

BAB 6

KESIMPULAN DAN SARAN

6.1. Kesimpulan

- a. Dari hasil analisis DFA dengan metode Boothroyd dan Dewhurst pada design awal dan rancangan usulan diperoleh kesimpulan sebagai berikut:

Tabel 6.1. *Design Efficiency*

Nama Perakitan Awal	TM	Design Efficiency	Nama Perakitan Usulan	TM	Design Efficiency
Assy. Oil Filter	9,38	0,96	Assy. Oil Filter	9,38	0,96
Assy. Crank Shaft	28,03	0,43	Assy. Crank Shaft	28,03	0,43
Assy. Bearing Case	14,86	0,61	Assy. Main Bearing Case	37,96	0,46
Assy. Seal Cover	26,55	0,34			
Assy. Piston	36,46	0,41	Assy. Piston	36,46	0,41
Assy. Final Crank Shaft	21,43	0,28	Assy. Final Crank Shaft	16,20	0,37
Assy. Bolt MBC	43,33	0,97	Assy. Bolt MBC	43,33	0,97
Assy. Connection Rod A	49,08	0,43	Assy. Connection Rod A	49,08	0,43
Assy. Connection Rod B	11,6	0,52	Assy. Connection Rod B	11,6	0,52
Rakitan 2	123,75	0,29	Rakitan 2	93,75	0,39
Total	364,47		Total	325,79	

- b. Berdasar analisis DFA Metode Boothroyd dan Dewhurst part yang dapat dirancang ulang adalah *Bearing Case* dan *Seal Cover*. Dan dari Pendekatan Metode Rasional diperoleh alternatif rancangan gabungan antara *Bering Case* dan *Seal Cover* yang disebut dengan *Main Bearing Case*. Selain itu rancangan ini juga

mengurangi jumlah *Bolt* yang digunakan. (Hasil rancangan dapat dilihat pada Lampiran 6)

- c. Antara Perakitan Rancangan semula dan Perakitan Rancangan usulan diperoleh selisih waktu sebesar 17,96% dan perubahan biaya perakitan dari Rp. 2024,80 menjadi Rp. 1809,90 untuk tiap produk di *Main Line MBC, Crank Shaft*.

Tabel 6.2. Perbandingan Biaya Perakitan

Nama Perakitan	Biaya Perakitan	Nama Perakitan Usulan	Biaya Perakitan Usulan
<i>Assy. Oil Filter</i>	Rp. 52,11	<i>Assy. Oil Filter</i>	Rp. 52,11
<i>Assy. Crank Shaft</i>	Rp. 155,72	<i>Assy. Crank Shaft</i>	Rp. 155,72
<i>Assy. Bearing Case</i>	Rp. 82,56	<i>Assy. Main Bearing Case</i>	Rp. 210,89
<i>Assy. Seal Cover</i>	Rp. 147,50		
<i>Assy. Piston</i>	Rp. 202,56	<i>Assy. Piston</i>	Rp. 202,56
<i>Assy. Final Crank Shaft</i>	Rp. 119,06	<i>Assy. Final Crank Shaft</i>	Rp. 90,00
<i>Assy. Bolt MBC</i>	Rp. 240,72	<i>Assy. Bolt MBC</i>	Rp. 240,72
<i>Assy. Connection Rod A</i>	Rp. 272,67	<i>Assy. Connection Rod A</i>	Rp. 272,67
<i>Assy. Connection Rod B</i>	Rp. 64,40	<i>Assy. Connection Rod B</i>	Rp. 64,40
Rakitan 2	Rp. 687,50	Rakitan 2	Rp. 520,83
Total	Rp.2024,80	Total	Rp.1809,9

6.2. Saran

- Dalam penelitian lanjutan di *Main Line MBC, Crank Shaft* sebaiknya aspek kondisi operator, *tools* dan lingkungan kerja lebih diperhatikan.
- Untuk penelitian dengan metode yang sama dapat ditambahkan mengenai analisis waktu operasi nyata, untuk dibandingkan dengan waktu operasi estimasi sehingga dapat memberi solusi yang lebih baik bagi perusahaan.

- c. Dalam Penelitian ini kurang dibahas mengenai material *Seal Cover* awal yang berbeda dengan *Bearing Case*, baik meliputi karakteristik bahan maupun bentuk rancangan. Material awal *Seal Cover* yang Alumunium, diubah sama dengan material *Bearing Case* yaitu Besi. Akan jauh lebih baik bila penelitian lanjutan lehub membahas mengenai, apakah hal ini akan merubah Sistem Kerja Mesin Diesel, Proses Perawatan, dan Proses Perakitan Ulang ?
- d. Selain analisis waktu perakitan dan analisis biaya perakitan sebaiknya penelitian selanjutnya juga didibahas mengenai pengurangan biaya yang berasal dari proses permesinan, pengurangan *part*, kemudahan *handling* dan *insertion*, kemudahan pengecekan kualitas, dll.
- e. Kemungkinan proses casting untuk membuat *part Main Bearing Case* sebaiknya juga dibahas dengan melakukan penelitian lebih lanjut di *Foundry Shop*.

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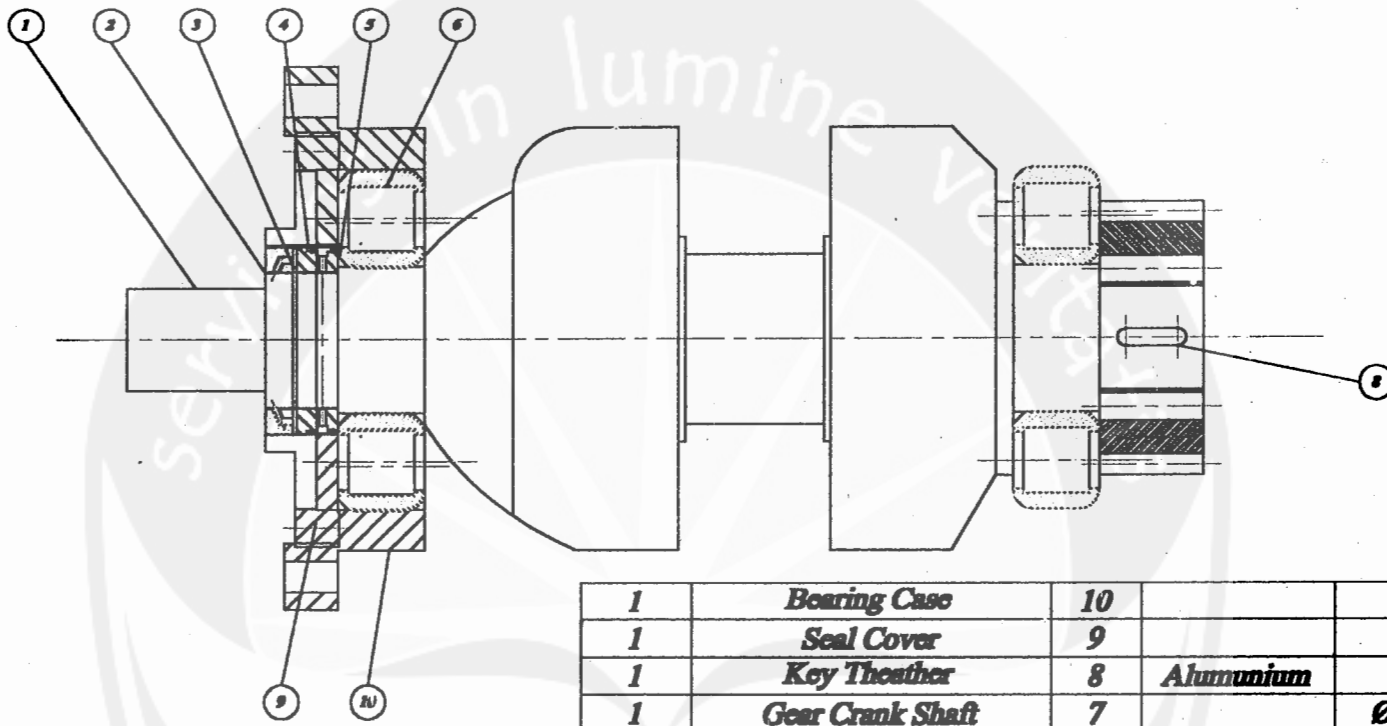
Kuisak, A., *Concurrent Engineering : Automation, Tools and Techniques*, 1993, Jonh Willey & son, Inc., New York.

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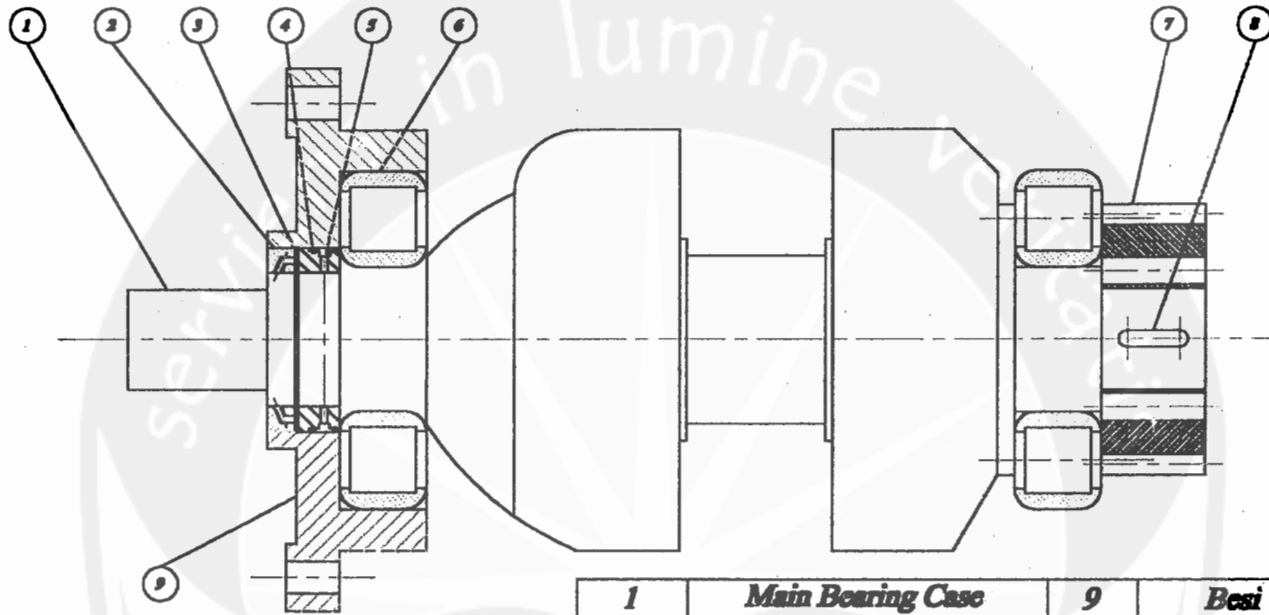
Wahjudi, D., 1999, Penilaian Desain Produk dengan *Assembly Analysis and Balancing Spreadsheet* dan *Ullman 13 Guidelines* untuk Meningkatkan Kinerja Perakitan, *Jurnal Teknik Mesin*, Vol. I, No. 2, pp 142-149.

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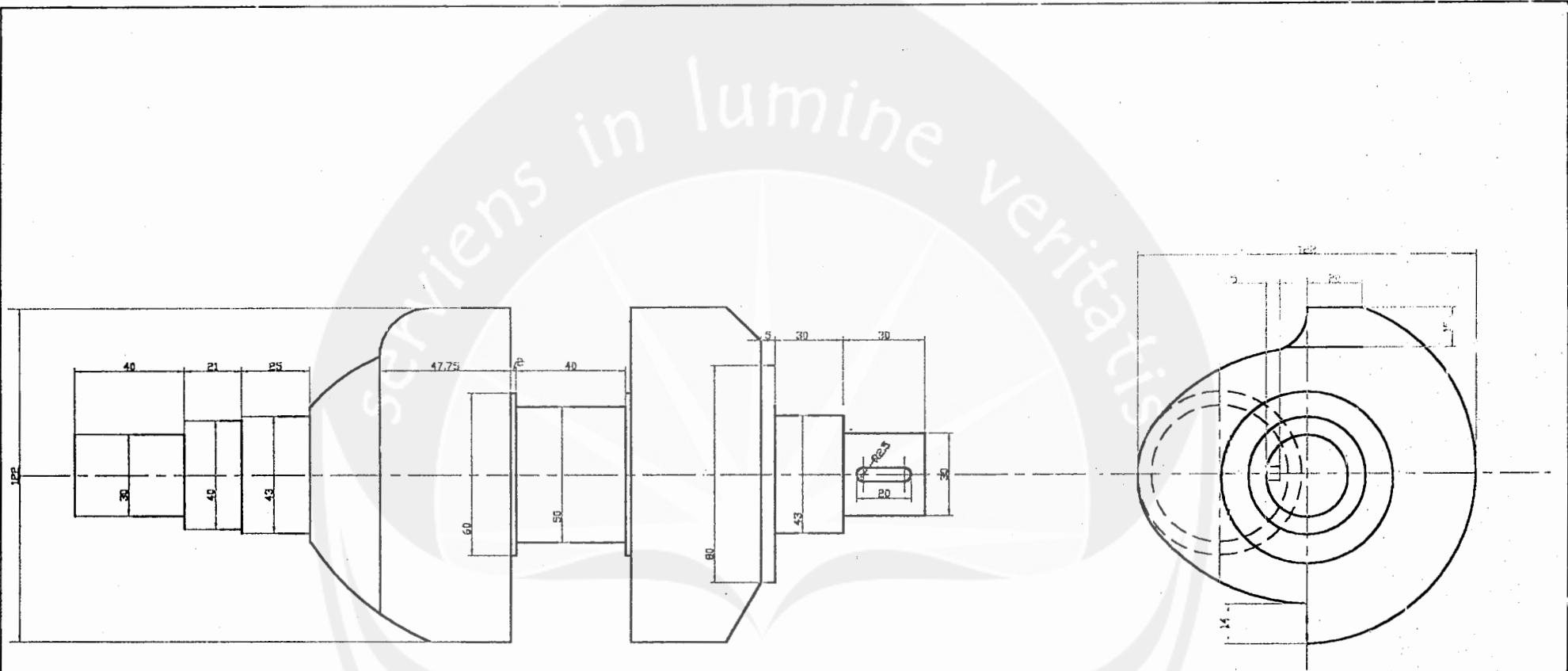
1	Bearing Case	10			
1	Seal Cover	9			
1	Key Theather	8	Alumunium	20 x 5	
1	Gear Crank Shaft	7		Ø 80 x 30	
2	Main Bearing	6		Ø 100 x 25	
1	Ring Oil Filter	5	Alumunium	Ø 55 x 12	
2	O-Ring Oil Filter	4	Karet	Ø 53 x 1	
1	Internal Circlip	3	Besi	Ø 58 x 1	
1	Seal Oil	2	Alumunium	Ø 55 x 8	
1	Crank Shaft	1		Ø 122 x 311	
Pieces	Description	Item	Material	Dimension	Remarks

Revision Index	Drawn. by : Caccilia Shandy	Scale : 1:2	
	Reg. Nr. : 03230	Unit : mm	
	Date : 20 Nov 2006	Material	
	Checked by :	Sign. :	
	A4	Assy Crank Shaft	
INDUSTRIAL ENGINEERING UAJY		Operation	Dwg. Nr.
Origin.	Rep.	Rep. by.	SN. NS.



1	Main Bearing Case	9	Besi	195 x 27,5	
1	Key Theather	8	Alumunium	20 x 5	
1	Gear Crank Shaft	7		Ø 80 x 30	
2	Main Bearing	6		Ø 100 x 25	
1	Ring Oil Filter	5	Alumunium	Ø 55 x 12	
2	O-Ring Oil Filter	4	Karet	Ø 53 x 1	
1	Internal Circlip	3	Besi	Ø 58 x 1	
1	Seal Oil	2	Alumunium	Ø 55 x 8	
1	Crank Shaft	1		Ø 122 x 311	
Pieces	Description	Item	Material	Dimension	Remarks

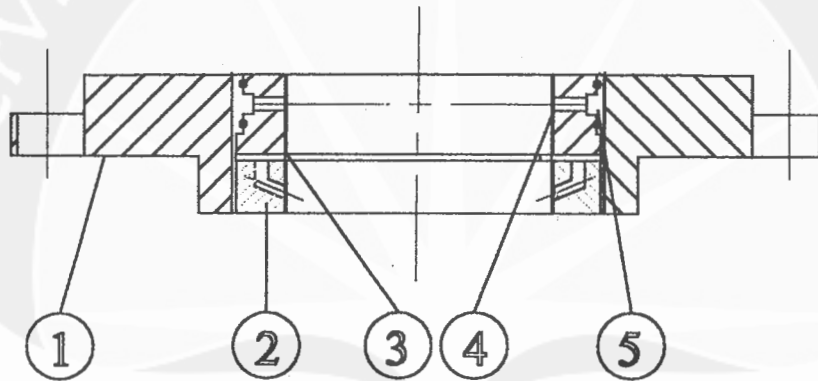
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		Date : 20 Nov 2006		Material	
		Checked by :		Sign. :	
		A4	Assy. Crank Shaft Usulan		
INDUSTRIAL ENGINEERING UAJY				Operation	Dwg. Nr.
Origin.	Rep.	Rep. by.	SN. NS.		



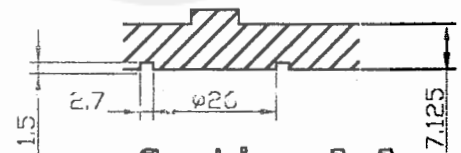
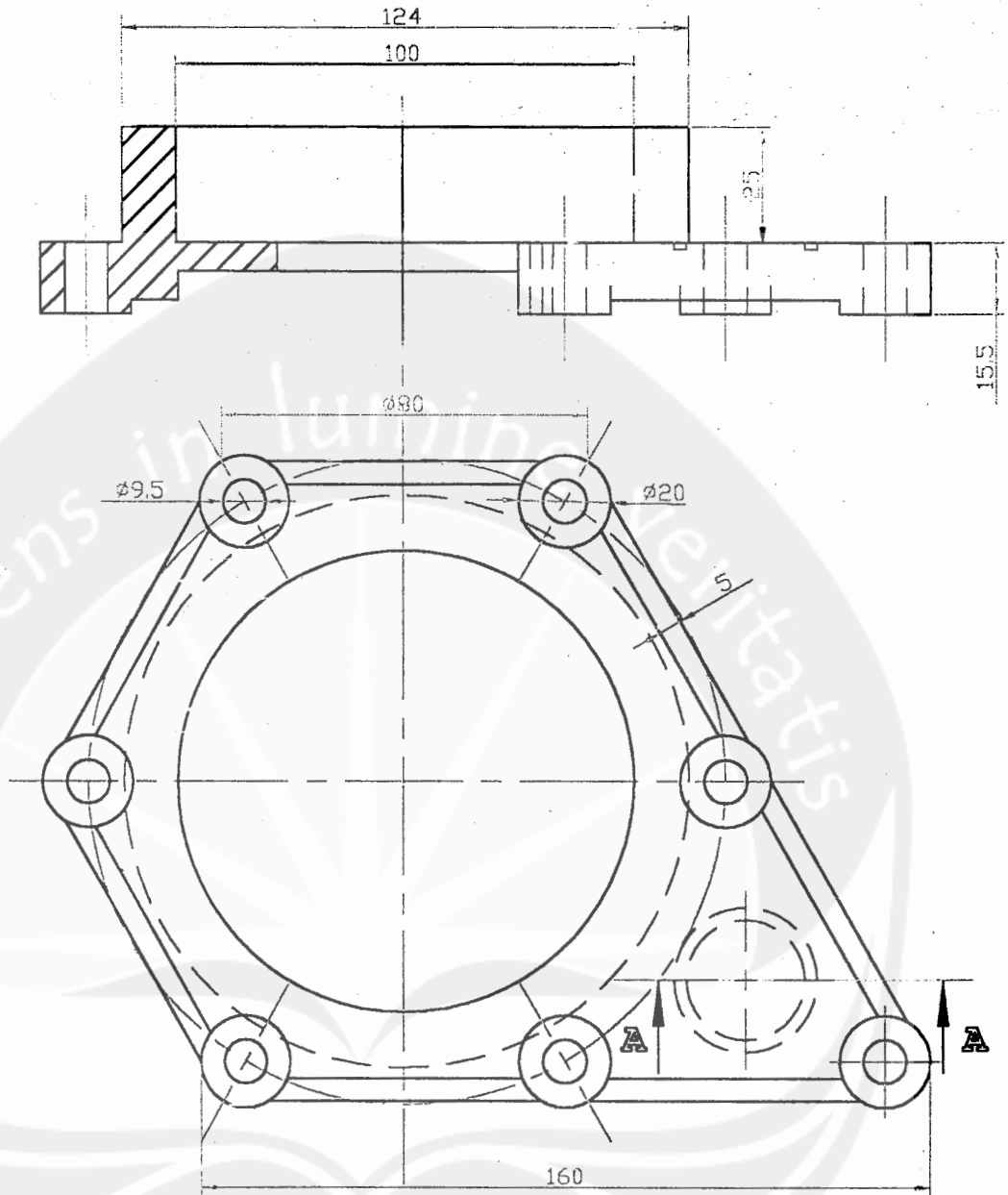
Lampiran 4 : Crank Shaft

Revision Index	Drawn. by : Cecilia Shandy	Scale : 1:2
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	Date : 20 Nov 2006	Material
	Checked by :	Sign. :
	A4	Crank Shaft
INDUSTRIAL ENGINEERING UAJY		Operation
Origin.	Rep.	Rep. by.
		Dwg. Nr.
		SN. NS.

Lampiran 8



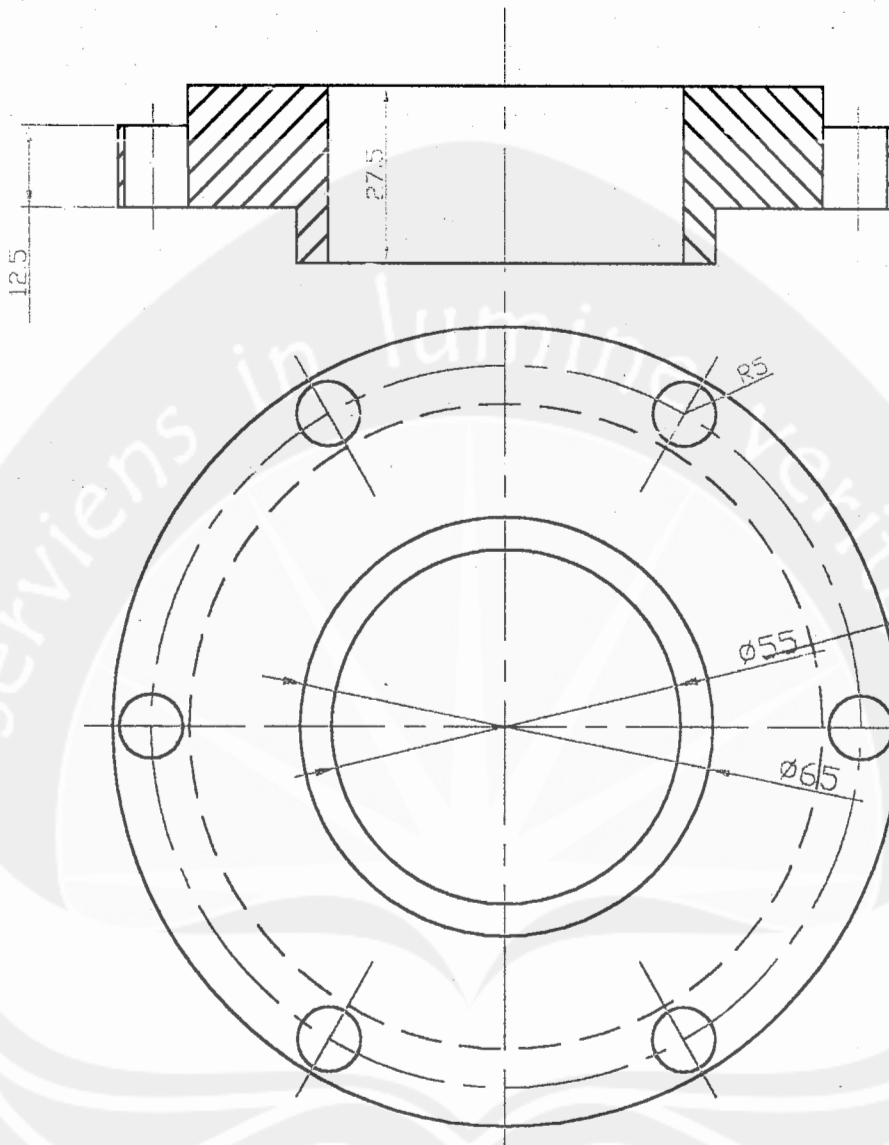
2	O-Ring Oil Filter	5	Karst	Ø 53 x 1	
1	Oil Filter	4	Aluminium	Ø 55 x 12	
1	Internal Circlip	3	Besi	Ø 58 x 1	
1	Seal Oil	2	Aluminium	Ø 55 x 8	
1	Seal Cover	1	Aluminium		
Pieces	Description	Item	Material	Dimension	Remarks
Revision Index		Drawn. by : Caecilia Shandy		Scale : 1:1	
		Reg. Nr. : 03230		Unit : mm	
		Date : 20 Nov 2006		Material	
		Checked by :		Sign. :	
		A4		Lampiran 19	
INDUSTRIAL ENGINEERING UAJY				Operation	
				Dwg. Nr.	

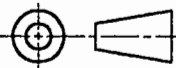


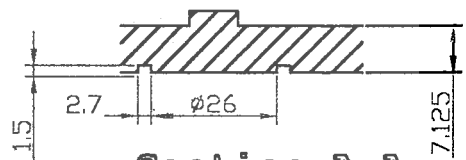
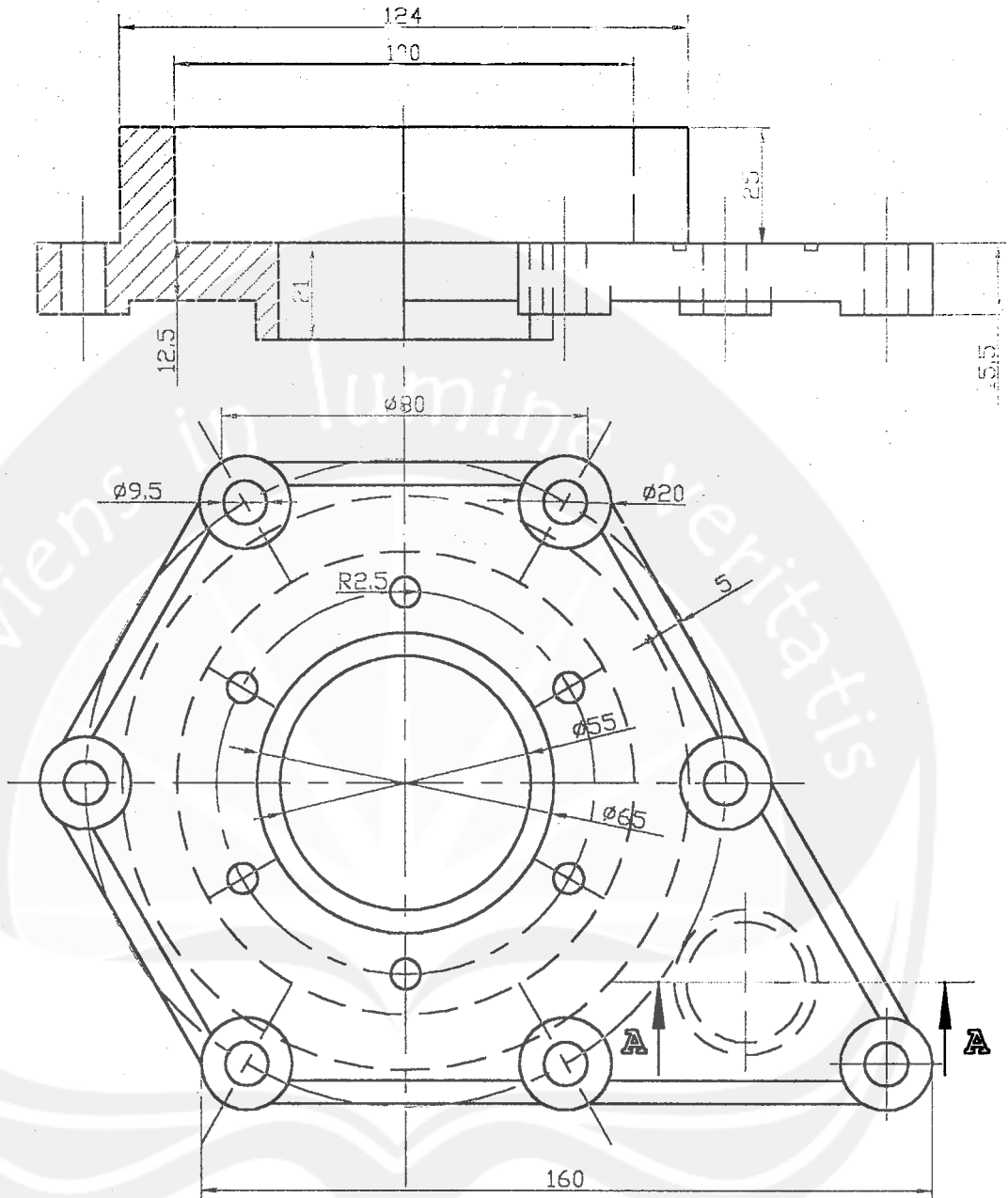
Section A-A

<i>Revision Index</i>	<i>Drawn. by</i> : Caecilia Shandy	<i>Scale</i> : 2:3	
	<i>Reg. Nr.</i> : 03230	<i>Unit</i> : mm	
	<i>Date</i> : 20 Nov 2006	<i>Material</i> : FC 25	
	<i>Checked by</i> :	<i>Sign.</i> :	
	A4	Bearing Case	
INDUSTRIAL ENGINEERING UAJY		<i>Operation</i>	<i>Dwg. Nr.</i>
<i>Origin.</i>	<i>Rep.</i>	<i>Rep. by.</i>	<i>SN. NS.</i>

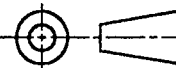
Lampiran 6 : Seal Cover

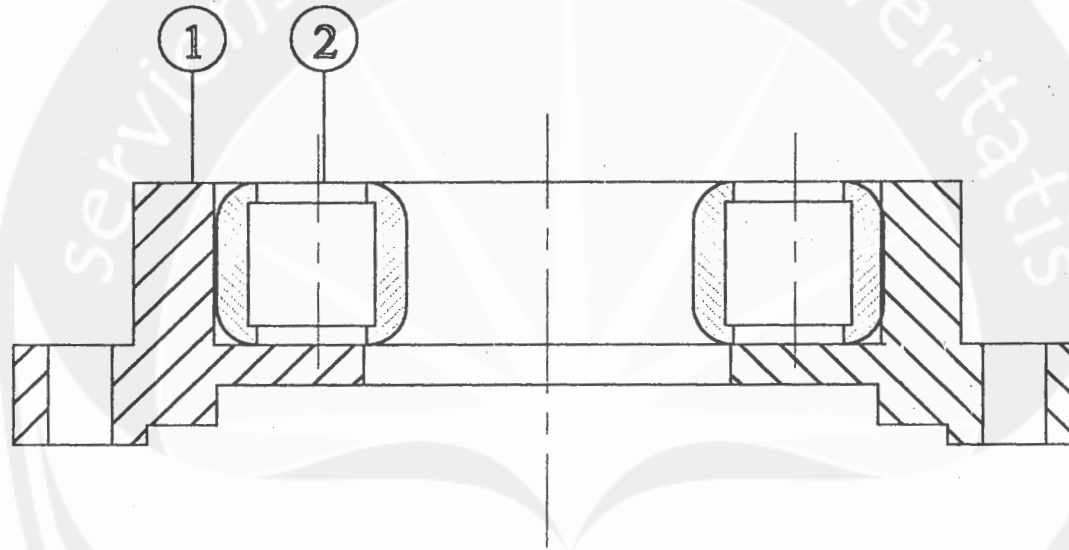


Revision Index	Drawn by : Caecilia Shandy	Scale : 2:3
	Reg. Nr. : 03230	Unit : mm
	Date : 20 Nov 2006	Material : FC 25
	Checked by :	Sign. :
	A4	Seal Cover
INDUSTRIAL ENGINEERING UAJY		Operation
Origin.	Rep.	Rep. by.
		Dwg. Nr.
		SN. NS.

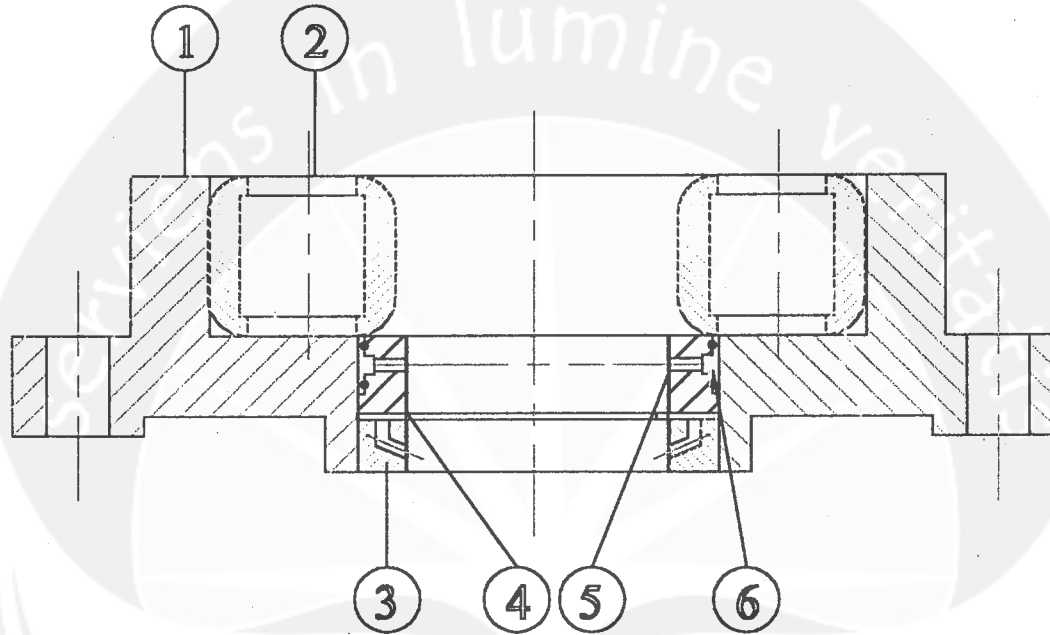


Section A-A

Revision Index	Drawn. by : Caecilia Shandy	Scale : 2:3
	Reg. Nr. : 03230	Unit : mm
	Date : 20 Nov 2006	Material : FC 25
	Checked by :	Sign. :
A4 Main Bearing Case Usulan		
INDUSTRIAL ENGINEERING UAJY		Operation
Origin	Rep.	Dwg. Nr.
		SN. NS.



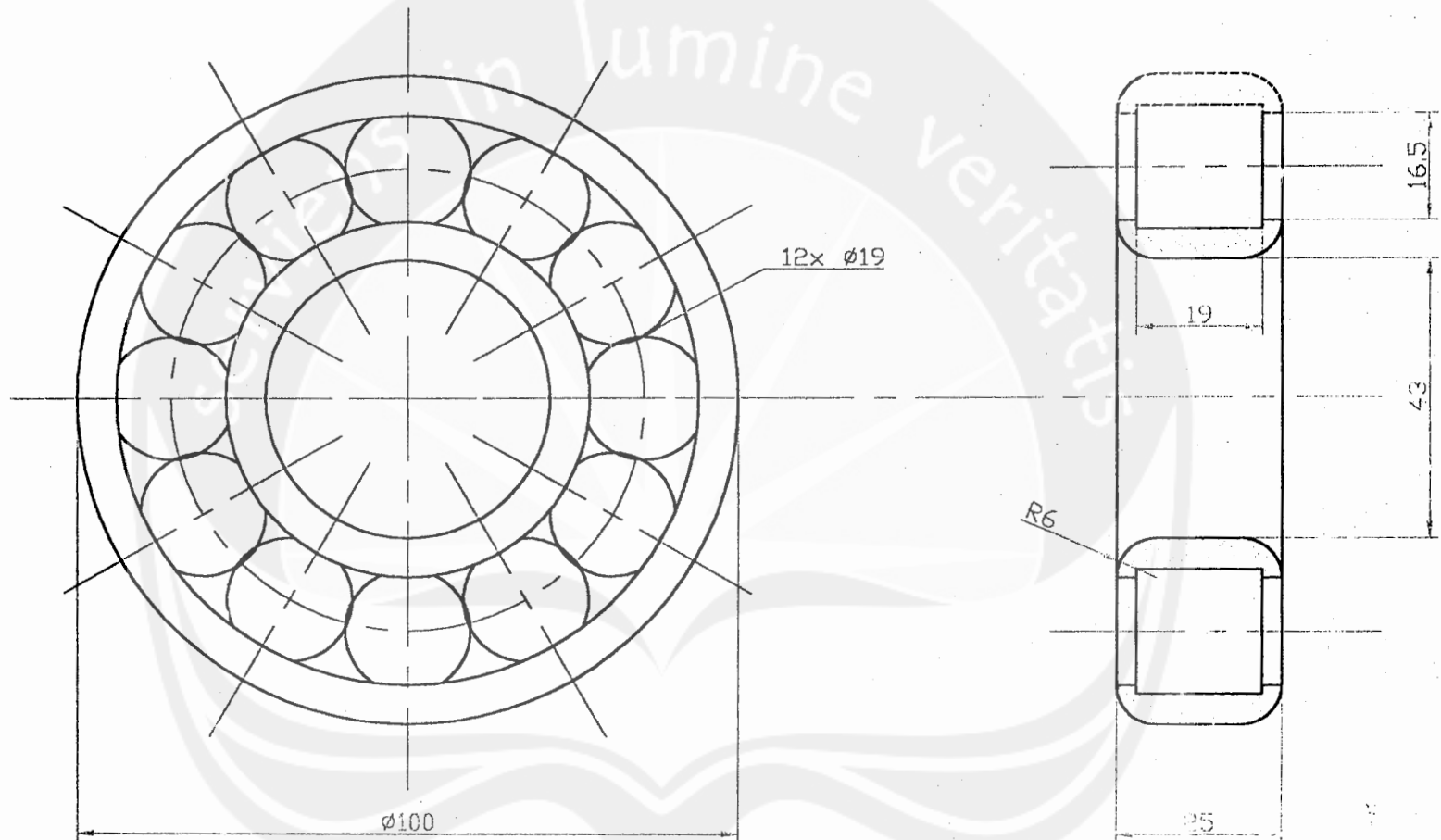
1	Main Bearing	2		Ø58 x 1	
1	Bearing Case	1	Bcsi	Ø55 x 8	
Pieces	Description	Item	Material	Dimension	Remarks
Revision Index		Drawn. by : Caecilia Shandy		Scale : 1:1	
		Reg. Nr. : 03230		Unit : mm	
		Date : 20 Nov 2006		Material	
		Checked by :		Sign. :	
		A4		Lampiran 7	
INDUSTRIAL ENGINEERING UAJY				Operation	
Origin.		Rep.		Dwg. Nr.	
				SN. NS.	
				Rep. by.	



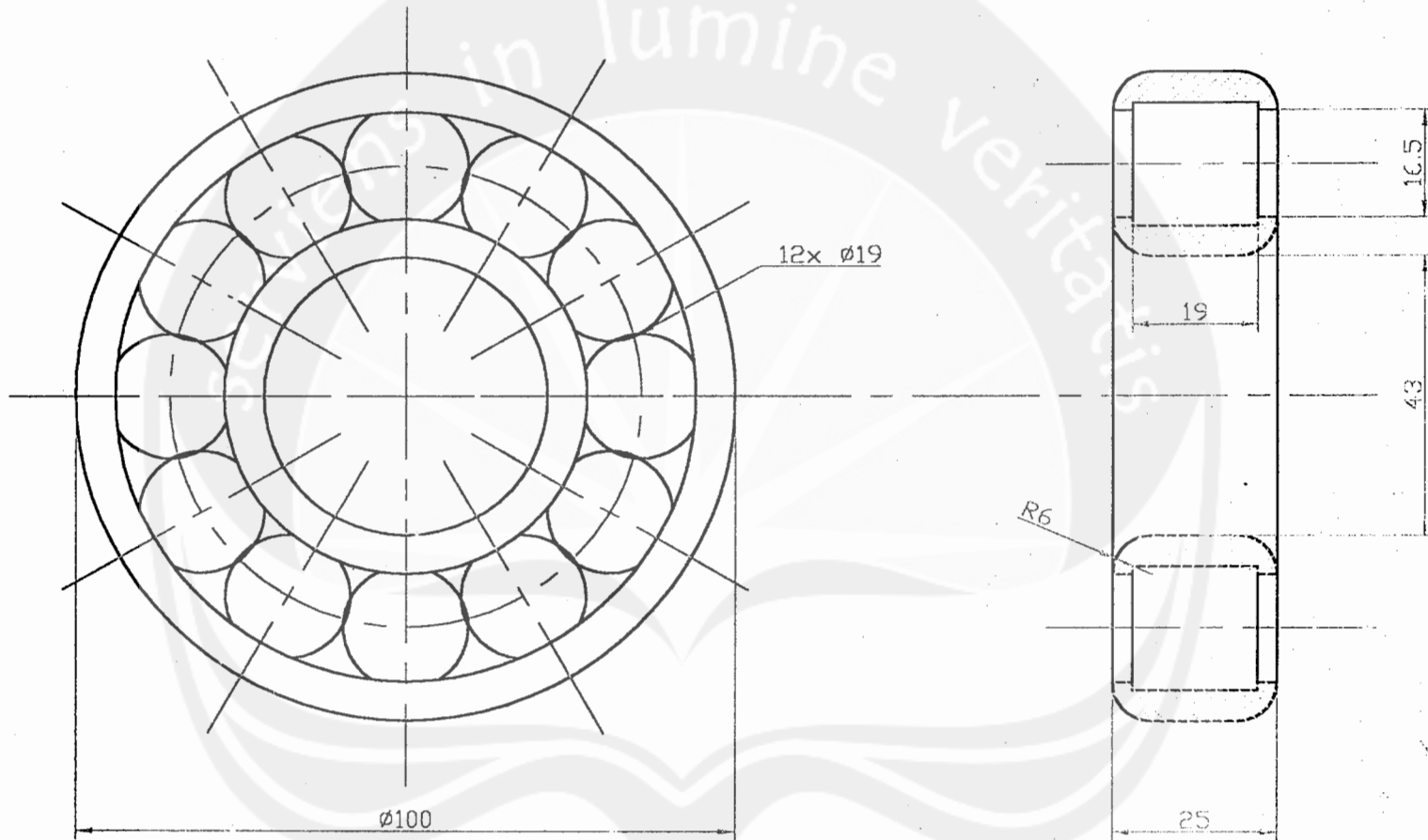
Pieces	Description	Item	Material	Dimension	Remarks
2	O-Ring Oil Filter	6	Karet	Ø53 x 1	
1	Oil Filter	5	Alumunium	Ø55 x 12	
1	Internal Circlip	4	Besi	Ø58 x 1	
1	Seal Oil	3	Alumunium	Ø55 x 8	
1	Main Bearing	2		Ø58 x 1	
1	Main Bearing Case	1	Alumunium	Ø55 x 8	

Revision Index	Drawn. by : Cecilia Shandy	Scale : 1:1
	Reg. Nr. : 03230	Unit : mm
	Date : 20 Nov 2006	Material
	Checked by :	Sign. :
A4		Lampiran 19
INDUSTRIAL ENGINEERING UAJY		Operation
Origin	Rep.	Rep. by.
		Dwg. Nr.
		SN. NS.

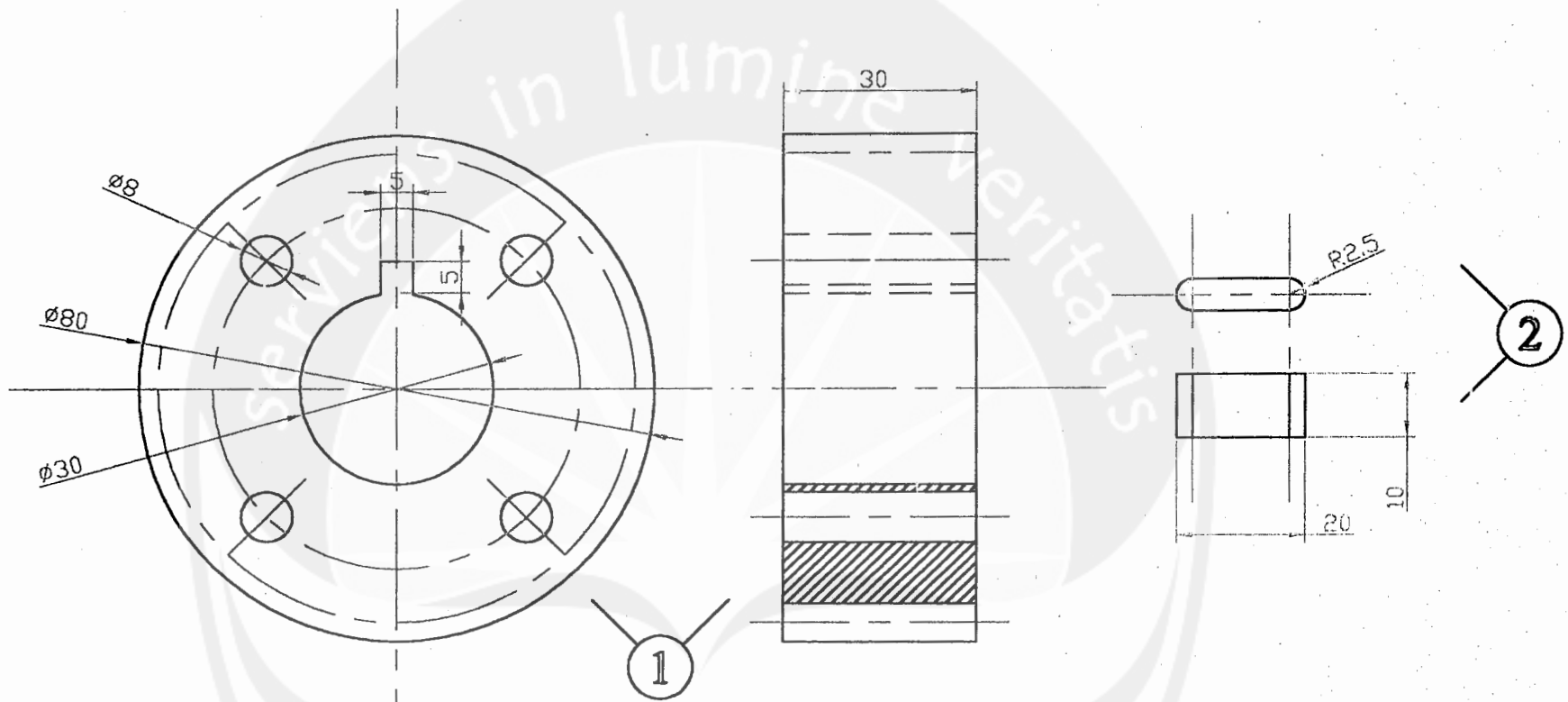
Lampiran 10 : Assy. Main Bearing Case



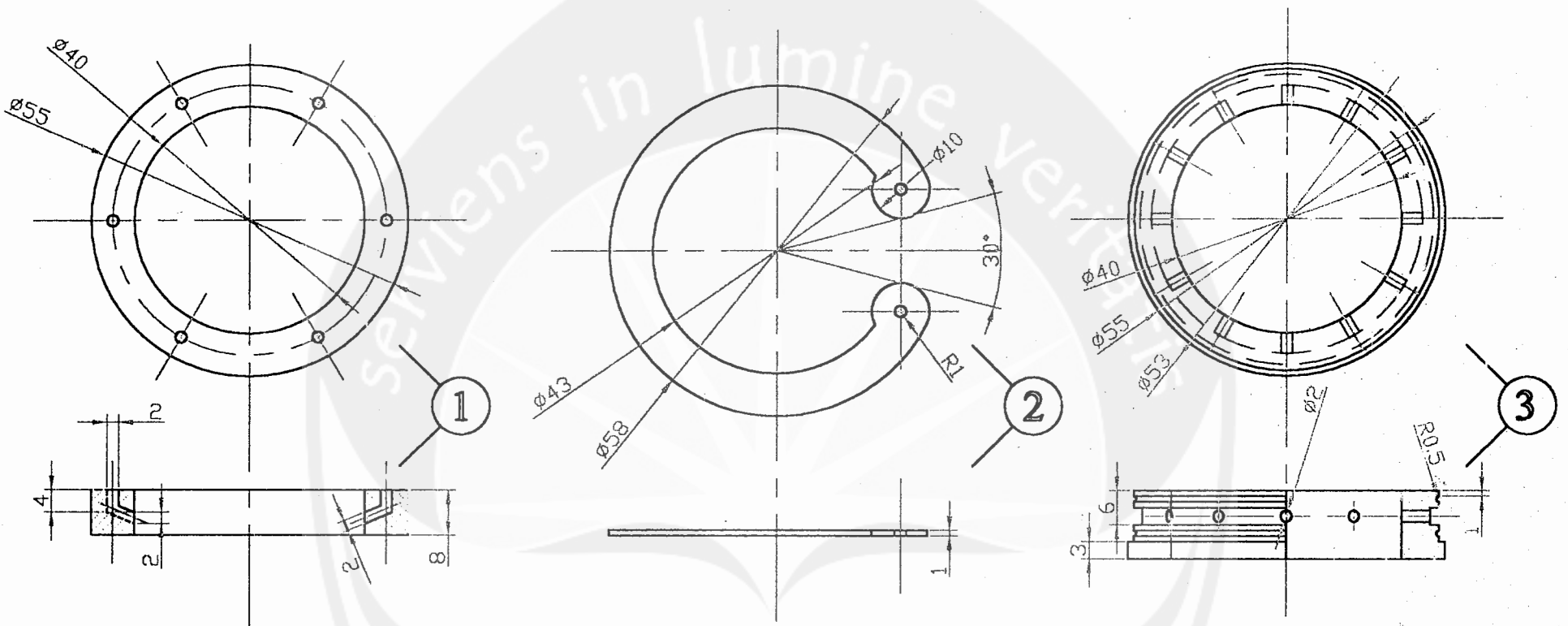
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	Date : 20 Nov 2006		Material : FC 25
	Checked by :		Sign. :
A4		Main Bearing	
INDUSTRIAL ENGINEERING UAJY			Operation
Origin.	Rep.	Rep. by.	Dwg. Nr. SN. NS.



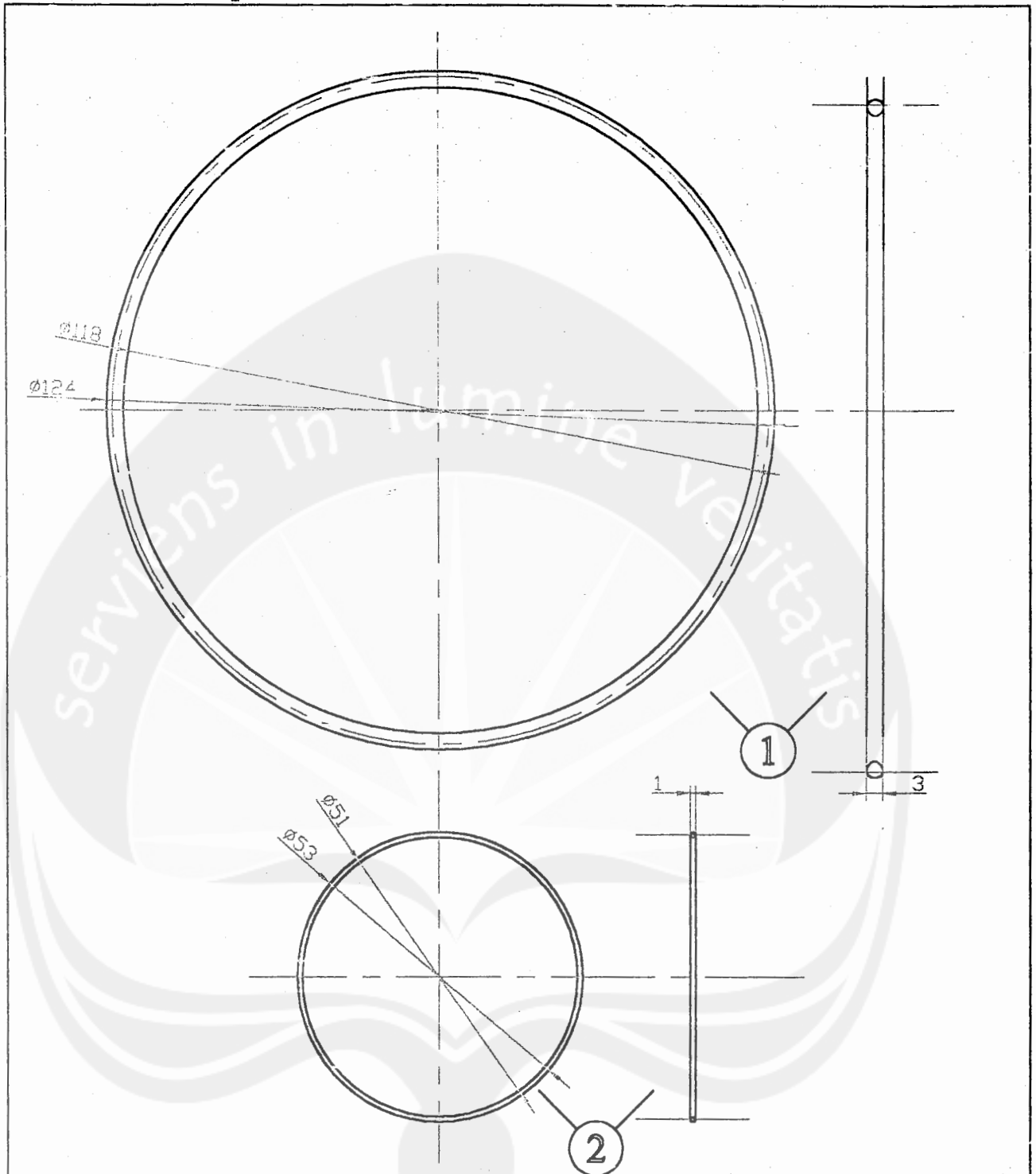
Revision Index	Drawn. by : Caecilia Shandy		Scale : 1:1
	Reg. Nr. : 03230		Unit : mm
	Date : 20 Nov 2006		Material : FC 25
	Checked by :		Sign. :
A4		Bearing Gear Crank Shaft	
INDUSTRIAL ENGINEERING UAJY		Operation	Dwg. Nr.
Origin.	Rep.	Rep. by.	SIN. NS.



2	Key Teather	1	Alumunium	Ø 20 x 10	
1	Gear Crank Shaft	1		Ø 80 x 30	
Pieces	Description	Item	Material	Dimension	Remarks
Revision Index		Drawn. by : Caecilia Shandy		Scale : 1:1	
		Reg. Nr. : 03230		Unit : mm	
		Date : 20 Nov 2006		Material : FC 25	
		Checked by :		Sign. :	
		A4		Lampiran 12	
INDUSTRIAL ENGINEERING UAJY				Operation	
Origin.		Rep.		Dwg. Nr.	
		Rep. by.		SN. NS.	

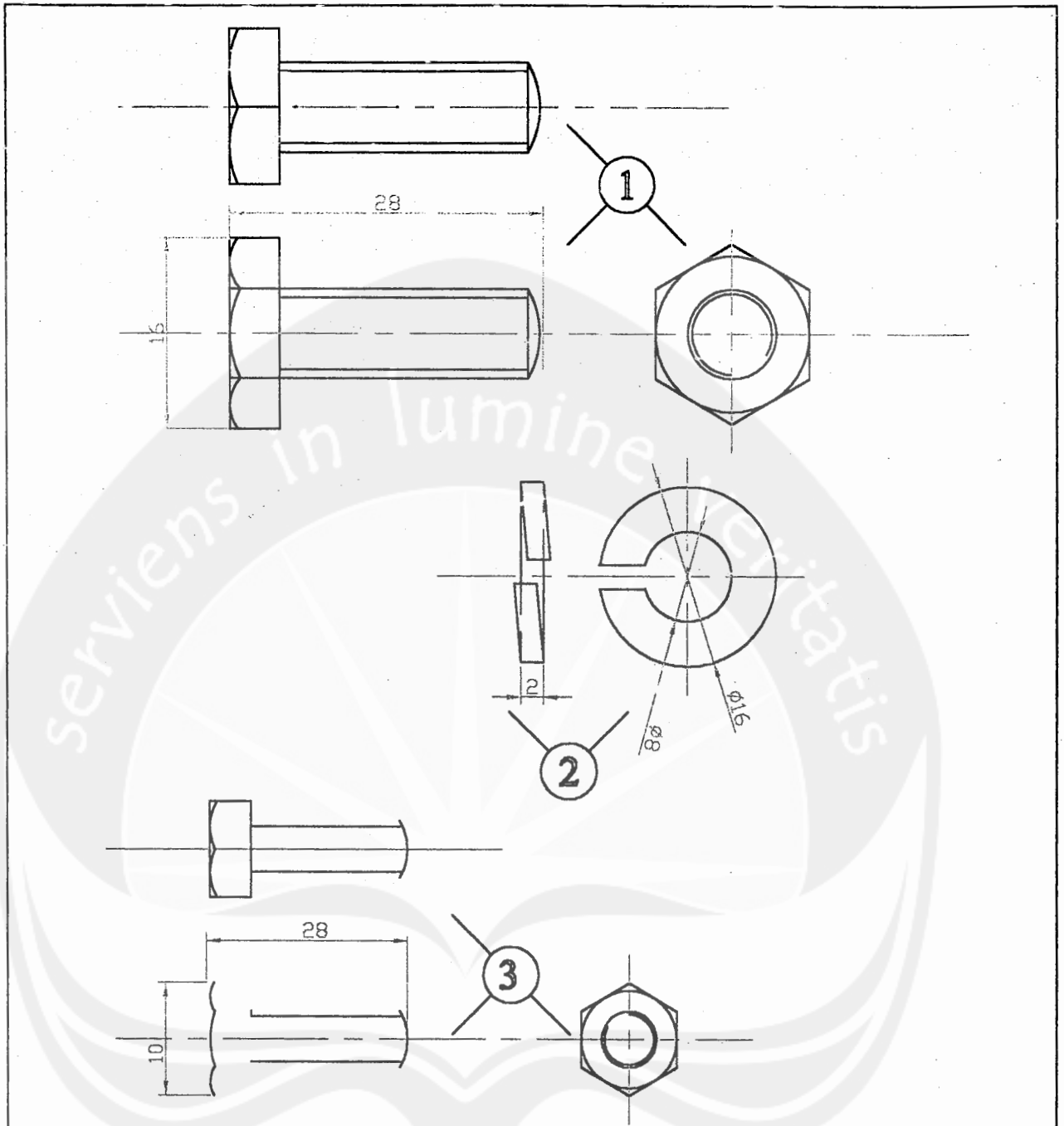


1	Oil Filter	3	Aluminium	$\phi 55 \times 12$	
1	Internal Circlip	2	Besi	$\phi 58 \times 1$	
1	Seal Oil	1	Aluminium	$\phi 55 \times 8$	
Pieces	Description	Item	Material	Dimension	Remarks
Revision Index		Drawn. by : Caecilia Shandy		Scale : 1:1	
		Reg. Nr. : 03230		Unit : mm	
		Date : 20 Nov 2006		Material	
		Checked by :		Sign. :	
		A4		Lampiran 13	
INDUSTRIAL ENGINEERING UAJY				Operation	
Origin.		Rep.		Dwg. Nr.	
		Rep. by.		SN. NS.	



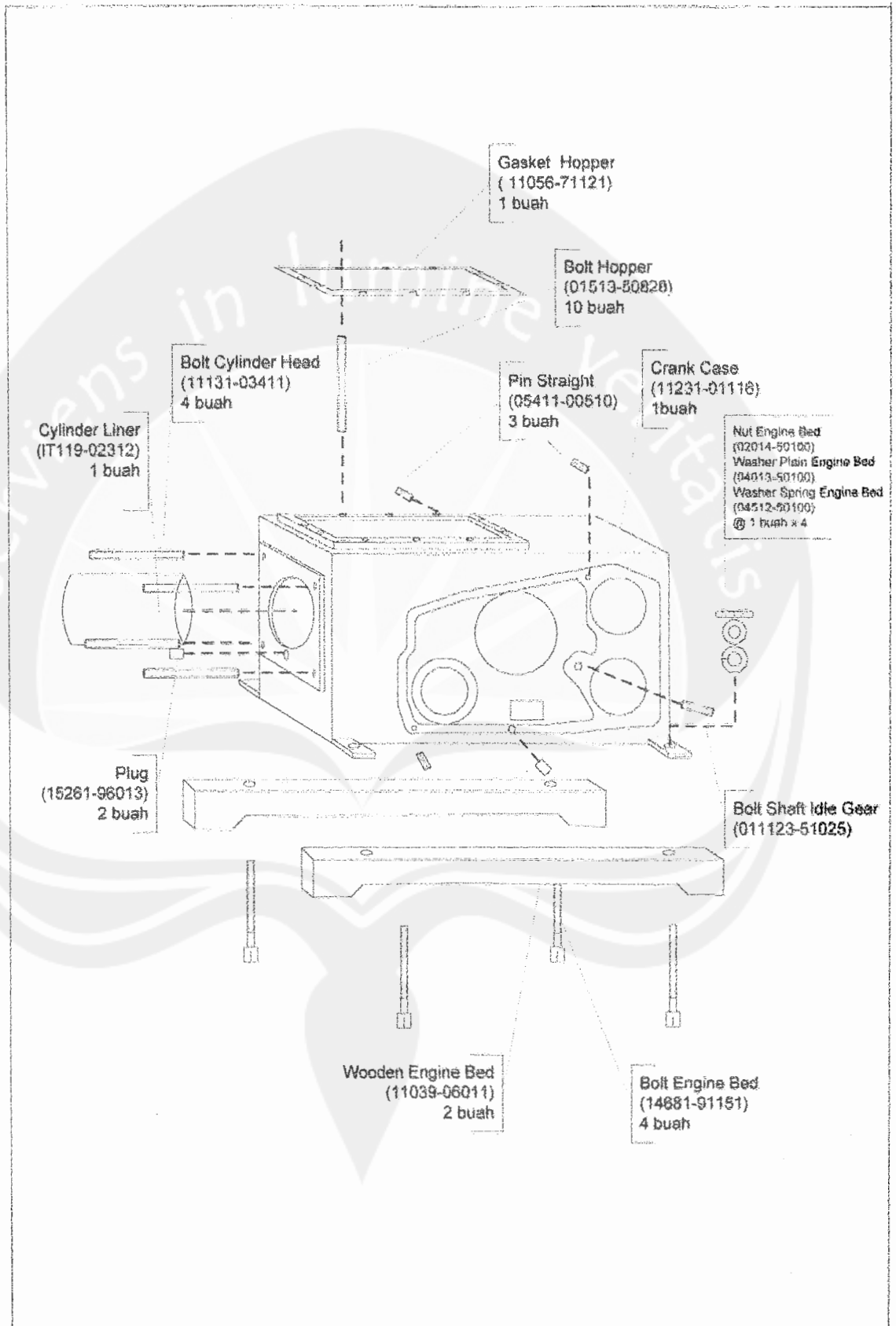
2	O-Ring Ring oil Filter	2	Karet	Ø 53 x 1	
1	O-Ring Bearing Case	1	Karet	Ø 124 x 3	
Pieces	Description	Item	Material	Dimension	Remarks
Revision Index	Drawn. by : Caecilia Shandy			Scale	: 1:1
	Reg. Nr. : 03230			Unit	: mm
	Date : 20 Nov 2006			Material	
	Checked by :			Sign.	:
		A4	Lampiran 14		
INDUSTRIAL ENGINEERING UAJY			Operation		Dwg. Nr.
Origin.	Rep.	Rep. by.	SN. NS.		

Lampiran 16 : Komponen 4

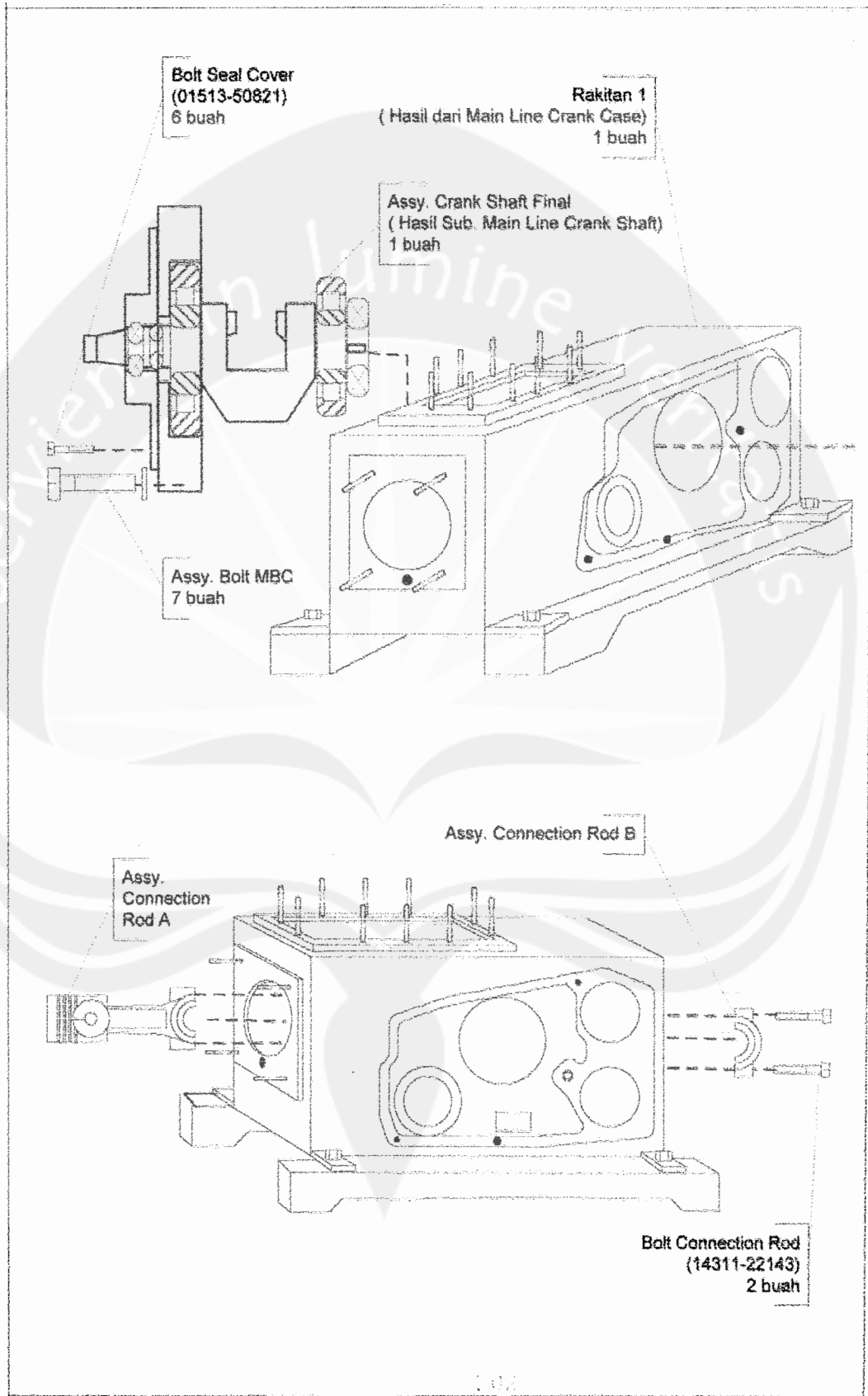


Pieces	Description	Item	Material	Dimension	Remarks
3	Bolt Seal Cover	6		Ø 10 x 18	
2	Washer Spring	7		Ø 16 x 2	
1	Bolt MBC	7		Ø 16 x 28	
Revision Index		Drawn. by : Caecilia Shandy		Scale : 1:2	
		Reg. Nr. : 03230		Unit : mm	
		Date : 20 Nov 2006		Material	
		Checked by :		Sign. :	
		A4		Lampiran 15	
INDUSTRIAL ENGINEERING UAJY				Operation	
Origin.		Rep.		Dwg. Nr.	
		Rep. by.		SN. NS.	

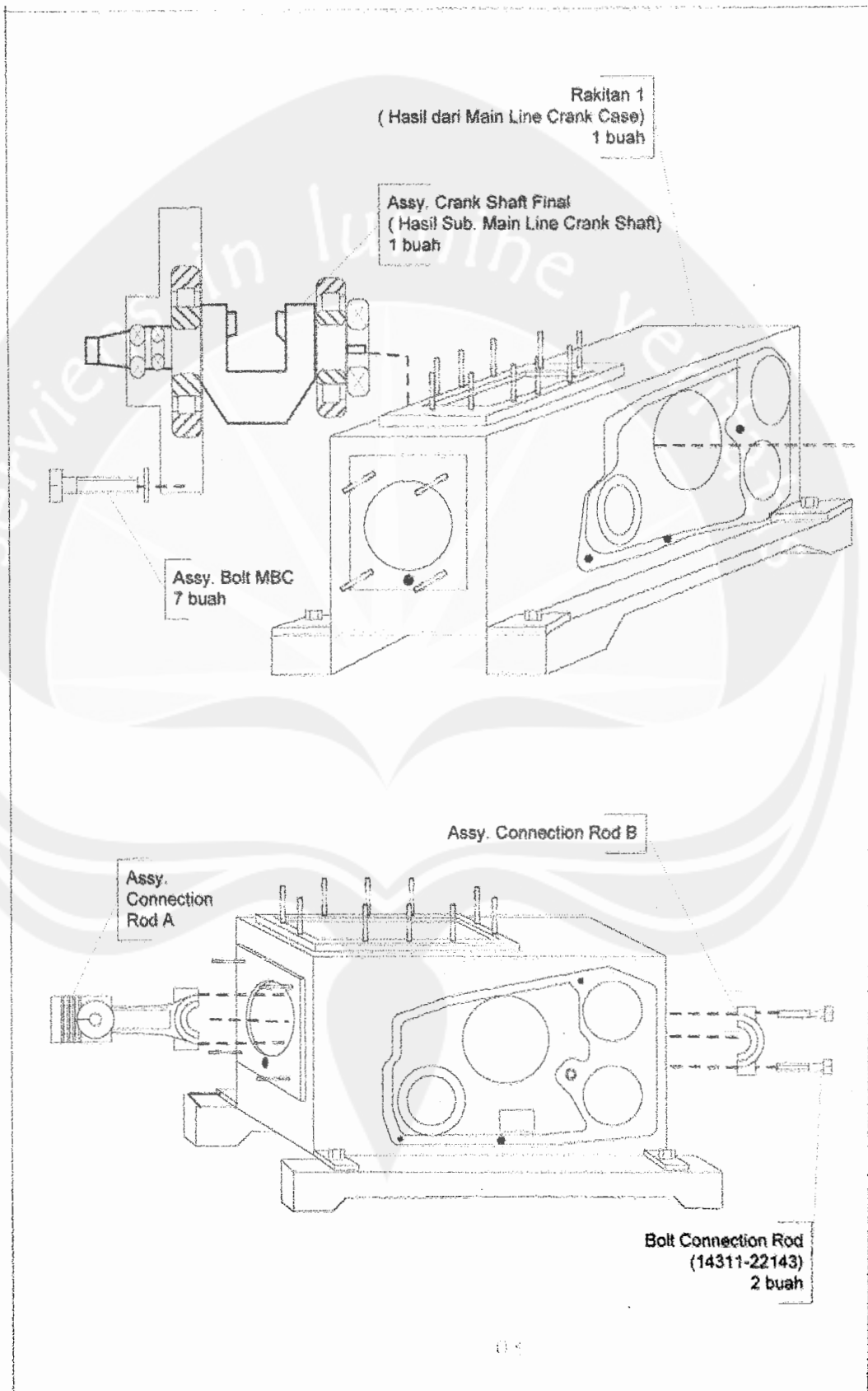
Lampiran 17. Ilustrasi Perakitan di Main Line Crank Case



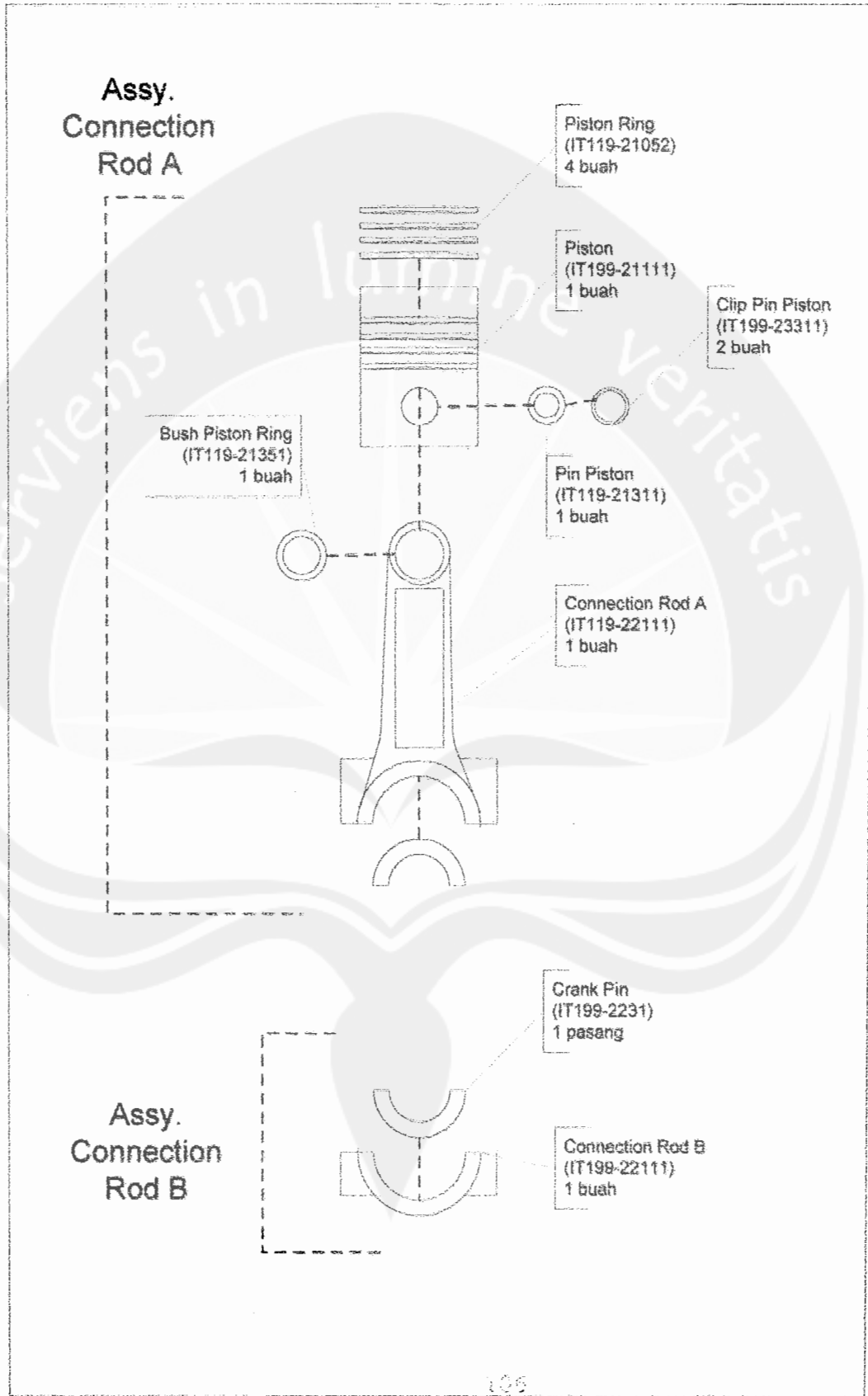
Lampiran 18. Ilustrasi Perakitan di Main Line MBC, Crank Shaft



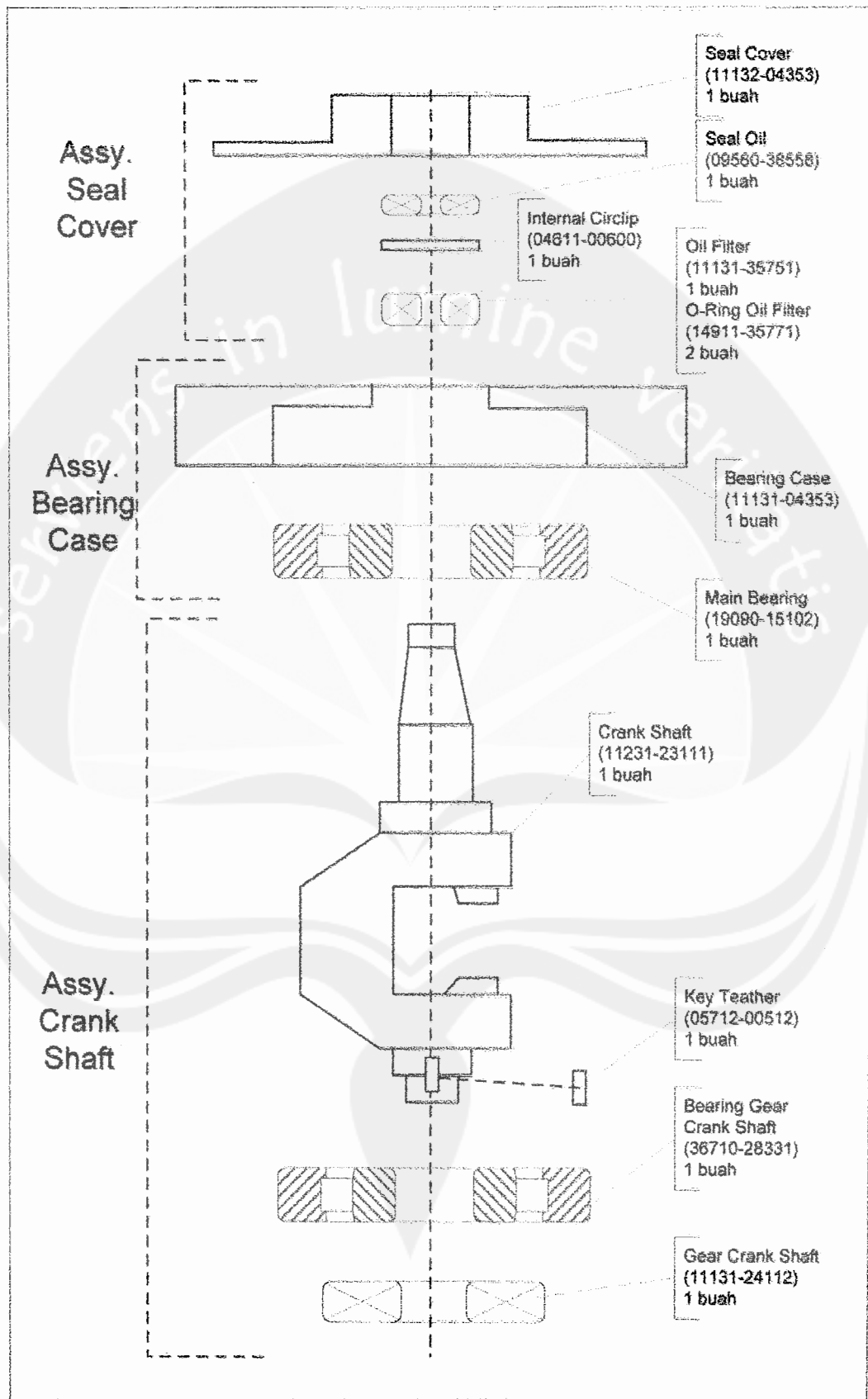
Lampiran 19. Ilustrasi Perakitan di Main Line MBC, Crank Shaft
(Usulan)



Lampiran 22. Ilustrasi Perakitan di Sub - Main Line Piston



Lampiran 20. Ilustrasi Perakitan di Sub - Main Line Crank Shaft



Lampiran 21. Ilustrasi Perakitan di Sub - Main Line Crank Shaft
(Usulan)

