TA202A – MANUFACTURING PROCESSES - II

POWER REGENRATION USING SPEED BRAKERS

Group 45(THURSDAY)

Instructor – Dr. Mohit Law
Tutor – Mr. G Sreenivasulu
Guide – Mr. Mahesh Kumar

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IV.	Medha Srivastava	210603
V.	Abhinav Singhal	210031
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VII.	Rikin Chirag Shah	210841
VIII.	Amit Bohra	210120
IX.	Brid Ojas Chandrashekhar	210275
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PROJECT OVERVIEW

Objective: To develop an efficient **Power Regeneration system using Speed Breakers** with the aim of minimising energy losses and provide a better eco-friendly solution to energy crisis.

Number of Parts Manufactured: 19

Cost of The Project: ₹ 5544

Suggested Improvements: The project is the demonstration of probable solution of generating energy through Speed Breakers and serves as a proof of concept for the same. The project can be scaled up with better gear output ratio using chain and sprocket mechanism and better generators to generate considerable amount of energy. Installing bearing a shaft ends would reduce losses.

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ABSTRACT

This mechanical project aims to design and develop a system for power regeneration using speed breakers. The concept involves using the kinetic energy of vehicles passing over speed breakers to generate electrical energy, which can be stored and used to power street lights or other low-power applications.

The project involves the design and construction of a mechanism that can efficiently convert the mechanical energy of the vehicle into electrical energy through the use of generators and control circuitry. The proposed system has the potential to reduce the energy consumption of street lighting and provide an eco-friendly solution for power generation.

The project also explores the economic feasibility and scalability of implementing the technology in urban areas. Overall, this project presents a promising solution for sustainable energy generation in urban areas by utilizing a previously untapped energy source.

INTRODUCTION

The world is facing a severe energy crisis due to the increasing demand for energy and the limited availability of natural resources. In this context, it has become crucial to find new and innovative ways to generate clean and renewable energy. One promising solution is to tap into the abundant kinetic energy of vehicles passing over speed breakers. Speed breakers are an integral part of urban infrastructure and can be found in abundance in many cities around the world. They are designed to slow down the speed of vehicles and ensure the safety of pedestrians and other road users. However, the energy that is dissipated during this process can be harnessed and utilized for generating electrical power.

The proposed mechanical project aims to design and develop a system for power regeneration using speed breakers. The concept involves capturing the kinetic energy of vehicles passing over the speed breakers and converting it into electrical energy. The generated energy can then be stored and used to power street lights or other low-power applications, reducing the energy consumption of the city and providing an eco-friendly solution for power generation.

This project is not only environmentally friendly but also has economic and social benefits. By implementing this technology, cities can reduce their energy consumption and costs, as well as decrease their carbon footprint. Furthermore, the power generated can be used to power streetlights, providing better lighting and enhancing the safety of pedestrians and other road users.

In this project, we will explore the design and construction of a mechanism that can efficiently convert the mechanical energy of the vehicle into electrical energy through the use of generators and control circuitry. We will also investigate the economic feasibility and scalability of implementing this technology in urban areas. The proposed system presents a promising solution for sustainable energy generation in urban areas by utilizing a previously untapped energy source.

WORKING

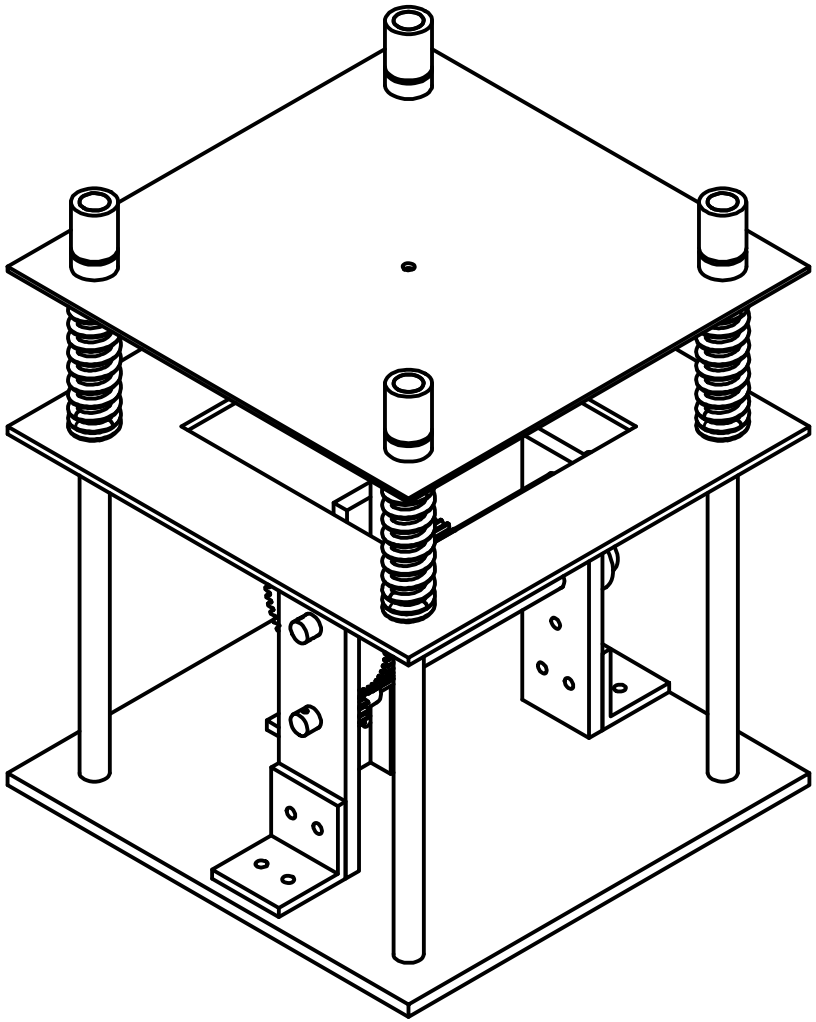
The mechanical project "power regeneration using speed breakers" is designed to convert the kinetic energy of vehicles passing over speed breakers into electrical energy. The system consists of three primary components: a speed breaker, a mechanical mechanism, and an electrical generator.

When a vehicle passes over the speed breaker, its kinetic energy is converted into potential energy as the vehicle is lifted and then released by the speed breaker. This potential energy is then transferred to the mechanical mechanism of the system. The mechanical mechanism is designed to convert the potential energy into rotational motion, which is then used to turn the shaft of an electrical generator.

The electrical generator is the heart of the system and is responsible for converting the mechanical energy into electrical energy. The generator consists of a stator and a rotor. The rotor is connected to the mechanical mechanism and rotates as the vehicle passes over the speed breaker. The rotation of the rotor generates a magnetic field, which induces an electrical current in the stator coils. This electrical current is then rectified and stored in a battery or capacitor.

The electrical energy generated by the system can be used to power streetlights, traffic signals, or other low-power applications. The system can also be designed to include a controller that regulates the power output and ensures the safe and efficient operation of the system.

Overall, the system is an efficient and sustainable way to harness the energy that is normally wasted during the operation of speed breakers. The technology has the potential to reduce the energy consumption of urban areas, improve the safety of pedestrians and other road users, and provide an eco-friendly solution for power generation.



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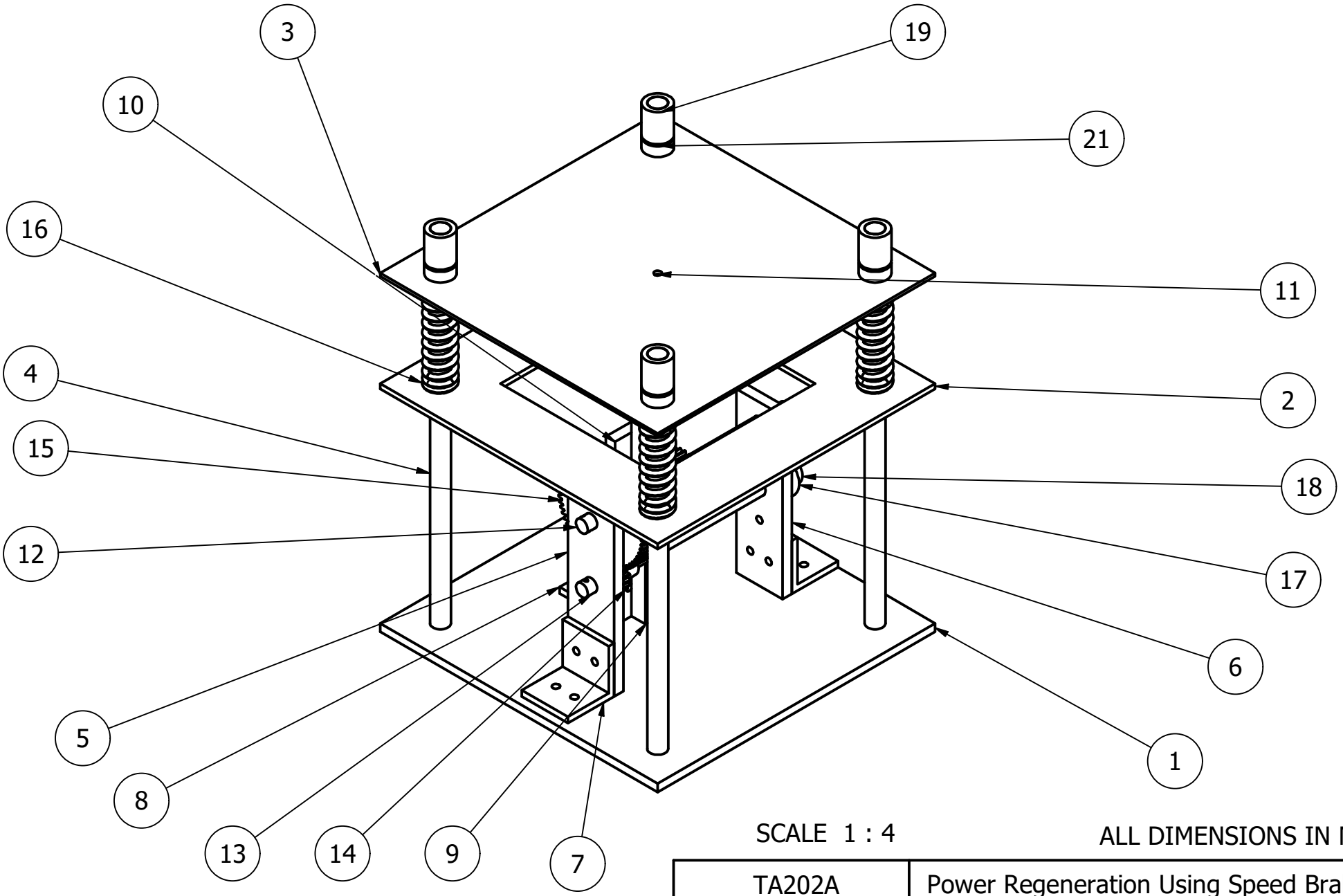
ALL DIMENSIONS IN MM

TA202A	Power Regeneration Using Speed Brakers		
ISOMETRIC VIEW		Page Number	4



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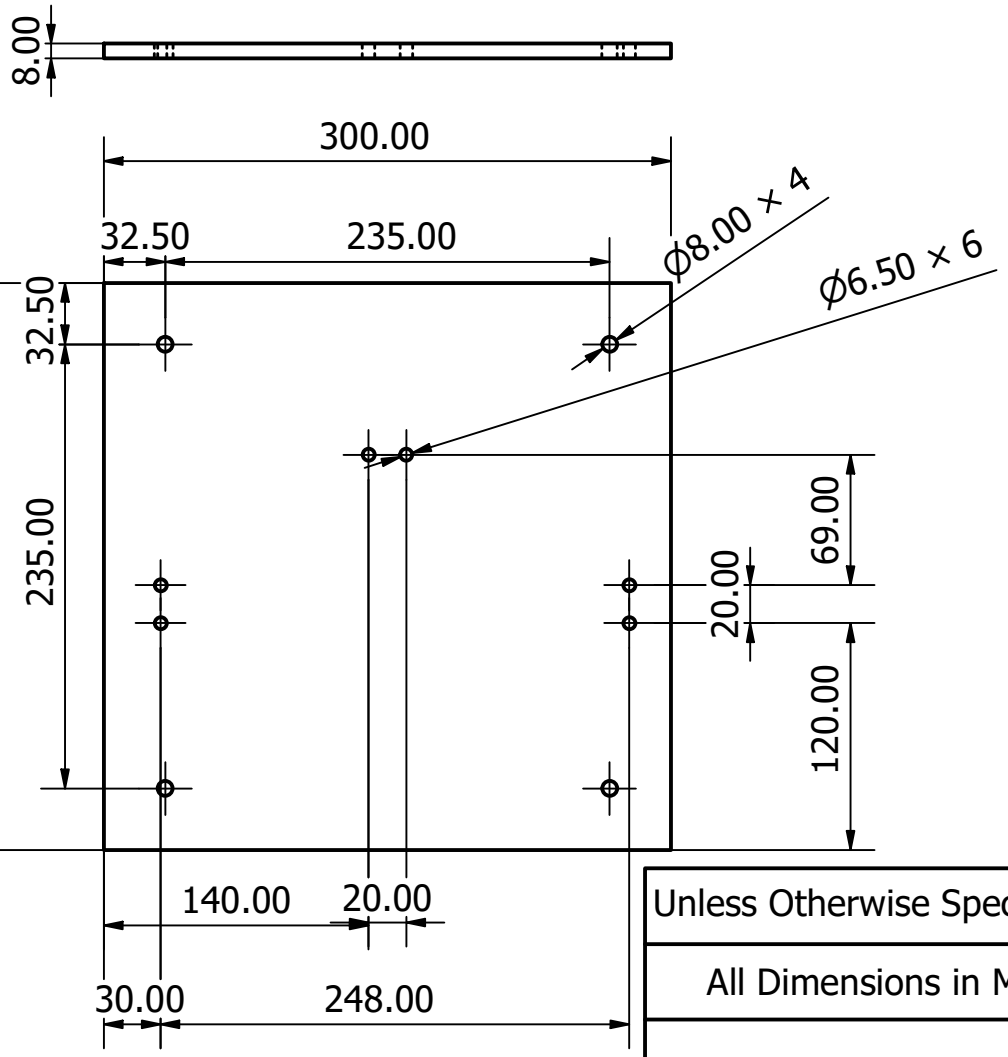
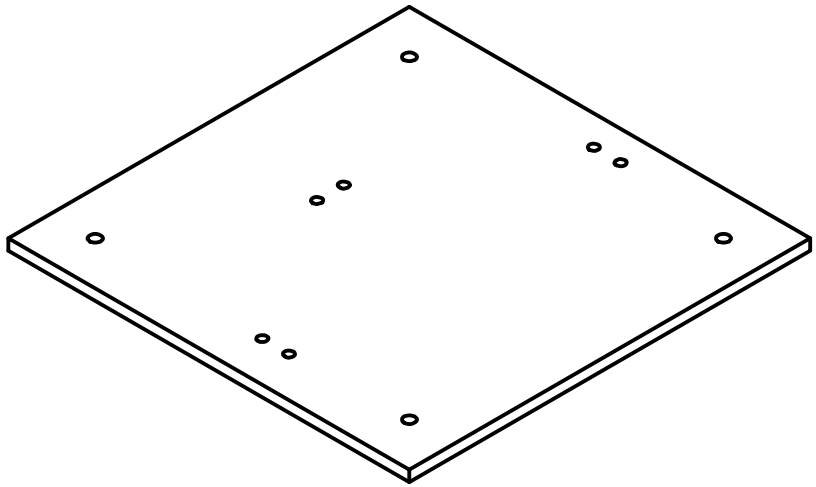
ALL DIMENSIONS IN MM

TA202A	Power Regeneration Using Speed Brakers	
ISOMETRIC VIEW	Page Number	5

PART LIST

Part No.	Part Name	Qty.	Material (in MM)	Part Manufactured (OR) Bought	Machining Operations
1	Base Plate	1	MS 300×300×8	Manufactured	Drilling, Cutting
2	Mid Plate	1	MS 300×300×3	Manufactured	Drilling, Cutting
3	Top Plate	1	MS 300×300×3	Manufactured	Drilling, Cutting
4	Support Rod	4	MS ϕ16×360	Manufactured	Drilling, Turning
5	Gear Support Stand	1	MS 192×50×8	Manufactured	Drilling
6	Motor Support Stand	1	MS 172×50×8	Manufactured	Drilling
7	L - Support	2	MS 50×50×6	Manufactured	Drilling
8	Rack L - Support	1	MS 50×50×6	Manufactured	Drilling
9	Rack Guide	1	MS 190×20×20	Manufactured	Drilling, Milling
10	Rack Guide Support	1	MS 172×50×10	Manufactured	Drilling
11	Rack	1	MS 215×12.7×12.7	Manufactured	Drilling, Milling
12	Main Shaft	1	MS ϕ12.7×220	Manufactured	Drilling, Turning
13	Motor Shaft	1	MS ϕ12.7×210	Manufactured	Drilling, Turning
14	Spur Gear (20 Teeth)	2	MS ϕ35×30	Manufactured	Drilling, Turning, Milling
15	Spur Gear (60 Teeth)	1	MS ϕ95×30	Manufactured	Drilling, Turning, Milling
16	Spring	4	-	Bought	-
17	Motor Clamp	1	PLA 84×50×25	Manufactured	3D Printing
18	Motor	1	-	Bought	-
19	Stop Bush	4	MS ϕ25×30	Manufactured	Drilling, Turning
20	Mid Bush	4	MS ϕ35×25	Manufactured	Drilling, Turning
21	Top Bush	4	MS ϕ25×25	Manufactured	Drilling, Turning





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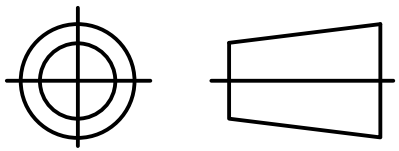

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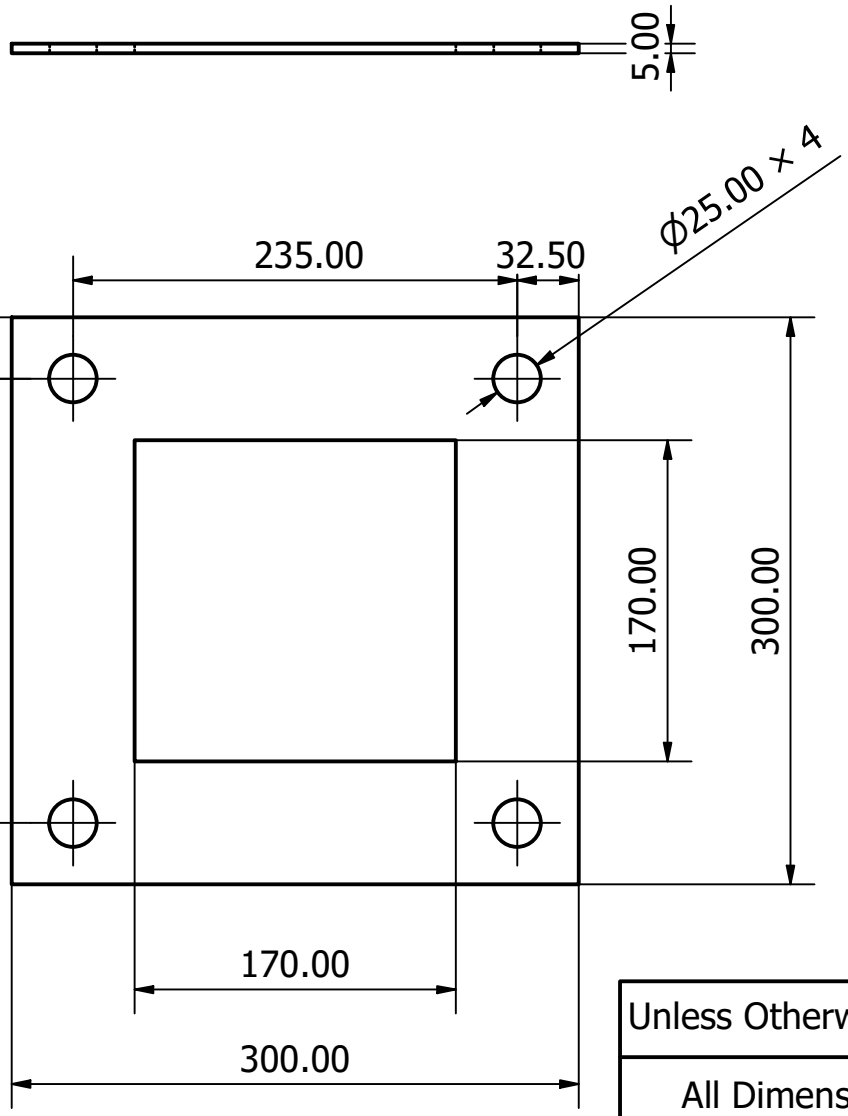
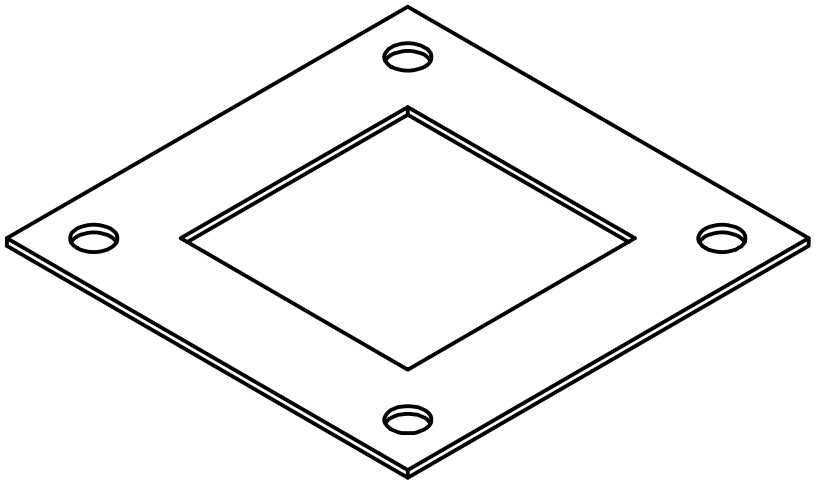
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Base Plate	
	Part Number	1	Material	MS
	Quantity	1	Page Number	7





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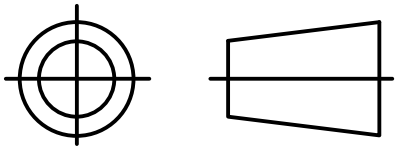

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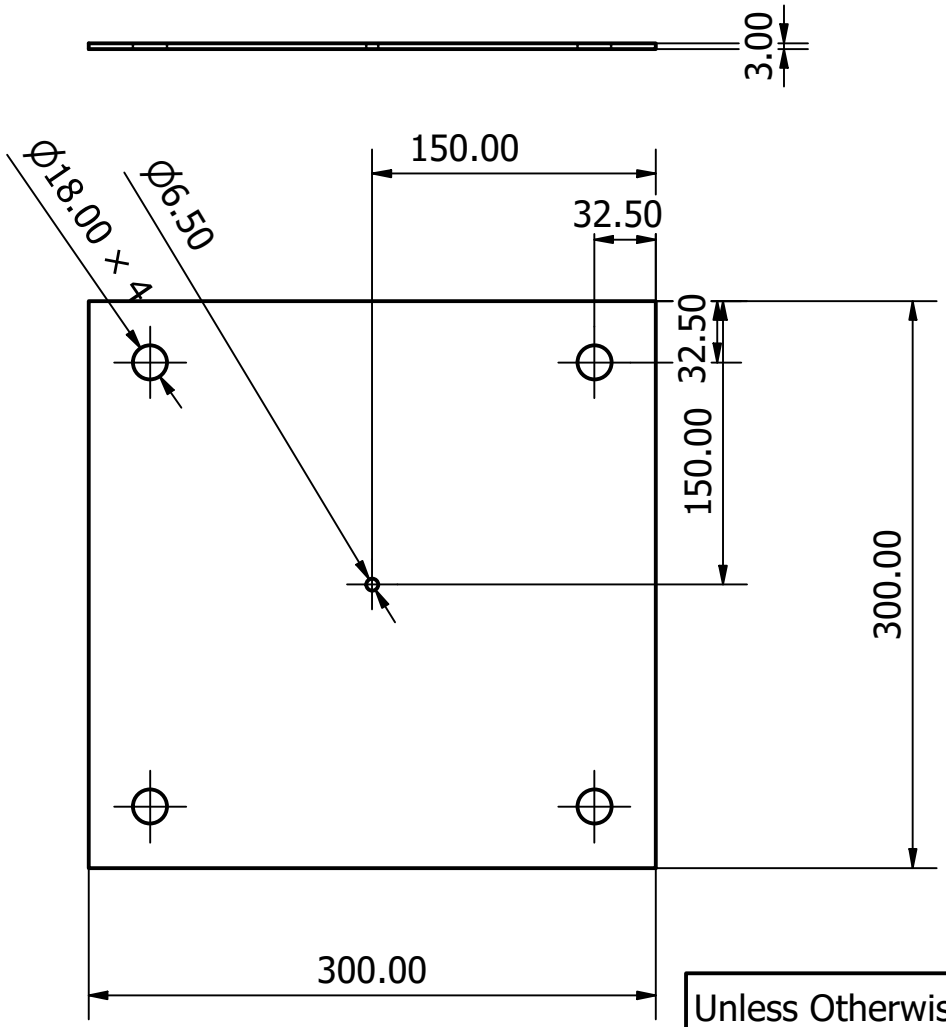

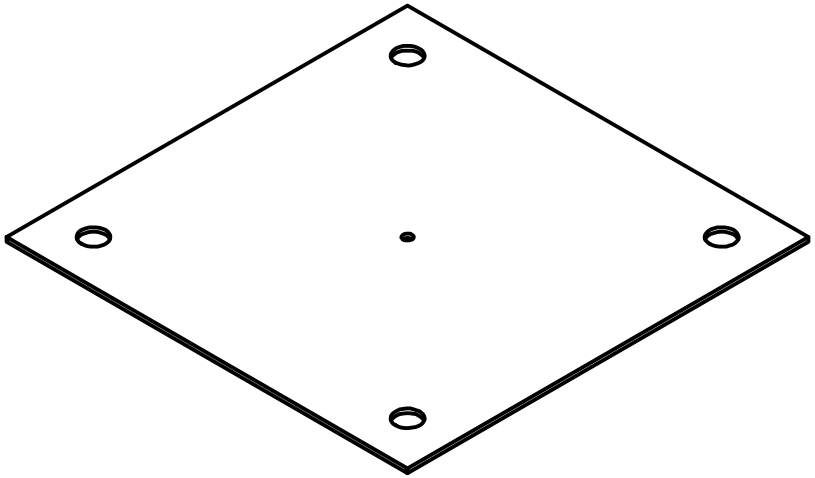

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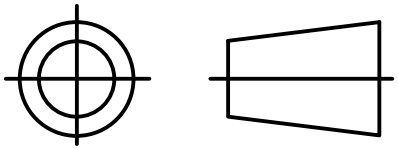

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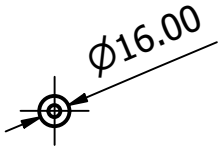

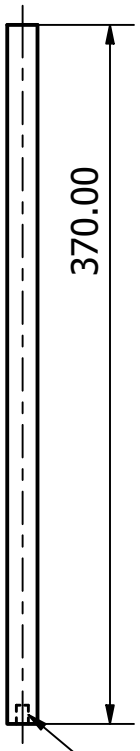

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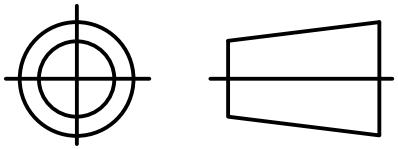

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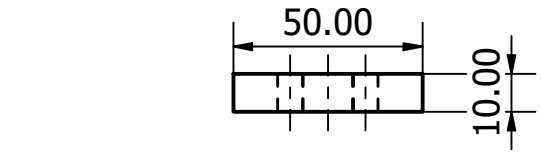

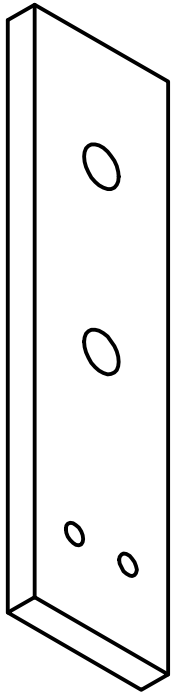

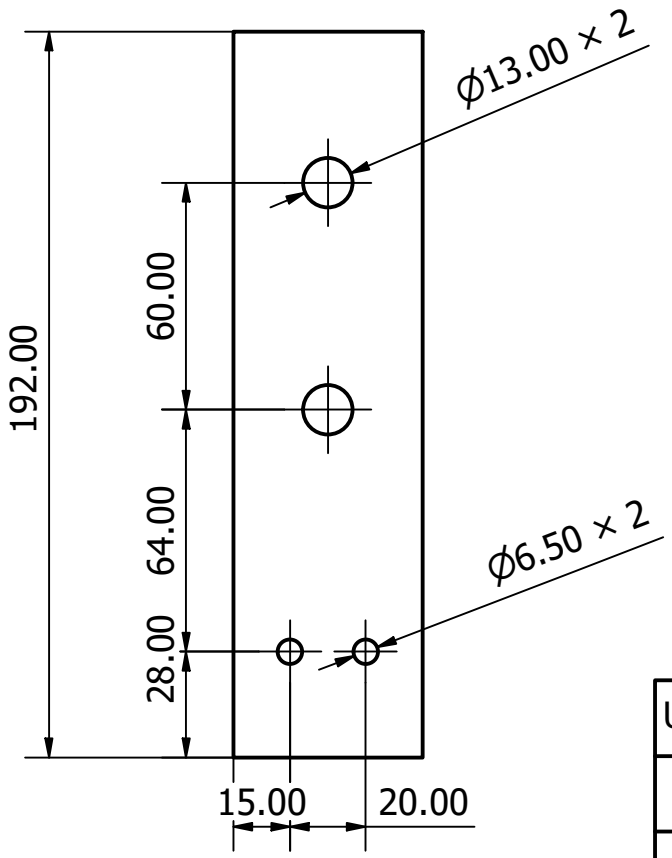

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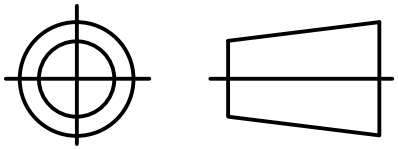

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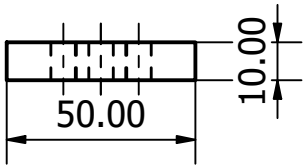

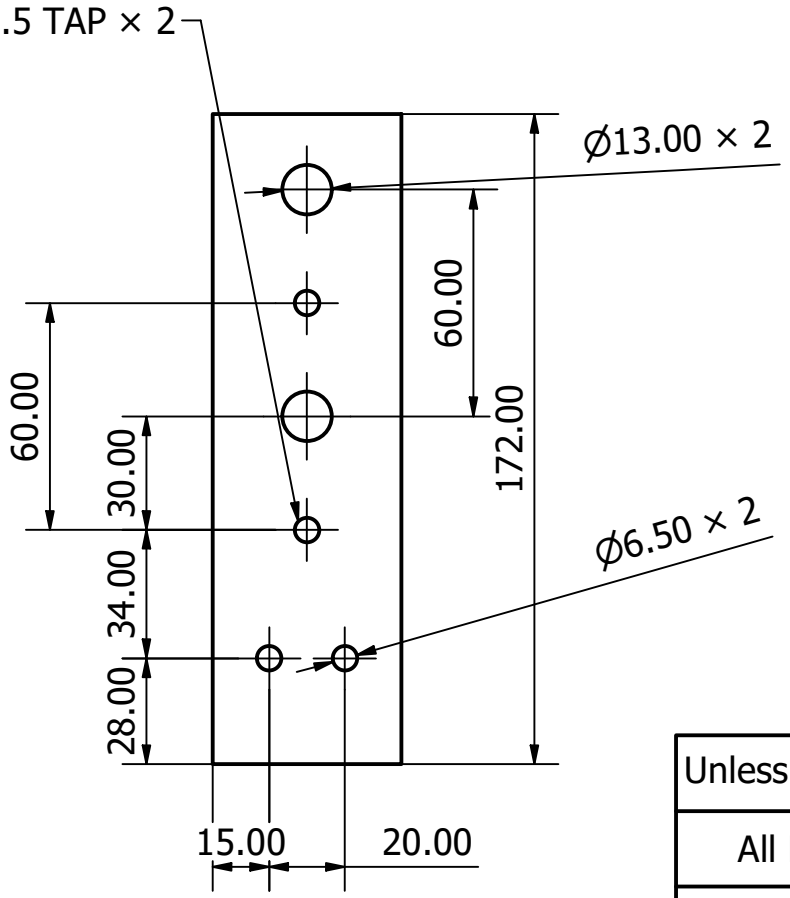

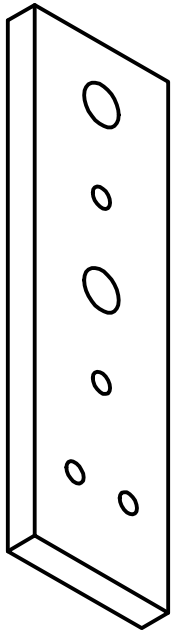

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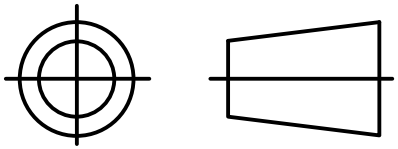

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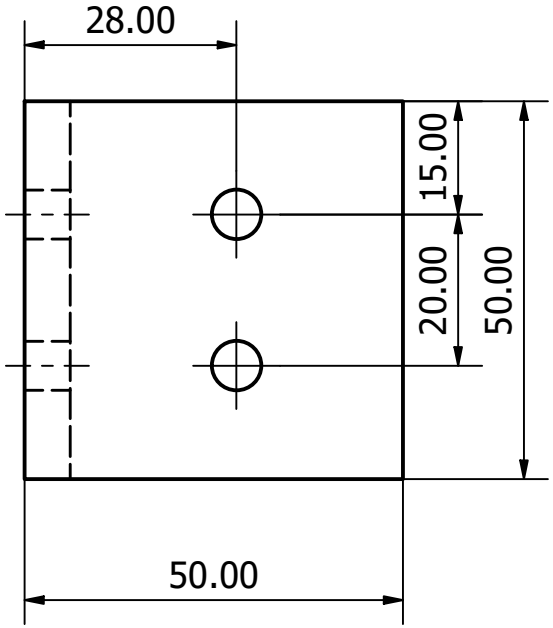

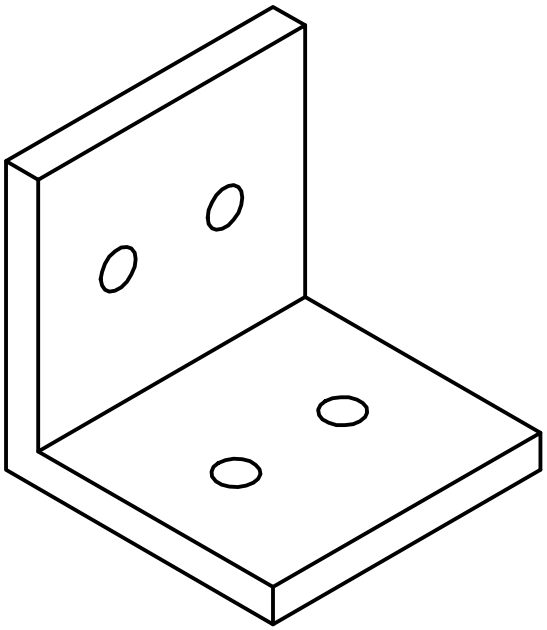

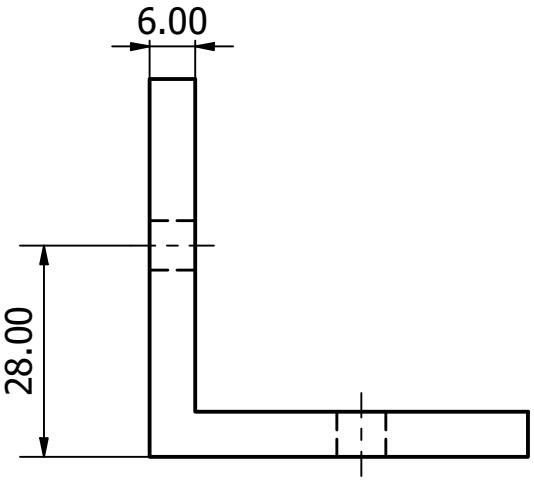

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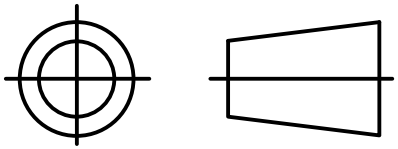

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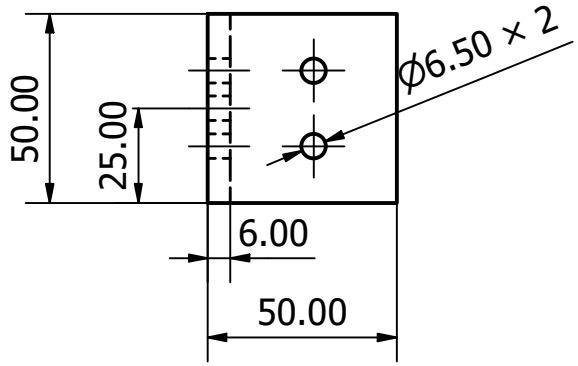

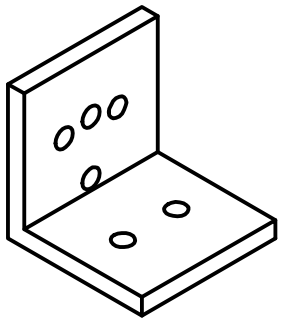

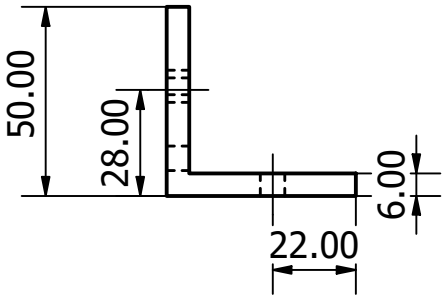

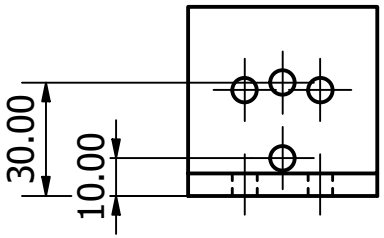

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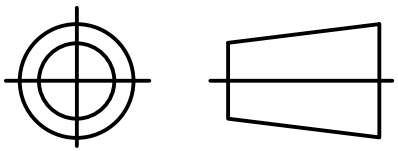

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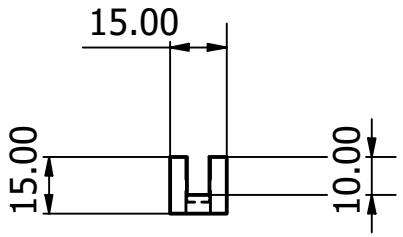

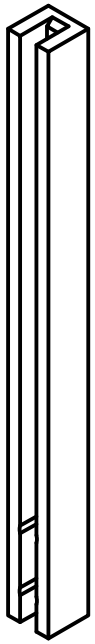

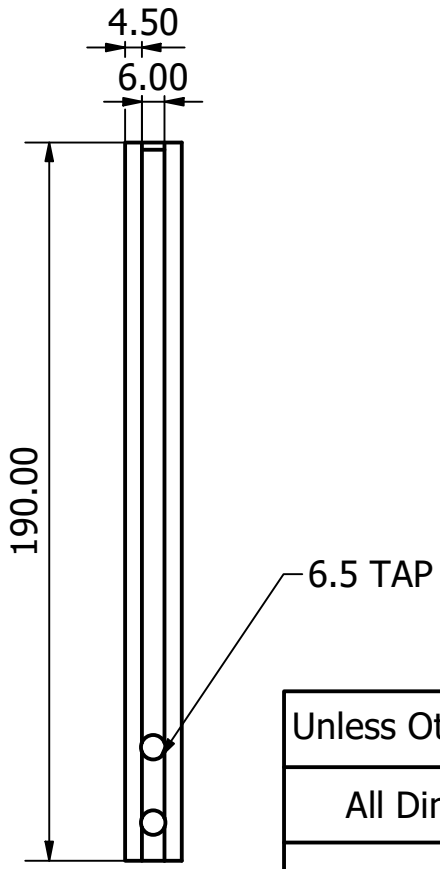

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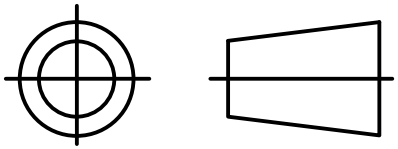

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Tolerances: Two Decimal Point = ± 0.5	Part Name		Rack Guide	
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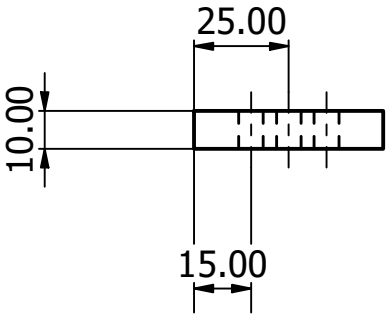

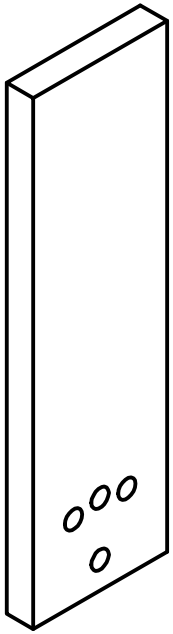

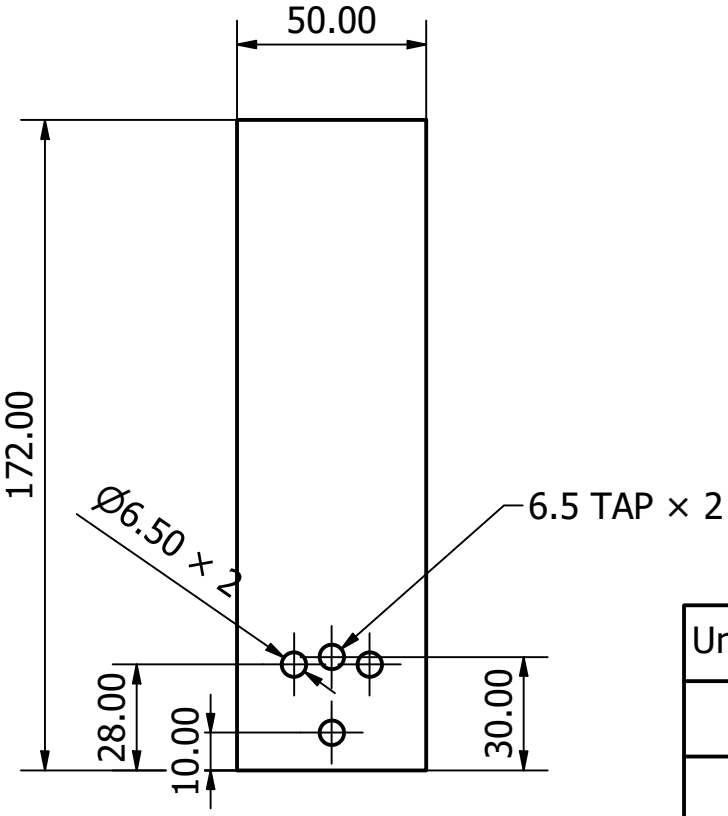

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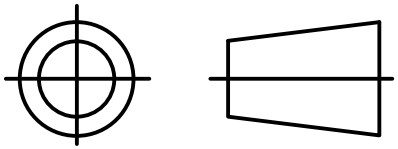

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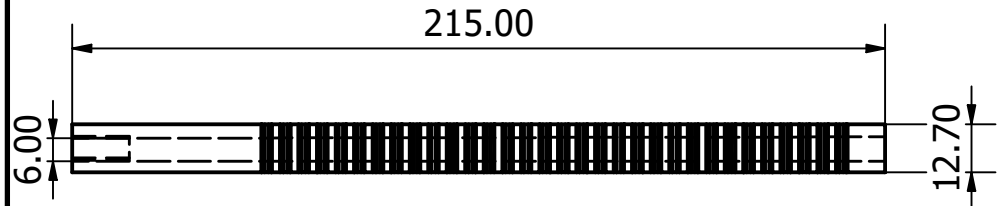
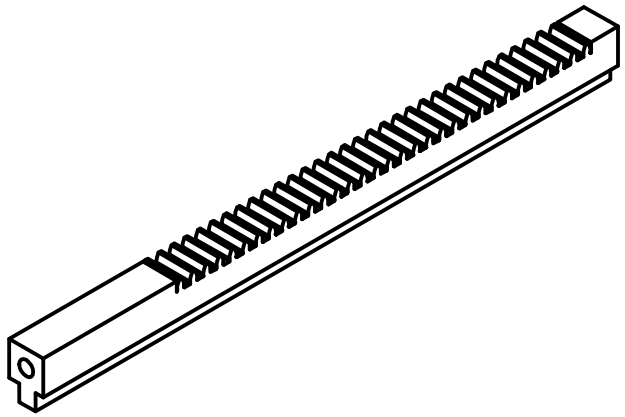
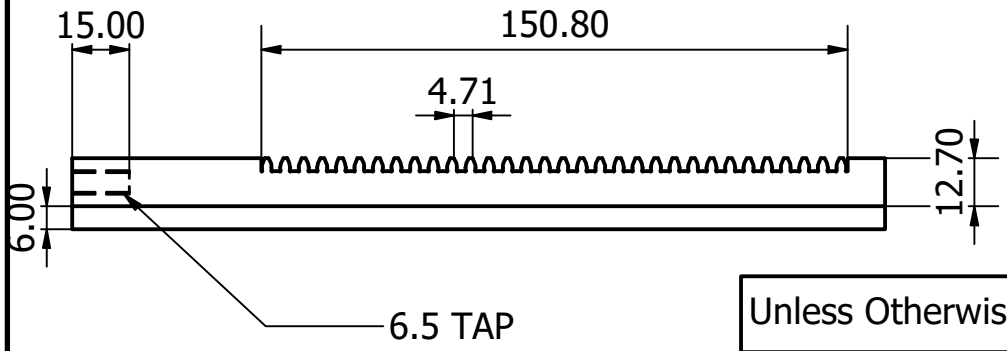
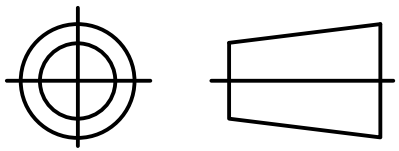




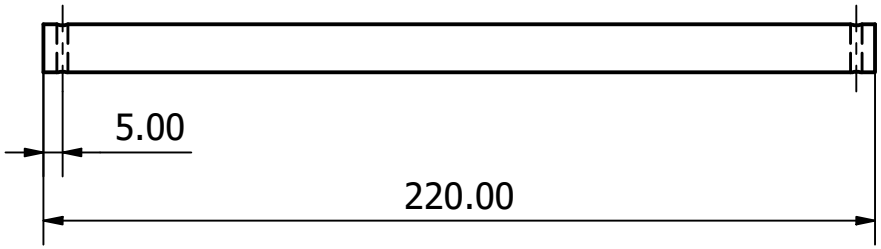


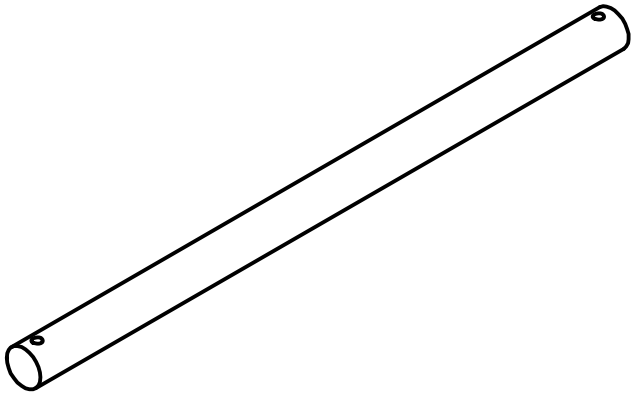
Number of Teeth	32
Module	1.5
Linear Pitch	4.71

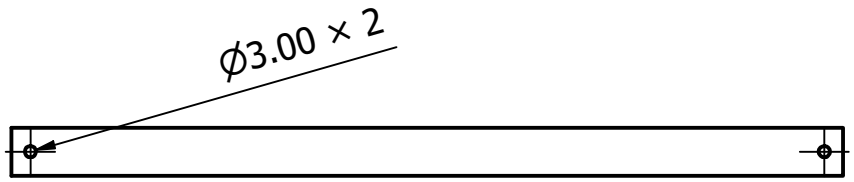
SCALE 1 : 2

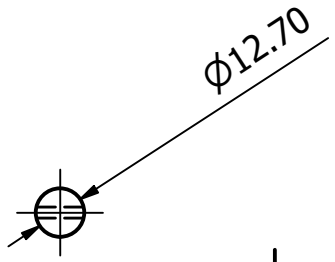


Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Rack	
	Part Number	11	Material	MS
	Quantity	1	Page Number	17









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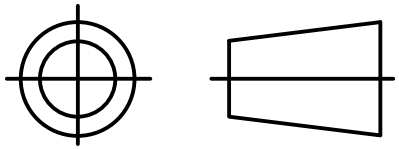
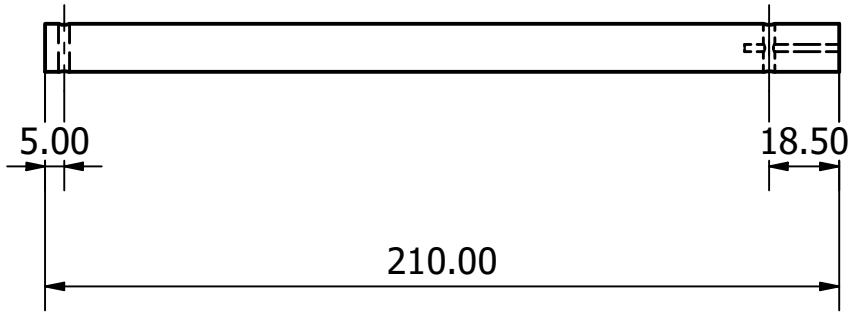
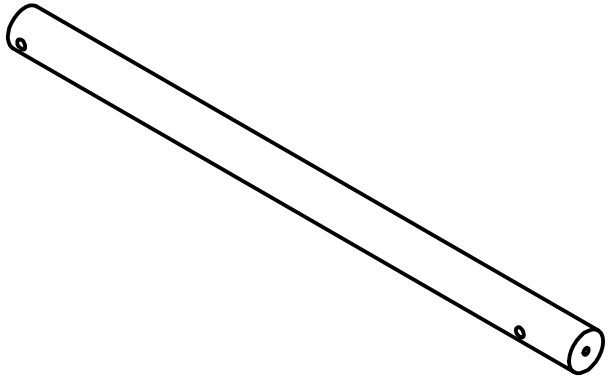
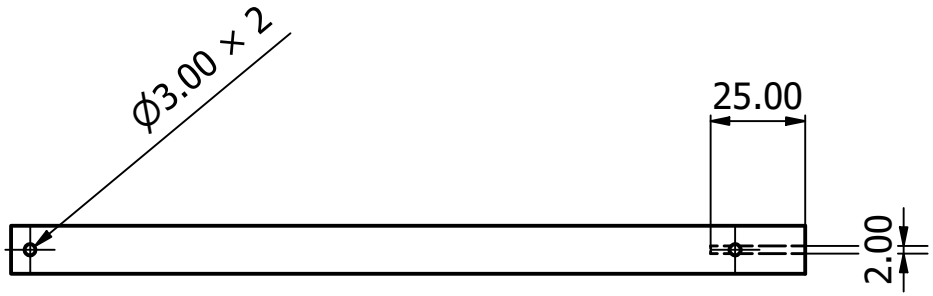
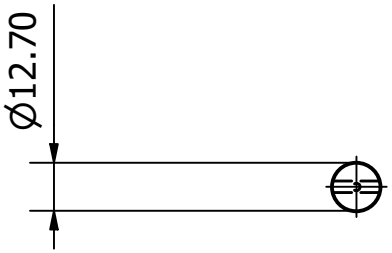


Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Khush Khandelwal	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Main Shaft	
	Part Number	12	Material	MS
	Quantity	1	Page Number	18









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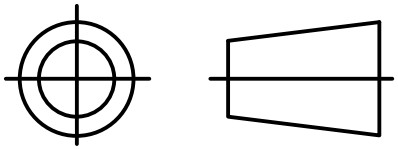
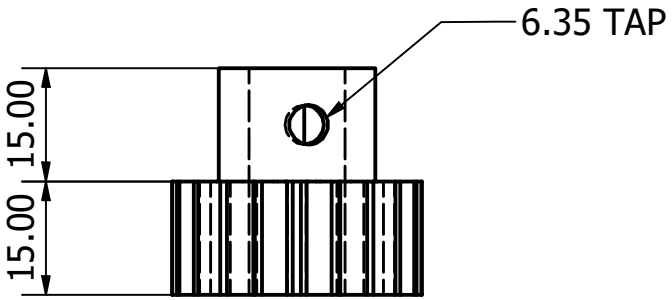
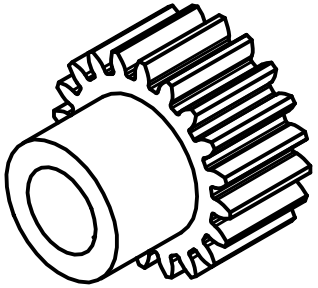
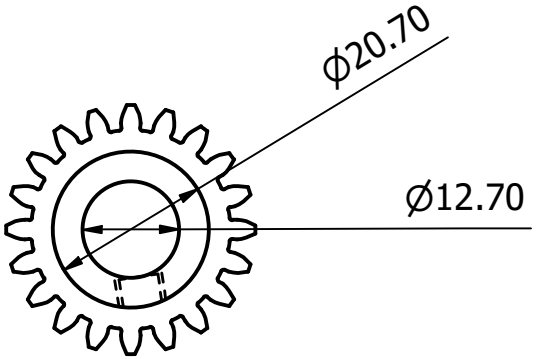


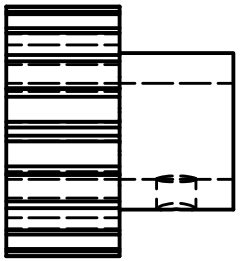
Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Khush Khandelwal	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Motor Shaft	
	Part Number	13	Material	MS
	Quantity	1	Page Number	19





Item	Formula	Value
Number Of Teeth (N)	-	20
Module (m)	-	1.5
Pitch Diameter (PD)	N×m	30
Diametral Pitch (DP)	N/PD	0.667
Addendum (a)	1×m	1.5
Whole Depth (wd)	2.157/DP	3.2355
Dedendum (d)	wd - a	1.7355
Outside Diameter (OD)	(N+2)×m	33
Root Diameter (RD)	OD - 2wd	29.529
Circular Pitch (CP)	π×m	4.71
Tooth Radius (R)	(3/4)×CP	3.5343
Indexing	40/N	2





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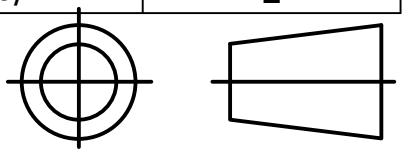
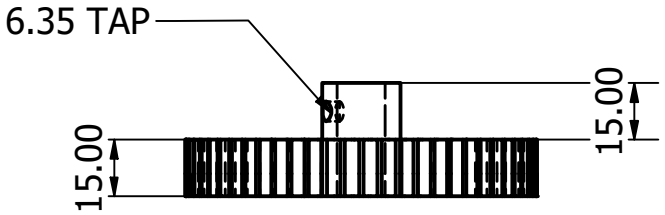
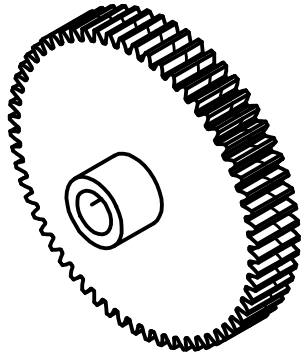
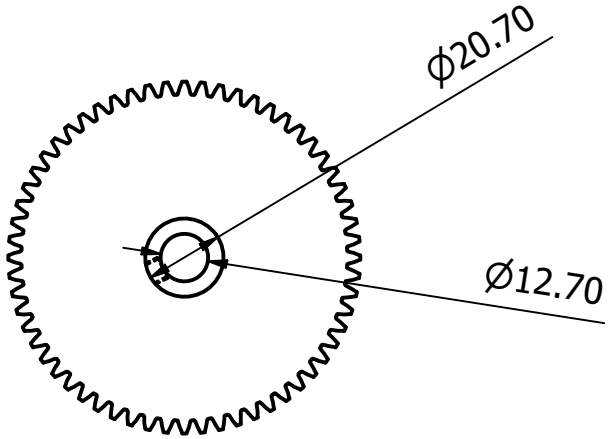


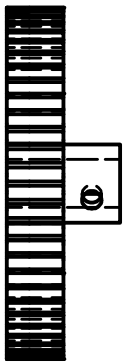
Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Spur Gear (20 Teeth)	
	Part Number	14	Material	MS
	Quantity	2	Page Number	20





Item	Formula	Value
Number Of Teeth (N)	-	60
Module (m)	-	1.5
Pitch Diameter (PD)	N×m	90
Diametral Pitch (DP)	N/PD	0.667
Addendum (a)	1×m	1.5
Whole Depth (wd)	2.157/DP	3.2355
Dedendum (d)	wd - a	1.7355
Outside Diameter (OD)	(N+2)×m	93
Root Diameter (RD)	OD - 2wd	89.529
Circular Pitch (CP)	π×m	4.71
Tooth Radius (R)	(3/4)×CP	3.5343
Indexing	40/N	0.6667





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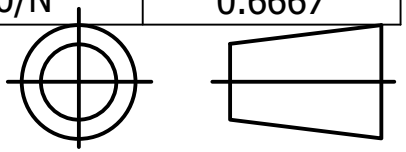
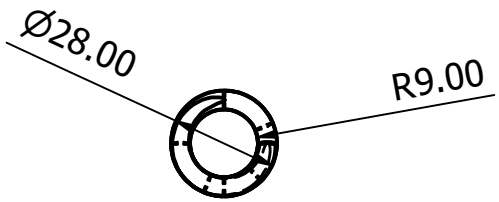
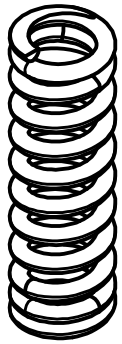
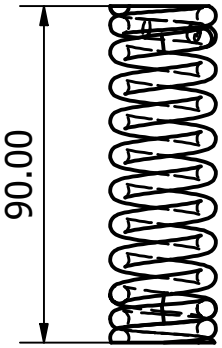
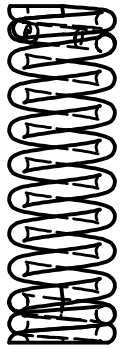


Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Spur Gear (60 Teeth)	
	Part Number	15	Material	MS
	Quantity	1	Page Number	21









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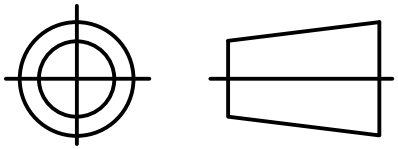
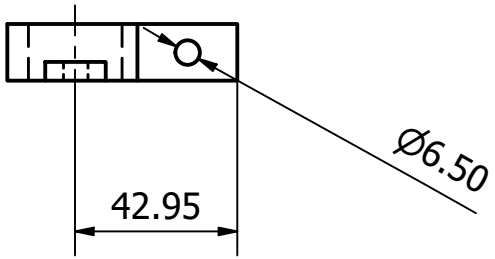
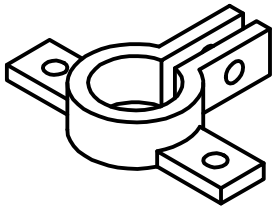
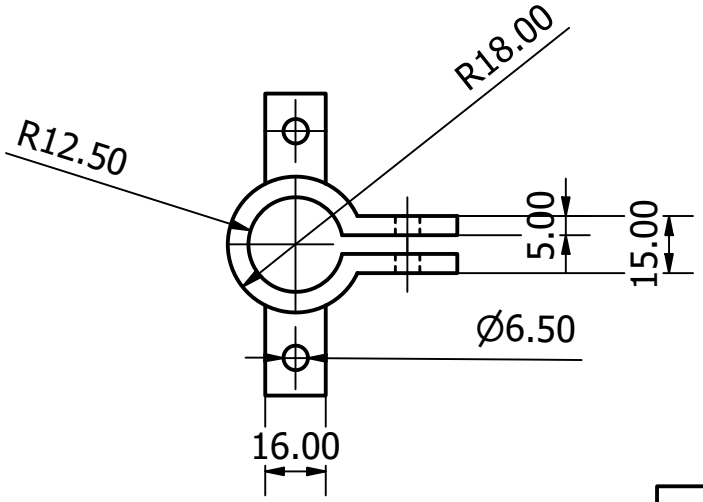
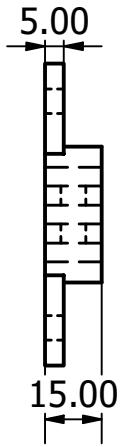


Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Spring	
	Part Number	16	Material	-
	Quantity	4	Page Number	22









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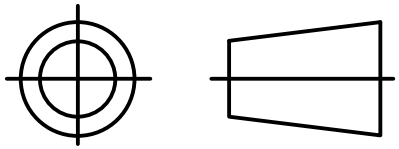
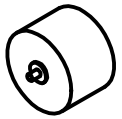
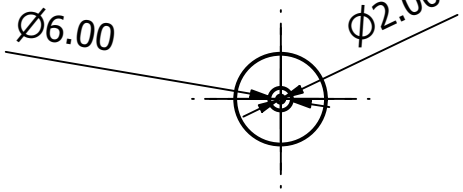
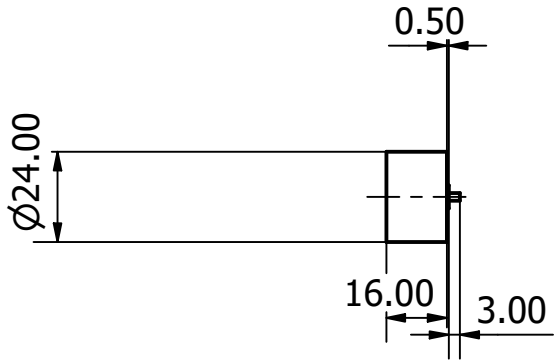


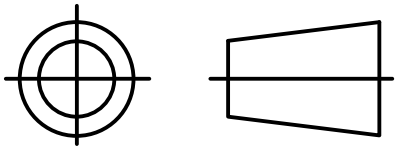
Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Motor Clamp	
	Part Number	17	Material	PLA
	Quantity	1	Page Number	23



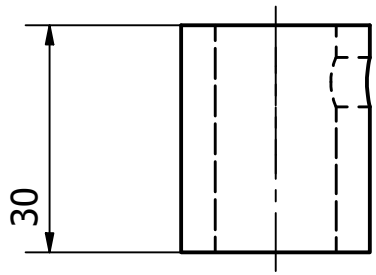


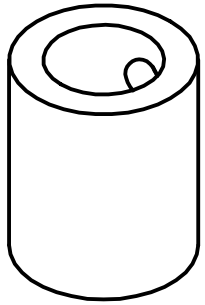


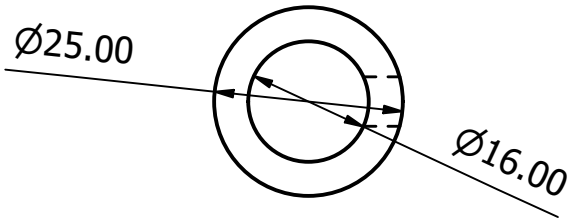
SCALE 1 : 2

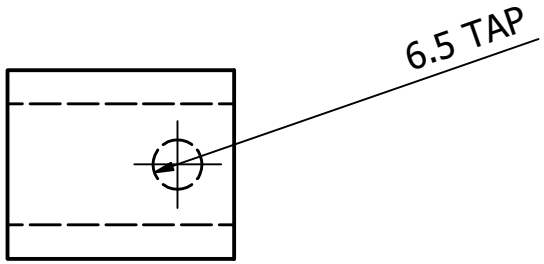


Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Motor (Dynamo)	
	Part Number	18	Material	-
	Quantity	1	Page Number	24

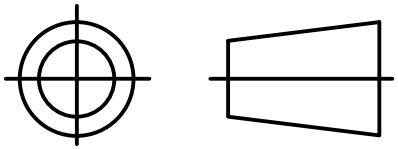




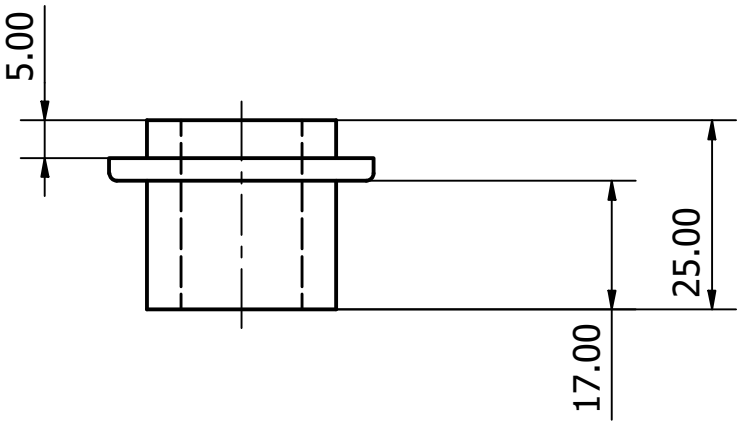


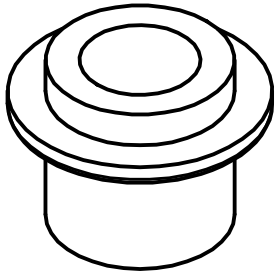


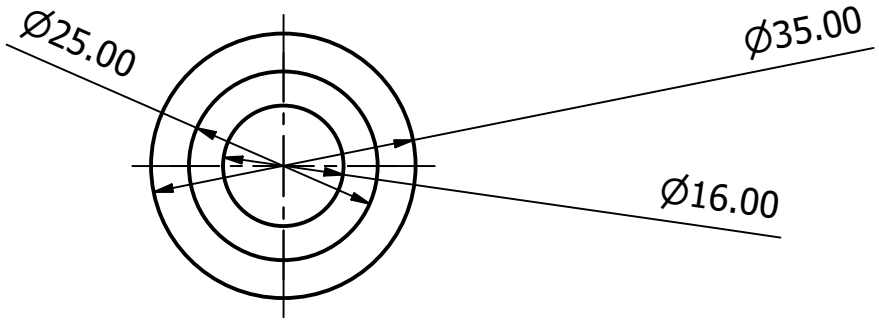
SCALE 1 : 1



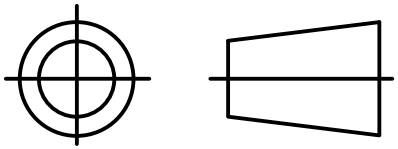
Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Abhinav Singhal	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Stop-Bush	
	Part Number	19	Material	MS
	Quantity	4	Page Number	25



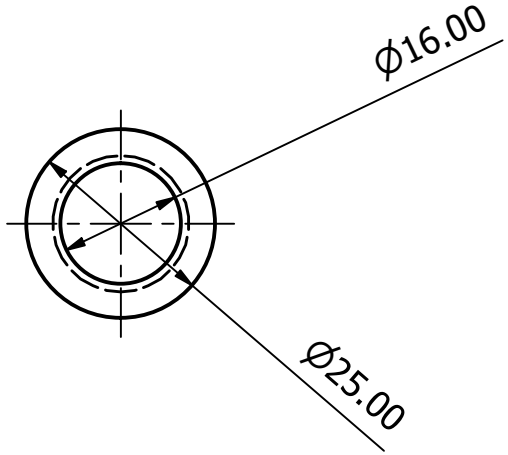


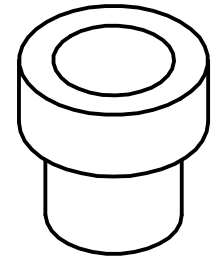


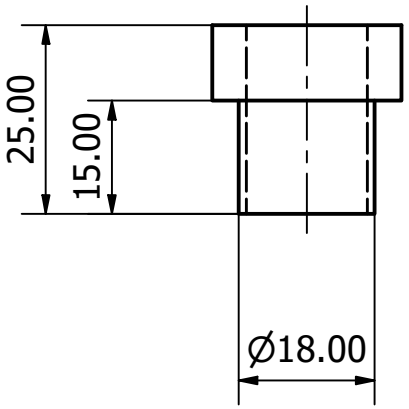
SCALE 1 : 1

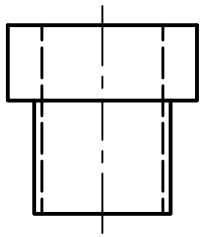


Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Mid Bush	
	Part Number	20	Material	MS
	Quantity	4	Page Number	26









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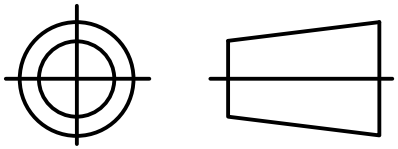

Unless Otherwise Specified:	TA202A	Power Regeneration Using Speed Brakers		
All Dimensions in MM	Drawn By		Shivam Gupta	
Tolerances: Two Decimal Point = ± 0.5	Part Name		Top Bush	
	Part Number	21	Material	MS
	Quantity	4	Page Number	27

COST ANALYSIS

Item	Total Time/ Amount	Rate	Total Price
Mild Steel	20.59 kg	₹ 100/kg	₹ 2059
Drilling	6 Hours	₹ 75/kg	₹ 450
Turning	7 Hours	₹ 150/kg	₹ 1050
Milling	7 Hours	₹ 250/kg	₹ 1750
3D - Printing	1 Hour	₹ 100/kg	₹ 100
DC Generator	1 unit	₹ 200/4 Pcs	₹ 50
Spring	4 units	₹ 20/Pcs	₹ 80
LED Bulb	1 unit	₹ 5/Pcs	₹ 5
SUM TOTAL			₹ 5544