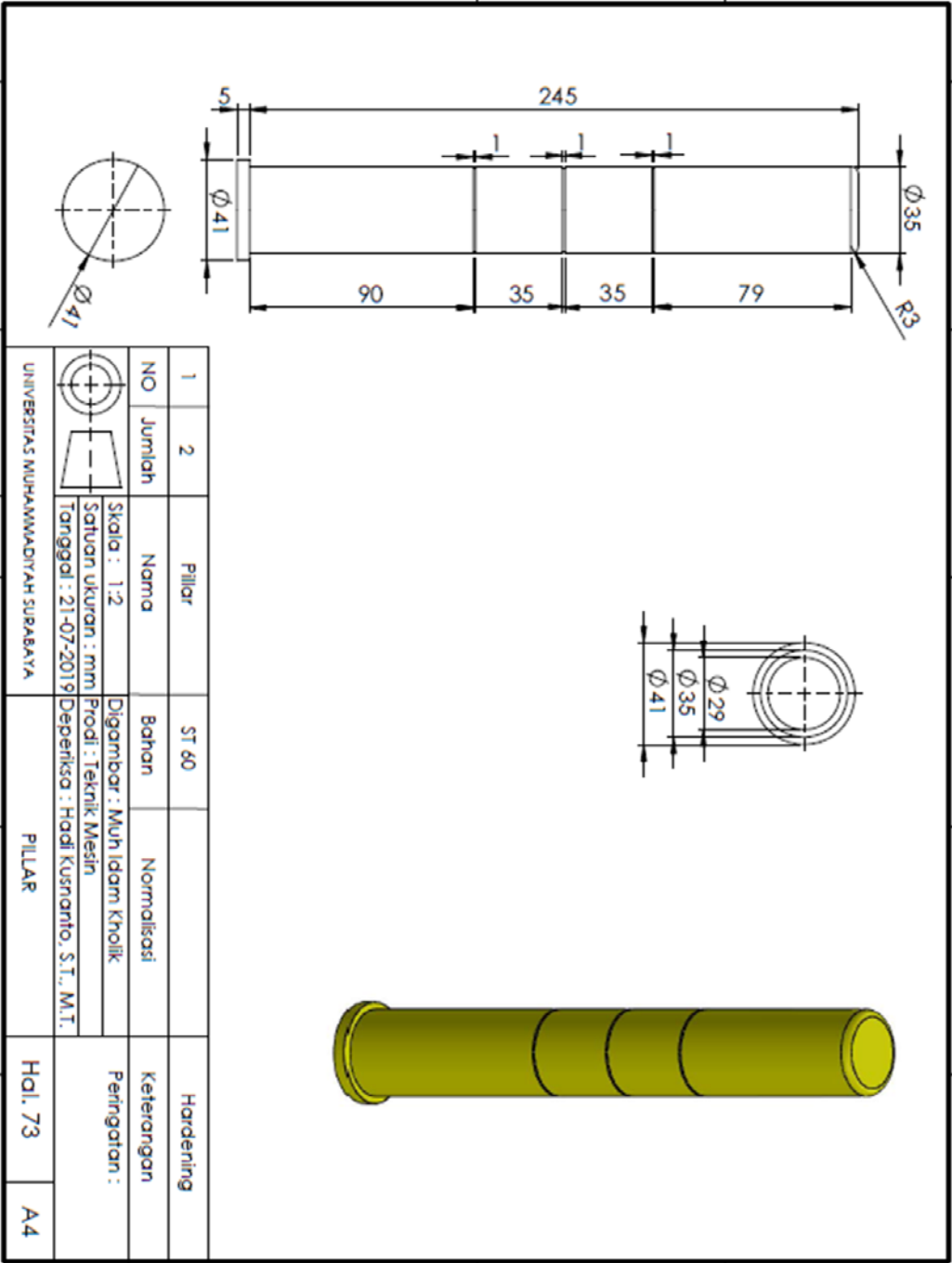




1	1	Plat Bawah	ST 60		
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:5	Digambar : Muh Idam Khoilik		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depeniksa : Hadi Kusnanto, S.T., M.T.		
UNIVERSITAS MUHAMMADIYAH SURABAYA			PLAT BAWAH		Hal. 72
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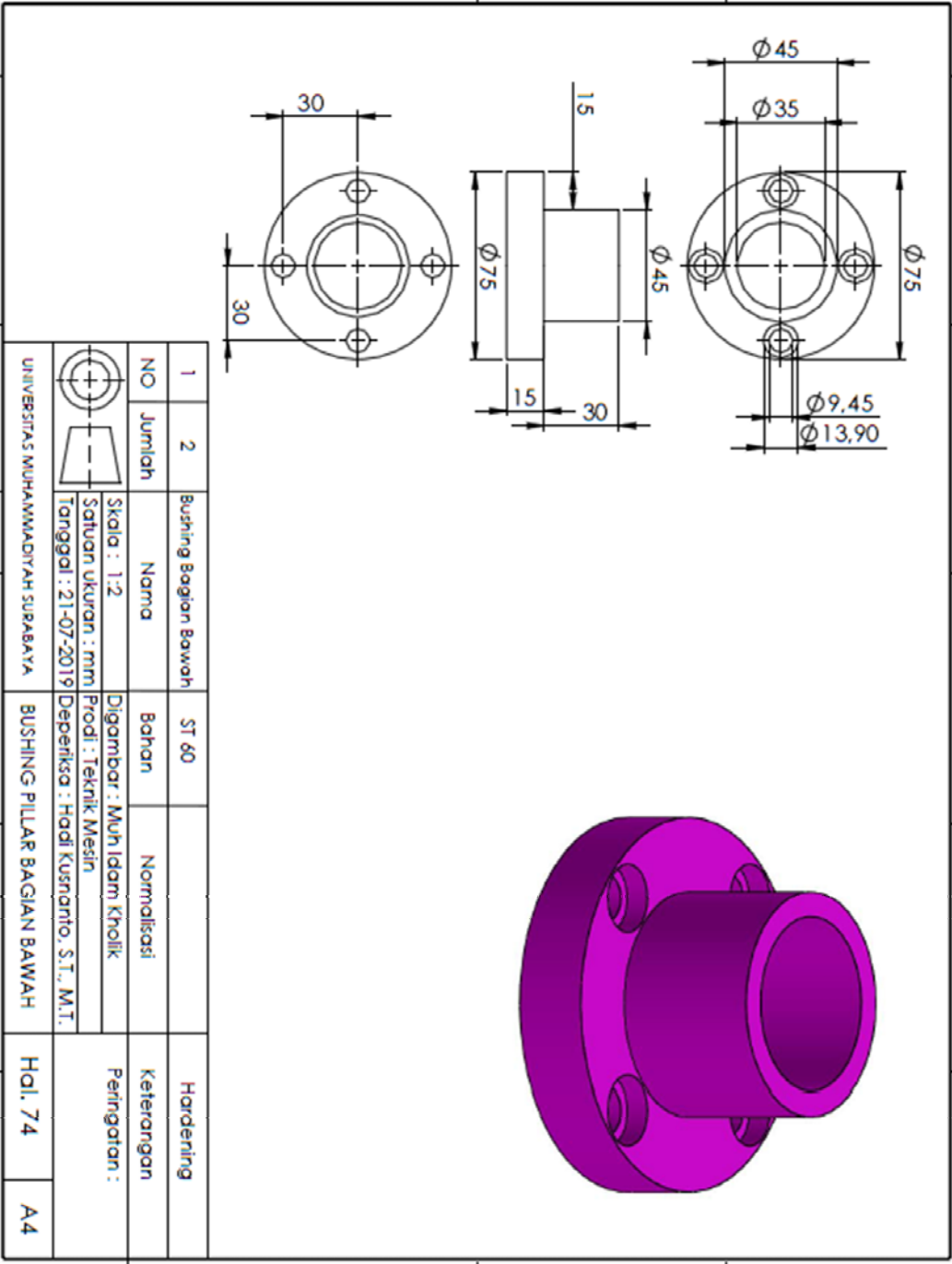
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1	2	Pillar	ST 60	Normalisasi	Hardening
NO	Jumlah	Nama	Bahan		Keterangan
		Skala : 1:2	Digambar : Muh Idam Khoilk		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Depeniksa : Hadi Kusnanto, S.T., M.T.		
UNIVERSITAS MUHAMMADIYAH SURABAYA					
PILLAR			Hal. 73		
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1	2	Bushing Bagian Bawah	ST 60		Hardenig
NO	Jumlah	Nama	Bahan	Normalisasi	Keterangan
		Skala : 1:2	Digambar : Muh Idam Khoilik		Peringatan :
		Satuan ukuran : mm	Prodi : Teknik Mesin		
		Tanggal : 21-07-2019	Deperiksa : Hadi Kusnanto, S.T., M.T.		

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BUSHING PILLAR BAGIAN BAWAH

Hdl. 74

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