Spring 2021

Door Barricade

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Mechanical Projects 001

Mr. Lukach

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Introduction

My goal for this project was to create a unique mechanical device. My mechanical design project for the Mechanical Projects class is a door barricade. The barricade is designed to be used for school doors. It would specifically for when there is an intruder in the school. “The FBI designates an active shooter as one or more individuals actively engaged in killing or attempting to kill people in a populated area.” In 2019, three of 28 shootings occurred at schools, resulting in five killed and 15 wounded (FBI, 2020). My design for the door barricade will be easy to install on doors and easy to operate. It will have automatic opening and closing when active. The barricade will keep the door from being opened by any human. These functions are designed to help deter active shooters in schools and/or reduce the amounts of injuries and deaths. The two aspects of mechanical engineering technology that my capstone project will focus on are stress analysis and electronics. I did calculations for stress to determine the necessary material for the bars. This report will go into detail about the design of my door barricade, how it functions and the calculations.

Body

My mechanical capstone project is a door barricade that I designed. The purpose of the door barricade is to lock down school doors so they cannot be opened in case of an emergency. This is meant specifically for active shooter situations to reduce the number of injuries and deaths. My design will be made from steel, so it is strong enough to stand up to gun fire and someone trying to pull down the door. The design of the door barricade is made so it gets mounted to the door and has two bars that block the door from being pulled open. The main part of the barricade is mounted to the door inside the room. There is a steel plate that is attached to the outside of the door for keeping the barricade secure. The barricade extends to 40 inches in

length, because the average classroom door is 36 inches wide (Erardi, 2020). My door barricade design uses electronics and mechanical devices to function.

The door barricade runs on electricity and the use of springs. The main part of my design has bars with springs attached to them and a solenoid that acts on the bar and spring. My design has a base that all of the parts set in. The two bars, springs and solenoid are set in a horizontal channel that holds them in place. There are multiple stages of how the barricade functions. When there is not power going to the solenoids, the bars will be extended via the spring which locks the door. When there is power going to the solenoids, they will pull in the bar with their magnetic field which retracts the bars and opens the door. The power for the barricade will be controlled by a toggle switch and a photo eye.

The power for the door barricade will come through the wall and door into the device through a hole in the base. The wires for power will split to run into the toggle switch and photo eye simultaneously so that they are connected in parallel. The toggle switch for my design is from the Nilight Store on Amazon. The photo eye that I found for my design was from AutomationDirect. After the toggle switch and photo eye, the wires come together and go to both of the solenoids, so they receive power them at the same time. There is also an alarm that is wired in after the photo eye, so that it goes off when someone would step in front of the door and activate the photo eye. The purpose of this is to let a teacher know if a student is trying to leave the room during a lockdown. A backup battery is wired in before the photo eye after the initial wire splits. This allows the door to be opened by the photo eye, if an intruder were to cut the power to the school. I drew the wires how they would be wired if the door barricade was made. There are wiring diagrams in my drawing section to show how everything is wired but in a ladder diagram format.

My door barricade design has multiple designs considerations based on safety. The first is the back up battery described previously. It is used to keep the barricade functioning when the power goes out which could be due to an intruder in a school or just a power outage caused by a storm. The battery is designed to be like a LiPo battery I found which allows it to be replaced and recharged when necessary (maxamps.com). There is also an alarm that warns teachers about the barricade being opened during a lockdown. The alarm is designed based on one I found that can be bought from floydbell.com. I designed the barricade with a steel plate outside the door so it can’t be ripped out of the door. The bolts on the outside of the door have round heads, so they can’t be unscrewed. Another safety feature was that I made my design be able to withstand the stress it could experience if someone was to try to pull the door open. I used information that I found to make shear and moment diagrams based on a few scenarios. I also calculated what kind of spring I would need to hold the bars securely in place. I took all of these factors into consideration when designing my door barricade for the capstone project.

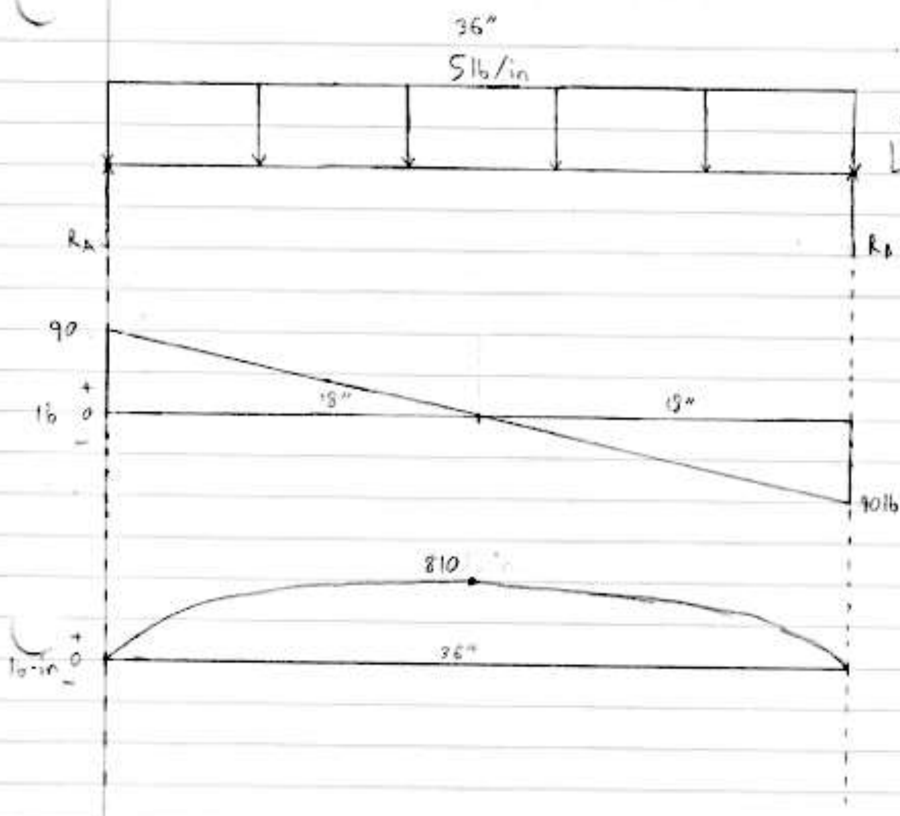
Conclusion:

My door barricade for the MET senior capstone project was designed for use in schools in the case of an intruder or active shooter. The basic part of the design is that it keeps the door from being opened. I did calculations based on the stress that the door could experience if someone was trying to pull it open. I found a study that listed the greatest pull strength of a standing man was 400N which is about 89.9lb (Das, 2015). Therefore, I used 150lb just to add a factor of safety to my design. I found diagrams of the different load types from the “BEAM DIAGRAMS AND FORMULAS For Various Static Loading Conditions” book. I used three scenarios consisting of a distributed load, a concentrated central load and concentrated load at a point (the door handle). From that I calculated the shear and bending stress for each scenario to

determine an approximate tensile strength needed. Then I used the Machinery's Handbook to determine that I can use steel 1025 for my bars in my design. It has a tensile strength of 60ksi which is way higher than my highest tensile strength of about 1,719psi. I chose steel instead of aluminum, because it is a cheaper material. From there I calculated the weight of each bar to determine what kind of spring I would need to move the bar. Based on my calculations, I found a spring on McMaster-Carr. I found a solenoid on Amazon that has a force of about 180lb (800N), so it should be able to pull the weight of the bar against the spring. All of my detailed calculations are down below under the calculations section. My door barricade was designed to be very safe, since it would be protecting kids in a school from an active shooter. There are changes though that could be made to my door barricade design to make it even safer. There could be some sort of special unlocking mechanism that would allow police to get into a school room if they needed to. A monitoring device could be made to allow a principal of a school to monitor each of the barricades during a lockdown to make sure everyone is safe. This is my finished door barricade design for my senior MET capstone project.

Calculations

Max pull force of 400N = 90lb
150 lbs to be safe



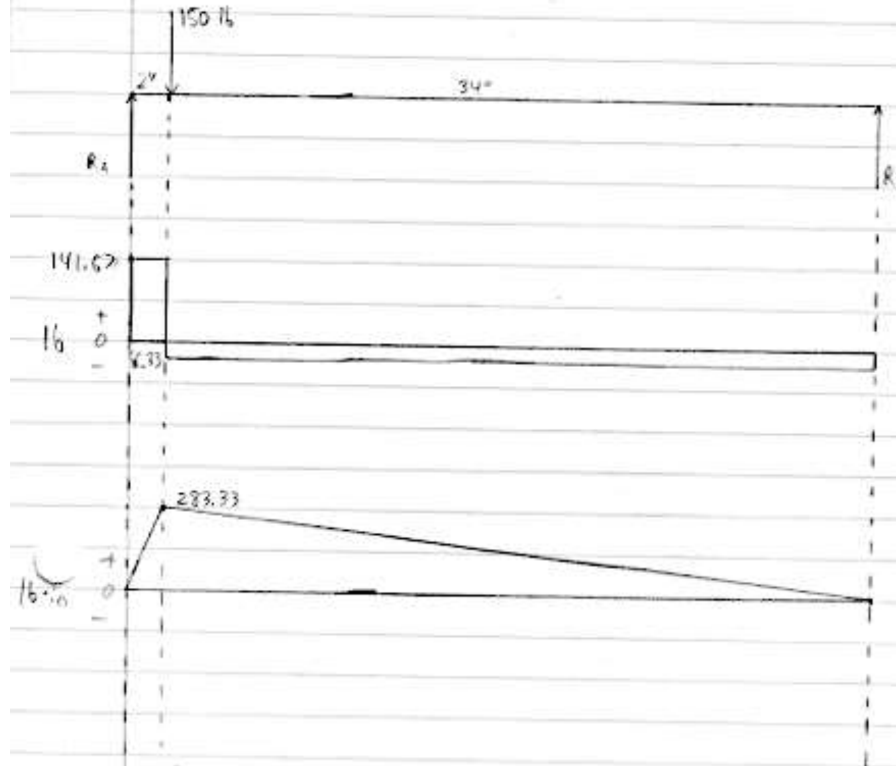
$w = 5lb/in$, $l = 36''$
$L = wl$
$L = 5lb/in \cdot 36'' = 180lb$
$R_A = R_B = \frac{L}{2}$
$R = \frac{180lb}{2} = 90lb$

$M_{max} = \frac{wl^2}{8}$
$M_{max} = \frac{5lb/in \cdot (36in)^2}{8}$
$M_{max} = 810lb \cdot in$

Shear: $\tau = \frac{4V}{3A}$ $V = 90lb$, $A = \frac{\pi d^2}{4}$, $d = 2.0in$
$\tau = (4 \cdot 90lb)/3\left(\frac{\pi(2.0in)^2}{4}\right)$ $\tau = 38.20$ psi

Bending: $\sigma = \frac{My}{I}$ $I = \frac{\pi d^4}{64}$, y = radius, $M = 810lb \cdot in$, $d = 2.0in$
$\sigma = (810lb \cdot in \cdot 1.0in)/\left(\frac{\pi(2.0in)^4}{64}\right)$ $\sigma = 1031.32$ psi

Suitable Material: Tensile strength$_1$ = Bending stress
Tensile strength$_1$ = 1031.32 psi 0.75 Tensile strength$_2$ = shear stress
Tensile strength$_2$ = $\frac{38.20 \text{ psi}}{0.75}$ Tensile strength$_2$ = 50.93 psi
Use steel, SAE 1025 tensile strength = 60-103 ksi



$P = 150lb,\ l = 36",\ b = 34"$

$R_A = \frac{Pb}{l}$

$R_A = \frac{150lb \cdot 34"}{36"} = 141.67lb$

$\Sigma F_y = 0$

$0 = 141.67lb - 150lb + R_B$

$R_B = 8.33\ lb$

$M_{max} = \frac{Pab}{l}$

$M_{max} = \frac{150lb \cdot 2" \cdot 34"}{36"}$

$M_{max} = 283.33lb \cdot in$

Shear: $\tau = \frac{4V}{3A}$ $V = 141.67lb$ $A = \frac{\pi d^2}{4}$ $d = 2.0\,in$

$\tau = \frac{4 \cdot 141.67lb}{3(\pi(2.0in)^2/4)}$ $\tau = 60.13\,psi$

Bending: $\sigma = \frac{My}{I}$ $I = \frac{\pi d^4}{64}$, y= radius, $M = 283.33lb\cdot in$, $d = 2.0in$

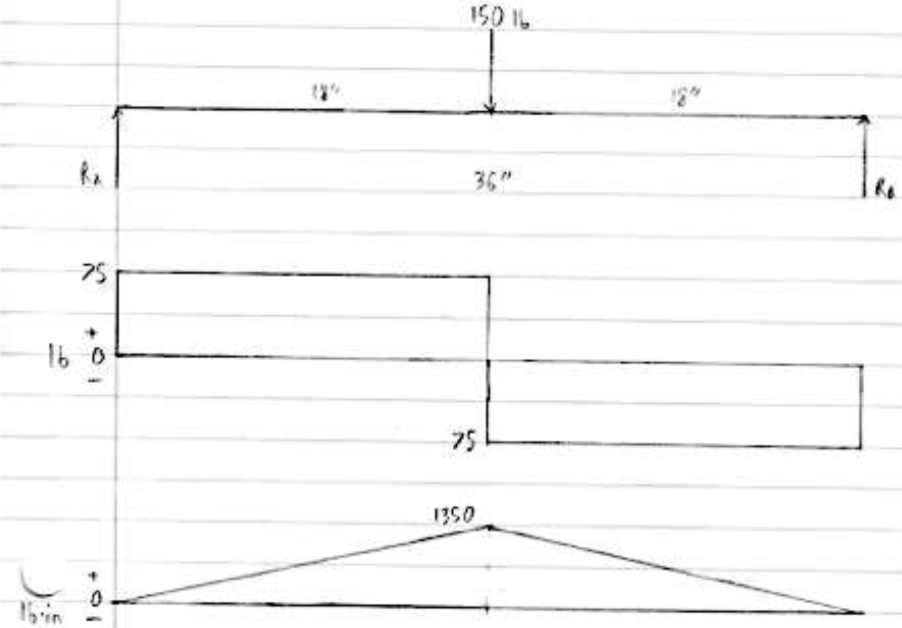
$\sigma = (283.33lb\cdot in \cdot 1.0in) / (\frac{\pi(2.0in)^4}{64})$ $\sigma = 360.75\,psi$

Suitable Material: Tensile strength$_1$ = Bending stress

Tensile strength$_1$ = 360.75 psi 0.75·Tensile strength$_2$ = Shear stress

Tensile strength$_2$ = $\frac{60.13psi}{0.75}$ Tensile strength$_2$ = 80.17psi

Use steel, SAE 1025 tensile strength = 60-103 ksi



$P = 150lb$
$R_A = R_B = \frac{P}{2}$
$R_A = \frac{150lb}{2} = 75lb$

$M_{max} = \frac{PL}{4}$
$P = 150lb, \; l = 36in$
$M_{max} = \frac{150lb \cdot 36in}{4}$
$M_{max} = 1350lb{\cdot}in$

Shear: $\tau = \frac{4V}{3A}$ $V = 75lb$, $A = \frac{\pi d^2}{4}$, $d = 2.0in$
$\tau = (4 \cdot 75lb)/(3 \cdot \frac{\pi(2.0in)^2}{4})$ $\tau = 31.83\ psi$

Bending: $\sigma = \frac{My}{I}$ $I = \frac{\pi d^4}{64}$, y = radius, $M = 1350\ lb{\cdot}in$, $d = 2.0\ in$
$\sigma = (1350lb{\cdot}in \cdot 1.0in)/(\frac{\pi(2.0in)^4}{64})$ $\sigma = 1718.87\ psi$

Suitable Material: Tensile $strength_1$ = Bending stress
Tensile $strength_1 = 1718.87\ psi$ $0.75 \cdot$ Tensile $strength_2$ = Shear stress
Tensile $strength_2 = \frac{31.83\ psi}{0.75}$ Tensile $strength_2 = 42.44\ psi$
Use steel, SAE 1025 tensile strength = 60-103 ksi

Mcmaster carr
has spring constant

Spring strength needed:

Weight of bar = ρV $\quad V = \pi r^2 h$

$\rho = 0.2839\ lb/in^3$, $r_1 = 1.0in$, $h_1 = 14.35in$, $r_2 = 0.75in$, $h_2 = 2.00in$

$V_1 = \pi(1.0in)^2 \cdot 14.35in = 45.08in^3$ $\quad V_2 = \pi(0.75in)^2 \cdot 2.00in = 3.53in^3$

$V_t = 45.08in^3 + 3.53in^3 = 48.61in^3$ $\quad W = 0.2839\ lb/in^3 \cdot 48.61in^3 = 13.80\ lb$

$wd = 0.20in$, $OD = 2.00in$, $L = 4.20in$, $n_a = 6$

$F = -kx$ $\quad F = -13.80lb$, $x = L - L_c$, $L_c = wd(n_a + 1)$

$L_c = 0.20in(6+1) = 1.40in$ $\quad x = 4.20in - 1.40in = 2.80in$

$k = \frac{-F}{-x}$ $\quad k = \frac{-13.80lb}{-2.80in}$ $\quad \boxed{k = 4.93\ lb/in}$

Spring selected:

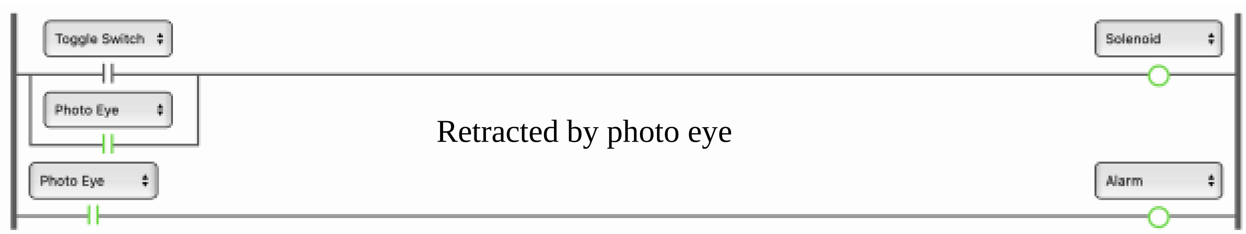
$L = 4.0in$, $OD = 2.188in$, $ID = 1.774in$, Max load $= 176lb$,
Rate $= 68lb/in$, Material = spring-tempered steel, $L_g = 1.45in$,
End = closed and ground

Spring selected max load = 176lb > Weight of bar = 13.80lb
This makes the new spring work.

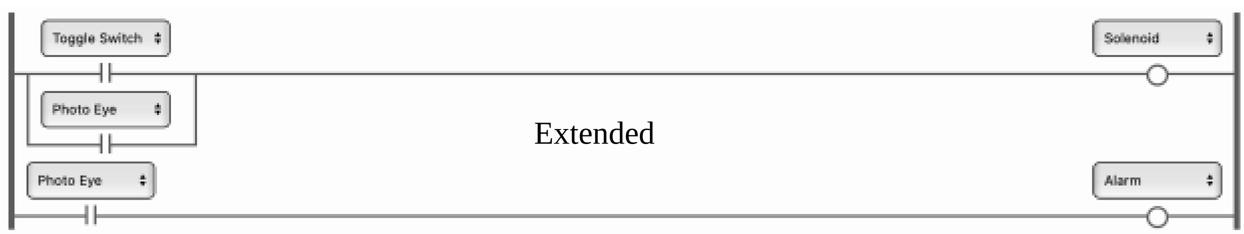
Drawings

Wiring Diagrams:

Retracted by toggle switch

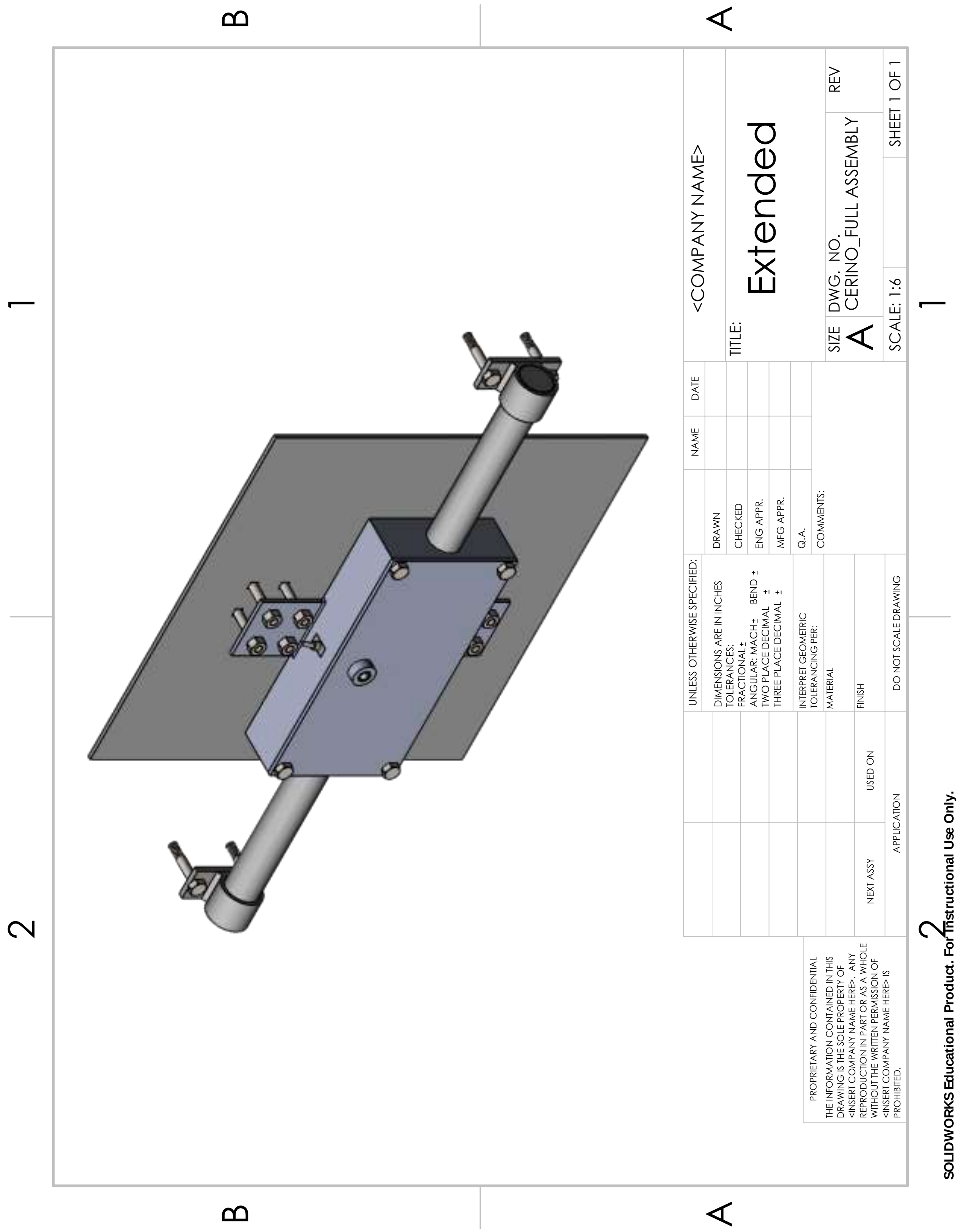


Retracted by photo eye



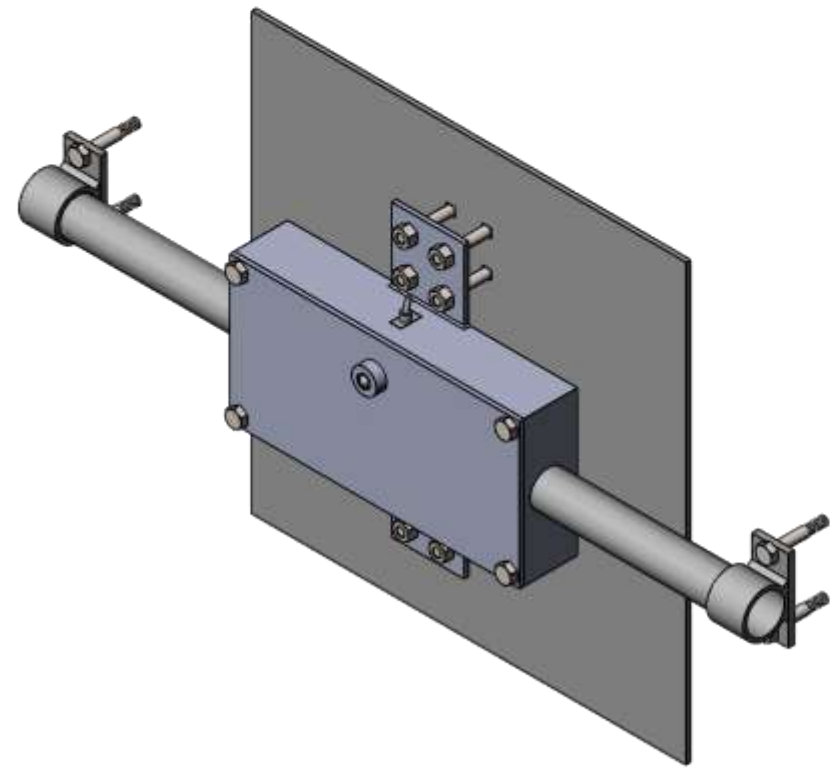
Extended

Detail Drawings:



2 1

B B



A A

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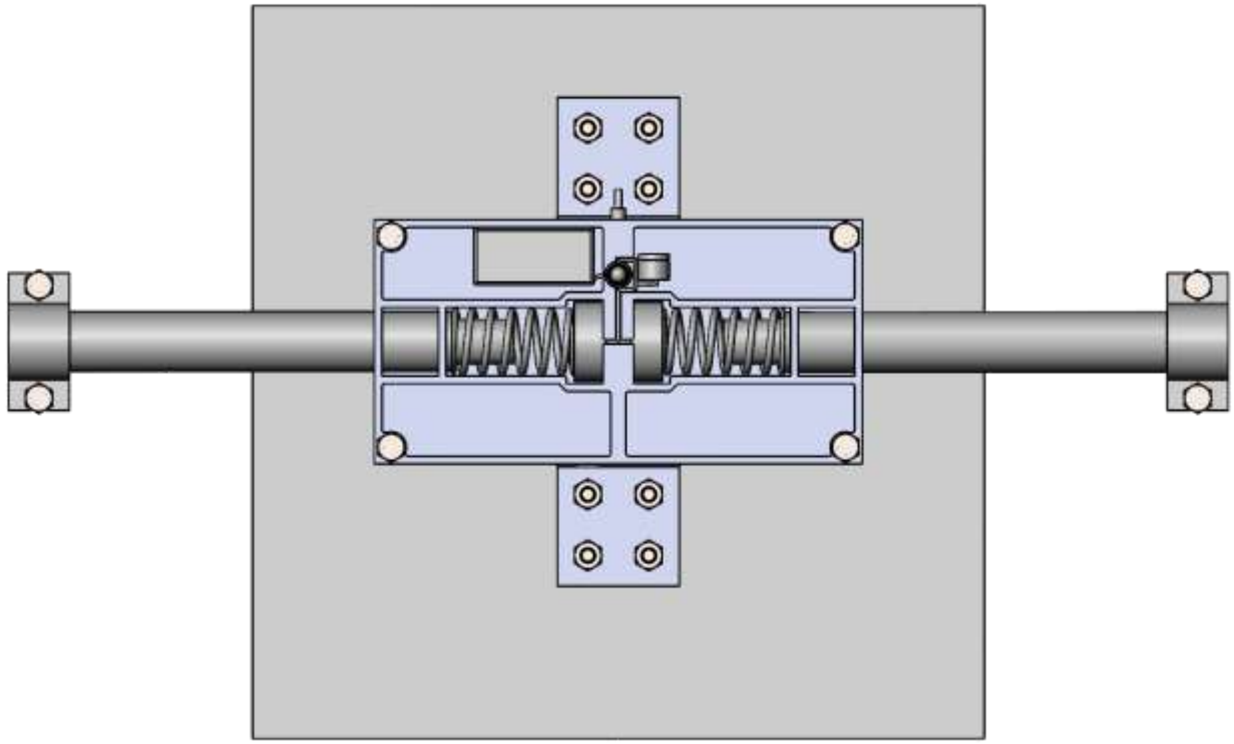

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Internals

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DWG. NO. CERINO_FULL INTERNALS

REV

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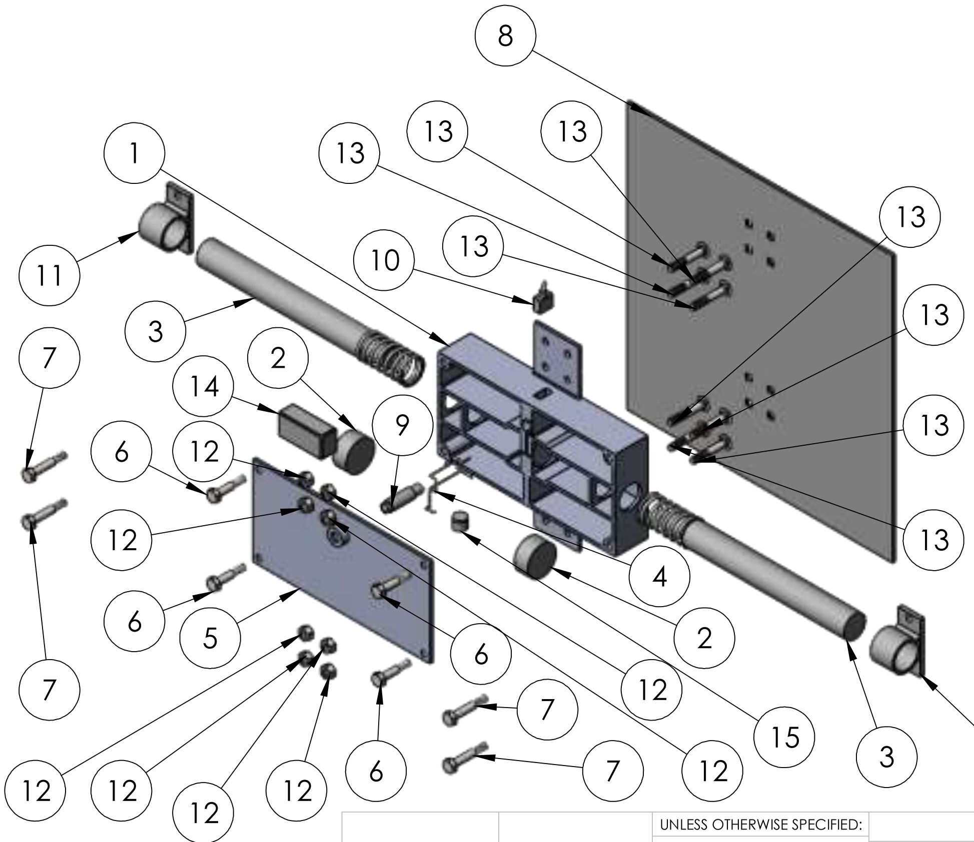
SHEET 1 OF 1



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1	Cerino_Base	1
2	Cerino_Solenoid	2
3	Cerino_Bar Assembly	2
4	Cerino_Wires	1
5	Cerino_Top	1
6	HHBOLT 0.5000-20x2.5x1-S	4
7	HHBOLT 0.5000-20x3x1-S	4
8	Cerino_Plate	1
9	Cerino_Photo Eye	1
10	Cerino_Toggle Switch	1
11	Cerino_Bracket	2
12	HHNUT 0.5000-20-B-S	8
13	RHSNBOLT 0.5-13x3x1.25-S	8
14	Cerino_Battery	1
15	Cerino_Alarm	1

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ANGULAR: MACH ± BEND ±
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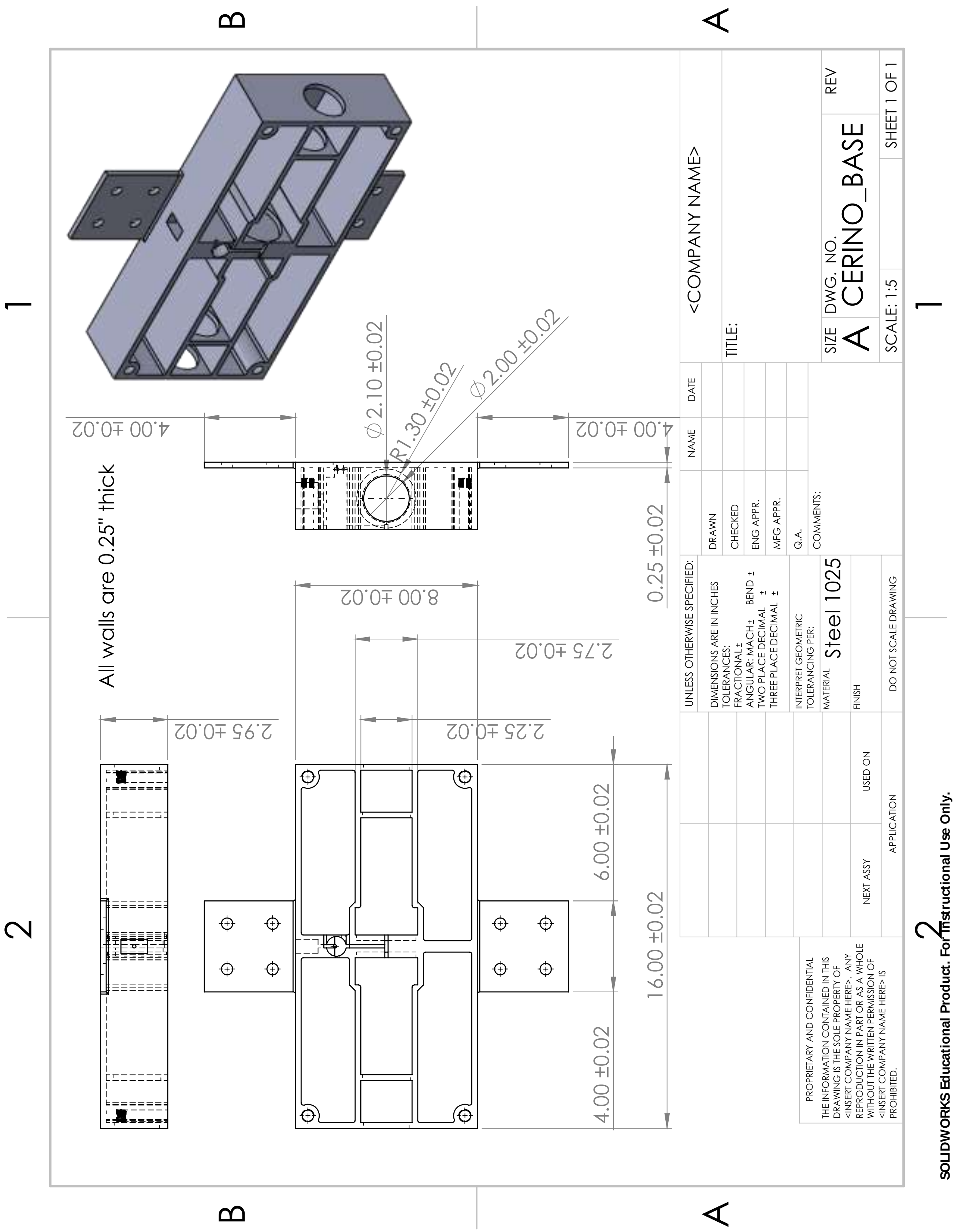
A
B
1
2
All walls are 0.25" thick
2.95 ±0.02
2.25 ±0.02
2.75 ±0.02
8.00 ±0.02
4.00 ±0.02
4.00 ±0.02
0.25 ±0.02
Ø2.10 ±0.02
R1.30 ±0.02
Ø2.00 ±0.02
6.00 ±0.02
16.00 ±0.02
4.00 ±0.02
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MATERIAL
Steel 1025
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DWG. NO.
CERINO_BASE
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SHEET 1 OF 1
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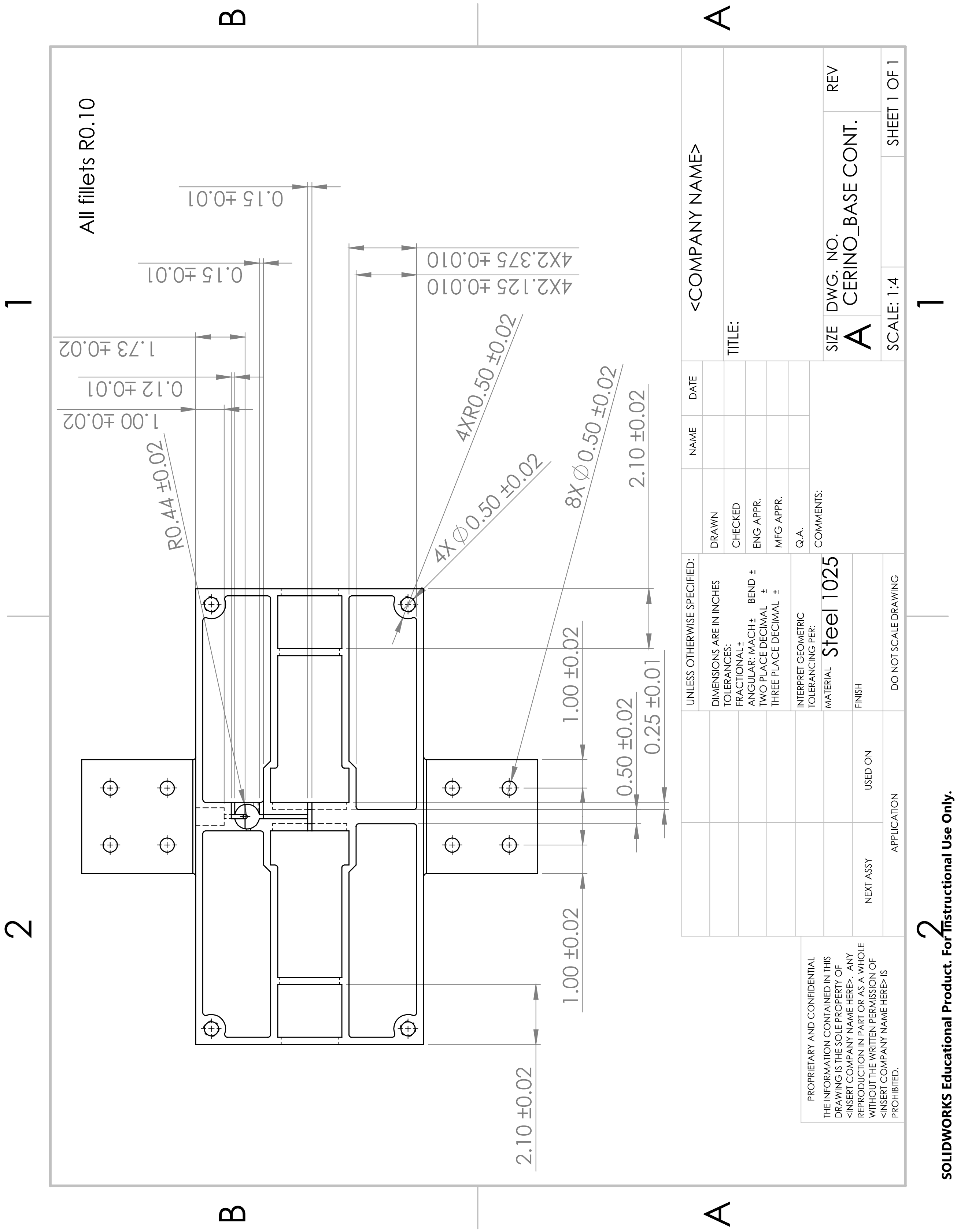
All fillets R0.10
0.15 ±0.01
0.15 ±0.01
4X2.375 ±0.010
4X2.125 ±0.010
1.73 ±0.02
0.12 ±0.01
1.00 ±0.02
4XR0.50 ±0.02
R0.44 ±0.02
4X ∅0.50 ±0.02
8X ∅0.50 ±0.02
2.10 ±0.02
1.00 ±0.02
0.50 ±0.02
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MFG APPR.
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ANGULAR: MACH ± BEND ±
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THREE PLACE DECIMAL ±
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MATERIAL Steel 1025
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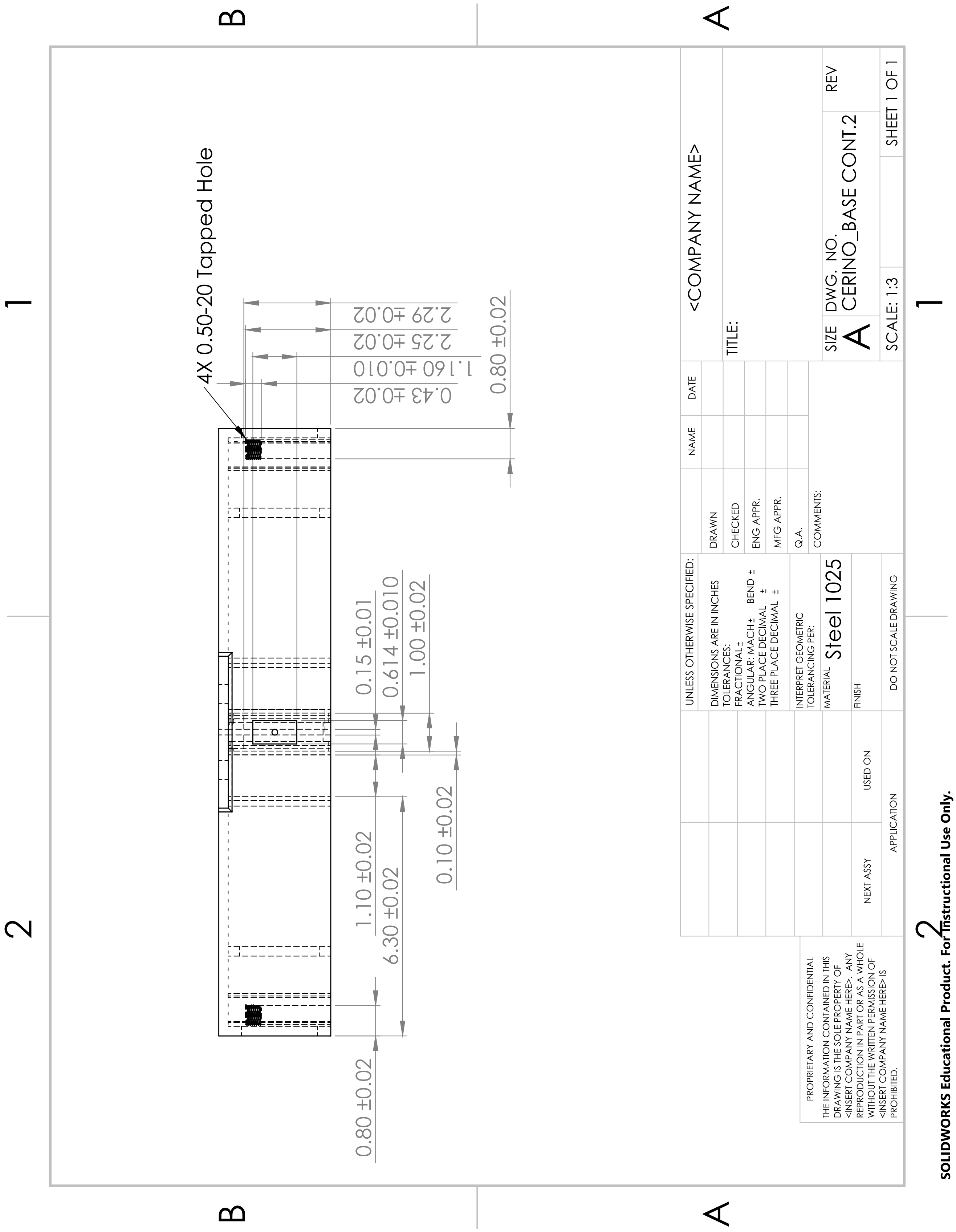

4X 0.50-20 Tapped Hole
2.29 ±0.02
2.25 ±0.02
1.160 ±0.010
0.43 ±0.02
0.80 ±0.02
0.15 ±0.01
0.614 ±0.010
1.00 ±0.02
1.10 ±0.02
6.30 ±0.02
0.10 ±0.02
0.80 ±0.02
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CERINO_BASE CONT.2
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NAME
DATE
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ENG APPR.
MFG APPR.
Q.A.
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ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
Steel 1025
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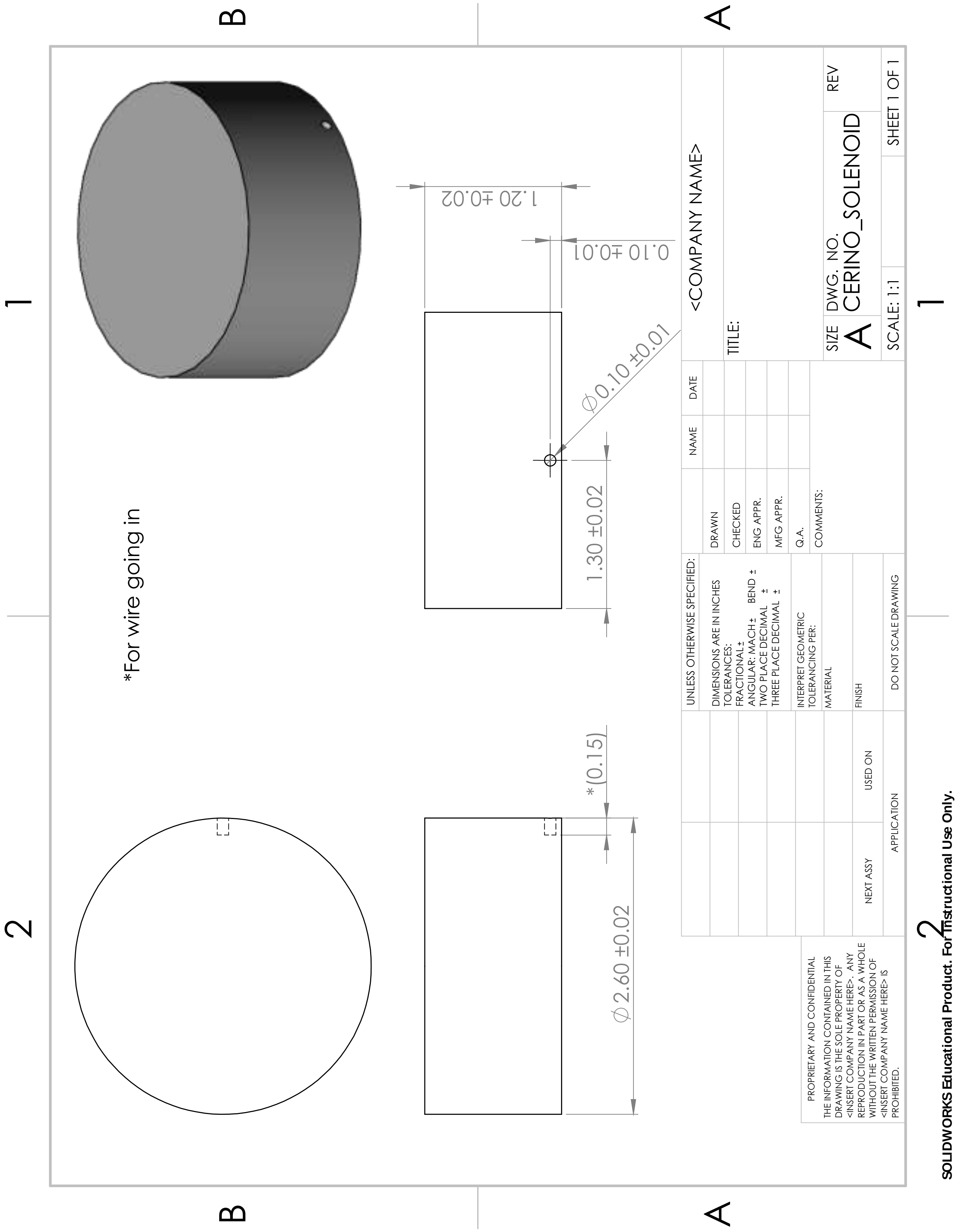
*For wire going in
∅2.60 ±0.02
*(0.15)
1.30 ±0.02
∅0.10 ±0.01
0.10 ±0.01
1.20 ±0.02
<COMPANY NAME>
TITLE:
SIZE A
DWG. NO.
CERINO_SOLENOID
REV
SCALE: 1:1
SHEET 1 OF 1
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
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TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
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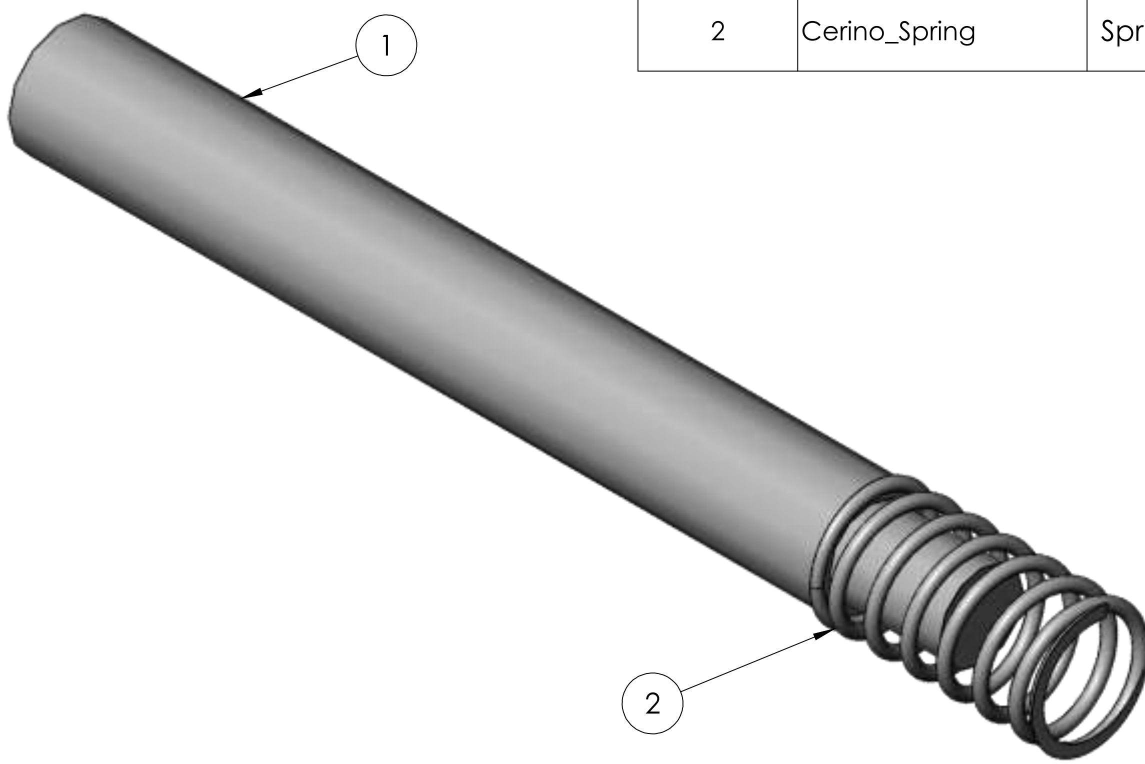
2	Cerino_Spring	Spring-Tempered Steel	1



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	MFG APPR.		
INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
MATERIAL	COMMENTS:		
FINISH			
DO NOT SCALE DRAWING			

NEXT ASSY	USED ON
APPLICATION	

<COMPANY NAME>

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SIZE A | DWG. NO. CERINO_BAR ASSEMBLY | REV

SCALE: 1:2 | SHEET 1 OF 1

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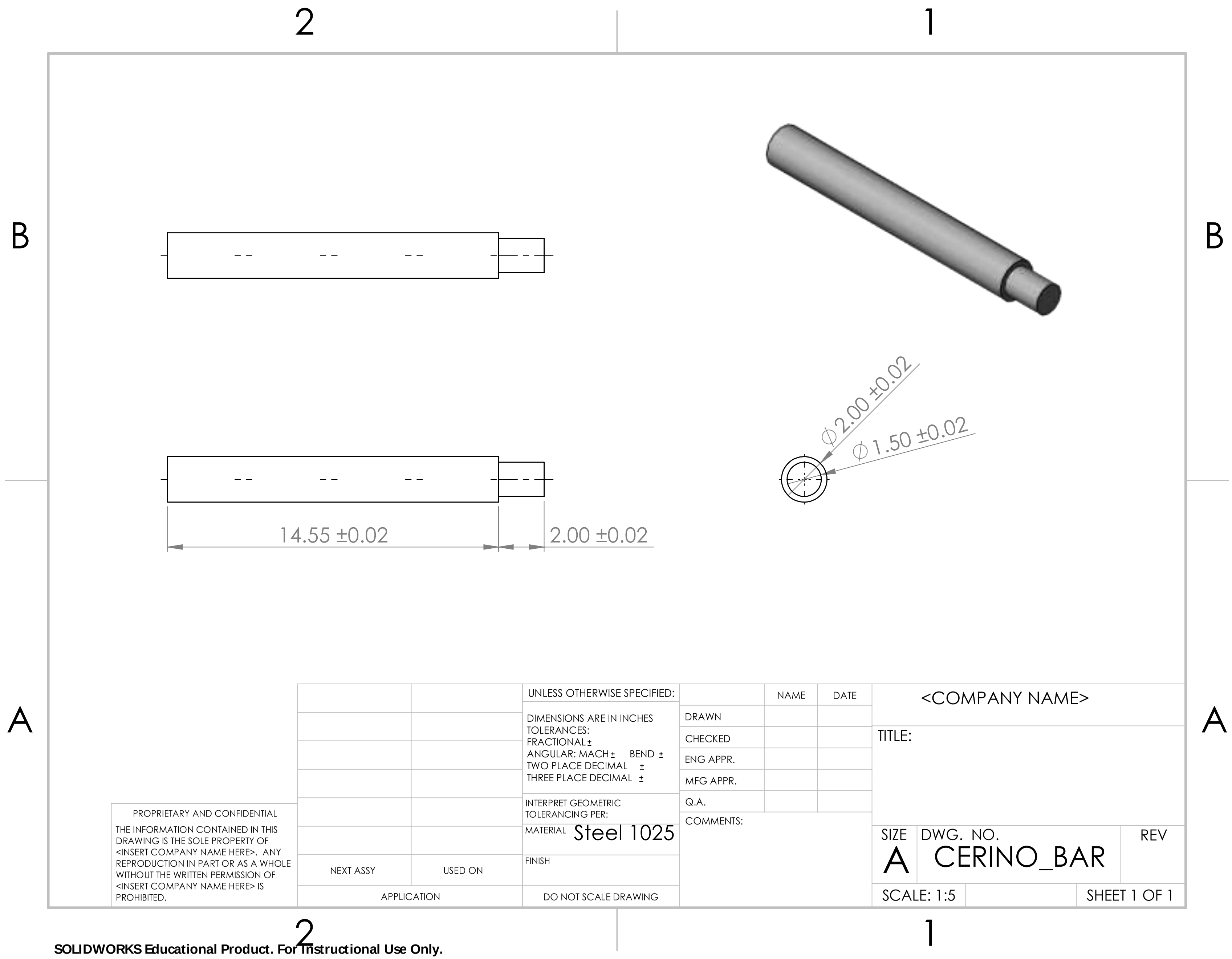
2
1
B
A
14.55 ±0.02
2.00 ±0.02
Ø2.00 ±0.02
Ø1.50 ±0.02
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL Steel 1025
FINISH
DO NOT SCALE DRAWING
NEXT ASSY
USED ON
APPLICATION
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
<COMPANY NAME>
TITLE:
SIZE A
DWG. NO. CERINO_BAR
REV
SCALE: 1:5
SHEET 1 OF 1
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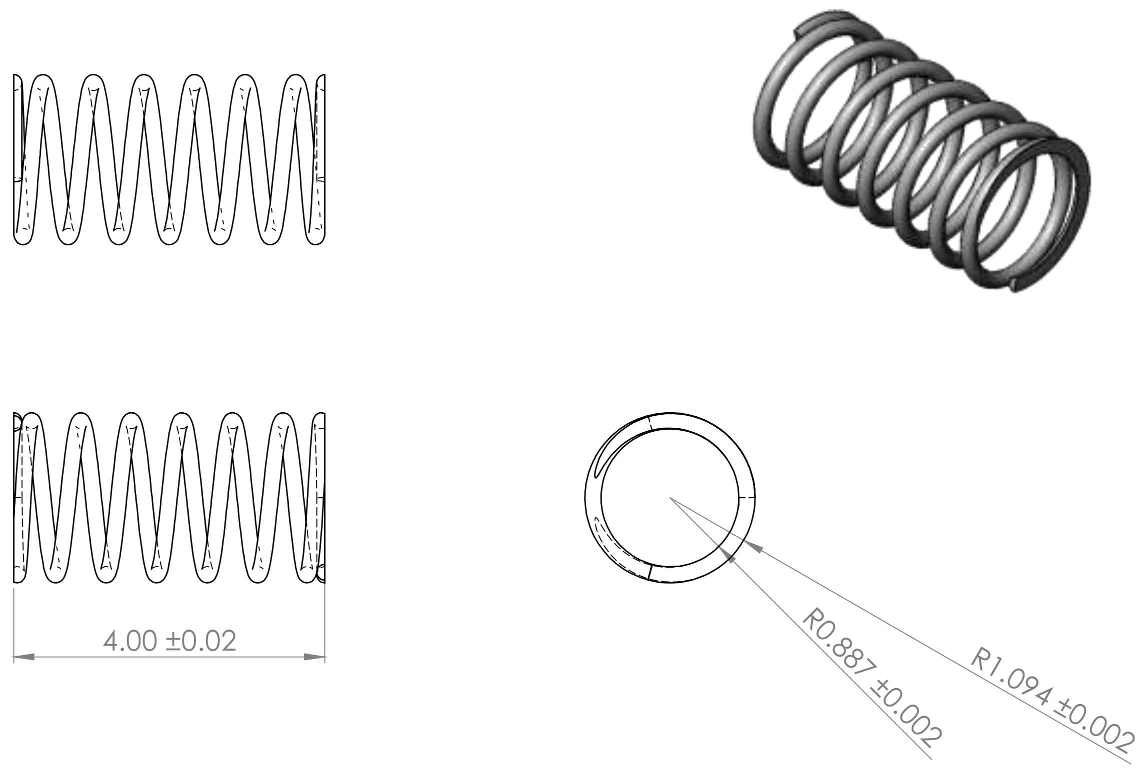
2 1

B B



A A

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NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
Spring-Tempered Steel

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN		
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

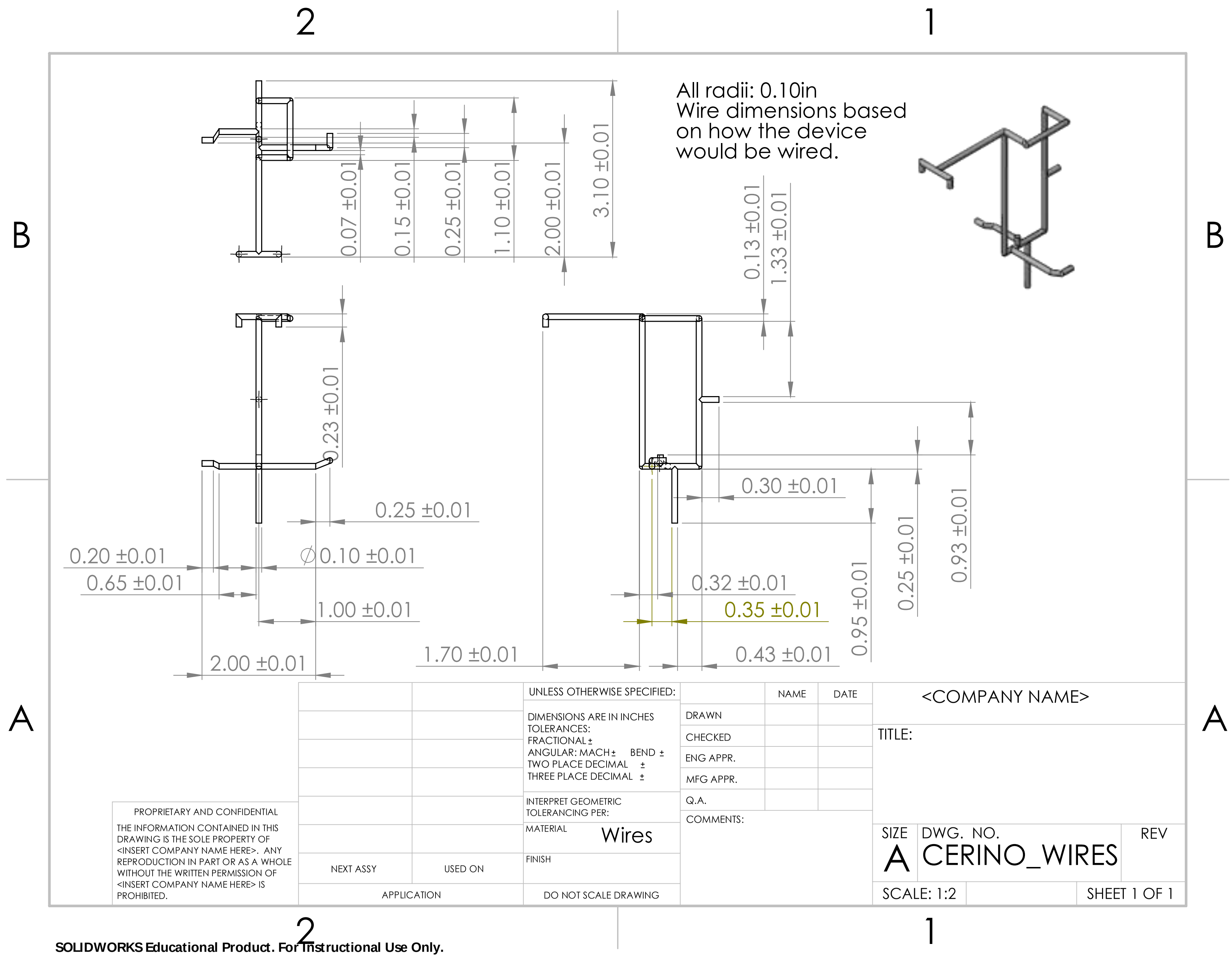
<COMPANY NAME>

TITLE:

SIZE A | DWG. NO. CERINO_SPRING | REV

SCALE: 1:2 | SHEET 1 OF 1

2 1



All radii: 0.10in
Wire dimensions based on how the device would be wired.
0.07 ±0.01
0.15 ±0.01
0.25 ±0.01
1.10 ±0.01
2.00 ±0.01
3.10 ±0.01
0.13 ±0.01
1.33 ±0.01
0.23 ±0.01
0.25 ±0.01
0.20 ±0.01
0.65 ±0.01
⌀0.10 ±0.01
1.00 ±0.01
2.00 ±0.01
1.70 ±0.01
0.30 ±0.01
0.32 ±0.01
0.35 ±0.01
0.43 ±0.01
0.95 ±0.01
0.25 ±0.01
0.93 ±0.01
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
Wires
FINISH
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
<COMPANY NAME>
TITLE:
SIZE
A
DWG. NO.
CERINO_WIRES
REV
SCALE: 1:2
SHEET 1 OF 1
NEXT ASSY
USED ON
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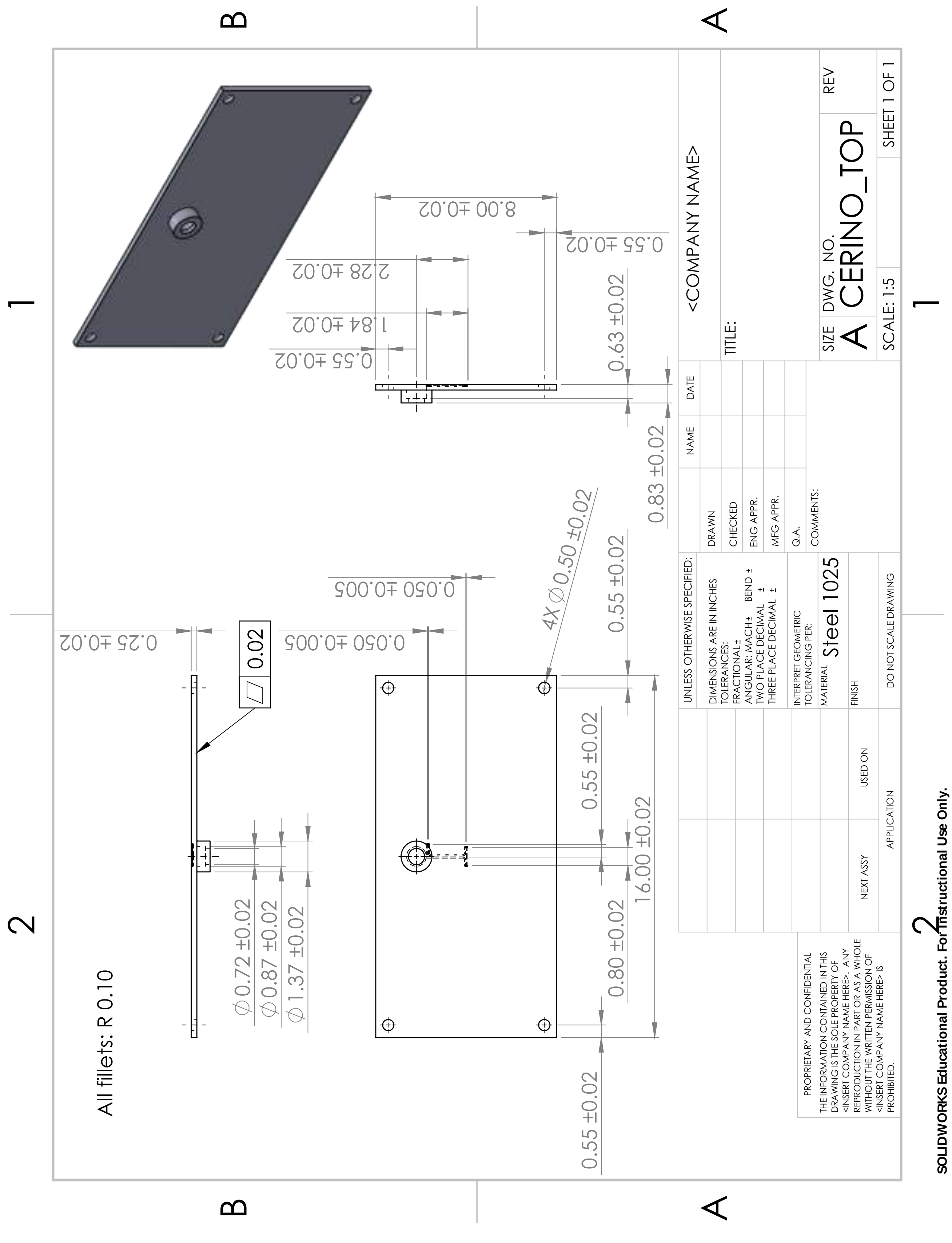
All fillets: R 0.10
0.25 ±0.02
0.02
0.050 ±0.005
0.050 ±0.005
4X ⌀0.50 ±0.02
⌀0.72 ±0.02
⌀0.87 ±0.02
⌀1.37 ±0.02
0.55 ±0.02
0.80 ±0.02
0.55 ±0.02
16.00 ±0.02
0.55 ±0.02
0.83 ±0.02
0.63 ±0.02
0.55 ±0.02
1.84 ±0.02
2.28 ±0.02
0.55 ±0.02
8.00 ±0.02
<COMPANY NAME>
TITLE:
SIZE A
DWG. NO. CERINO_TOP
REV
SCALE: 1:5
SHEET 1 OF 1
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL Steel 1025
FINISH
DO NOT SCALE DRAWING
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
NAME
DATE
NEXT ASSY
USED ON
APPLICATION
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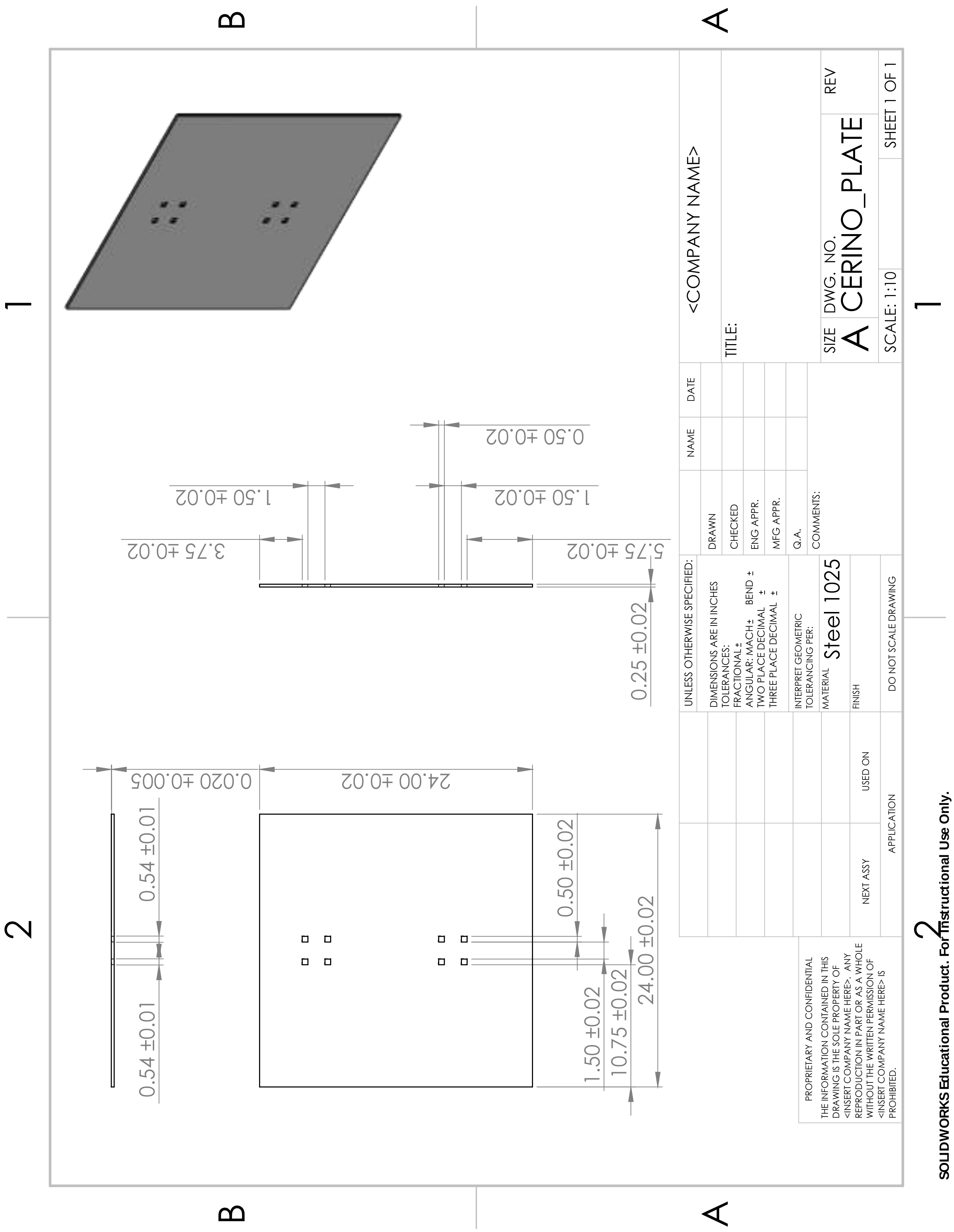

<COMPANY NAME>
TITLE:
SIZE
A
DWG. NO.
CERINO_PLATE
REV
SCALE: 1:10
SHEET 1 OF 1
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
Steel 1025
FINISH
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
NEXT ASSY
USED ON
APPLICATION
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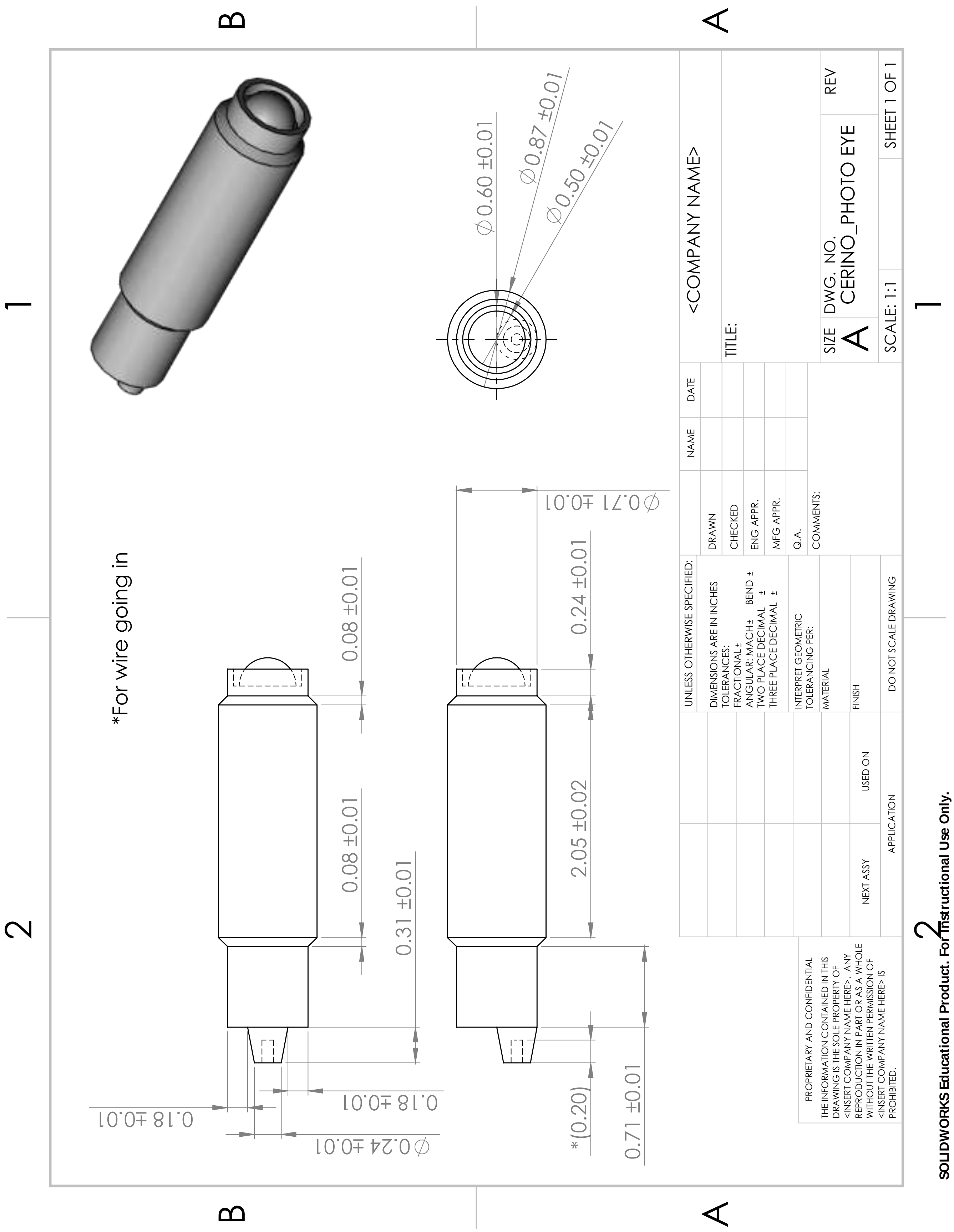
0.020 ±0.005
24.00 ±0.02
0.54 ±0.01
0.54 ±0.01
0.50 ±0.02
1.50 ±0.02
10.75 ±0.02
24.00 ±0.02
0.25 ±0.02
5.75 ±0.02
3.75 ±0.02
1.50 ±0.02
1.50 ±0.02
0.50 ±0.02
A
B
1
2
SOLIDWORKS Educational Product. For Instructional Use Only.


*For wire going in
0.08 ±0.01
0.08 ±0.01
0.31 ±0.01
0.18 ±0.01
0.18 ±0.01
Ø0.24 ±0.01
*(0.20)
0.71 ±0.01
2.05 ±0.02
0.24 ±0.01
Ø0.71 ±0.01
Ø0.60 ±0.01
Ø0.87 ±0.01
Ø0.50 ±0.01
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
<COMPANY NAME>
TITLE:
SIZE
A
DWG. NO.
CERINO_PHOTO EYE
REV
SCALE: 1:1
SHEET 1 OF 1
NEXT ASSY
USED ON
APPLICATION
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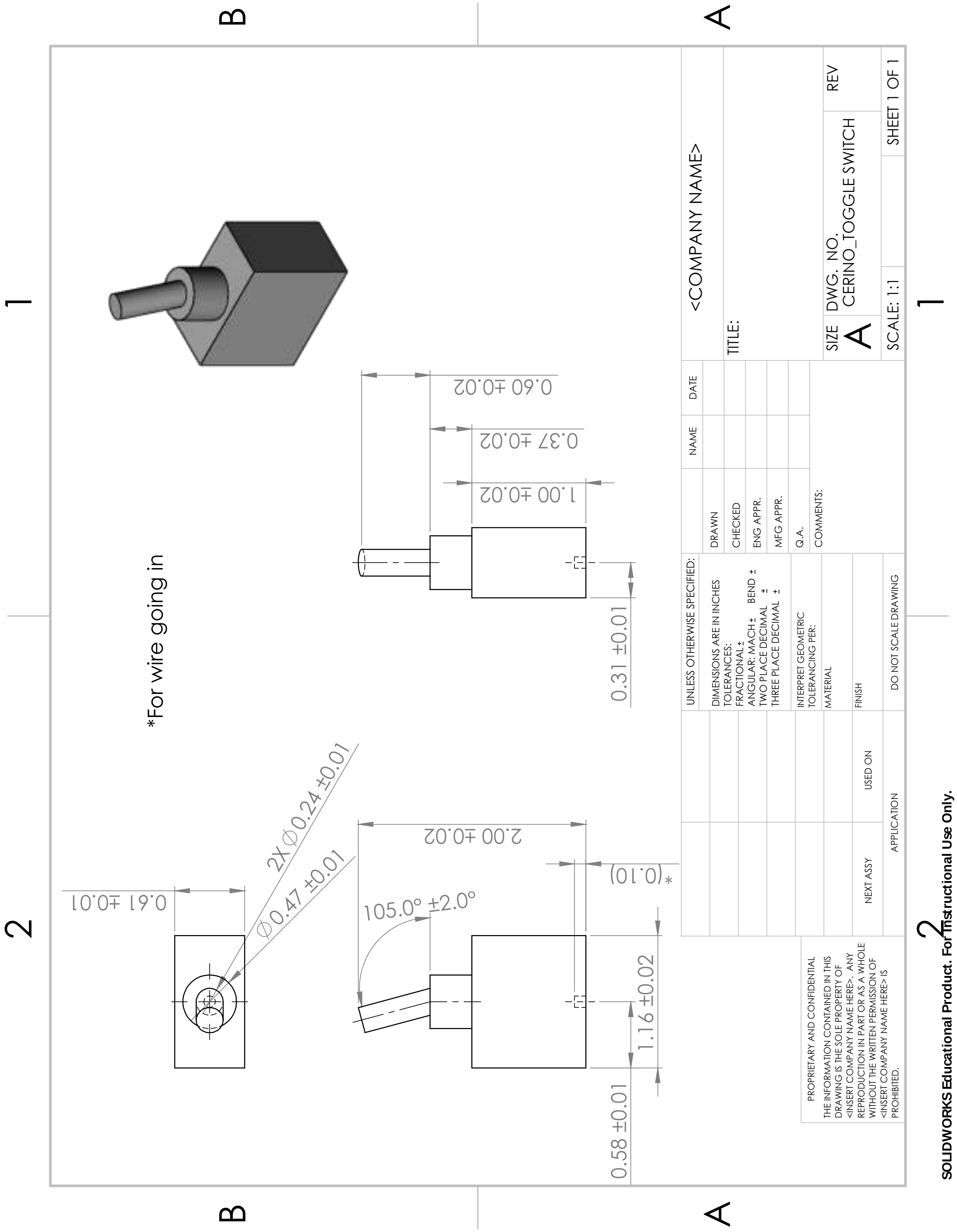

*For wire going in
0.61 ±0.01
2X ⌀0.24 ±0.01
⌀0.47 ±0.01
2.00 ±0.02
105.0° ±2.0°
(0.10)*
1.16 ±0.02
0.58 ±0.01
0.31 ±0.01
1.00 ±0.02
0.37 ±0.02
0.60 ±0.02
<COMPANY NAME>
TITLE:
SIZE A
DWG. NO. CERINO_TOGGLE SWITCH
REV
SCALE: 1:1
SHEET 1 OF 1
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING
NEXT ASSY
USED ON
APPLICATION
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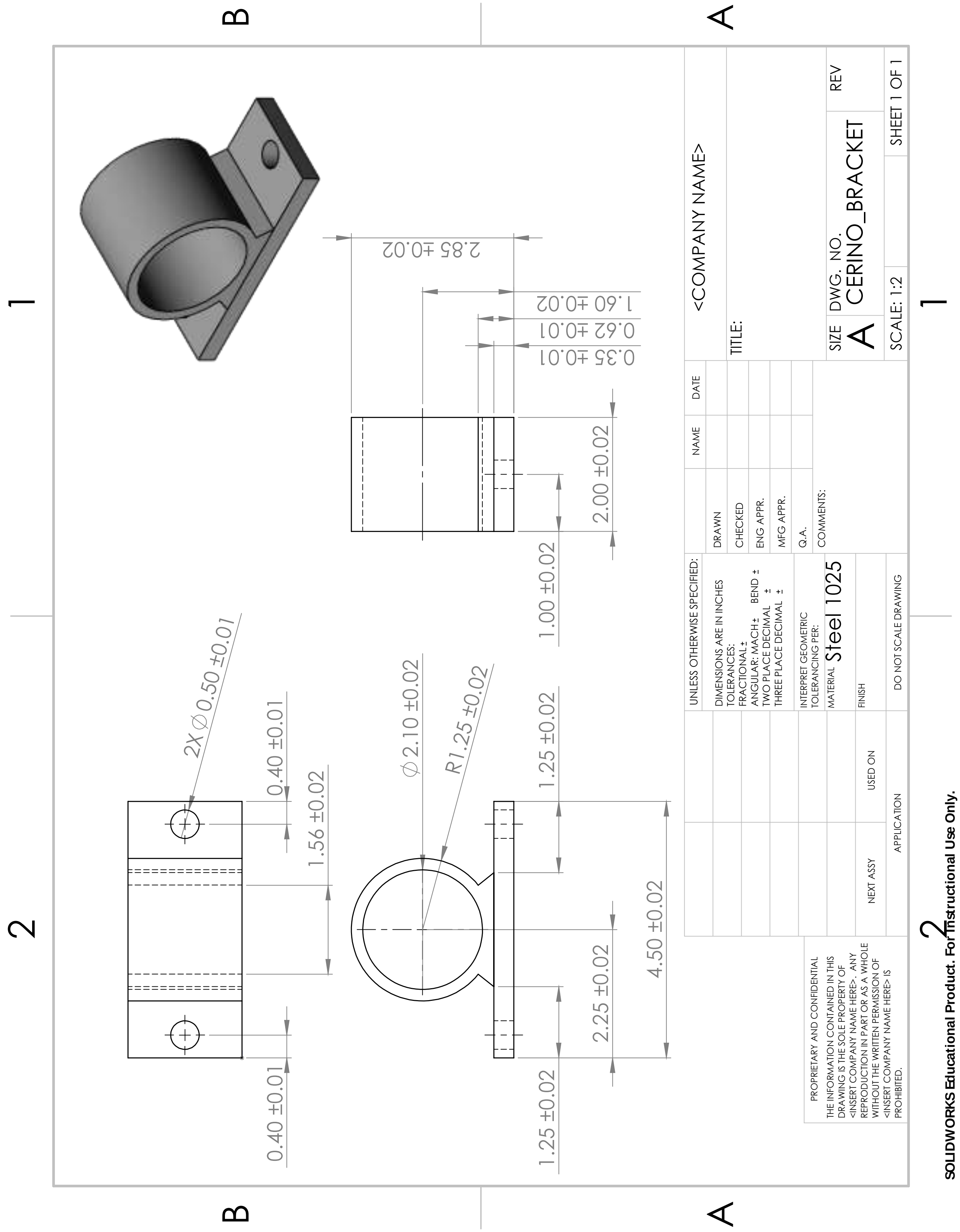

2X ∅0.50 ±0.01
0.40 ±0.01
1.56 ±0.02
0.40 ±0.01
∅2.10 ±0.02
R1.25 ±0.02
1.25 ±0.02
1.00 ±0.02
2.00 ±0.02
2.25 ±0.02
4.50 ±0.02
1.25 ±0.02
0.35 ±0.01
0.62 ±0.01
1.60 ±0.02
2.85 ±0.02
<COMPANY NAME>
TITLE:
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL Steel 1025
FINISH
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
SIZE A
DWG. NO. CERINO_BRACKET
REV
SCALE: 1:2
SHEET 1 OF 1
NEXT ASSY
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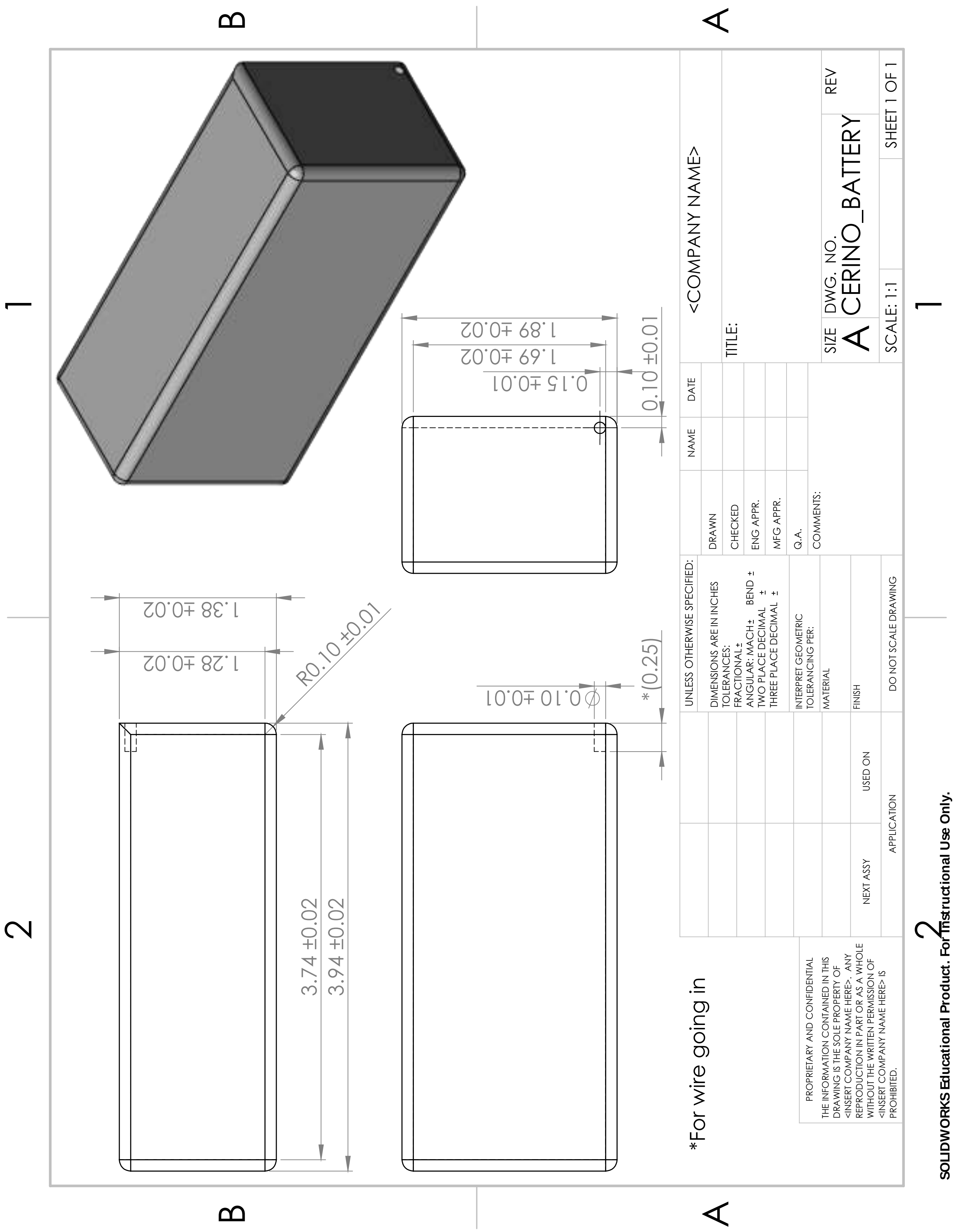

1.28 ±0.02
1.38 ±0.02
R0.10 ±0.01
3.74 ±0.02
3.94 ±0.02
∅0.10 ±0.01
*(0.25)
0.15 ±0.01
1.69 ±0.02
1.89 ±0.02
0.10 ±0.01
*For wire going in
<COMPANY NAME>
TITLE:
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING
NEXT ASSY
USED ON
APPLICATION
SIZE
A
DWG. NO.
CERINO_BATTERY
REV
SCALE: 1:1
SHEET 1 OF 1
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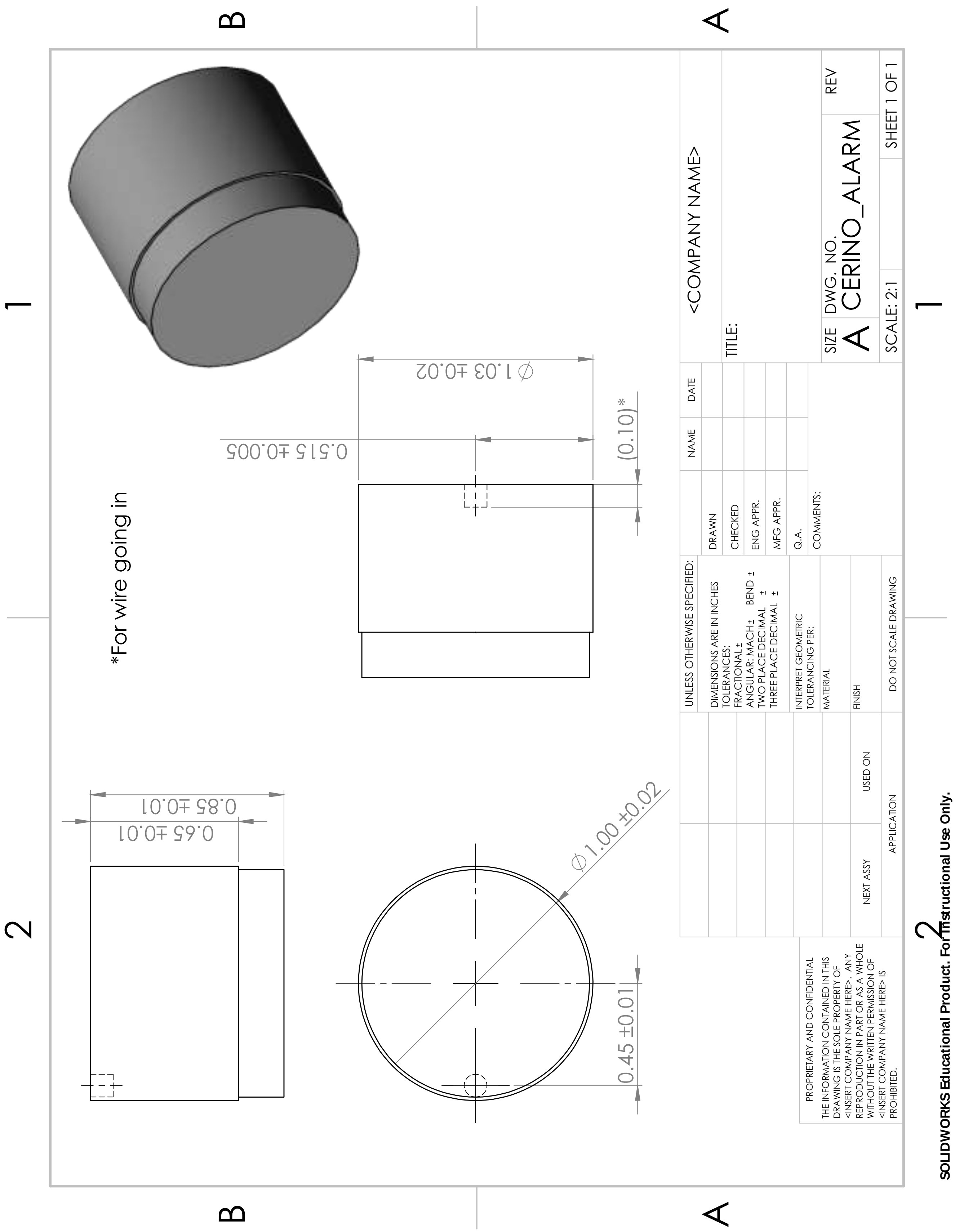

*For wire going in
0.65 ±0.01
0.85 ±0.01
Ø1.00 ±0.02
0.45 ±0.01
Ø 1.03 ±0.02
0.515 ±0.005
(0.10)*
<COMPANY NAME>
TITLE:
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
SIZE
A
DWG. NO.
CERINO_ALARM
REV
SCALE: 2:1
SHEET 1 OF 1
NEXT ASSY
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Toggle 15A 250V 20A 125V SPST 2Pin ON/Off Switch Metal Bat Waterproof Boot Cap Cover-5 Pack, 2 Years Warranty.

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Appendix

Alex Cerino

Mr. Lukach

Mechanical Projects

1/14/2021

Door Barricade: Progress Report #1

The name of my project is “door barricade.” I have been using SolidWorks for drawing my project. I have accomplished a lot already for my project.

- I have already drawn sketches of my design and some of the parts.
- I have drawn most of the 3D versions of the parts in SolidWorks.
- I have assembled all of my parts in SolidWorks.
- I have made a subassembly out of two parts for my design.

Alex Cerino

Mr. Lukach

Mechanical Projects

2/21/2021

Door Barricade: Progress Report #2

- 95% of my 3D drawings are done for my parts.
- 10% of the written report is done.
- 90% of my materials selection is done.
- 85% of my calculations are done for the project.
- 98% of my assembly drawing is done.
- By the next progress report, I hope to finalize all of my material selections.
- I hope to also have at least 50% of my detail drawings done.
- I plan on having the whole intro, references and completed drawings all in my written report.

Alex Cerino

Mr. Lukach

Mechanical Projects

3/18/2021

Door Barricade: Progress Report #3

- 95% completion of written report introduction, body and conclusion.
- 100% completion of calculations including statics and springs.
- 100% completion of material selection.
- 100% completion of assembly drawing.
- 100% completion of detail drawings.
- Modified timeline to match completed parts.