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NASA Psyche Sampling Team CAD Package

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Scott Sprauer

May 3, 2020

Project Sponsor: National Aeronautics and Space Administration &
Arizona State University's School of Earth and Space Exploration

Sponsor Mentor: Dr. Catherine (Cassie) Bowman

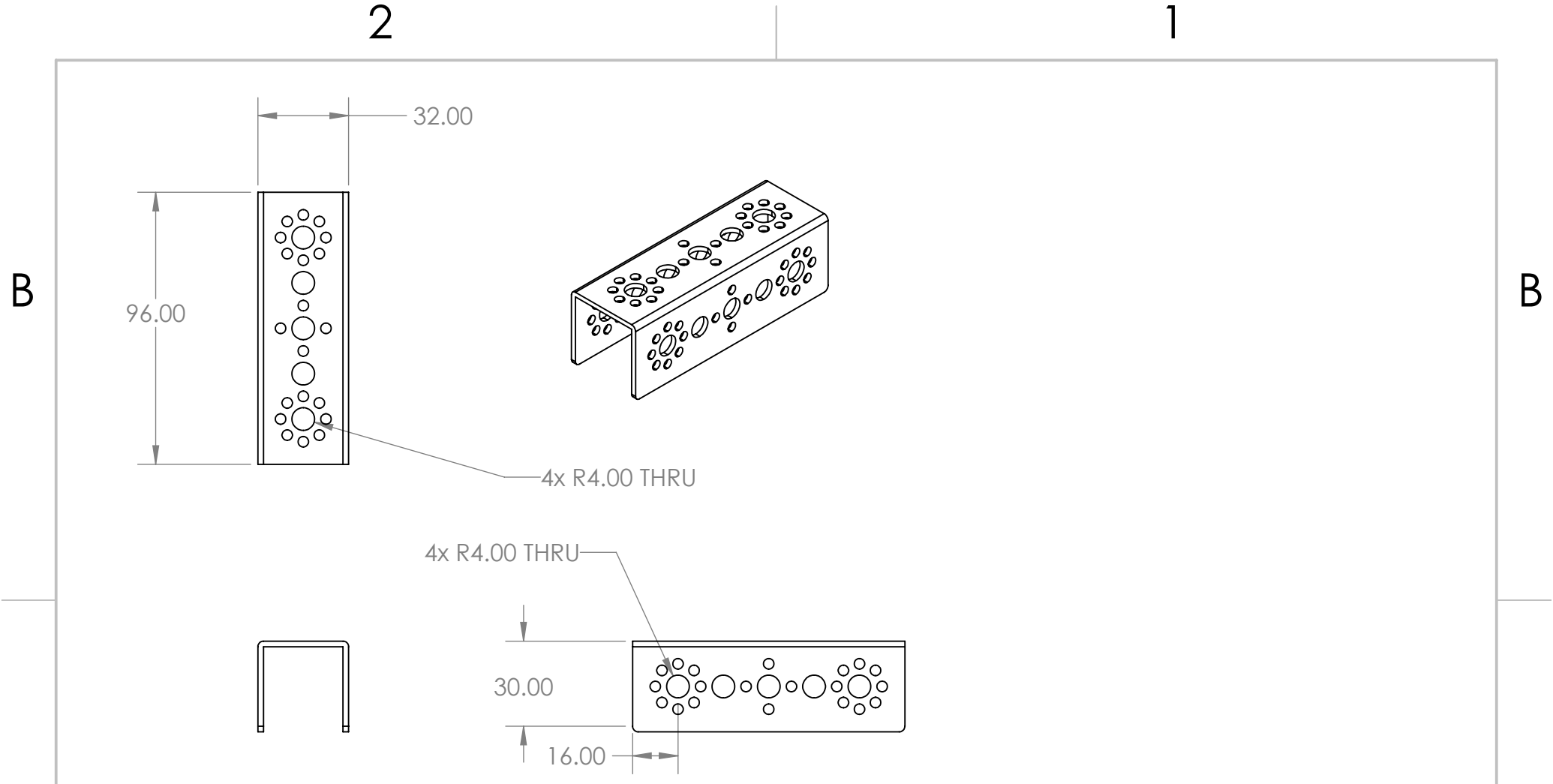
Instructor: Dr. Sarah Oman & Dr. David Trevas

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		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By Tetrix Inc.		
		MATERIAL Aluminum			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:
96mm Channel

SIZE	DWG. NO.	REV
A	96mmchannel	
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

2

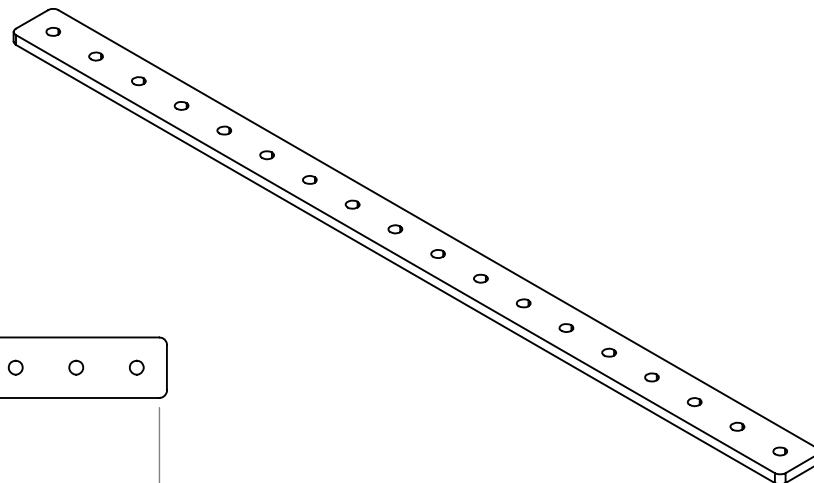
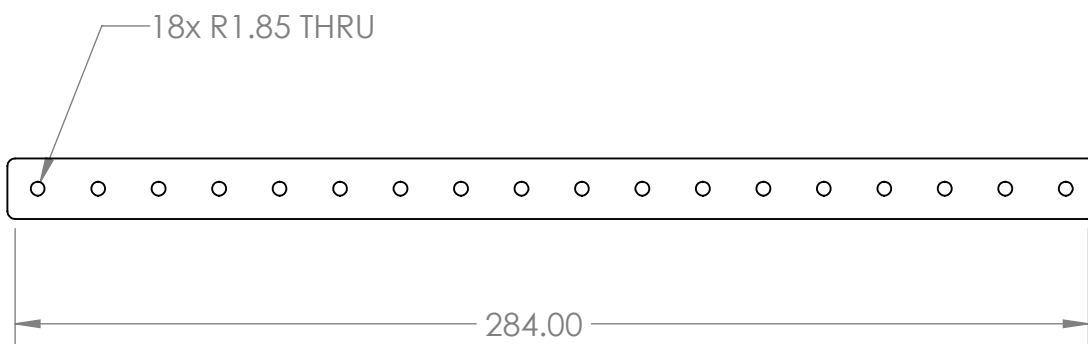
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		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By Tetrix Inc.		
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

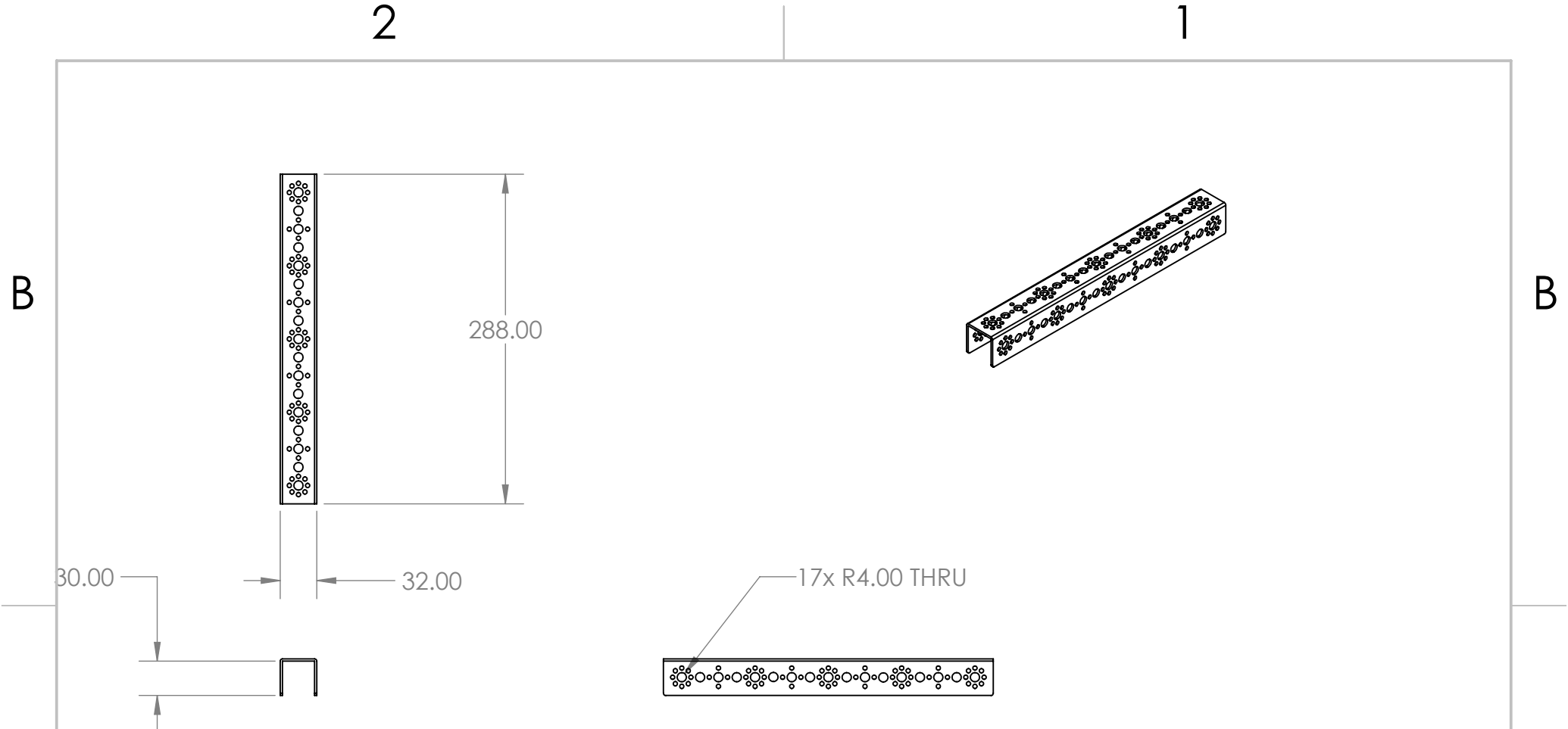
TITLE:
288 mm Flat Bar

SIZE **A** DWG. NO. **288mm_flat_bar** REV

SCALE: 1:2 WEIGHT: SHEET 1 OF 1

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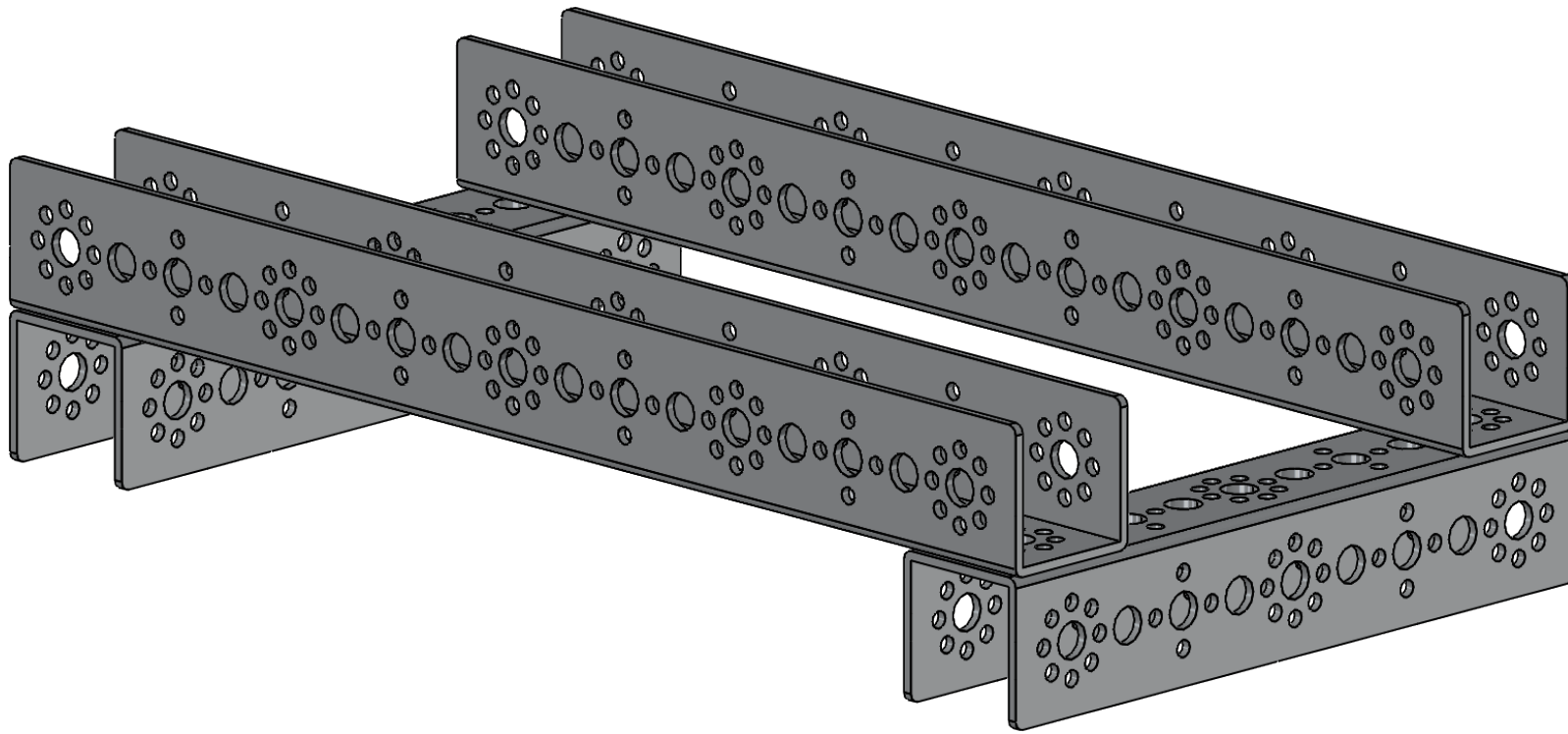
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		TWO PLACE DECIMAL ±	Q.A.						
		THREE PLACE DECIMAL ±	COMMENTS:						
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By tetric Inc.						
		MATERIAL							
	NEXT ASSY	USED ON	FINISH				SIZE	DWG. NO.	REV
							A	288mmchannel	
	APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:5	WEIGHT:	SHEET 1 OF 1

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		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		Aluminum			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:		
Tower Frame Side Assembly		
SIZE	DWG. NO.	REV
A	tf_side	
SCALE: 2:3	WEIGHT:	SHEET 1 OF 1

2

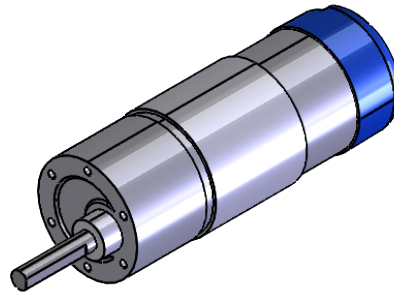
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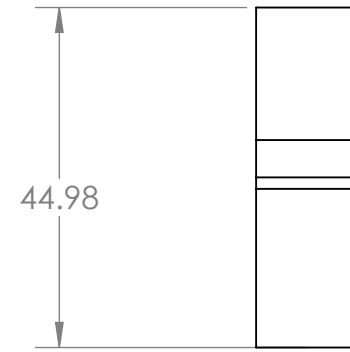
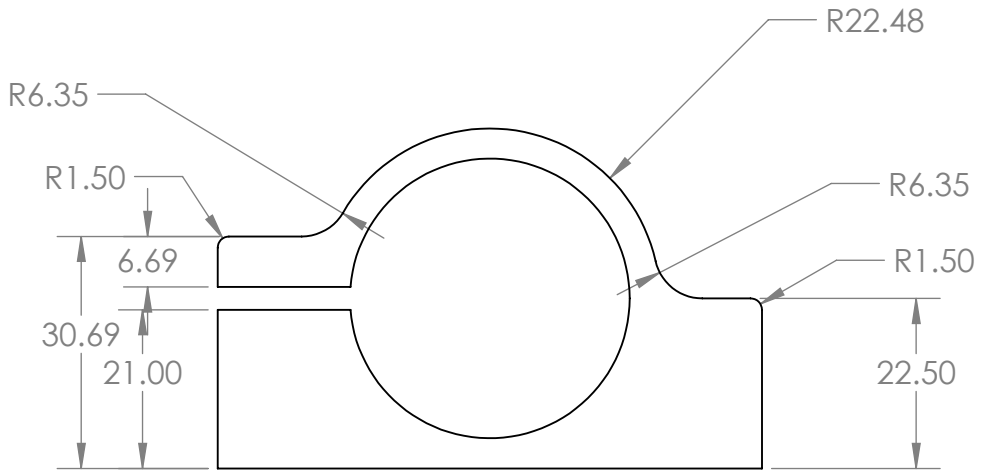
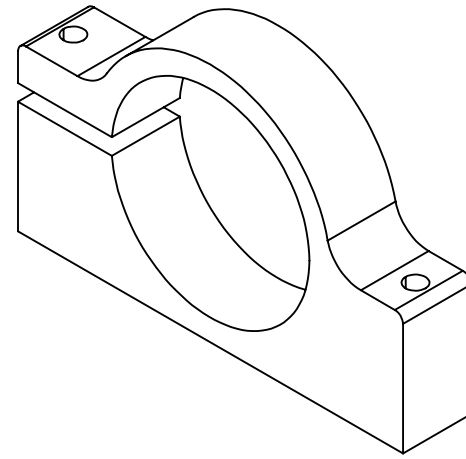
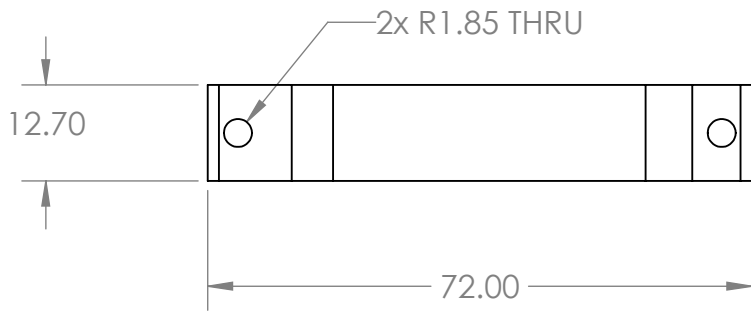
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: <h1>Geared DC Motor</h1>							
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20			SIZE A DWG. NO. torquenado_dc_motor REV SCALE: 1:2 WEIGHT: SHEET 1 OF 1					
		TOLERANCES:	CHECKED							Model Provided By Tetrix Inc.			
		FRACTIONAL ±	ENG APPR.									COMMENTS:	
		ANGULAR: MACH ± BEND ±	MFG APPR.										
		TWO PLACE DECIMAL ±				INTERPRET GEOMETRIC TOLERANCING PER:							
		THREE PLACE DECIMAL ±						MATERIAL					
										FINISH			
												NEXT ASSY USED ON	
						DO NOT SCALE DRAWING							

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		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By Tetrrix Inc.		
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:
Motor Mount

SIZE	DWG. NO.	REV
A	motormount	
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

2

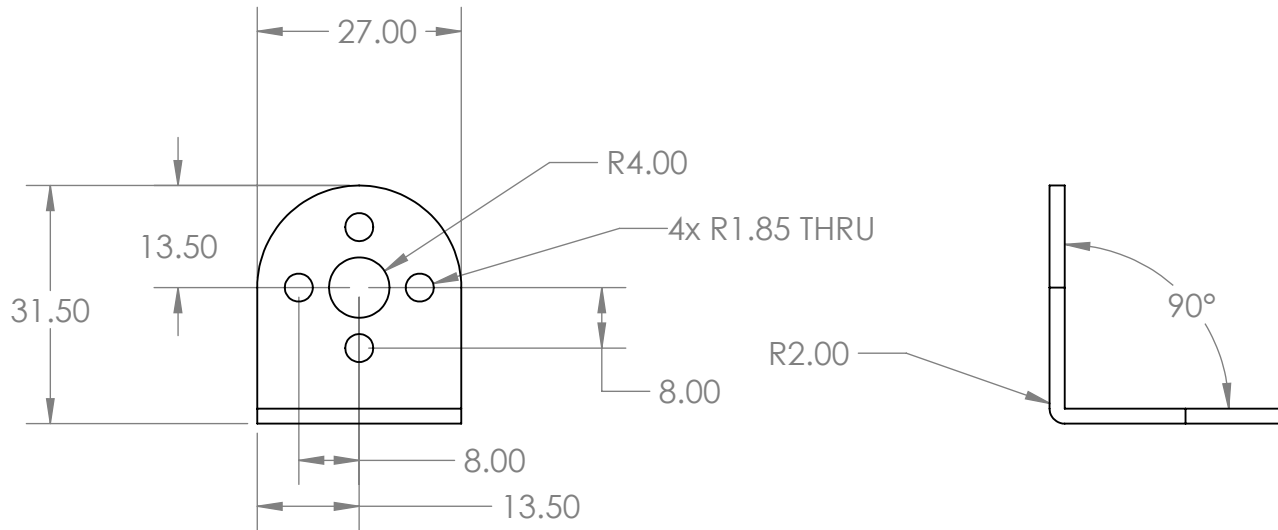
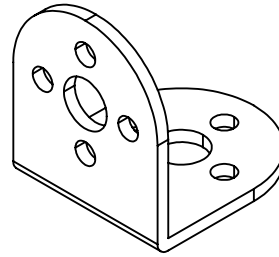
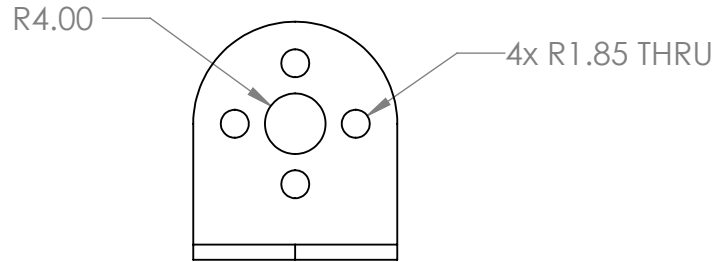
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		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By Tetrix Inc.		
		MATERIAL			
		Aluminum			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE: L-Bracket		
SIZE A	DWG. NO. lbrackets	REV
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

2

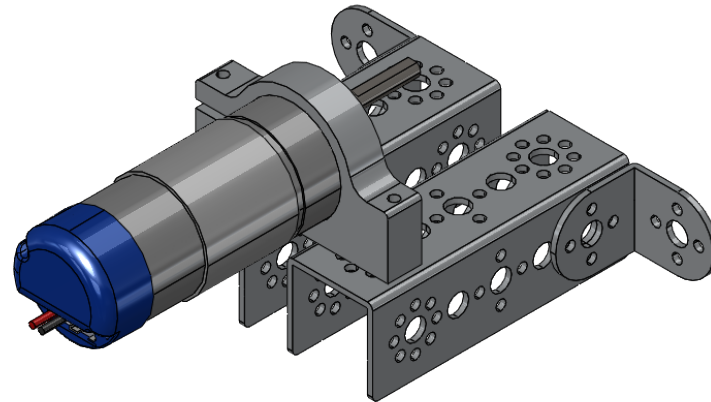
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: <h1>Motor Mount Assembly</h1>		
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20			
		TOLERANCES:	CHECKED					
		FRACTIONAL ±	ENG APPR.					
		ANGULAR: MACH ± BEND ±	MFG APPR.					
		TWO PLACE DECIMAL ±	Q.A.					
		THREE PLACE DECIMAL ±	COMMENTS:					
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE		
		MATERIAL				DWG. NO.		
		FINISH				REV		
NEXT ASSY	USED ON					motormounting		
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:5	WEIGHT:	SHEET 1 OF 1

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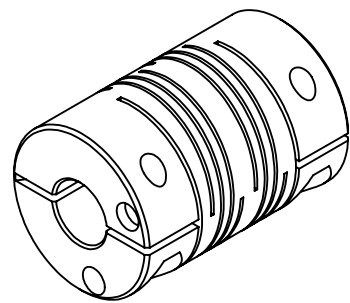
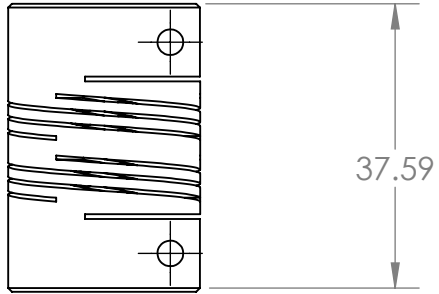
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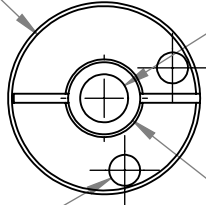
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R12.19

Ø 6.35



R4.76

Ø 4.09 ∇ 5.13

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		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:		
Motor Coupler		
SIZE	DWG. NO.	REV
A	Coupler Body	
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

2

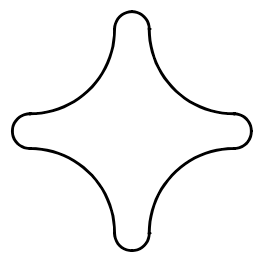
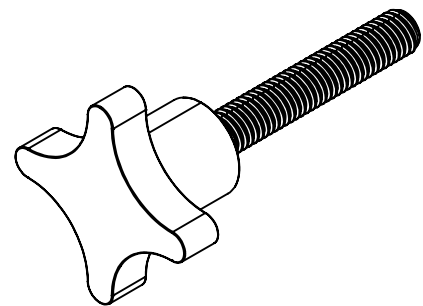
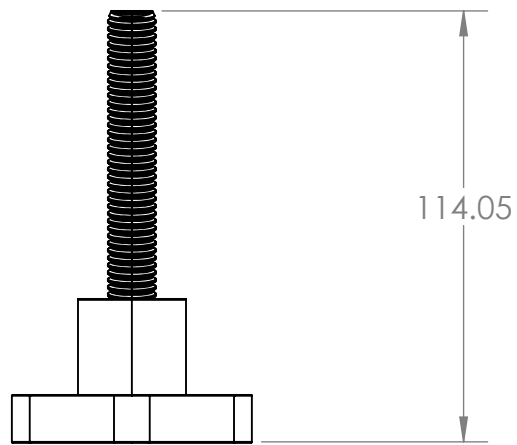
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		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By Mc Master Carr Inc.		
		MATERIAL			
		Steel			
		FINISH			
NEXT ASSY	USED ON	APPLICATION			
		DO NOT SCALE DRAWING			

TITLE: Magnet Pillar		
SIZE A	DWG. NO. knob	REV
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

2

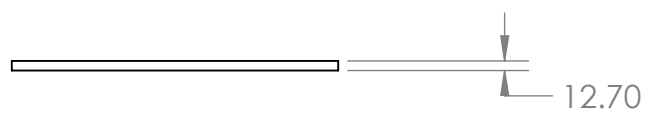
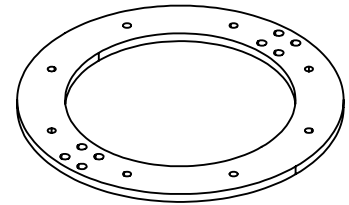
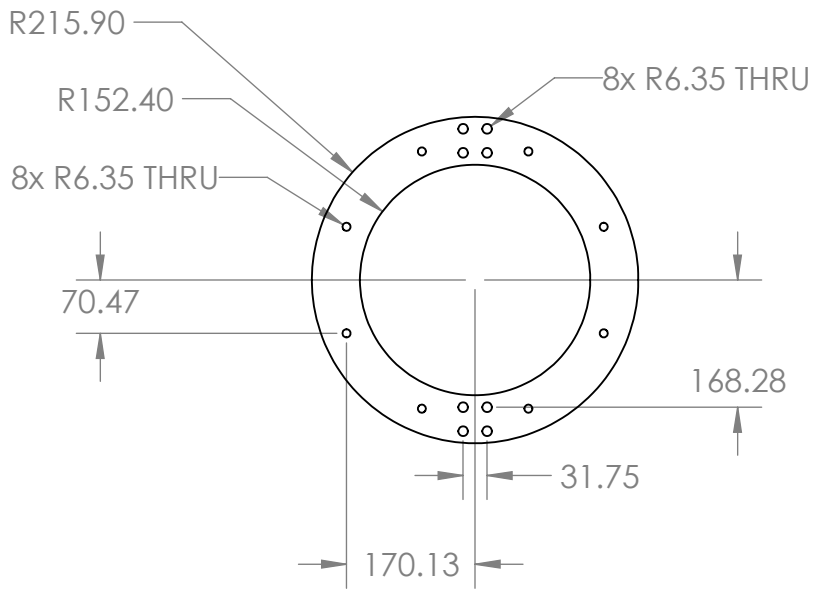
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		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:
Magnetic Base

SIZE DWG. NO. REV
A magbase

SCALE: 1:10 WEIGHT: SHEET 1 OF 1

2

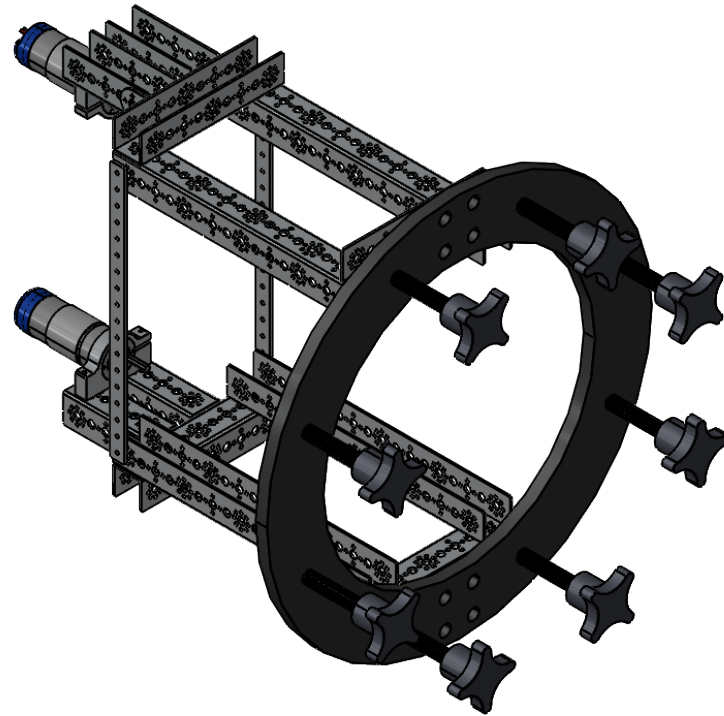
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: <h1 style="text-align: center;">Tower Frame Assembly</h1>			
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20				
		TOLERANCES:	CHECKED						
		FRACTIONAL ±	ENG APPR.						
		ANGULAR: MACH ± BEND ±	MFG APPR.						
		TWO PLACE DECIMAL ±	Q.A.						
		THREE PLACE DECIMAL ±	COMMENTS:						
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE	DWG. NO.	REV	
		MATERIAL				A towerframe			
		FINISH				SCALE: 1:10		WEIGHT:	
		APPLICATION						SHEET 1 OF 1	
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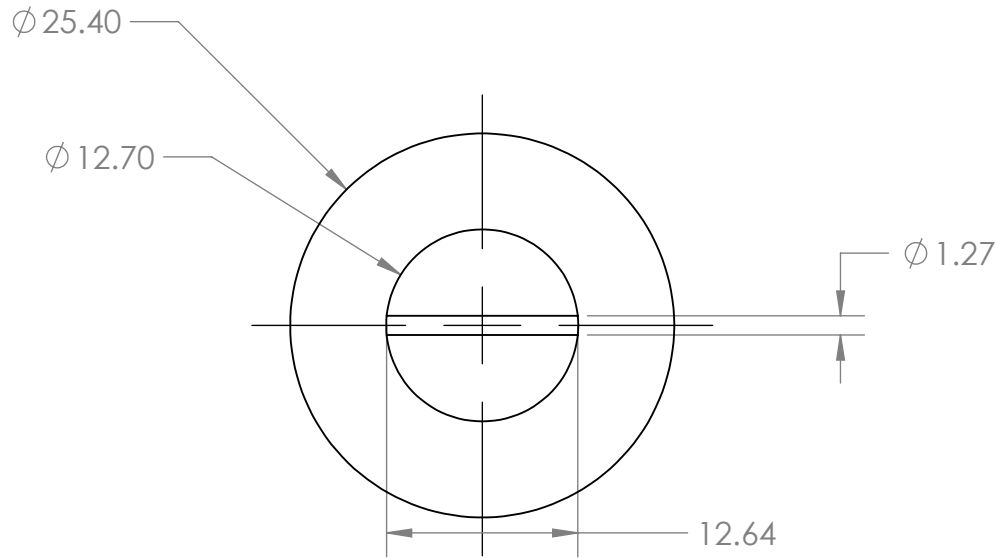
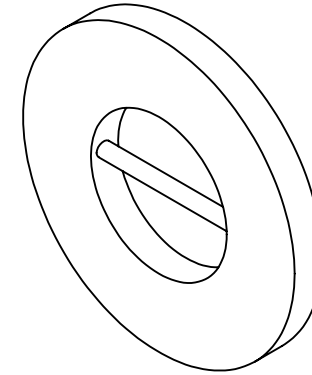
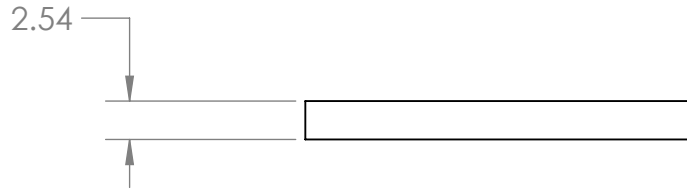
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		ANGULAR: MACH \pm BEND \pm	MFG APPR.		
		TWO PLACE DECIMAL \pm	Q.A.		
		THREE PLACE DECIMAL \pm	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		Aluminum			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:
Sample Pusher

SIZE	DWG. NO.	REV
A	pusher	

SCALE: 2:1	WEIGHT:	SHEET 1 OF 1
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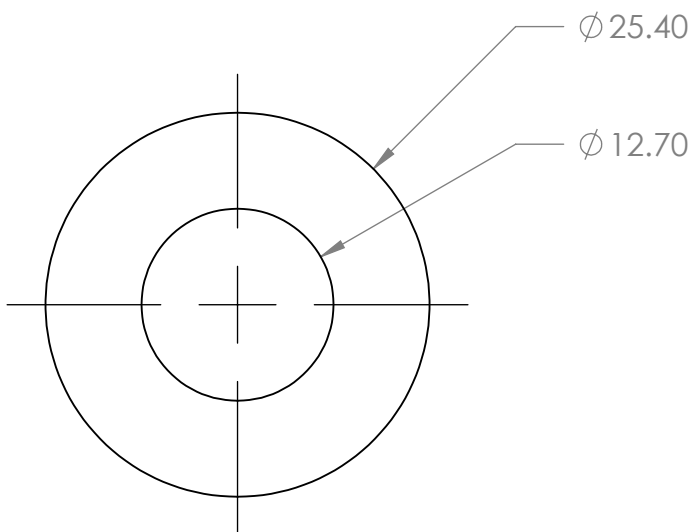
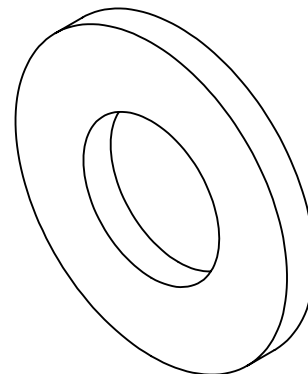
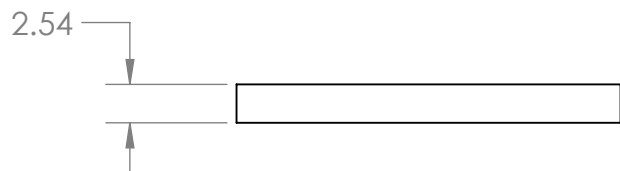
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		INTERPRET GEOMETRIC TOLERANCING PER:	CHECKED		
		MATERIAL Aluminum	ENG APPR.		
		FINISH	MFG APPR.		
NEXT ASSY	USED ON		Q.A.		
APPLICATION		DO NOT SCALE DRAWING	COMMENTS:		

TITLE: Sample Pusher Ring		
SIZE A	DWG. NO. Ring	REV
SCALE: 2:1	WEIGHT:	SHEET 1 OF 1

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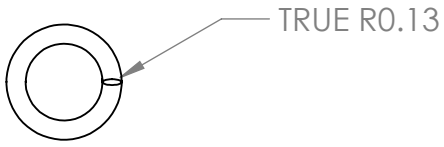
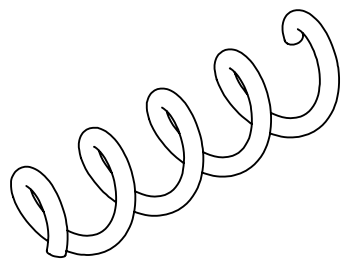
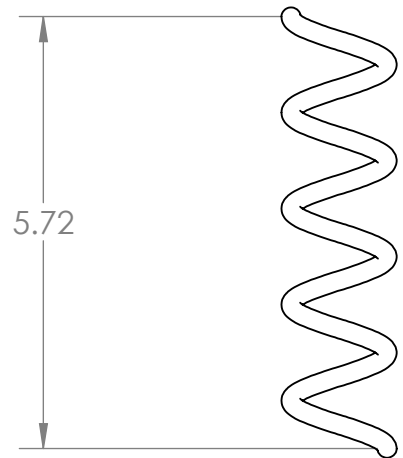
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		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		Spring Steel			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:		
Sample Pusher Spring		
SIZE	DWG. NO.	REV
A	spring	
SCALE: 10:1	WEIGHT:	SHEET 1 OF 1

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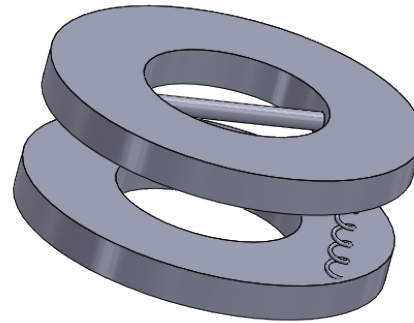
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: <h1>Caching Pusher</h1>			
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20			SIZE A DWG. NO. caching_pusher REV SCALE: 2:1 WEIGHT: SHEET 1 OF 1	
		TOLERANCES:	CHECKED						
		FRACTIONAL ±	ENG APPR.						
		ANGULAR: MACH ± BEND ±	MFG APPR.						
		TWO PLACE DECIMAL ±	Q.A.						
		THREE PLACE DECIMAL ±	COMMENTS:						
		INTERPRET GEOMETRIC TOLERANCING PER:							
		MATERIAL							
	NEXT ASSY	USED ON	FINISH						
	APPLICATION		DO NOT SCALE DRAWING						

2

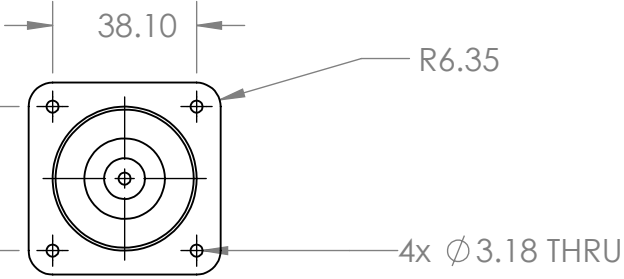
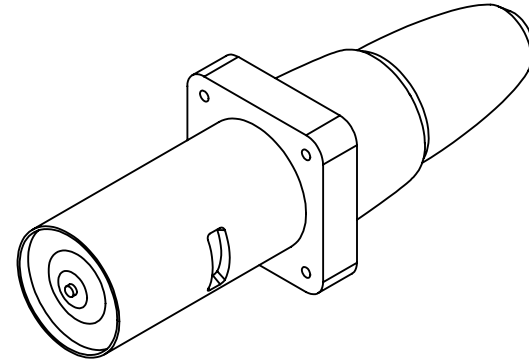
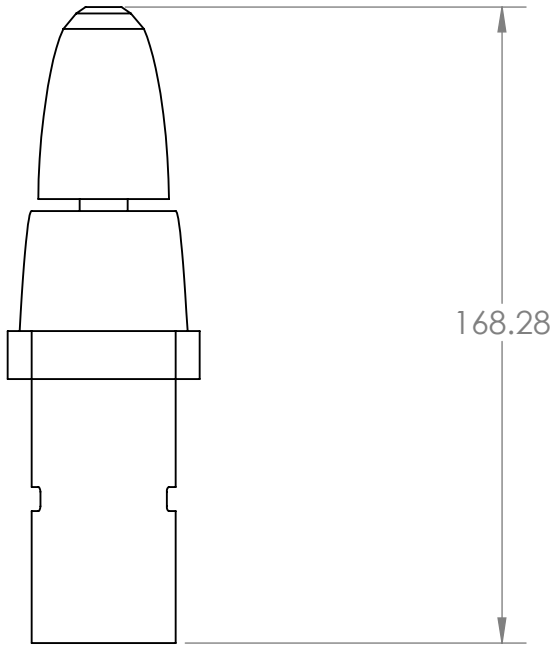
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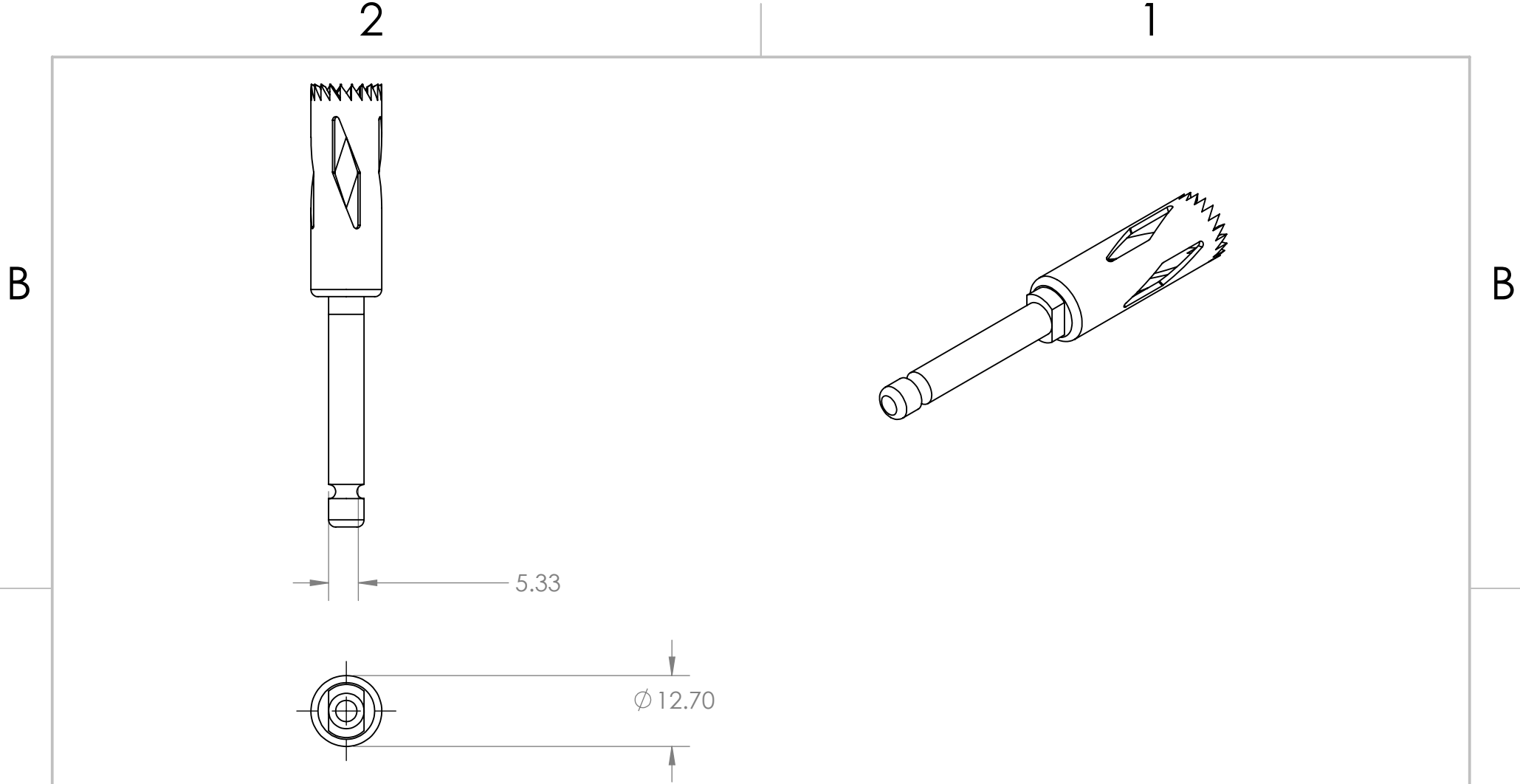
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Modeled After Milwaukee Drill Motor		
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE: Drill Motor		
SIZE	DWG. NO.	REV
A	Drill Motor	
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

2

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		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Modeled Using Milwaukee 1/2 Inch Hole Saw		
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE: Coring Bit		
SIZE A	DWG. NO. Coring Bit	REV
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

2

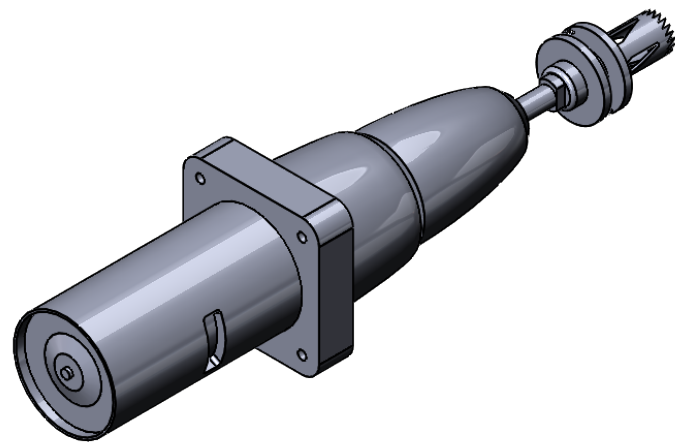
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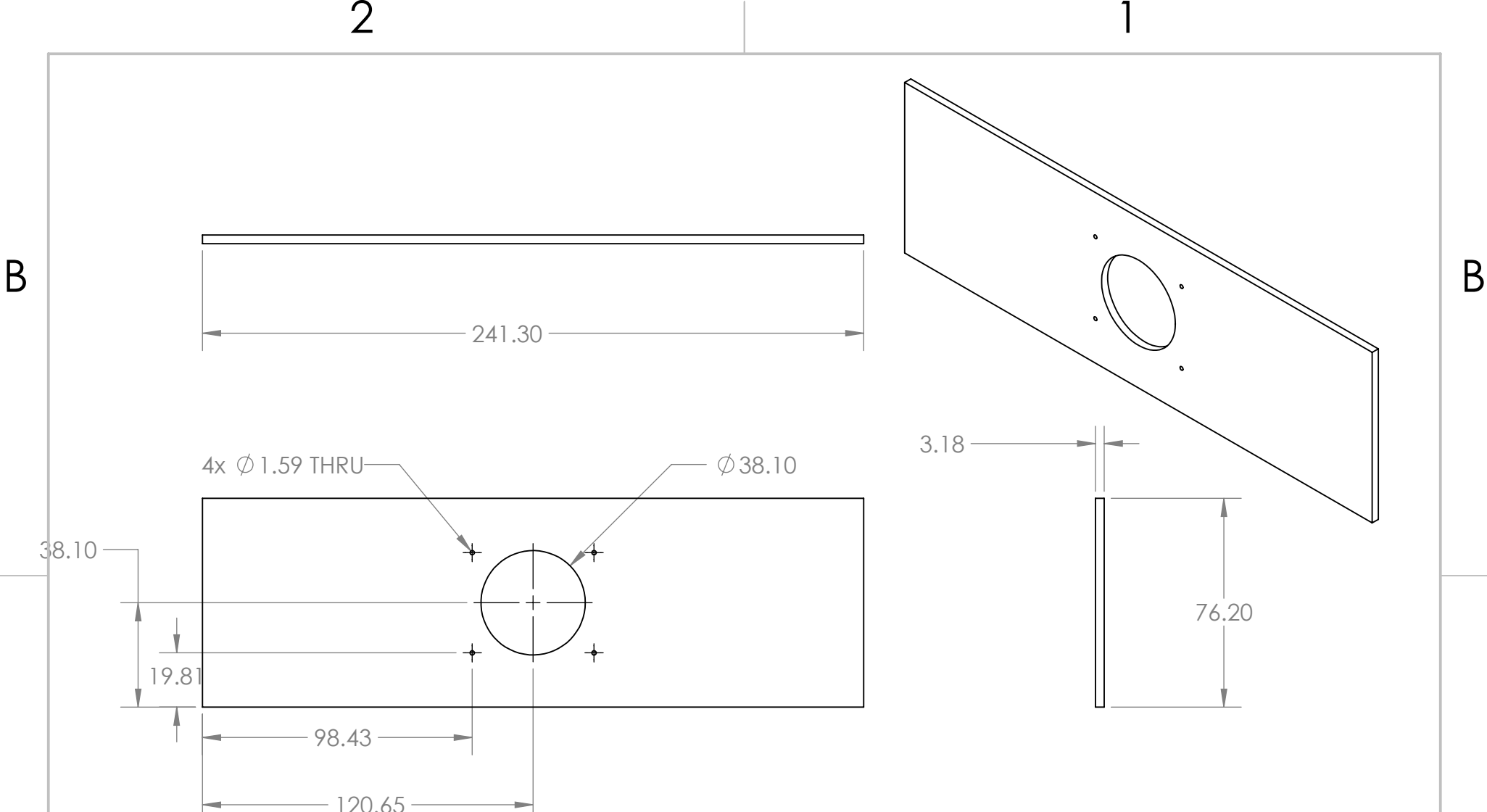
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: <h1>Drill Assembly</h1>			
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20			SIZE A DWG. NO. Final Drill Assembly REV SCALE: 1:2 WEIGHT: SHEET 1 OF 1	
		TOLERANCES: FRACTIONAL ±	CHECKED						
		ANGULAR: MACH ± BEND ±	ENG APPR.						
		TWO PLACE DECIMAL ±	MFG APPR.						
		THREE PLACE DECIMAL ±	Q.A.						
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:						
		MATERIAL							
		FINISH							
	NEXT ASSY	USED ON							
	APPLICATION		DO NOT SCALE DRAWING						

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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		Steel			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE:		
Drill Plate		
SIZE	DWG. NO.	REV
A	Drill Plate	
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: Ball Screw Nut		
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20			
		TOLERANCES: FRACTIONAL ±	CHECKED					
		ANGULAR: MACH ± BEND ±	ENG APPR.					
		TWO PLACE DECIMAL ±	MFG APPR.					
		THREE PLACE DECIMAL ±	Q.A.					
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:					
		MATERIAL	Model Provided By Mc Master Carr Inc.			SIZE	DWG. NO.	REV
		FINISH				A	3405N072_ BALL SCREW	
NEXT ASSY	USED ON							
APPLICATION		DO NOT SCALE DRAWING				SCALE: 4:1	WEIGHT:	SHEET 1 OF 1

2

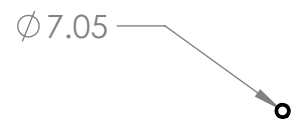
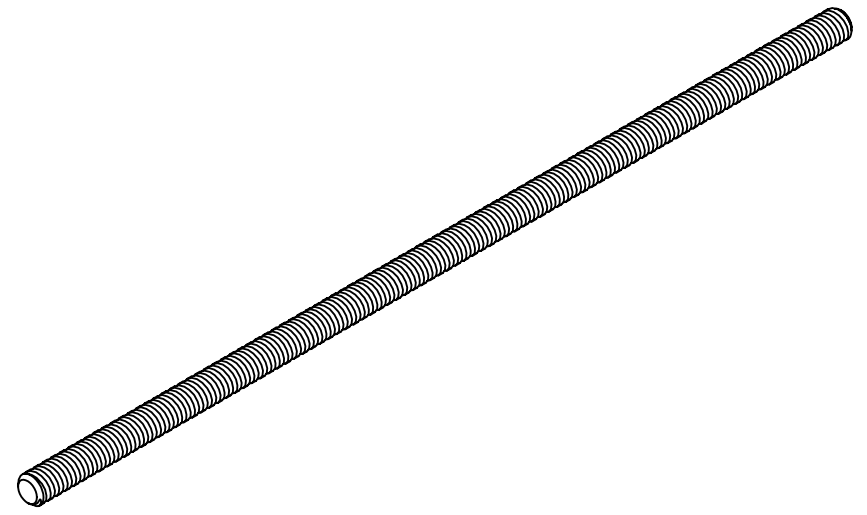
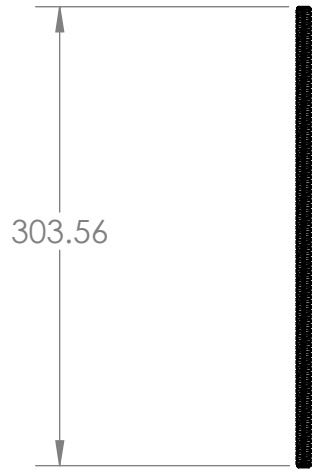
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By Mc Master Carr Inc.		
		MATERIAL			
		Alloy Steel			
		FINISH			
NEXT ASSY	USED ON	APPLICATION			
		DO NOT SCALE DRAWING			

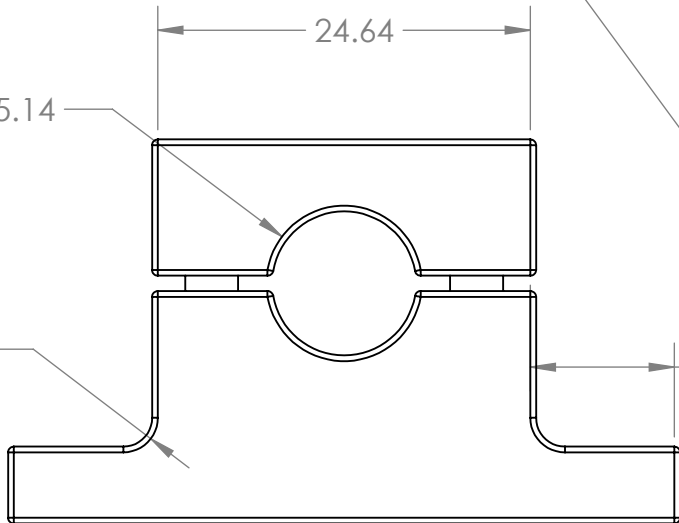
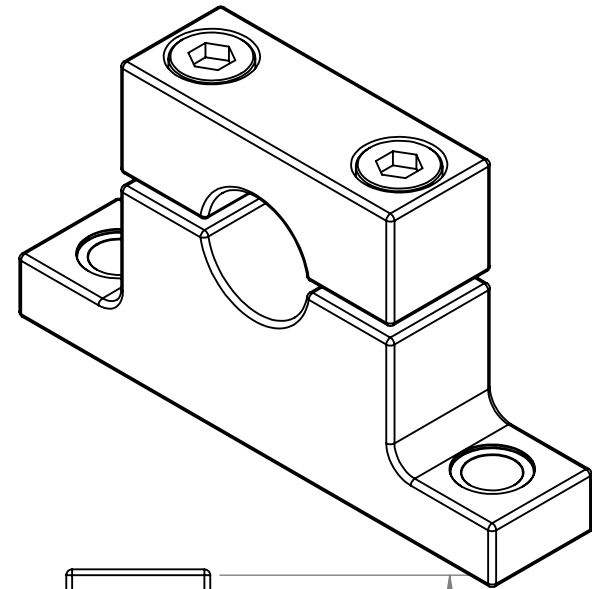
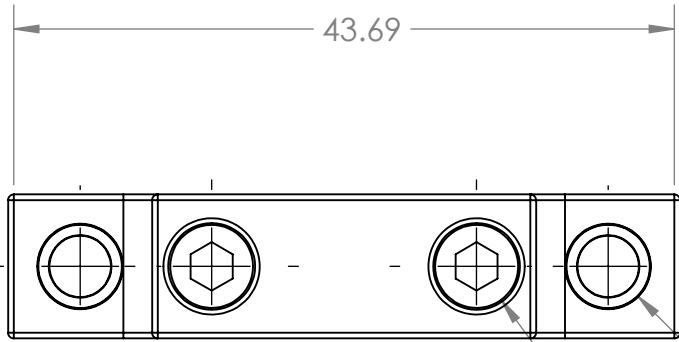
TITLE:		
<h1>Ball Screw</h1>		
SIZE	DWG. NO.	REV
A	3405N001_ BALL SCREW	
SCALE: 1:5	WEIGHT:	SHEET 1 OF 1

2

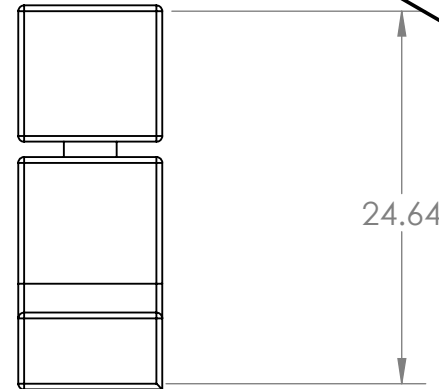
1

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$\phi 5.51$
 $\phi 3.51 \nabla 20.57$
 $\phi 5.74 \nabla 3.51$
 $\surd \phi 5.49 \times 90^\circ$



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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN MM	DRAWN	S.A.	05/20
		TOLERANCES:	CHECKED		
		FRACTIONAL \pm	ENG APPR.		
		ANGULAR: MACH \pm BEND \pm	MFG APPR.		
		TWO PLACE DECIMAL \pm	Q.A.		
		THREE PLACE DECIMAL \pm	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:	Model Provided By McMaster Carr Inc.		
		MATERIAL			
		6061 Aluminum			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

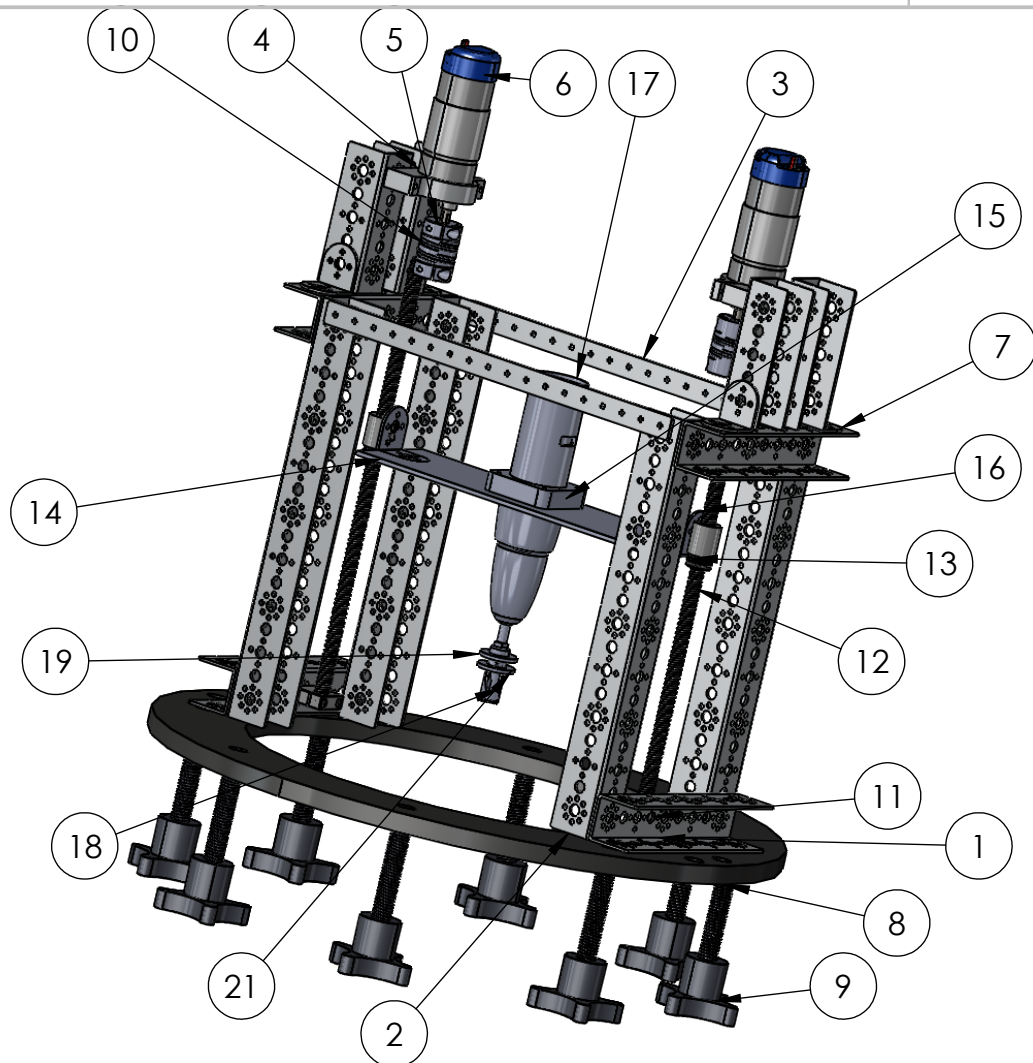
TITLE:
Shaft Support

SIZE **A** DWG. NO. Base_Shaft_Support REV
 SCALE: 2:1 WEIGHT: SHEET 1 OF 1

2

1

B



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	160mmchannel	Short Channel	4
2	288mmchannel	Long Channel	4
3	288mm_flat_bar	Long Flat Bar	2
4	motormount	Geared Motor Mount	2
5	96mmchannel	Medium Channel	4
6	torquenado_dc_motor	Geared Motor	2
7	lbrackets	L-Brackets	4
8	magbase	Magnetic Base	1
9	knob	Magnet Pillars	8
10	Coupler Body	Coupler	2
11	1865K2	End Support	2
12	3405N001	Ball Screw	2
13	3405N072_ BALL SCREW	Screw Nut	1
14	Ball Screw	Ball Screw	1
15	Drill Plate	Drill Plate	2
16	Part2	L-Bracket	2
17	Drill Motor	Drill Motor	2
18	Coring Bit	Coring Bit	2
19	Ring	Pusher Ring	2
20	spring	Pusher Spring	4
21	pusher	Sample Pusher	2

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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE
		DIMENSIONS ARE IN MM TOLERANCES: FRACTIONAL: ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN S.A.	05/20
		INTERPRET GEOMETRIC TOLERANCING PER:	CHECKED	
		MATERIAL	ENG APPR.	
		FINISH	MFG APPR.	
			Q.A.	
			COMMENTS:	
NEXT ASSY	USED ON			
APPLICATION		DO NOT SCALE DRAWING		

TITLE:

Sampling System Assembly

SIZE A	DWG. NO. Final_systemASSEMBLY	REV
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SCALE: 1:6	WEIGHT:	SHEET 1 OF 1
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2

1