Shaft Design [MEMS1029 HW1-3]

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> I wrote this in Markdown file and convert it to PDF by safari. It might not looking good locally, but pealse open the following link for a better reading experence. I believe it's a convenient and nice way for your reading (and grading).
>
> Refer to: https://github.com/ice-bear-git/_MEMS1029_DesignII_onGithub/blob/main/CAD/HW1-3-ShaftDesign-Jan27.md

Problem Statement

In this exercise, I walked through the conponent selecting, demension designing, assemblying, and drawing creating. What's more, I used this time to become familiar of onShape -- the recomended online CAD tools.

What's more, as the description of this assignment said:

> "You may find an easier time locating commercially-available components if you scale back to a smaller size and loads than the text typically uses."

- I simplified this by requiring the smallest diameter on whole shaft body should be larger than 20mm. And then, I put more efforts on the compoment selection and geometry designing, including the key slot.

> The wedsite for downloading the components' Free CAD: https://b2b.partcommunity.com/3d-cad-models/sso?cwid=5594
>
> All of my commerical components are downloaded from here.

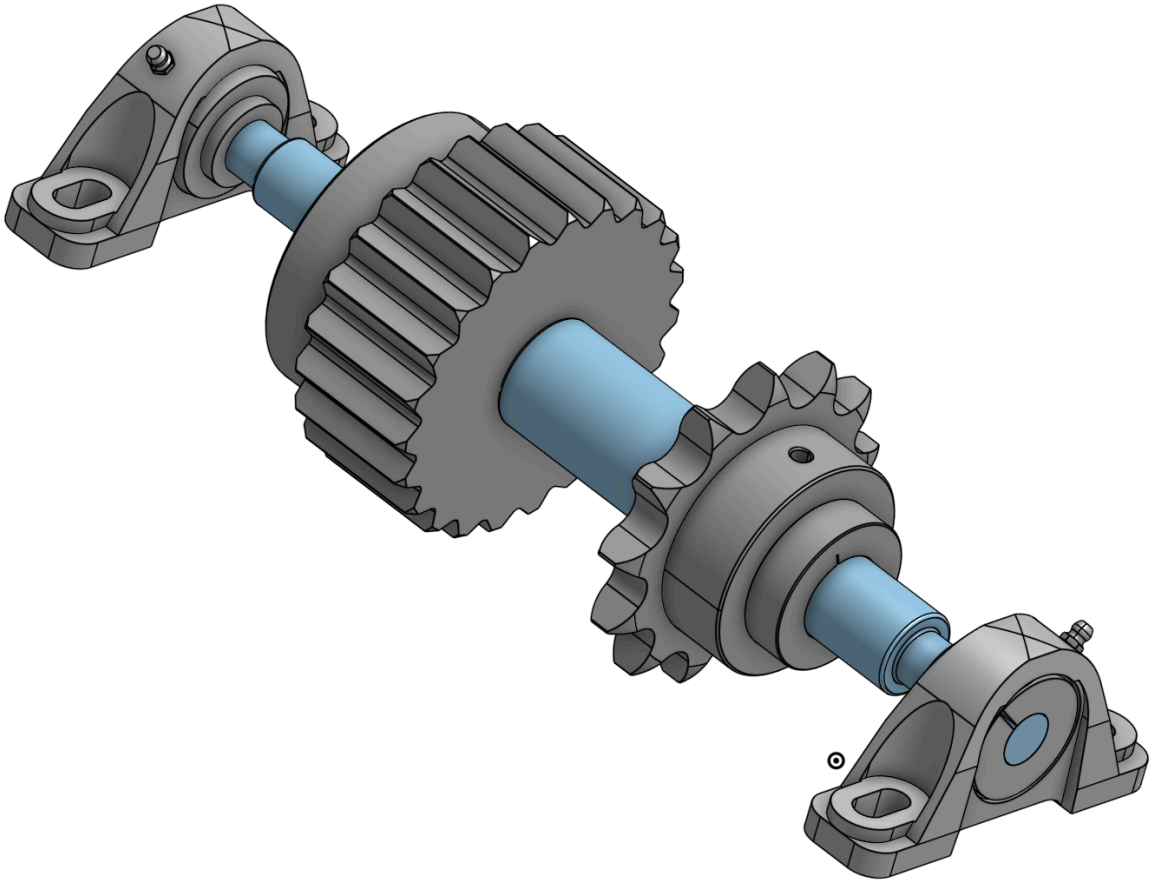
- To better simulate the real-world shaft, I combined both of the modeul gear and sprocket. For instance, gears will recieve the power from another/external power source, while the power will be transmit onto a belt by sprockets for robots motion.

> The difference was clearly being stated on (by the following link): In general, a gear is a toothed wheel designed to mesh with other gears and transmit movement to them, which in turn can cause movement elsewhere. A sprocket, conversely, is a toothed wheel designed to engage and directly move a flexible indented or perforated item, like a chain or belt.
>
> refer to: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjioaK2itL1AhV9kmoFHV8xBY8QFnoECBEQAw&url=https%3A%2F%2Fwww.infobloom.com%2Fwhat-is-the-difference-between-a-sprocket-and-a-gear.htm&usg=AOvVaw25Xay5WHKXrOqzwEnDe7cD

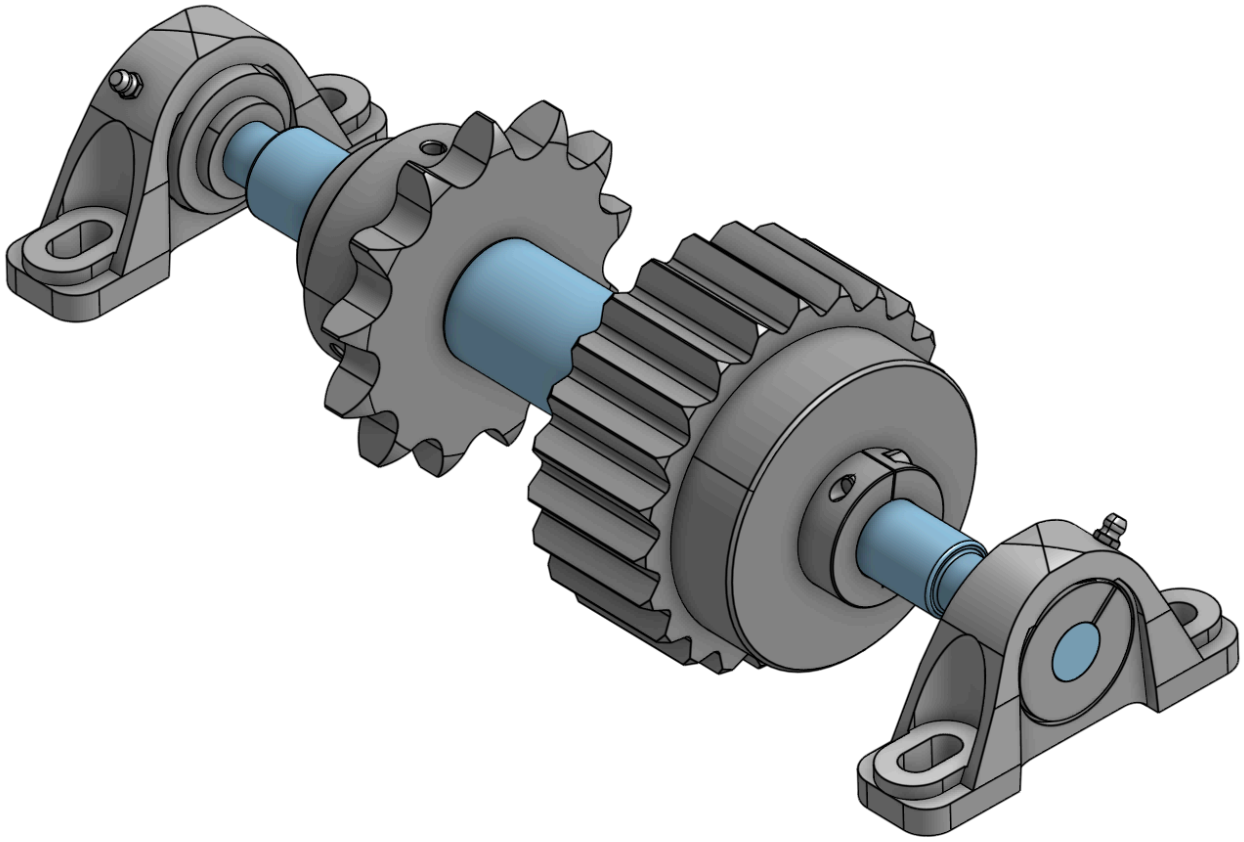
- What's more, I found the module gear do not have the key slot for locating. Hence, I use collar+key for the sprocket feasten, and only collar for the gear. I do not know wether it is allowable. But as there are so many commercial gears without key-design, it must have its reason.
- In terms of the shaft body length, I mainly follow my intuition. My rule is adding at least 30 mm to each section and round them to the upper nearest tens' multiple.

Here is my Output in 3D view

To show the Sprocket that fastened by key and collar.

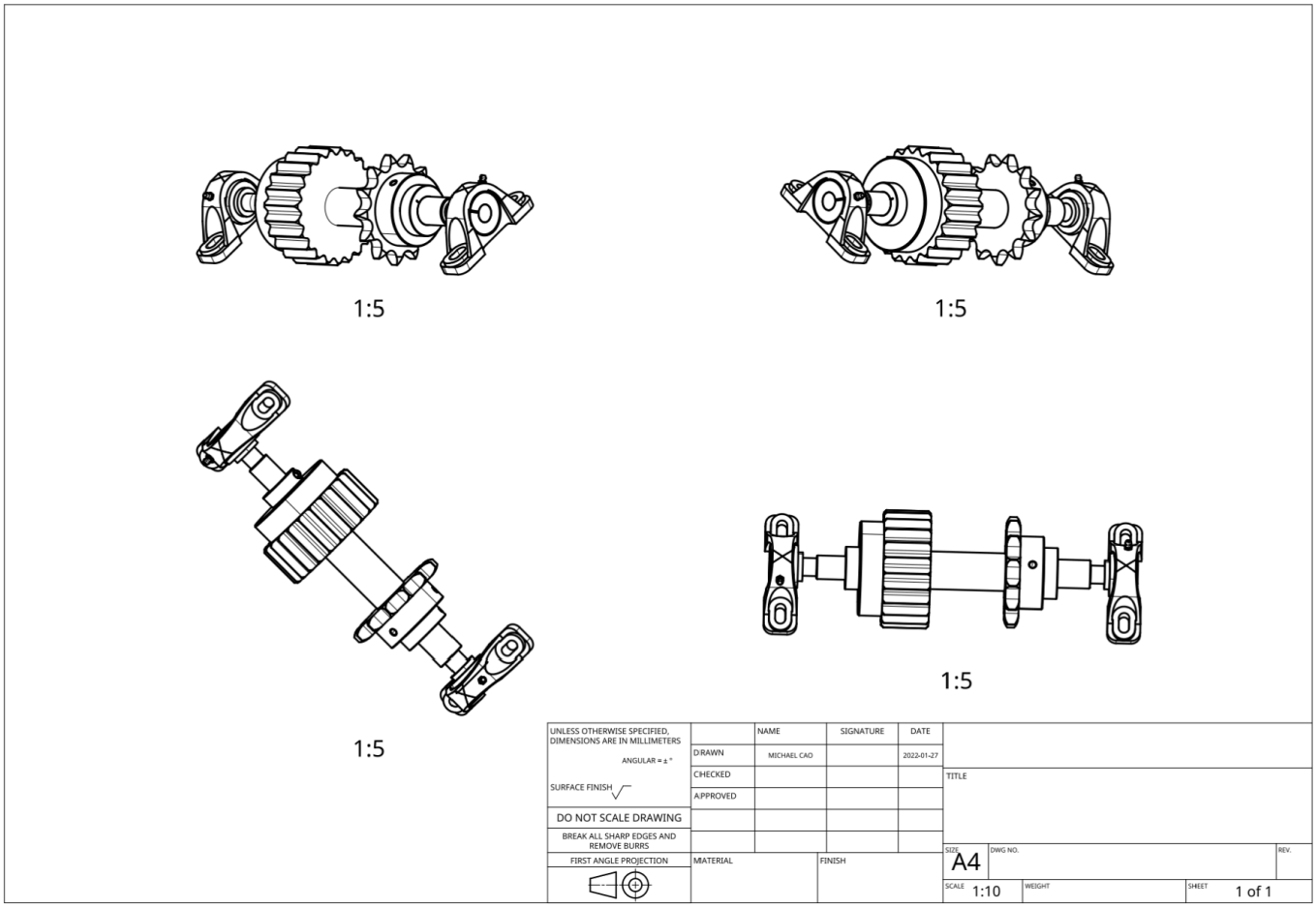


To show the Gear mounted by collar only.

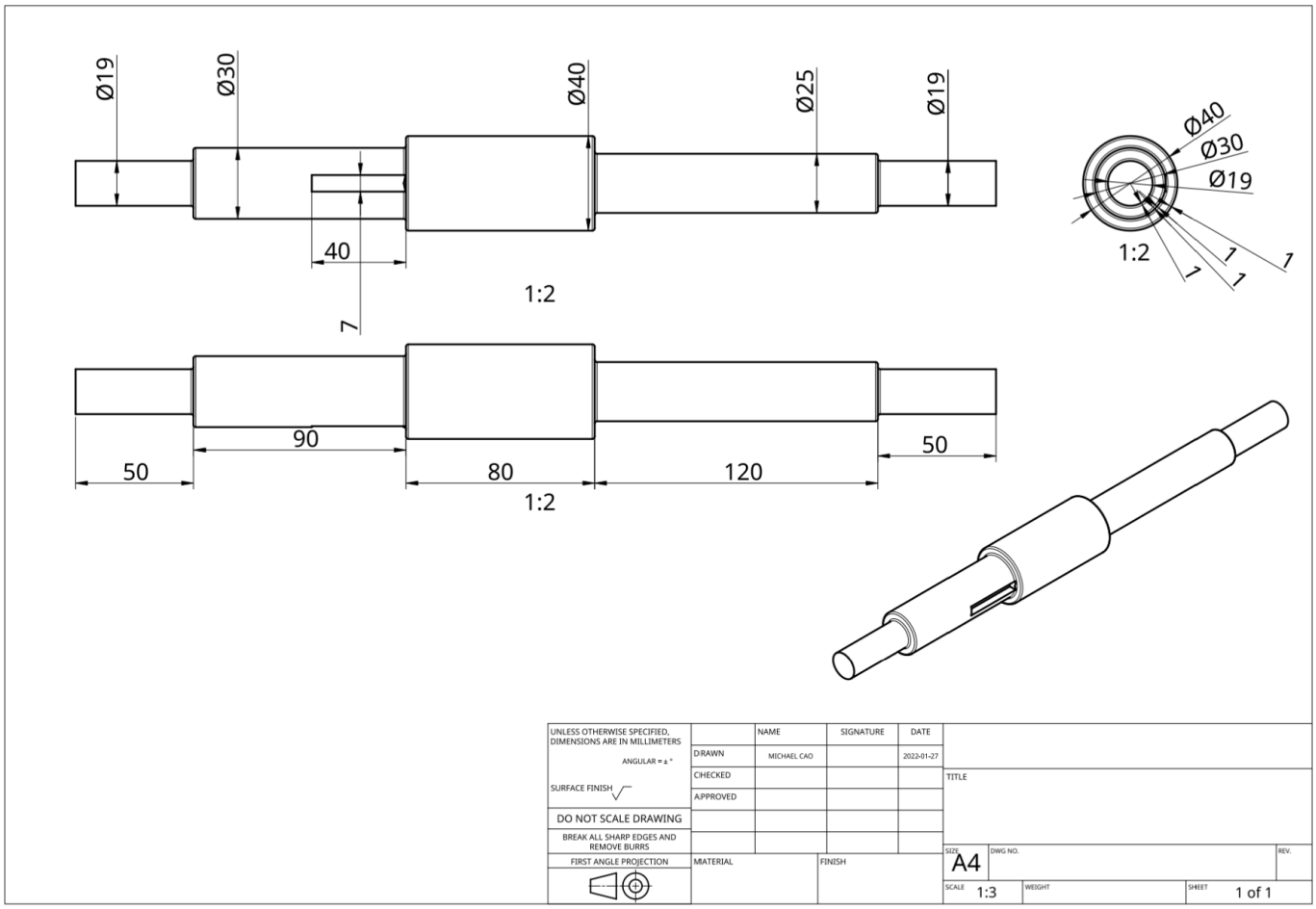


The Drawings for My designed components

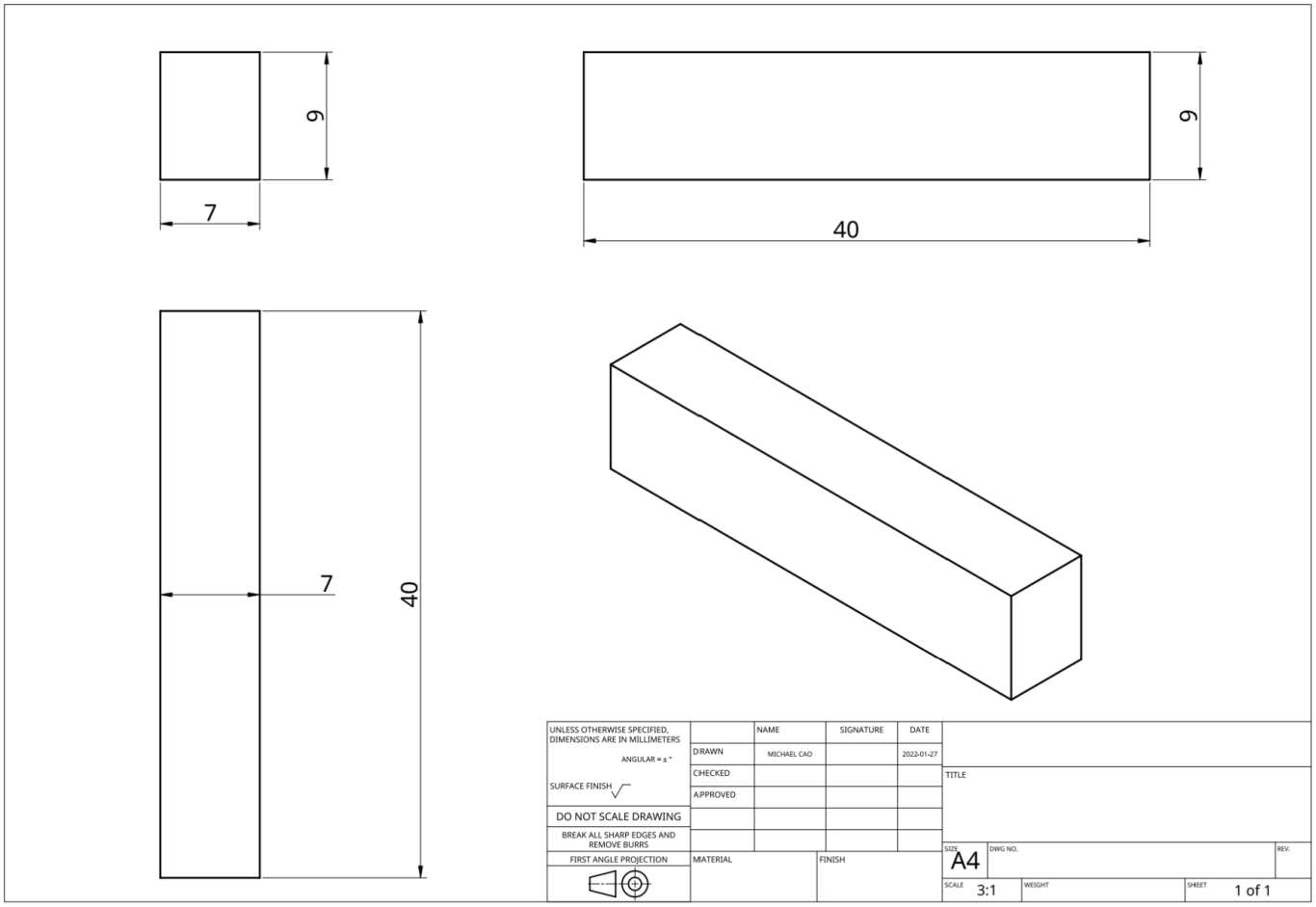
The Whole Shaft



The Shaft Body


Ø19
Ø30
Ø40
Ø25
Ø19
40
7
1:2
Ø40
Ø30
Ø19
1:2
1
1
1
1
90
50
50
80
120
1:2
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS
ANGULAR = ± °
SURFACE FINISH
DO NOT SCALE DRAWING
BREAK ALL SHARP EDGES AND REMOVE BURRS
FIRST ANGLE PROJECTION
NAME
SIGNATURE
DATE
DRAWN
MICHAEL CAO
2022-01-27
CHECKED
APPROVED
MATERIAL
FINISH
TITLE
SIZE
A4
DWG NO.
REV.
SCALE
1:3
WEIGHT
SHEET
1 of 1

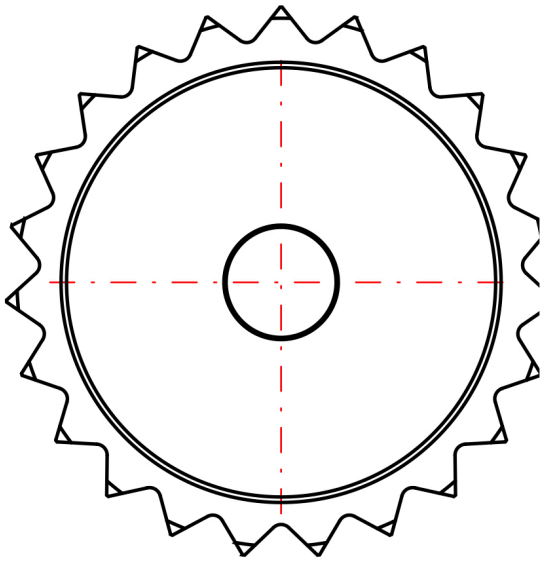
The Key



The Details for the imported components

The 25D Gear

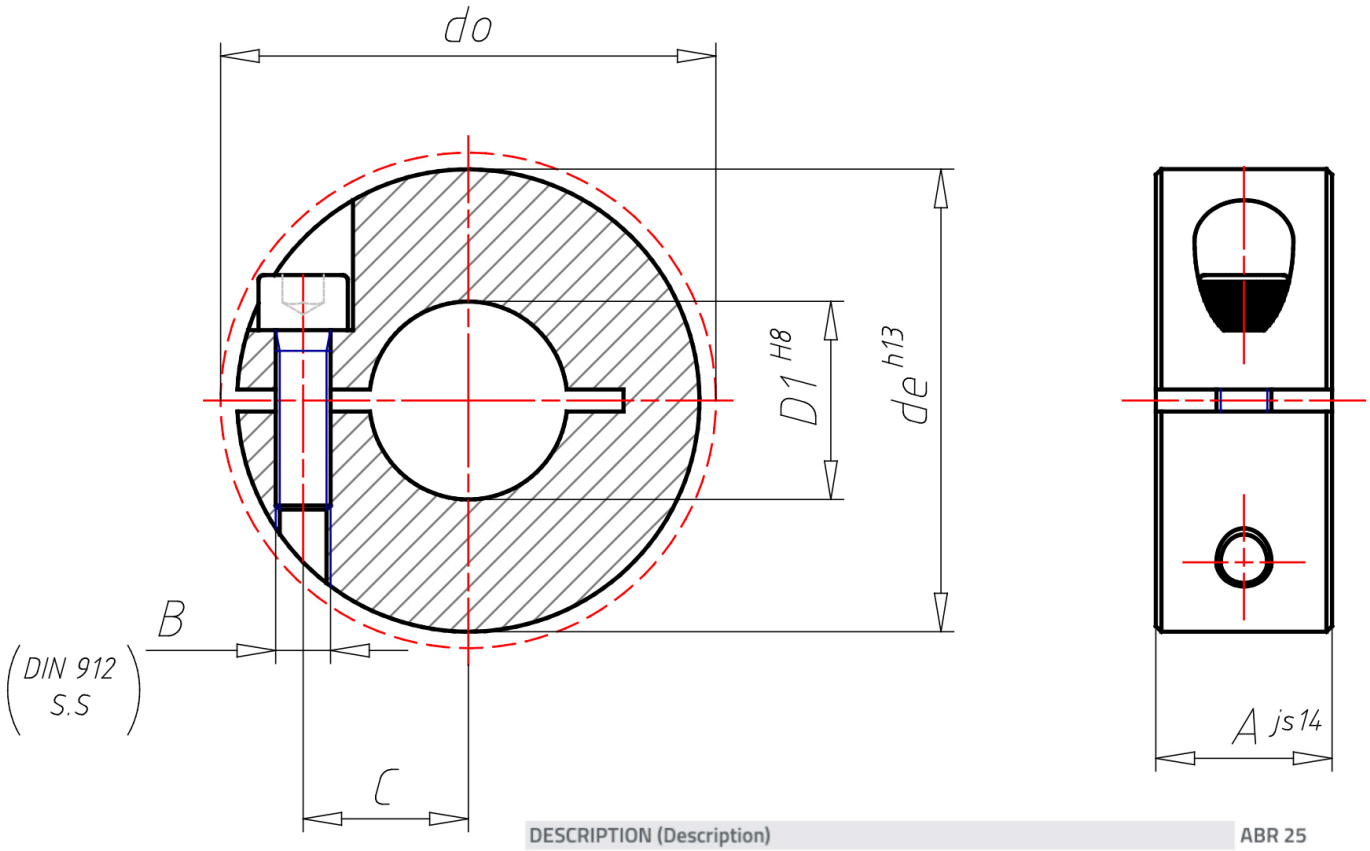
> Refer to: https://b2b.partcommunity.com/3d-cad-models/sso?cwid=5416#



K-Standard Pinion Gear | M 5 B 23

PNO (Product No.)	M 5 B 23
M (Module / mm)	5
NOT (Number of teeth / mm)	23
DO (Tip diameter / mm)	125
DP (Pitch diameter / mm)	115
SD (Bore / mm)	25
BD (Boss diameter / mm)	100
T (Tooth width / mm)	50
BL (Total length / mm)	75
SH (Shape)	S1

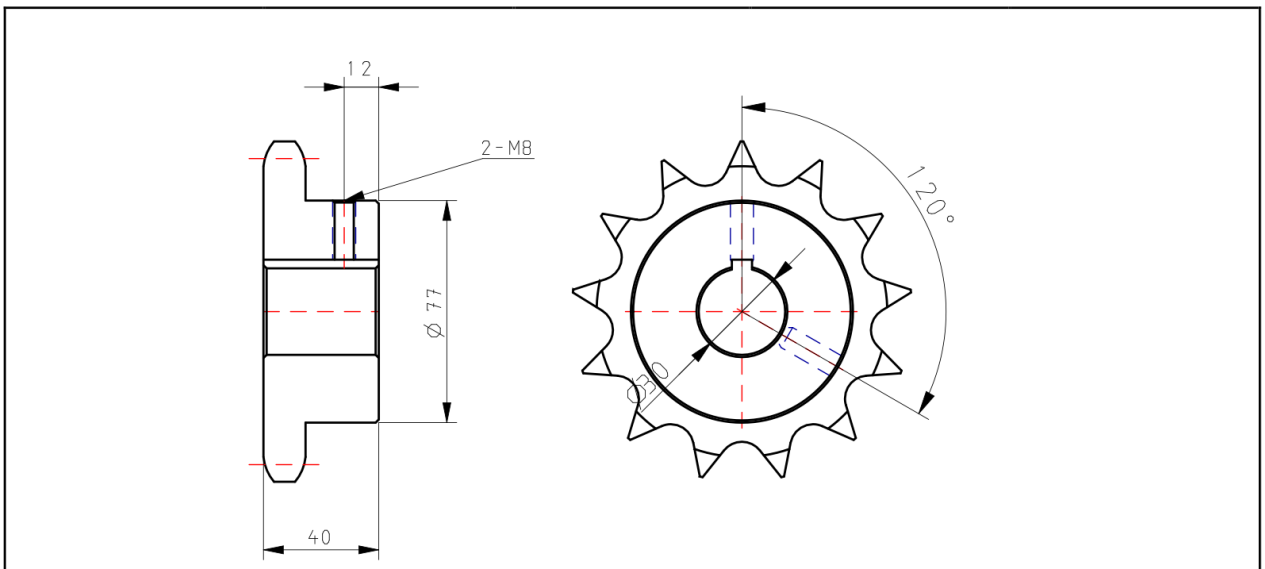
The 25D Collar



DESCRIPTION (Description)	ABR 25
CNSORDERNO (Order number)	SSABR025
D1 (D1 / mm)	25
DE (de / mm)	45
DO (do)	50.8
A (A / mm)	15
B (B / mm)	M6 x 16
C (C / mm)	17.5
KG (kg./100 pcs / kg)	0.114

The 30D Sprocket

> Refer to:



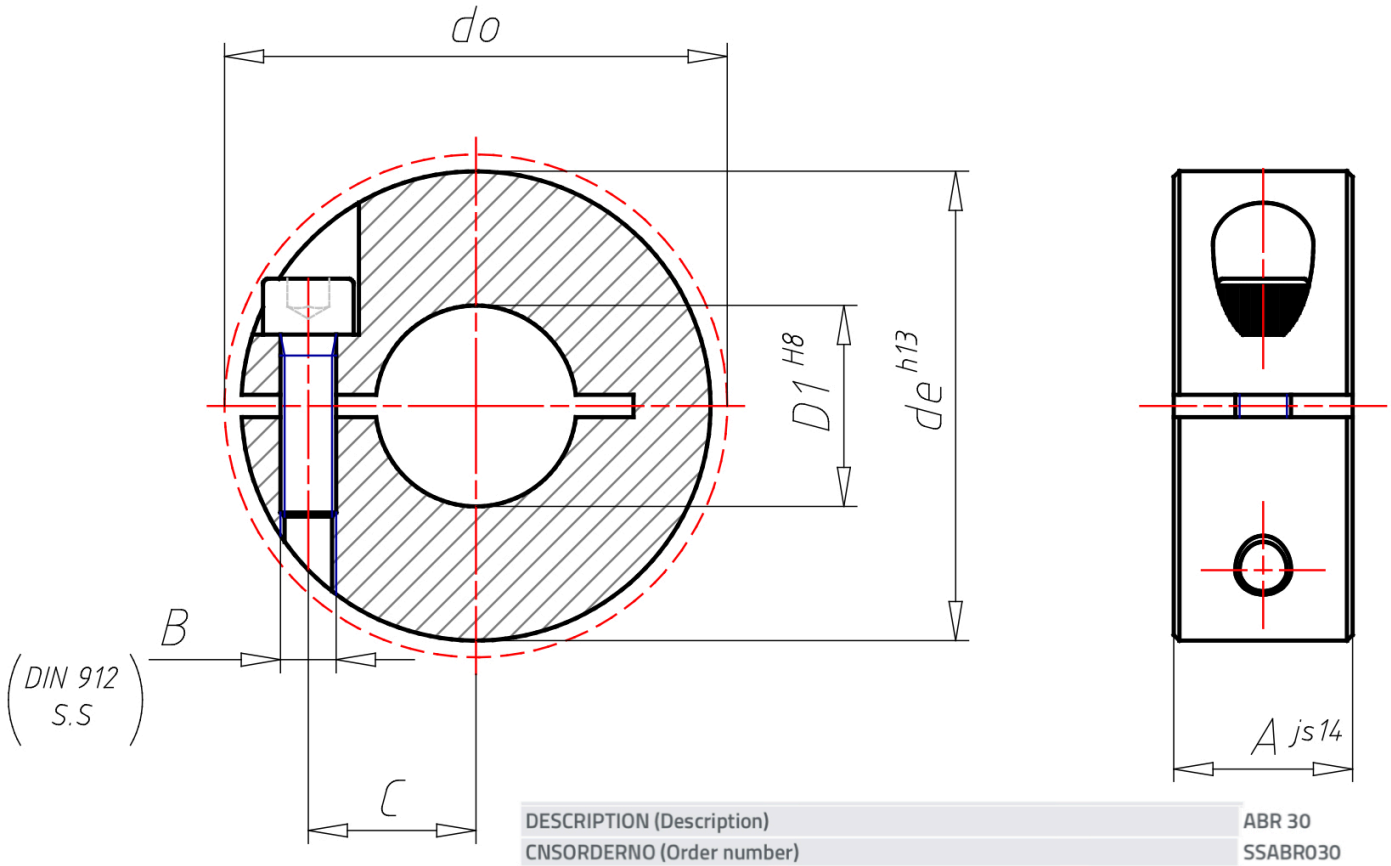
based on JIS B 1802

Classification of Dimension	Middle Class	Ordernumber
More than 0.5 - 3 and fewer	±0.2	**FBK80B13D30**
More than 3 - 6 and fewer		
More than 6 - 30 and fewer	±0.2	
More than 30 - 120 and fewer	±0.3	
More than 120 - 400 and fewer	±0.5	
More than 400 - 1000 and fewer	±0.8	Scale 1/Free
More than 1000 - 2000 and fewer	±1.2	26/01/2022 18:35

Tsubakimoto Chain Co.

The 30D Collar

> Refer to: https://b2b.partcommunity.com/3d-cad-models/sso/shaft-collar-abr-stainless-steel-shaft-collars-one-split-stainless-steel-bea-ingranaggi?info=bea%2Fclamp_element%2Fshaft_collars%2Fshaft_collar_stainless_steel%2Fshaft_collar_abr_s_s_asmtab.prj&cwid=9880



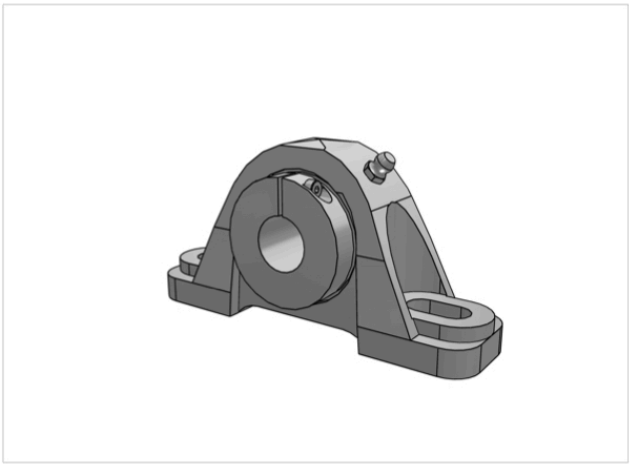
DESCRIPTION (Description)	ABR 30
CNSORDERNO (Order number)	SSABR030
D1 (D1 / mm)	30
DE (de / mm)	54
DO (do)	58.6
A (A / mm)	15
B (B / mm)	M6 x 18
C (C / mm)	21.5
KG (kg./100 pcs / kg)	0.163

Ball Bearing

Product Line
Industrialine HVAC Mounted Ball Bearing

Part Number:
1001-06201

Description:
PB281WAHX3/4 HVAC



PN (Part No.)	1001-06201
MN (Model Number)	PB281WAH
SS (Shaft Size)	3/4 HVAC
DESCRIPTION (Description)	PB281WAHX3/4 HVAC
IT (Insert Type)	Concentric Lock - Wide Inner Race
BL (Bearing Lubrication)	Relube
HM (Housing Material)	Cast Iron
HS (Housing Style)	2-Hole
PT (Product Type)	Pillow Block
PL (Product Line)	Industrialine HVAC Mounted Ball Bearing
A (A / INCH)	1.312
B (B / INCH)	2.5625
C (C / INCH)	1.756
D (D / INCH)	2.25
EMIN (E Min. / INCH)	3.25
EMAX (E Max. / INCH)	4.125
F (F / INCH)	5.125
G (G / INCH)	1.375
H (H / INCH)	0.5625
J (J / INCH)	0.4375
L (L / INCH)	1.5575
M (M / INCH)	0.87
S (S / INCH)	1.37
T (T Zerk)	1/4-28TPR
WTL (WT. / Lbs.)	2.0

TECHNICAL DETAILS - DIMENSIONS