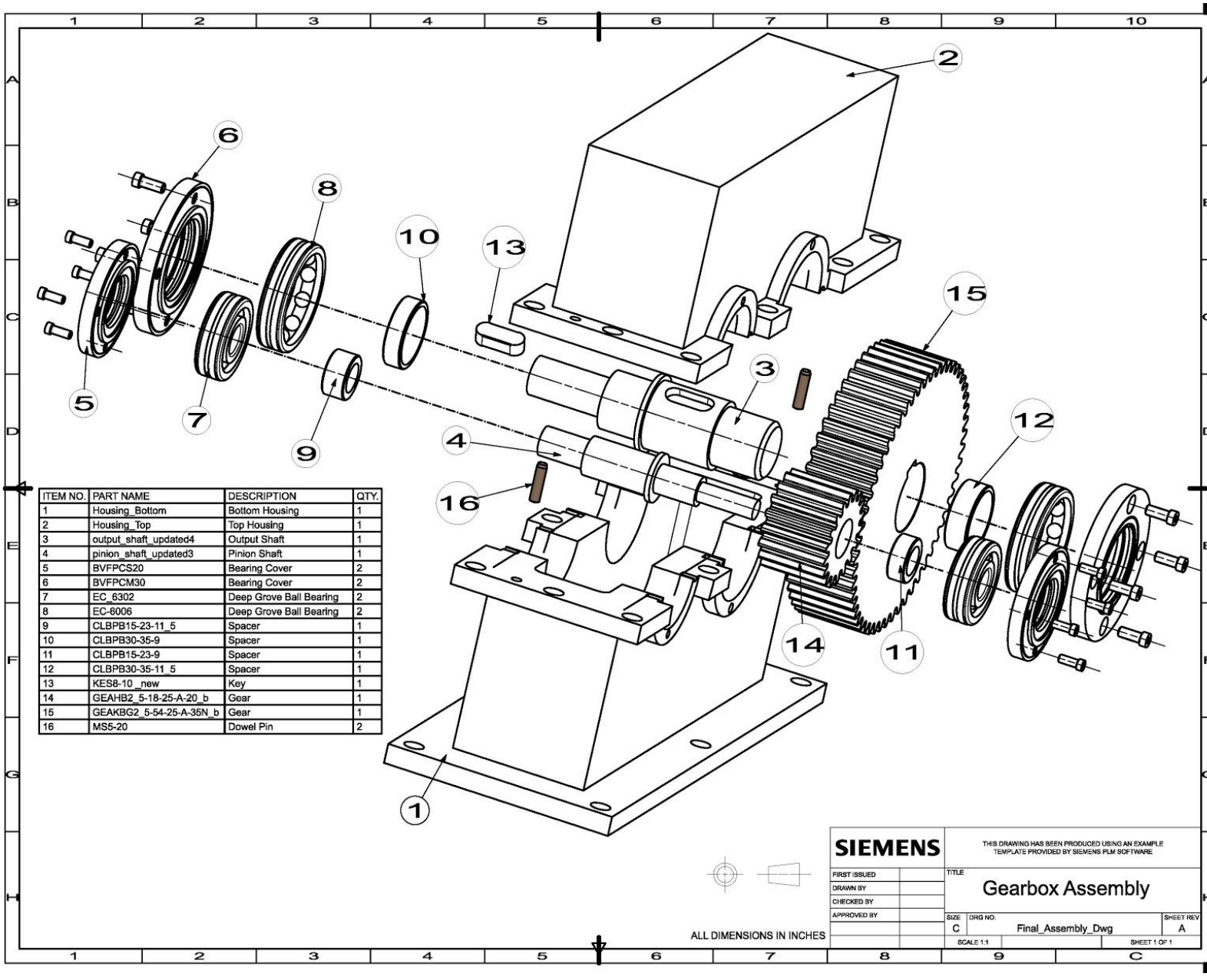
FINAL REPORT

Group 20
Gilberto Guadiana, Bryan Horn,
Kevin Kim, Abdallah Khawaldh

Project Description

We designed a transmission gearbox. Its function is to make speed and torque conversions from the input rotating power source connected to the input shaft and output it via the output shaft. The shafts are connected to a gear, two ball bearings, and two spacers. The output shaft has a key connecting the shaft to its gear. The bearings have bearing covers with oil seals. The housing is made up of two components and are connected via dowel pins.

Exploded View with BOM



ITEM NO.	PART NAME	DESCRIPTION	QTY.
1	Housing_Bottom	Bottom Housing	1
2	Housing_Top	Top Housing	1
3	output_shaft_updated4	Output Shaft	1
4	pinion_shaft_updated3	Pinion Shaft	1
5	BVFPCS20	Bearing Cover	2
6	BVFPCM30	Bearing Cover	2
7	EC_6302	Deep Grove Ball Bearing	2
8	EC-6006	Deep Grove Ball Bearing	2
9	CLBPB15-23-11_5	Spacer	1
10	CLBPB30-35-9	Spacer	1
11	CLBPB15-23-9	Spacer	1
12	CLBPB30-35-11_5	Spacer	1
13	KES8-10 _new	Key	1
14	GEAHB2_5-18-25-A-20_b	Gear	1
15	GEAKBG2_5-54-25-A-35N_b	Gear	1
16	MS5-20	Dowel Pin	2

ALL DIMENSIONS IN INCHES

SIEMENS

THIS DRAWING HAS BEEN PRODUCED USING AN EXAMPLE TEMPLATE PROVIDED BY SIEMENS PLM SOFTWARE

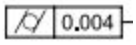
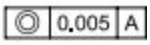
FIRST ISSUED	
DRAWN BY	
CHECKED BY	
APPROVED BY	

TITLE: Gearbox Assembly

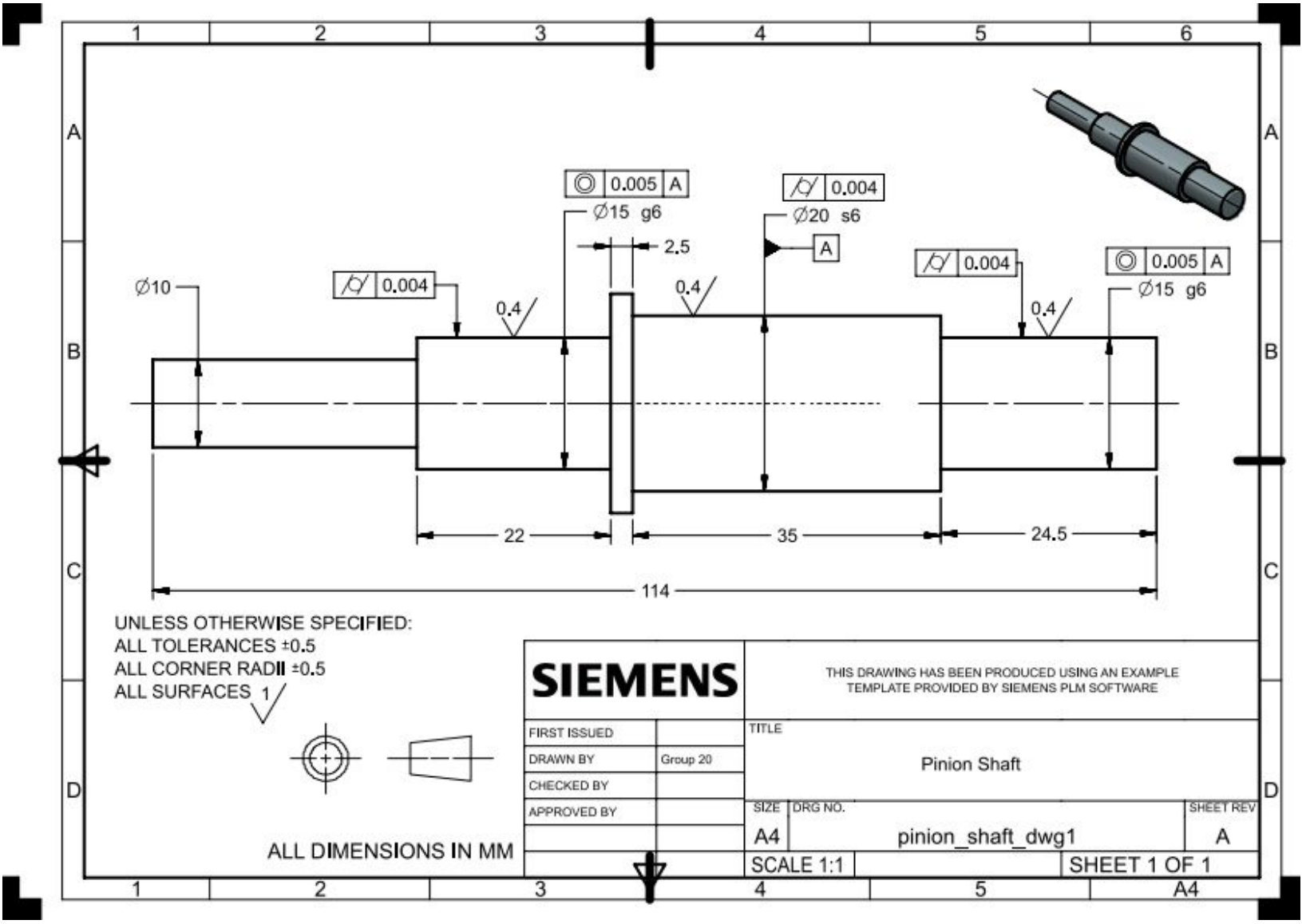
SIZE: C | DRG NO.: Final_Assembly_Dwg | SHEET REV: A

SCALE 1:1 | SHEET 1 OF 1

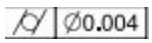
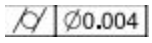
Pinion Shaft Data

	ITEM	DESCRIPTION SYMBOL/VALUE	RATIONALE/JUSTIFICATION
TOLERANCES LIMITS & FITS	1	Pinion Fit H7/s6	A permanent fit to the shaft without possibility of disassembly using a medium drive interference fit.
	2	Bearing Fit N7/g6	The NSK-Bearing fitting recommendations were used. This fit minimizes axial displacement.
	3	General Tolerance +/- 0.5	These are values that likely would not interfere with the function of the pinion shaft.
	4	General Corner Radii +/- 0.5	These are values that likely would not interfere with the function of the pinion shaft.
GD & T	1	Primary Datum A	Pinion axis selected since it is most functionally important. This axis is used as reference for the bearing surfaces.
	2	Pinion and Bearing Surface Cylindricity 	Provides a higher form accuracy than the limits of size. Assures a better fit between the shaft components and the shaft.
	3	Bearing Surface Concentricity 	Provides a higher form accuracy than the limits of size. Allows the bearing surface axis to line up with the pinion surface axis.
SURFACE ROUGHNESS	1	Pinion and Bearing Surface Roughness 	The specification reflects the need for a ground surface for proper function of the pinion shaft. We followed the 10x rule of thumb.
	2	General Surface Roughness 	The specification allows for a ground surface and is less restrictive than the more functionally important surfaces.

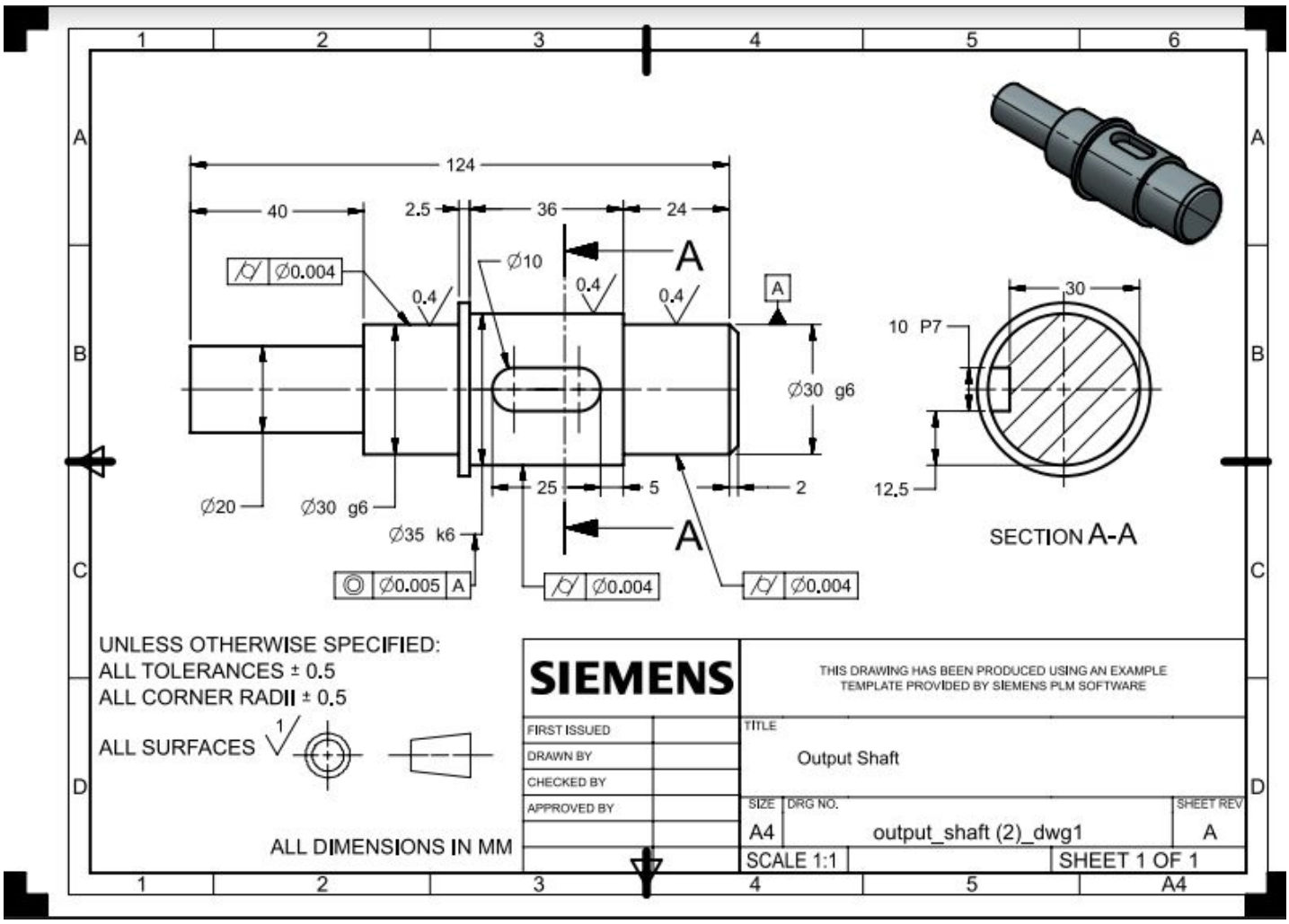
Pinion Shaft Drawing



Gear Shaft Data

	ITEM	DESCRIPTION SYMBOL/VALUE	RATIONALE/JUSTIFICATION
TOLERANCES LIMITS & FITS	1	Gear Fit H7/k6	Provides for accurate location, a compromise between clearance and interference fits
	2	Bearing Fit H7/g6	The NSK-Bearing fit recommendations were used
	3	Key Fit P7/h6	This fit between key and keyway provides rigidity and alignment without excessive pressure requirements
	4	General Tolerance ± 0.5	This general tolerance wouldn't interfere with the key functions of the gear shaft
	5	General Corner Radii ± 0.5	This general tolerance wouldn't interfere with the key functions of the gear shaft
GD & T	1	Primary Datum A	The center axis of the gear shaft is very important in regards to the rest of the geometry of the shaft
	2	Gear Surface Concentricity 	Important for the gear to be not oscillating and not wear quickly, so concentricity takes care of that
	3	Gear Surface Cylindricity 	Further ensures the gear functions properly and safely on the shaft
	4	Bearing Surface Cylindricity 	Further accuracy for the bearings to function properly with the gear
SURFACE ROUGHNESS	1	Gear and Bearing Surfaces 	Ensures the proper ground surface for the gear and bearing to function properly
	2	General Surface Roughness 	Ensures a proper ground surface for the other surfaces

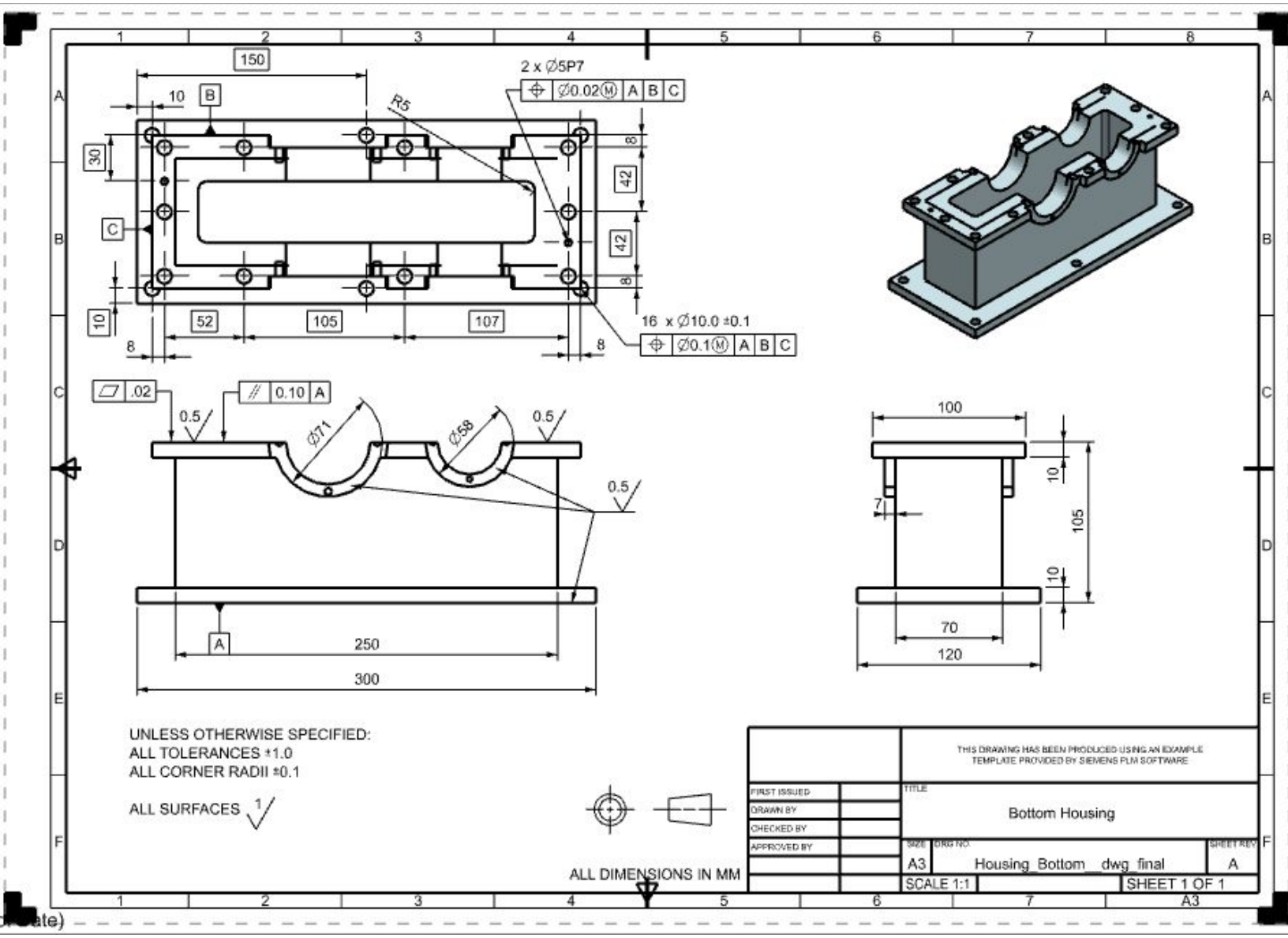
Gear Shaft Drawing



Bottom Housing Data

	ITEM	DESCRIPTION SYMBOL/VALUE	RATIONALE/JUSTIFICATION
TOLERANCES LIMITS & FITS	1	Locating Pin Fit P7/h6	Locational interference fit is needed. Shaft basis is used, since the locating pin is provided.
	2	General Tolerance ± 1.0	This general tolerance won't restrict manufacturing processes or the function of the housing
	3	General Corner Radii ± 0.1	This general tolerance won't restrict manufacturing processes or the function of the housing
GD & T	1	Primary Datum A	Bottom of the housing selected. The bottom can easily be put flat against a datum surface to make three-point contact.
	2	Secondary Datum B	One side of the flange is selected. Important for defining the locations of holes..
	3	Tertiary Datum C	Other side of the flange is selected. Important for defining the locations of holes..
	4	Hole Position 16 x ∅10.0 ±0.1 ⌖ ∅0.1Ⓜ A B C	Controls position of hole centers relative to datums. Position tolerance is selected so that the holes line up reasonably close to the holes on the top housing.
	5	Mating Pin Hole Position 2 x ∅5P7 ⌖ ∅0.02Ⓜ A B C	Position tolerance must be smaller than for the general holes, since these holes are responsible for locating the top and bottom housing.
	6	Mating Surface Flatness ⏥ .02	Needed so the two mating surfaces can be closely pressed against each other with minimal separation.
	7	Mating Surface Parallelism // 0.10 A	Needed so the mating surface is oriented at the correct angle.
SURFACE ROUGHNESS	1	Mating Surface 0.5	Allows for a ground surface for proper function of the mating components. We followed the 10x rule of thumb.
	2	Bearing Bores and Bearing Cover Mounting Surfaces 0.5	Allows for a ground surface for proper function of the Bearing Bores. We followed the 10x rule of thumb.

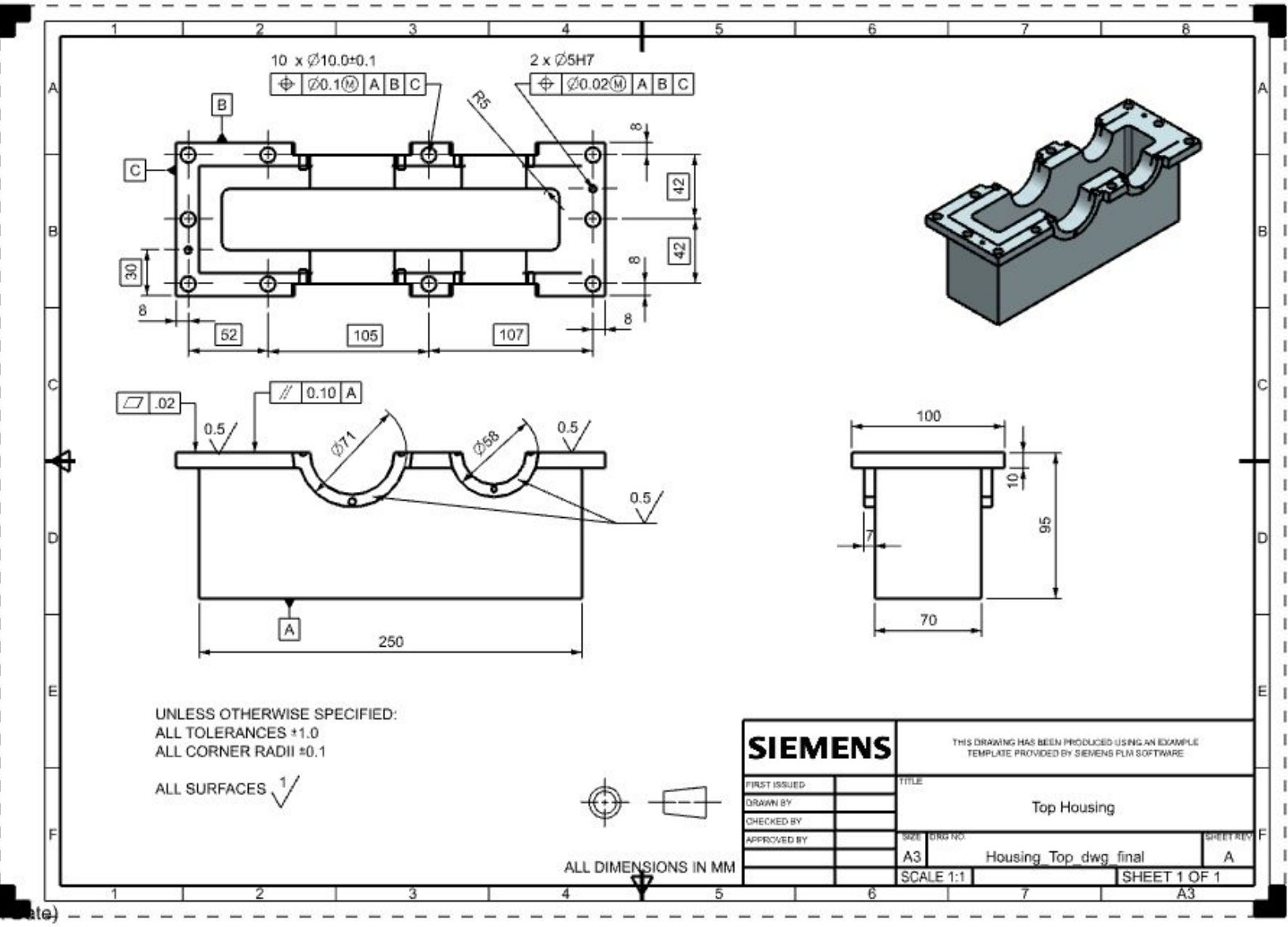
Bottom Housing Drawing



Top Housing Data

	ITEM	DESCRIPTION SYMBOL/VALUE	RATIONALE/JUSTIFICATION
TOLERANCES LIMITS & FITS	1	Locating Pin Fit H7/h6	Locational clearance fit is needed. Shaft basis is used, since the locating pin is provided.
	2	General Tolerance ± 1.0	This general tolerance won't restrict manufacturing processes or the function of the housing
	3	General Corner Radii ± 0.1	This general tolerance won't restrict manufacturing processes or the function of the housing
GD & T	1	Primary Datum A	Bottom of the housing selected. The bottom can easily be put flat against a datum surface to make three-point contact.
	2	Secondary Datum B	One side of the flange is selected. Important for defining the locations of holes..
	3	Tertiary Datum C	Other side of the flange is selected. Important for defining the locations of holes..
	4	Hole Position 10 x ∅10.0±0.1 ⌖ ∅0.1Ⓜ A B C	Controls position of hole centers relative to datums. Position tolerance is selected so that the holes line up reasonably close to the hole on the top housing.
	5	Mating Pin Hole Position 2 x ∅5H7 ⌖ ∅0.02Ⓜ A B C	Position tolerance must be smaller than for the general holes, since these holes are responsible for locating the top and bottom housing.
	6	Mating Surface Flatness ⏥ .02	Needed so the two mating surfaces can be closely pressed against each other with minimal separation.
	7	Mating Surface Parallelism // 0.10 A	Needed so the mating surface is oriented at the correct angle.
SURFACE ROUGHNESS	1	Mating Surface 0.5	Allows for a ground surface for proper function of the mating components. We followed the 10x rule of thumb.
	2	Bearing Bores and Bearing Cover Mounting Surfaces 0.5	Allows for a ground surface for proper function of the Bearing Bores. We followed the 10x rule of thumb.

Top Housing Drawing



Housing Assembly Data

	ITEM	DESCRIPTION SYMBOL/VALUE	RATIONALE/JUSTIFICATION
TOLERANCES LIMITS & FITS	1	Bearings Fit N7/g6	The NSK-Bearing fitting recommendations were used. This fit minimizes axial displacement.
	2	General Tolerance ± 1.0	This general tolerance won't restrict manufacturing processes or the function of the housing
	3	General Corner Radii ± 0.1	This general tolerance won't restrict manufacturing processes or the function of the housing
GD & T	1	Primary Datum A	Bottom of the housing selected. The bottom can easily be put flat against a datum surface to make three-point contact.
	2	Secondary Datum B	Bearing hole axis selected.This axis is important for the geometry of the assembly.
	4	Small Bearing Hole Position ∅42N7 ⌖ ∅0.024Ⓜ A B	Controls position of hole center relative to datums. A diameter for tolerance zone is also specified.
	5	Large Bearing Hole Position ∅55N7 ⌖ ∅0.024Ⓜ A B	Controls position of hole center relative to datums. A diameter for tolerance zone is also specified.
	6	Large Bearing Cover Hole Position Tolerance 4 x ∅ 5.0 ±0.1 ⌖ ∅0.1Ⓜ A B	Positions of the holes must be controlled so that all four holes line up with the four holes on the large bearing cover.
	7	Small Bearing Cover Hole Position Tolerance 4 x ∅ 4.0 ±0.1 ⌖ ∅0.1Ⓜ A B	Positions of the holes must be controlled so that all four holes line up with the four holes on the small bearing cover
	8	perpendicularity ⊥ 0.1 A	Needed to ensure correct angle and orientation.
	9	Bearing Holes Cylindricity 2X ⌭ 0.1	Provides a higher form accuracy than is given by the limits of size to ensure that the shafts and bearings can fit inside it.

SURFACE ROUGHNESS	1	General Surface Roughness	The specification allows for a ground surface and is less restrictive than the more functionally important surfaces.
		1	

Housing Assembly Drawing