Mec E 265
Engineering Graphics and CAD

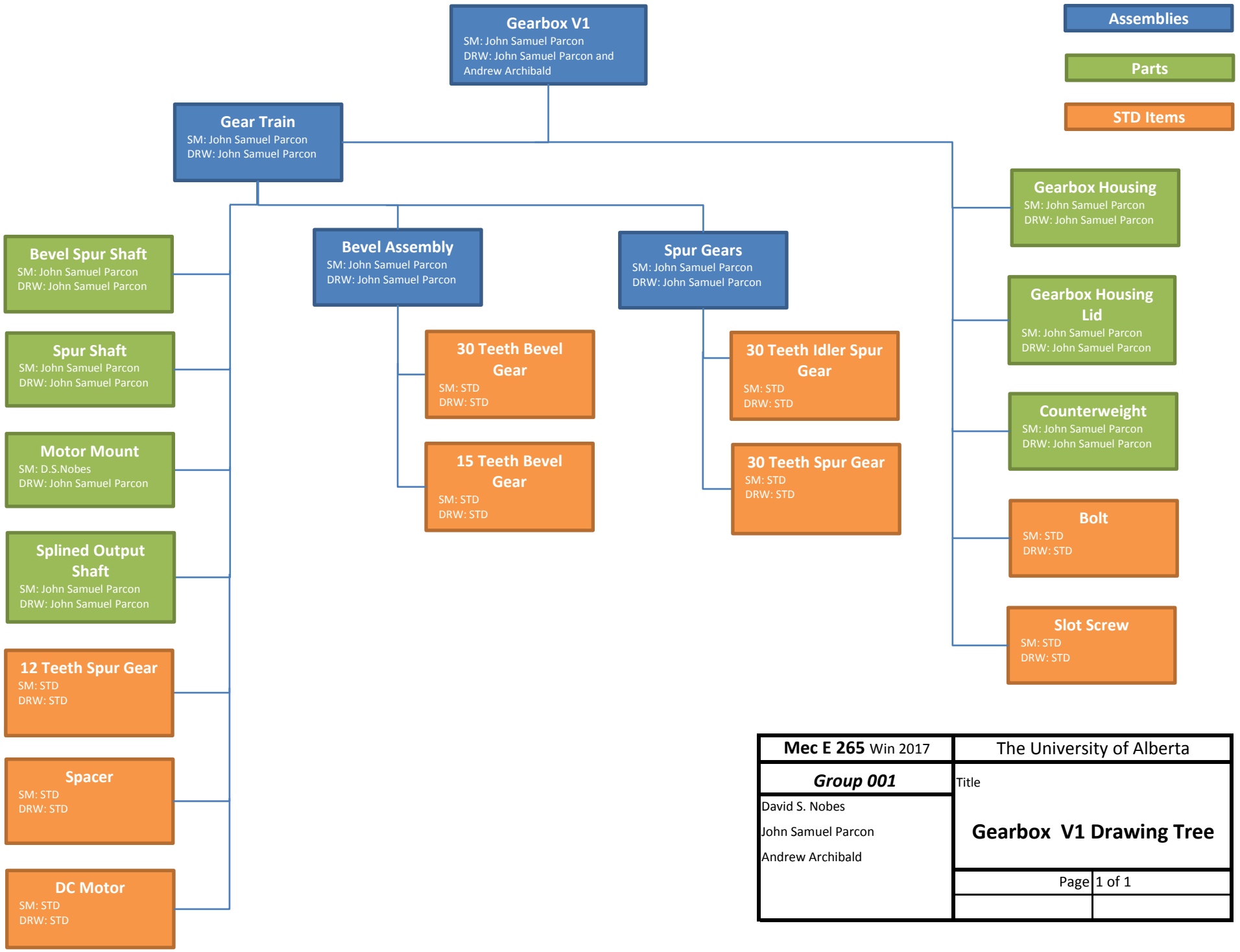
An Example Drawing Package:

Overall Gearbox V1



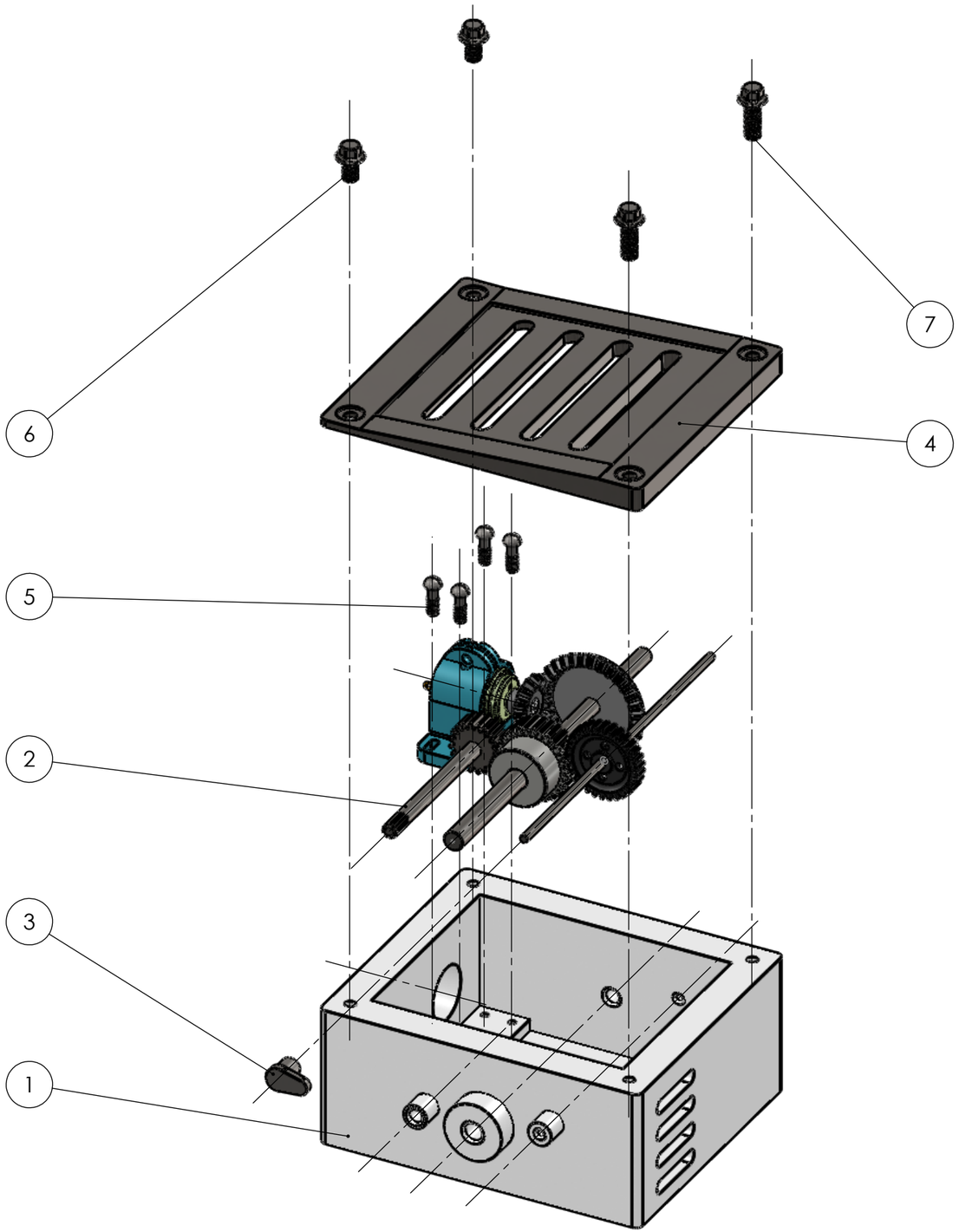
FALL 2017

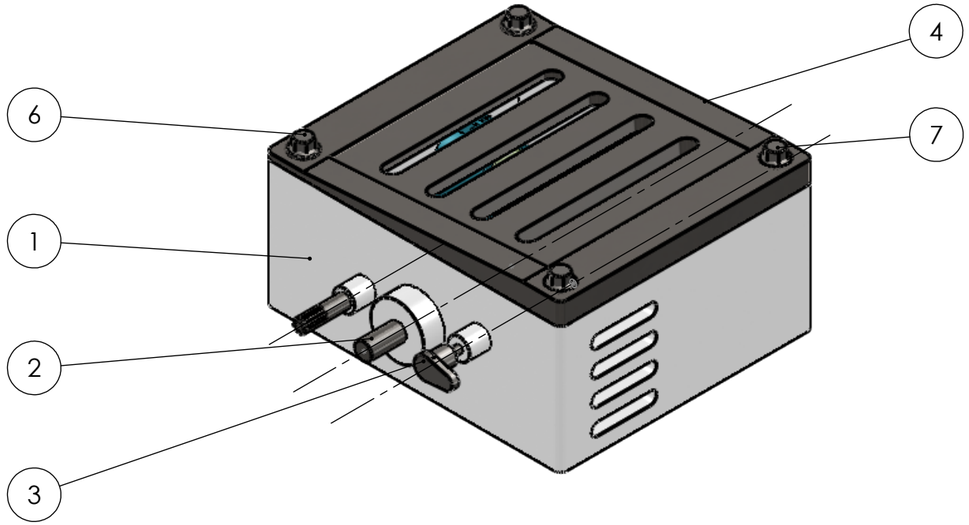
Dr. David S. Nobes



Mec E 265 Win 2017	The University of Alberta
Group 001	Title
David S. Nobes John Samuel Parcon Andrew Archibald	**Gearbox V1 Drawing Tree**
	Page 1 of 1

ITEM NO.	SW-Author(Author)	SW-Title(Title)	Material	QTY.
1	John Samuel Parcon	Gearbox Housing	ABS	1
2	John Samuel Parcon	Gear Train and Shafts	Multiple	1
3	John Samuel Parcon	Counterweight	Cast Stainless Steel	1
4	John Samuel Parcon	Gearbox Housing Lid	AISI 316 Stainless Steel Sheet (SS)	1
5	David S. Nobes	6-32 UNC 0.5in Slot Screw	Cast Alloy Steel	4
6	John Samuel Parcon	Bolt ISO 4162-M5x10x10-N	Cast Alloy Steel	2
7	John Samuel Parcon	Bolt ISO 4163-M5x10x17-N	Cast Alloy Steel	2





Note:
-Only top-level parts of the overall assembly were listed in the BOM
-GearTrain subassembly is to be assembled in place

MecE 265
Instructor:
Dr. D.S.Nobes
Win 2017
Comments:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MM
TOLERANCES:
ANGULAR: ± 0.5°
LINEAR
X = ± 0.5
X.X = ± 0.1
X.XX = ± 0.025
SURFACE FINISH 0.6 µm
DO NOT SCALE DRAWING

DRAWN BY:
John Samuel Parcon
Lab Day: ALL
SM By: **John Samuel Parcon**
TA Initials: DSN/AA
aarchiba
Monday, August 21, 2017 10:24:56 AM
Tuesday, June 21, 2016 11:18:12 AM

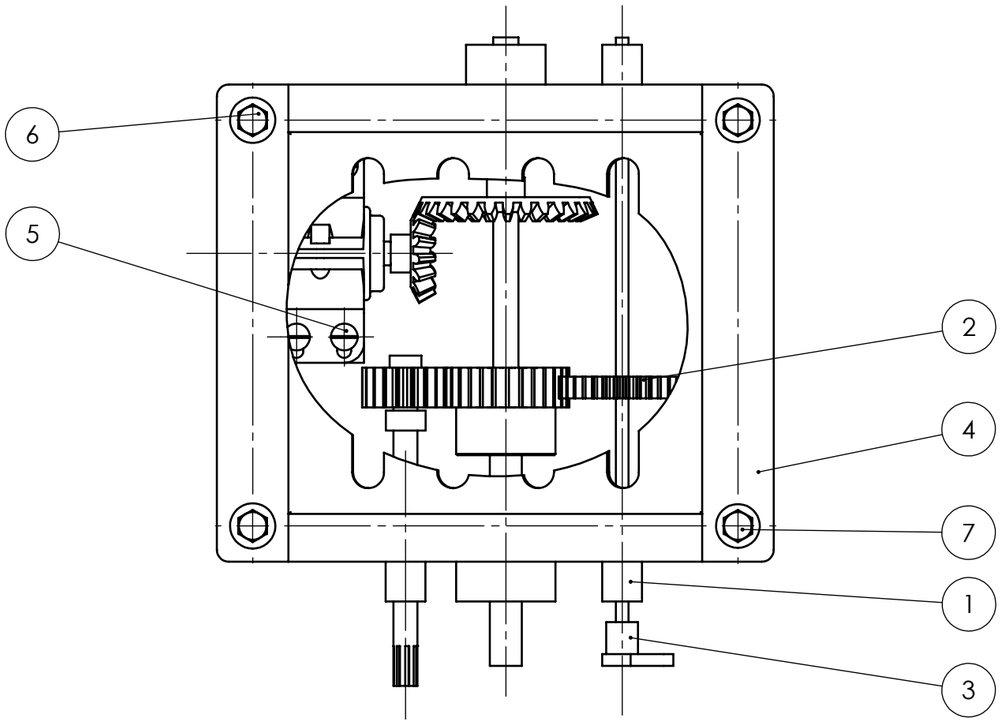
The Department of Mechanical Engineering
UNIVERSITY OF ALBERTA

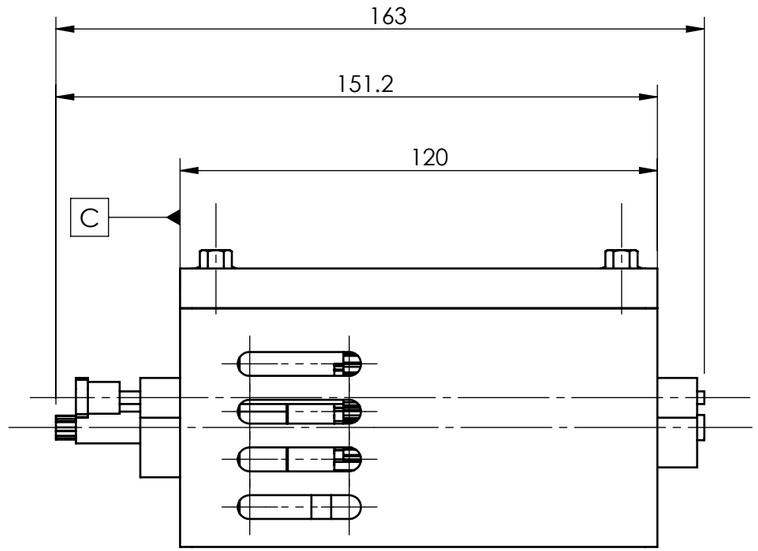
TITLE:
Exploded View of the Gearbox Assembly

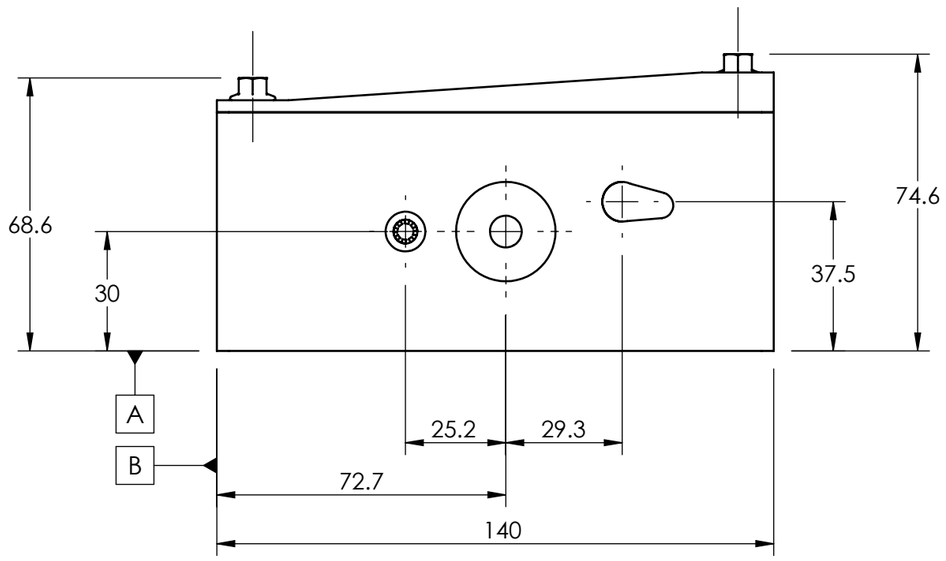
MATERIAL: Multiple
FILE NAME: Overall Gearbox

SIZE B | Assignment Number ALL | REV 2
SCALE: 1:2 | Mass: 1330.57 | SHEET 1 OF 14

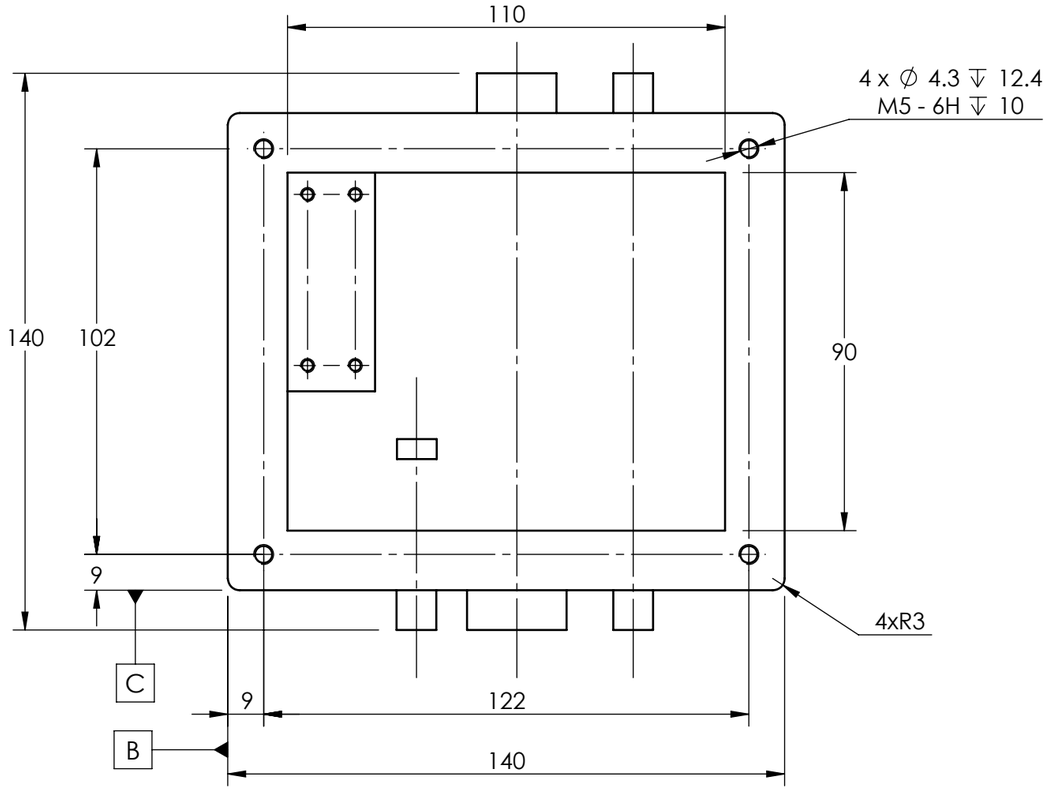
ITEM NO.	SW-Author(Author)	SW-Title(Title)	Material	QTY.
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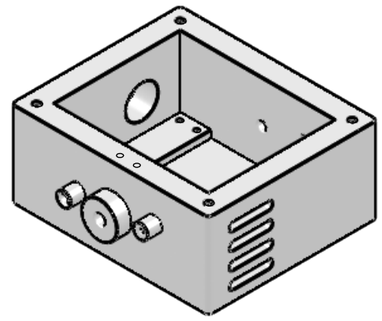


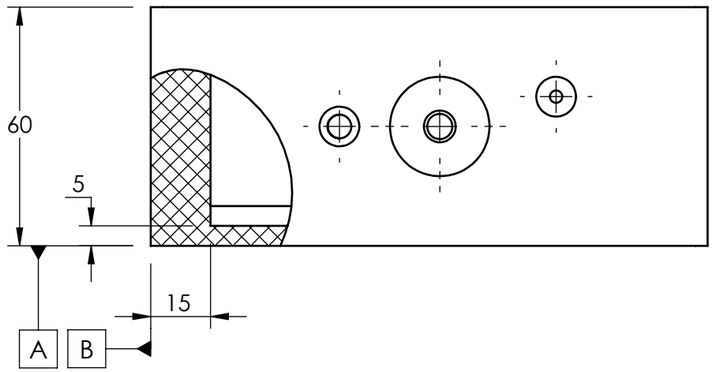


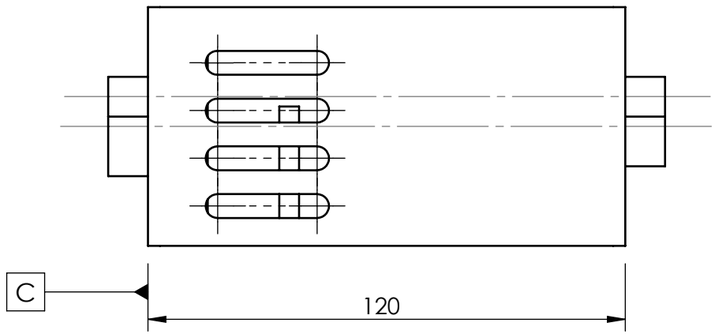


MecE 265 Instructor: **Dr. D.S.Nobes** **Win 2017** Comments:	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: ± 0.5° LINEAR X = ± 0.5 X.X = ± 0.1 X.XX = ± 0.025 SURFACE FINISH µm 0.6 DO NOT SCALE DRAWING	DRAWN BY: **John Samuel Parcon** Lab Day: ALL SM By: **John Samuel Parcon** TA Initials: DSN/AA aarchiba Monday, August 21, 2017 10:24:56 AM Tuesday, June 21, 2016 11:18:12 AM	The Department of Mechanical Engineering UNIVERSITY OF ALBERTA TITLE: Overall Gearbox assembly
MATERIAL: Multiple			SIZE B | Assignment Number ALL | REV 2
FILE NAME: Overall Gearbox			SCALE: 2:3 | Mass: 1330.57 | SHEET 3 OF 14

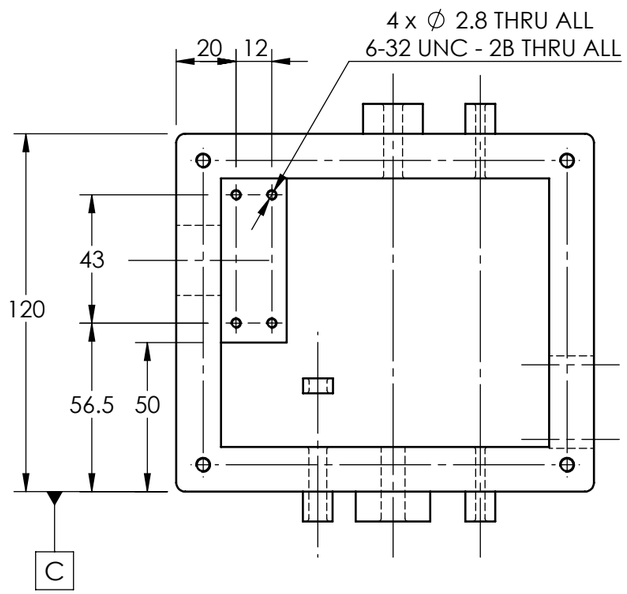




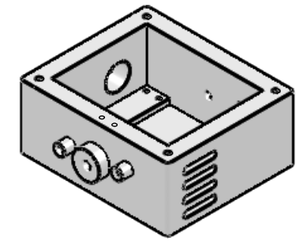


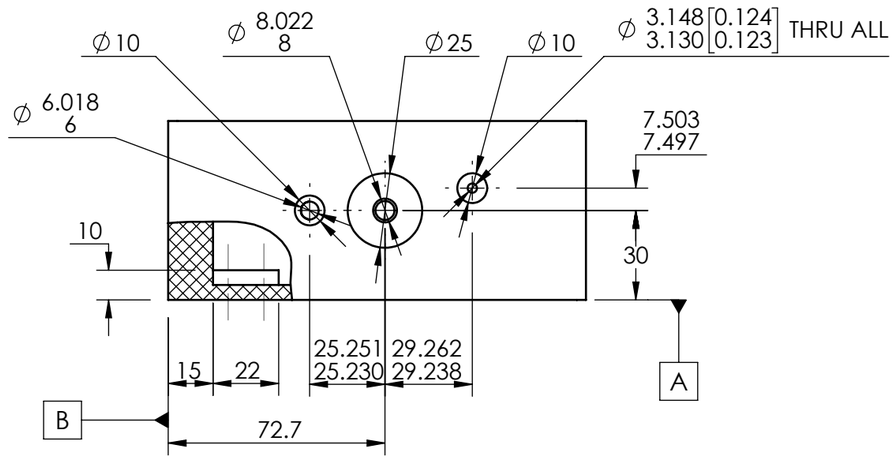


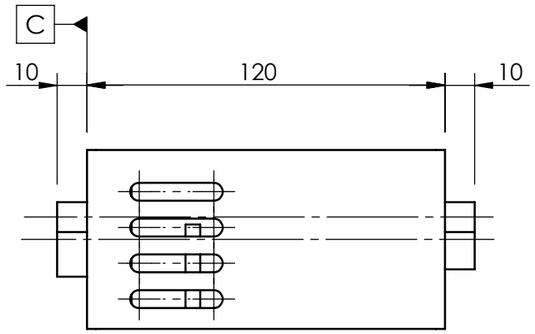
MecE 265 Instructor: Dr. D.S.Nobes Win 2017 Comments:	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: ± 0.5° LINEAR X = ± 0.5 X.X = ± 0.1 X.XX = ± 0.025 SURFACE FINISH µm 0.6 DO NOT SCALE DRAWING	DRAWN BY: **John Samuel Parcon** Lab Day: ALL SM By: **John Samuel Parcon** TA Initials: DSN/AA aarchiba Thursday, August 17, 2017 3:11:34 PM Tuesday, June 21, 2016 9:38:15 AM	The Department of Mechanical Engineering UNIVERSITY OF ALBERTA TITLE: Dimensioning the Overall Gearbox Housing
MATERIAL: ABS FILE NAME: Gearbox housing			SIZE B | Assignment Number ALL | REV 2 SCALE: 2:3 | Mass: 468.67 | SHEET 5 OF 14

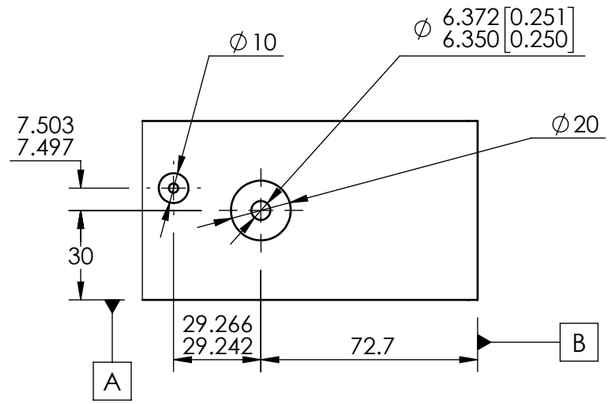


Note: All hole fillets have a radius of 1 mm

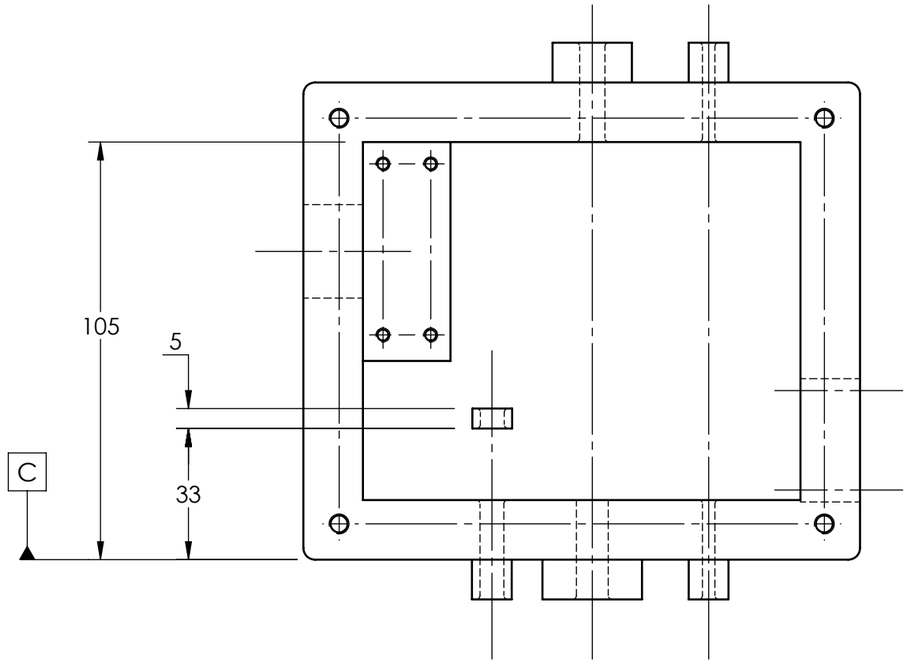


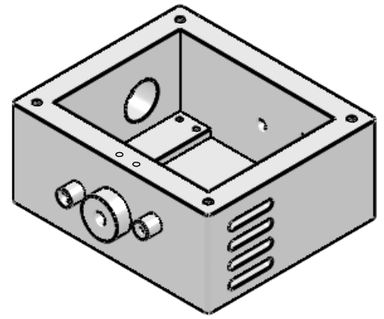


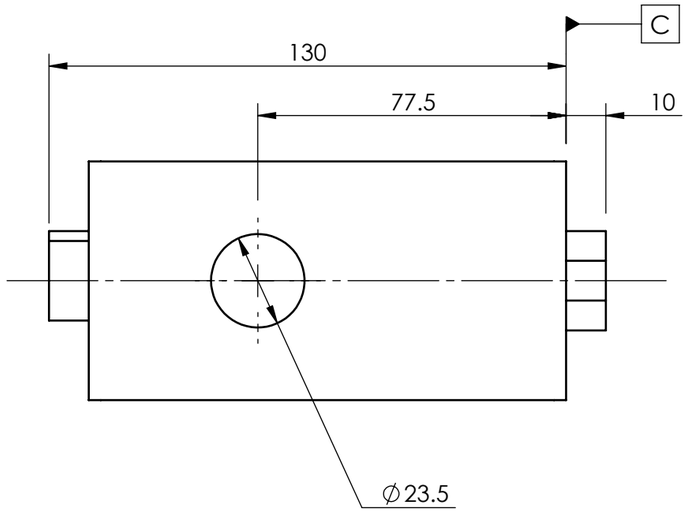


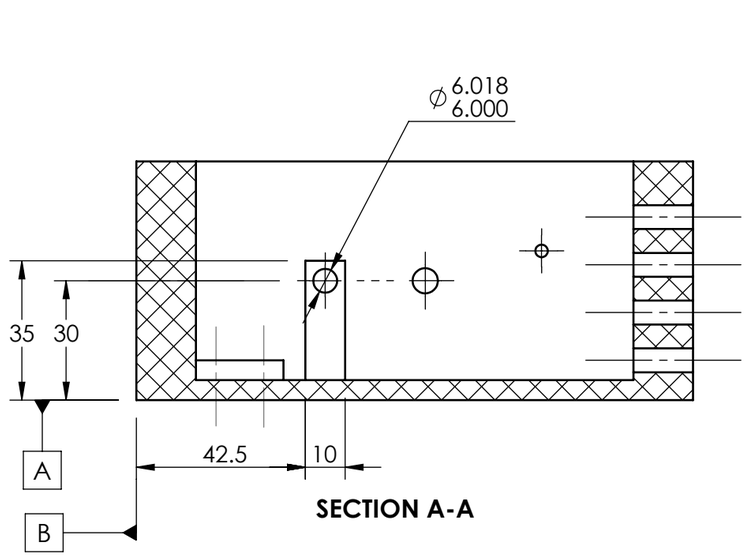


MecE 265 Instructor: Dr. D.S.Nobes Win 2017 Comments:	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: ± 0.5° LINEAR X = ± 0.5 X.X = ± 0.1 X.XX = ± 0.025 SURFACE FINISH µm 0.6 DO NOT SCALE DRAWING	DRAWN BY: **John Samuel Parcon** Lab Day: ALL SM By: **John Samuel Parcon** TA Initials: DSN/AA aarchiba Thursday, August 17, 2017 3:11:34 PM Tuesday, June 21, 2016 9:38:15 AM	The Department of Mechanical Engineering UNIVERSITY OF ALBERTA TITLE: Locating key features and shaft holes of the Gearbox Housing SIZE **B** · Assignment Number ALL · REV 2
MATERIAL: ABS FILE NAME: Gearbox housing			SCALE: 1:2 · Mass: 468.67 · SHEET 7 OF 14

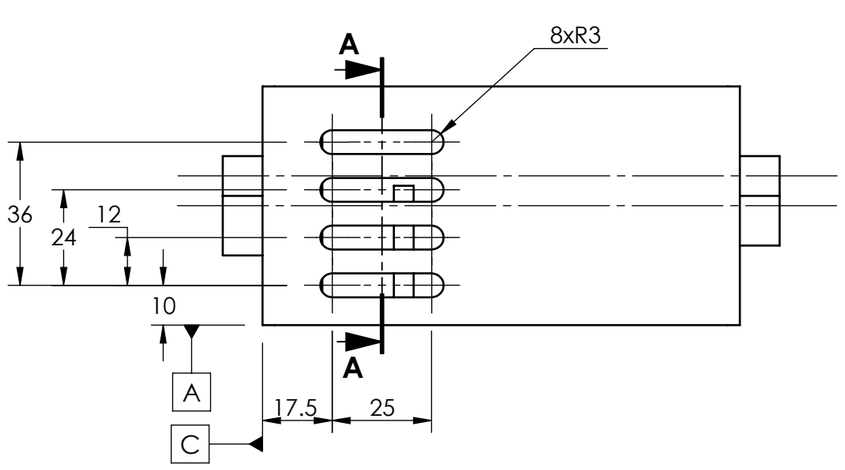




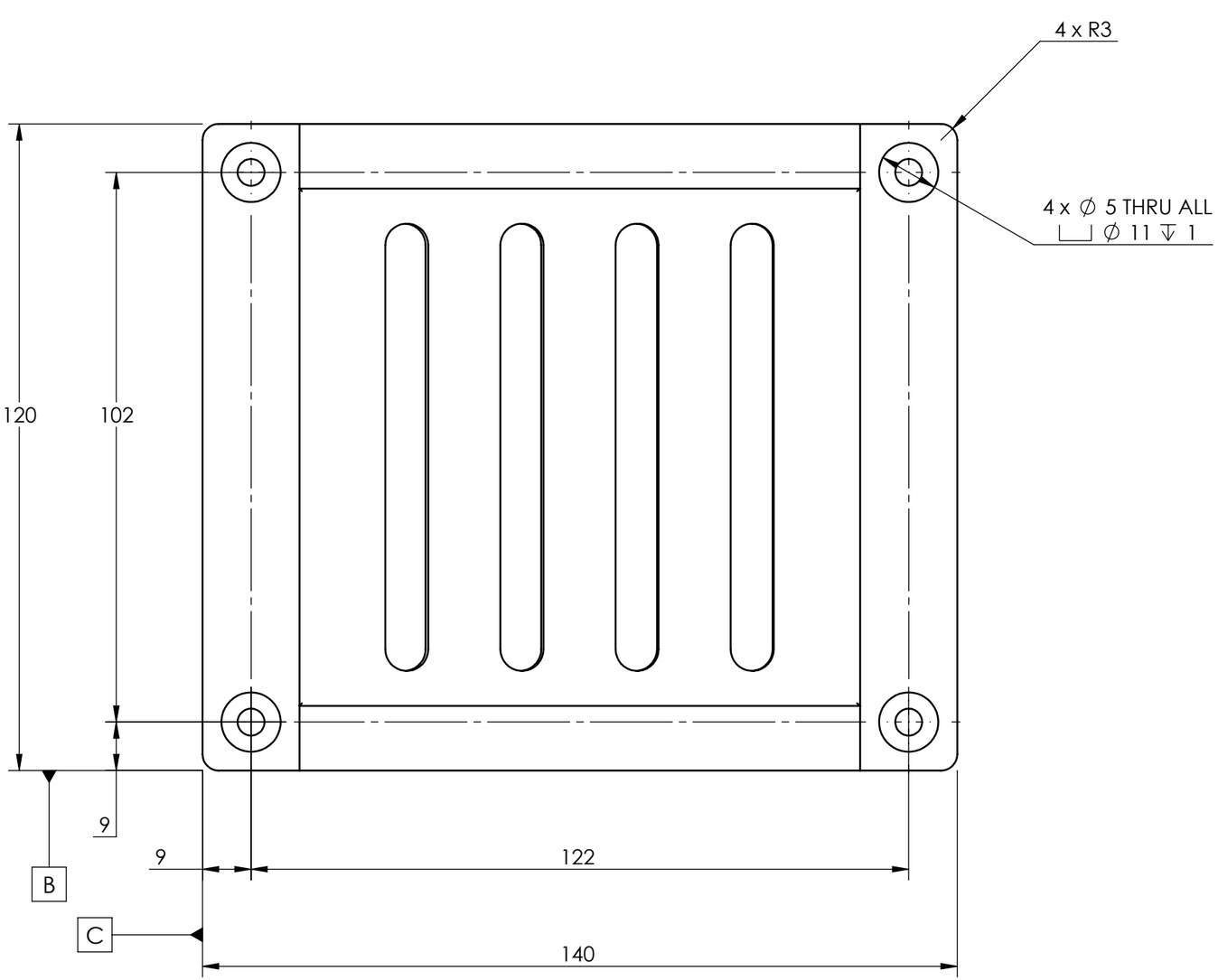


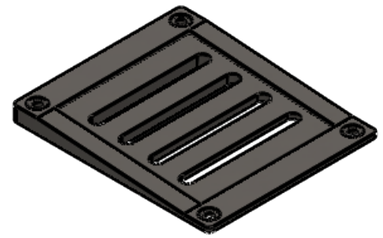


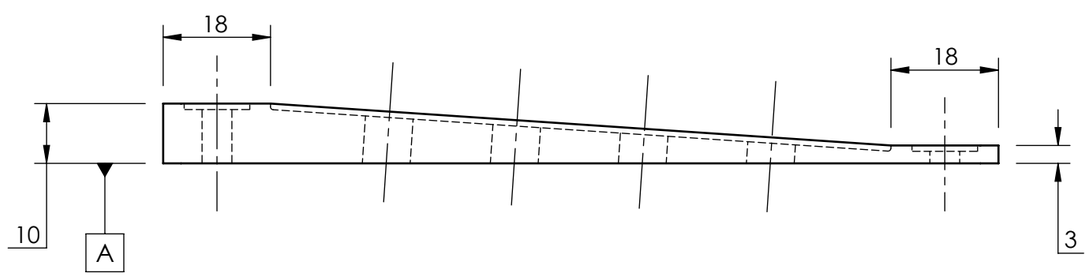
SECTION A-A



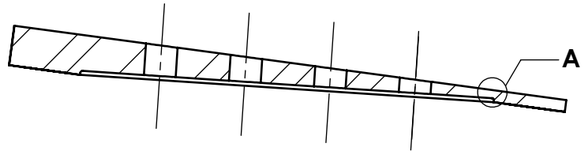
MecE 265	UNLESS OTHERWISE SPECIFIED:	DRAWN BY: **John Samuel Parcon**	The Department of Mechanical Engineering, UNIVERSITY OF ALBERTA
Instructor: Dr. D.S.Nobes Win 2017	DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: ± 0.5° LINEAR X = ± 0.5 X.X = ± 0.1 X.XX = ± 0.025	Lab Day: ALL SM By: **John Samuel Parcon** TA Initials: DSN/AA	TITLE: Dimensioning Features of the Gearbox Housing
Comments:	SURFACE FINISH µm 0.6 DO NOT SCALE DRAWING	aarchiba Thursday, August 17, 2017 3:11:34 PM Tuesday, June 21, 2016 9:38:15 AM	SIZE B · Assignment Number ALL · REV 2
MATERIAL: ABS			SCALE: 2:3 · Mass: 468.67 · SHEET 9 OF 14
FILE NAME: Gearbox housing			



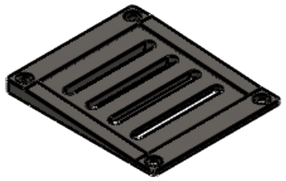


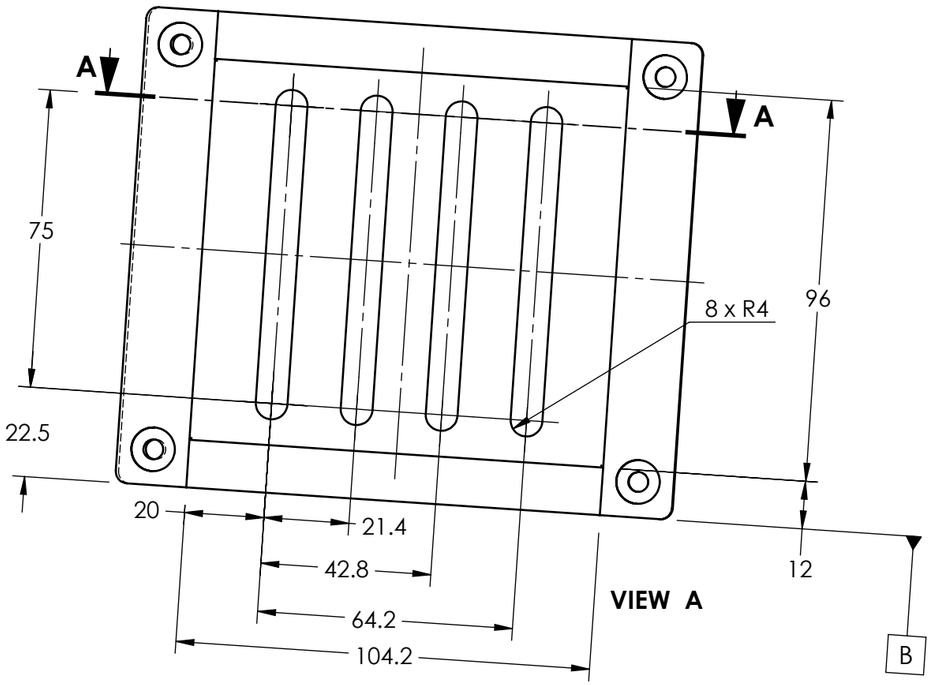


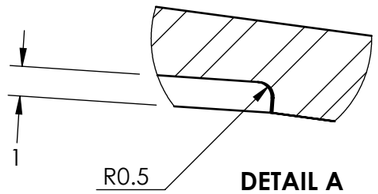
MecE 265	UNLESS OTHERWISE SPECIFIED:	DRAWN BY:	The Department of Mechanical Engineering, UNIVERSITY OF ALBERTA
Instructor: **Dr. D.S.Nobes** **Win 2017**	DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: ± 0.5° LINEAR X = ± 0.5 X.X = ± 0.1 X.XX = ± 0.025	**John Samuel Parcon**	TITLE: **Gearbox Housing Lid**
Comments:	SURFACE FINISH µm 0.6	Lab Day: ALL SM By: **John Samuel Parcon** TA Initials: DSN/AA	SIZE **B** · Assignment Number: ALL · REV: 2
	DO NOT SCALE DRAWING	aarchiba Monday, August 21, 2017 10:24:56 AM Tuesday, June 21, 2016 11:00:13 AM	
MATERIAL: AISI 316 Stainless Steel Sheet (SS)			SCALE: 1:1 · Mass: 672.06 · SHEET 11 OF 14
FILE NAME: Gearbox housing Lid1			



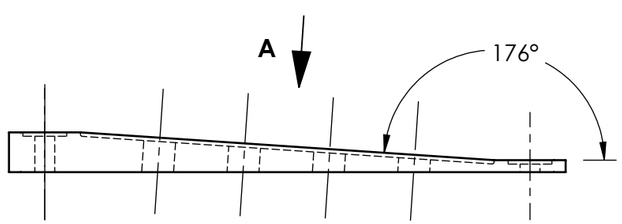
SECTION A-A







DETAIL A
SCALE 5 : 1



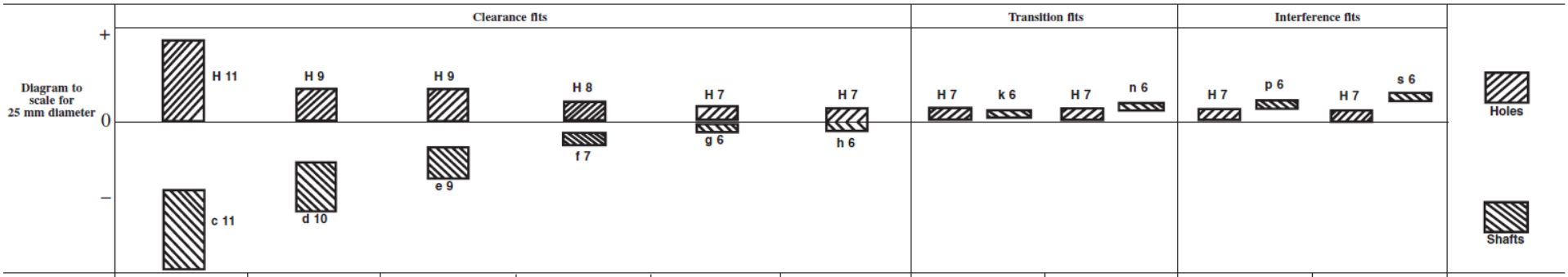
MecE 265	UNLESS OTHERWISE SPECIFIED:	DRAWN BY: **John Samuel Parcon**	The Department of Mechanical Engineering, UNIVERSITY OF ALBERTA
Instructor: Dr. D.S.Nobes Win 2017	DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: ± 0.5° LINEAR X = ± 0.5 X.X = ± 0.1 X.XX = ± 0.025	Lab Day: ALL	TITLE: Locating key features of the Lid
Comments:	SURFACE FINISH µm 0.6	SM By: **John Samuel Parcon**	
	DO NOT SCALE DRAWING	TA Initials: DSN/AA	
		aarchiba Monday, August 21, 2017 10:24:56 AM Tuesday, June 21, 2016 11:00:13 AM	SIZE **B** / Assignment Number: ALL / REV: 2
MATERIAL: AISI 316 Stainless Steel Sheet (SS)			
FILE NAME: Gearbox housing Lid1			SCALE: 2:3 / Mass: 672.06 / SHEET 13 OF 14

TOLERANCE CALCULATIONS

Action	Splined output shaft in 6mm Gearbox bore	Bevel-Spur shaft in 8mm Gearbox bore	Spur-spur-shaft in 3.13mm Gearbox bore	Bevel-Spur shaft in 6.35mm Gearbox bore
1. Determine the type of fit using table 12.1 (below)	A close running fit	A close running fit	A close running fit	A close running fit
2. Fit Basis	Hole Basis	Hole Basis	Hole Basis	Hole Basis
3. Selection of the ISO symbol for	H8/f7	H8/f7	H8/f7	H8/f7
4. Define the nominal sizes	6mm	8mm	3.13mm	6.35mm
5. From table 12.2, get the tolerance ranges	H8 → [0 +18] f7 → [-10 -28]	H8 → [0 +22] f7 → [-13 -28]	H8 → [0 +18] f7 → [-10 -28]	H8 → [0 +22] f7 → [-13 -28]
6. Calculate the tolerance dimensions	Bore [6.000 6.018] Shaft [5.972 5.990]	Bore [8.000 8.022] Shaft [7.972 7.983]	Bore [3.130 3.148] Shaft [3.108 3.120]	Bore [6.350 6.372] Shaft [6.322 6.337]

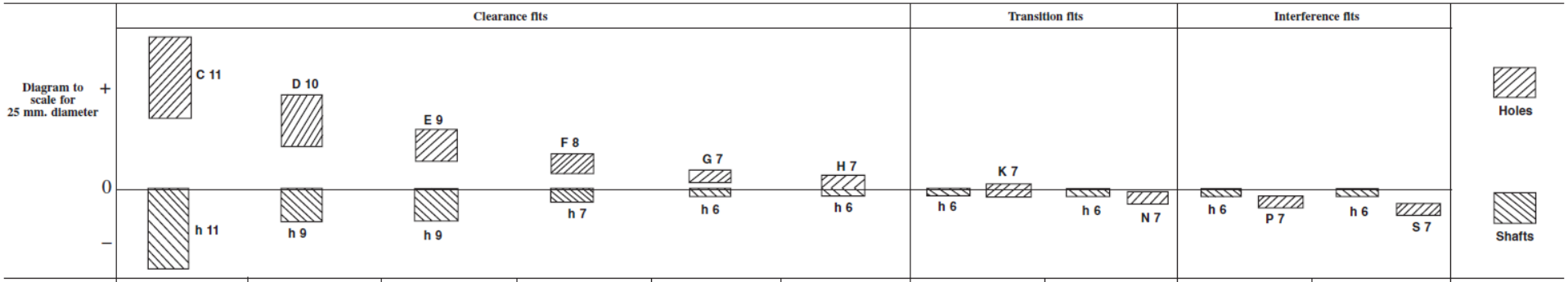
Table 12.1 Description of fits for circular objects

Fit	ISO Symbol		Description
	Hole Basis	Shaft Basis	
Clearance Fits	H11/c11	C11/h11	Loose fit. Wide tolerance
	H9/d9	D9/h9	Free running. Not when accuracy is important.
	H8/f7	F8/h7	Close running fit.
	H7/g6	G7/h6	Sliding fit. Not meant for the two parts running against each other but suitable for sliding adjustments.
Transition Fits	H7/h6	H7/h6	Snug fit but easy assembly
	H7/k6	K7/h6	Accurate location with some interference
	H7/n6	N7/h6	Use when larger interference is permissible
Interference Fits	H7/p6	P7/h6	For rigidity and correct alignment but not for power transmission
	H7/s6	S7/h6	Medium drive fit for ordinary steel parts. The tightest fit for cast iron parts
	H7/u6	U7/h6	High interference. Shrink fit recommended. Force fit for heavy parts only



Nominal sizes		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Nominal sizes	
Over	To	H11	c11	H9	d10	H9	e9	H8	f7	H7	g6	H7	h6	H7	k6	H7	n6	H7	p6	H7	s6	Over	To
mm	mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	mm	mm
—	3	+ 60 0	– 60 – 120	+ 25 0	– 20 – 60	+ 25 0	– 14 – 39	+ 14 0	– 6 – 16	+ 10 0	– 2 – 8	+ 10 0	– 6 0	+ 10 0	+ 6 + 0	+ 10 0	+ 10 + 4	+ 10 0	+ 12 + 6	+ 10 0	+ 20 + 14	—	3
3	6	+ 75 0	– 70 – 145	+ 30 0	– 30 – 78	+ 30 0	– 20 – 50	+ 18 0	– 10 – 28	+ 12 0	– 4 – 12	+ 12 0	– 8 0	+ 12 0	+ 9 + 1	+ 12 0	+ 16 + 8	+ 12 0	+ 20 + 12	+ 12 0	+ 27 + 19	3	6
6	10	+ 90 0	– 80 – 170	+ 36 0	– 40 – 98	+ 36 0	– 25 – 61	+ 22 0	– 13 – 28	+ 15 0	– 5 – 14	+ 15 0	– 9 0	+ 15 0	+ 10 + 1	+ 15 0	+ 19 + 10	+ 15 0	+ 24 + 15	+ 15 0	+ 32 + 23	6	10
10	18	+ 110 0	– 95 – 205	+ 43 0	– 50 – 120	+ 43 0	– 32 – 75	+ 27 0	– 16 – 34	+ 18 0	– 6 – 17	+ 18 0	– 11 0	+ 18 0	+ 12 + 1	+ 18 0	+ 23 + 12	+ 18 0	+ 29 + 18	+ 18 0	+ 39 + 28	10	18
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120	140	+ 250 0	– 200 – 450																	+ 40 0	+ 117 + 92	120	140
140	160	+ 250 0	– 210 – 460	+ 100 0	145 305	+ 100 0	– 84 – 185	+ 63 0	– 43 – 83	– 40 0	– 14 – 39	+ 40 0	– 25 0	+ 40 0	+ 28 + 3	+ 40 0	+ 52 + 27	– 40 0	+ 68 + 43	+ 40 0	+ 125 + 100	140	160
160	180	+ 250 0	– 230 – 480																	+ 40 0	+ 133 + 108	160	180
180	200	+ 290 0	– 240 530																	+ 46 0	+ 151 + 122	180	200
200	225	+ 290 0	260 550	+ 115 0	– 170 – 355	+ 115 0	– 100 – 215	+ 72 0	– 50 – 96	+ 46 0	– 15 – 44	+ 46 0	– 29 0	+ 46 0	+ 33 + 4	+ 46 0	+ 60 + 31	+ 46 0	+ 79 + 50	+ 46 0	+ 159 + 130	200	225
225	250	+ 290 0	280 570																	+ 46 0	+ 169 + 140	225	250
250	280	+ 320 0	300 620	+ 130	– 190	+ 130	– 110	+ 81	– 56	+ 52	– 17	+ 52	+ 32	+ 52	– 36	+ 52	+ 66	+ 52	+ 88	+ 52 0	+ 190 + 158	250	280
280	315	+ 320 0	330 650	0	– 400	0	– 240	0	– 108	0	– 49	0	0	0	+ 4	0	+ 34	0	+ 56	+ 52 0	+ 202 + 170	280	315
315	355	+ 360 0	360 – 720	+ 140	– 210	+ 140	– 125	+ 89	– 62	+ 57	– 18	+ 57	– 36	+ 57	+ 40	+ 57	+ 73	+ 57	+ 98	+ 57 0	+ 226 + 190	315	355
355	400	+ 360 0	400 760	0	– 440	0	– 265	0	– 119	0	– 54	0	0	0	+ 4	0	+ 37	0	+ 62	+57 0	+ 244 + 208	355	400
400	450	+ 400 0	440 840	+ 155	– 230	+ 155	– 135	+ 97	– 68	+ 63	– 20	+ 63	– 40	+ 63	+ 45	+ 63	+ 80	+ 63	+ 108	+ 63 0	+ 272 + 232	400	450
450	500	+ 400 0	480 880	0	– 480	0	– 290	0	– 131	0	– 60	0	0	0	+ 5	0	+ 40	0	+ 68	+ 63 0	+ 292 + 252	450	500

Table 12.2 Selected ISO Fits : Hole Bases



Nominal sizes		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Nominal sizes	
Over	To	h11	C11	h9	D10	h9	E9	h7	F8	h6	G7	h6	H7	h6	K7	h6	N7	h6	P7	h6	S7	Over	To
mm	mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm	mm	mm
–	3	0 – 60	+ 120 + 60	0 – 25	+ 60 + 20	0 – 25	+ 39 + 14	0 – 10	+ 20 + 6	0 – 6	+ 12 + 2	0 – 6	+ 10 0	0 – 6	0 – 10	0 – 6	– 4 – 14	0 – 6	– 6 – 16	0 – 6	– 14 – 24	–	3
3	6	0 – 75	+ 145 + 70	0 – 30	+ 78 + 30	0 – 30	+ 50 + 20	0 – 12	+ 28 + 10	0 – 8	+ 16 + 4	0 – 8	+ 12 0	0 – 8	+ 3 – 9	0 – 8	– 4 – 16	0 – 8	– 8 – 20	0 – 8	– 15 – 27	3	6
6	10	0 – 90	+ 170 + 80	0 – 36	+ 98 + 40	0 – 36	+ 61 + 25	0 – 15	+ 35 + 13	0 – 9	+ 20 + 5	0 – 9	+ 15 0	0 – 9	+ 5 – 10	0 – 9	– 4 – 19	0 – 9	– 9 – 24	0 – 9	– 17 – 32	6	10
10	18	0 – 110	+ 205 + 95	0 – 43	+ 120 + 50	0 – 43	+ 75 + 32	0 – 18	+ 43 + 16	0 – 11	+ 24 + 6	0 – 11	+ 18 0	0 – 11	+ 6 – 12	0 – 11	– 5 – 23	0 – 11	– 11 – 29	0 – 11	– 21 – 39	10	18
18	30	0 – 130	+ 240 + 110	0 – 52	+ 149 + 65	0 – 52	+ 92 + 40	0 – 21	+ 53 + 20	0 – 13	+ 28 + 7	0 – 13	+ 21 0	0 – 13	+ 6 – 15	0 – 13	– 7 – 28	0 – 13	– 14 – 35	0 – 13	– 27 – 48	18	30
30	40	0 – 160	+ 280 + 120	0	+ 180	0	+ 112	0	+ 64	0	+ 34	0	+ 25	0	+ 7	0	– 8	0	– 17	0	– 34	30	40
40	50	0 – 160	+ 290 + 130	– 62	+ 80	– 62	+ 50	– 25	+ 25	– 16	+ 9	– 16	0	– 16	– 18	– 16	– 33	– 16	– 42	– 16	– 59	40	50
50	65	0 – 190	+ 330 + 140	0	+ 220	0	+ 134	0	+ 76	0	+ 40	0	+ 30	0	+ 9	0	– 9	0	– 21	0 – 19	– 42 – 72	50	65
65	80	0 – 190	+ 340 + 150	– 74	+ 100	– 74	+ 60	– 30	+ 30	– 19	+ 10	– 19	0	– 19	– 21	– 19	– 39	– 19	– 51	0 – 19	– 48 – 78	65	80
80	100	0 – 220	+ 390 + 170	0	+ 260	0	+ 159	0	+ 90	0	+ 47	0	+ 35	0	+ 10	0	– 10	0	– 24	0 – 22	– 58 – 93	80	100
100	120	0 – 220	+ 400 + 800	– 87	+ 120	– 87	+ 72	– 35	+ 36	– 22	+ 12	– 22	0	– 22	– 25	– 22	– 45	– 22	– 59	0 – 22	– 66 – 101	100	120
120	140	0 – 250	+ 450 + 200																	0 – 25	– 77 – 117	120	140
140	160	0 – 250	+ 460 + 210	0 – 100	+ 305 + 145	0 – 100	+ 185 + 85	0 – 40	+ 106 + 43	0 – 25	+ 54 + 14	0 – 25	+ 40 0	0 – 25	+ 12 – 28	0 – 25	– 12 – 52	0 – 25	– 28 – 68	0 – 25	– 85 – 125	140	160
160	180	0 – 250	+ 480 + 230																	0 – 25	– 93 – 133	160	180
180	200	0 – 290	+ 530 + 240																	0 – 29	– 105 – 151	180	200
200	225	0 – 290	+ 550 – 260	0 – 115	+ 355 + 170	0 – 115	+ 215 + 100	0 – 46	+ 122 + 50	0 – 29	+ 61 + 15	0 – 29	+ 46 0	0 – 29	+ 13 – 33	0 – 29	– 14 – 60	0 – 29	– 33 – 79	0 – 29	– 113 – 159	200	225
225	250	0 – 290	+ 570 + 280																	0 – 29	– 123 – 169	225	250
250	280	0 – 320	+ 620 + 300	0	+ 400	0	+ 240	0	+ 137	0	+ 62	0	+ 52	0	+ 16	0	– 14	0	– 36	0 – 32	– 138 – 190	250	280
280	315	0 – 320	+ 650 + 330	– 130	+ 190	– 130	+ 110	– 52	+ 56	– 32	+ 17	– 32	0	– 32	– 36	– 32	– 66	– 32	– 88	0 – 32	– 150 – 202	280	315
315	355	0 – 360	+ 720 + 360	0	+ 440	0	+ 265	0	+ 151	0	+ 75	0	+ 57	0	+ 17	0	– 16	0	– 41	0 – 36	– 169 – 226	315	355
355	400	0 – 360	+ 760 + 400	– 140	+ 210	– 140	+ 125	– 57	+ 62	– 36	+ 18	– 36	0	– 36	– 40	– 36	– 73	– 36	– 98	0 – 36	– 187 – 244	355	400
400	450	0 – 400	+ 840 + 440	0	+ 480	0	+ 290	0	+ 165	0	+ 83	0	+ 63	0	+ 18	0	– 17	0	– 45	0 – 40	– 209 – 272	400	450
450	500	0 – 400	+ 880 + 480	– 155	+ 230	– 155	+ 135	– 63	+ 68	– 40	+ 20	– 40	0	– 40	– 45	– 40	– 80	– 40	– 108	0 – 40	– 229 – 292	450	500

Table 12.3 Selected ISO Fits : Shaft Bases

Spur Gear Center to Center Tolerance Calculations:

<table>
<tr><th>Action</th><th>Drive Spur Gear to Pinion Spur Gear</th><th colspan="2">Drive Spur Gear to Idler Spur Gear</th></tr>
<tr><td>1. Selection for the class of Accuracy</td><td>Js7</td><td colspan="2">Js7</td></tr>
<tr><td rowspan="2">2. Define the nominal sizes</td><td rowspan="2">25.24mm</td><td colspan="2">30.20mm</td></tr>
<tr><td>Horizontal
29.25mm</td><td>Vertical
7.5mm</td></tr>
<tr><td rowspan="2">3. From table below, get the tolerance ranges</td><td rowspan="2">[-10.5 +10.5]</td><td colspan="2">[-12.5 +12.5]</td></tr>
<tr><td>Horizontal
[-12.1 +12.1]</td><td>Vertical
[-3.1 +3.1]</td></tr>
<tr><td rowspan="2">4. Calculate the tolerance dimensions</td><td rowspan="2">[25.230 25.251]</td><td colspan="2">[30.188 30.213]</td></tr>
<tr><td>Horizontal
[29.262 29.238]</td><td>Vertical
[7.497 7.503]</td></tr>
</table>

Note: The accuracy class varies according to:
The manufacturing process

- 9 to 12 for gears that undergo a heat treatment after the finish
- 6 to 12 for teeth obtained by milling, hobbing or shaving
- 4 to 6 for grinded teeth

Rotational speed

- 10 to 12 for a circumferential speed of 3 m/sec
- 7 to 10 for a circumferential speed of 3 to 6 m/sec
- 4 to 6 for a circumferential speed of 6 to 20 m/sec
- Tolerance on the centre distance

Seven tolerance fields are applicable: from js 5 to 11. In table 1 you will find the most widely used tolerances: js's 7 to 10.

Tolerances on the centre distance								
	Class of accuracy of centre distance 5 to 6 Class of accuracy of centre distance 7 to 9 Class of accuracy of centre distance 10 to 12							
a = centre distance in mm	Tolerance zone (deviations in µm) – js							
	5	6	7	8	9	10	11	12
more than 10 tot 18	± 4,0	± 5,5	± 9,0	± 13,5	± 21,5	± 35,0	± 55,0	± 90,0
more than 18 tot 30	± 4,5	± 6,5	± 10,5	± 16,5	± 26,0	± 42,0	± 65,0	± 105
more than 30 tot 50	± 5,5	± 8,0	± 12,5	± 19,5	± 31,0	± 50,0	± 80,0	± 125
more than 50 tot 80	± 6,5	± 9,5	± 15,0	± 23,0	± 37,0	± 60,0	± 95,0	± 150
more than 80 tot 120	± 7,5	± 11,0	± 17,5	± 27,0	± 43,5	± 70,0	± 110	± 175
more than 120 tot 180	± 9,0	± 12,5	± 20,0	± 31,5	± 50,0	± 80,0	± 125	± 200
more than 180 tot 250	± 10,0	± 14,5	± 23,0	± 36,0	± 57,5	± 92,5	± 145	± 230
more than 250 tot 315	± 11,5	± 16,0	± 26,0	± 40,5	± 65,0	± 105	± 160	± 260
more than 315 tot 400	± 12,5	± 18,0	± 28,5	± 44,5	± 70,0	± 115	± 180	± 285
more than 400 tot 500	± 13,5	± 20,0	± 31,5	± 48,5	± 77,5	± 125	± 200	± 315
more than 500 tot 630	± 15,5	± 23,0	± 35,0	± 55,0	± 87,0	± 140	± 218	± 350
more than 630 tot 800	± 17,0	± 25,0	± 40,0	± 62,0	± 100	± 160	± 250	± 395
more than 800 tot 1000	± 19,5	± 29,0	± 45,0	± 70,0	± 115	± 180	± 290	± 455
more than 1000 tot 1250	± 23,0	± 33,0	± 52,0	± 82,0	± 130	± 210	± 330	± 525
more than 1250 tot 1600	± 27,0	± 38,5	± 62,0	± 97,0	± 155	± 250	± 385	± 625

http://www.tandwiel.info/en/gears/level-of-accuracy-and-compliance-of-the-teeth/