SWIVEL BASE BENCH VISE

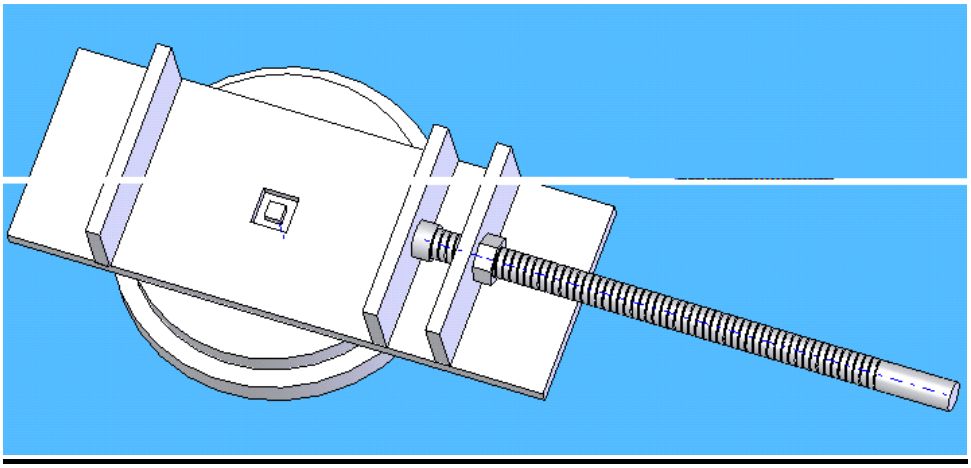


Fig – **cad model of swivel bench vise**

It is necessary that the work should be properly and securely held on for machining operations, a VISE is a effective work holding device.
Vises: Vises are the most common appliances for holding work on table due to its quick loading and unloading arrangement. There are mainly three types of vises commonly used,

- Plain vise
- Swivel vise
- Tool makers universal vise

Plain Vise: the plain vise bolted directly on the table on the T-slots. The vise may be fastened to the table with the jaws set at right angles to the table T-slots. Work is camped between the fixed and movable jaws and for holding work pieces of irregular shape special jaws are used.

Swivel vise: the swivel vise is used to mill angular surface in relation to a straight surface without removing the work from the vise. In construction it may be considered a plain vise, which is mounted on a circular base graduated in degrees. The base is clamped on the table by means of T-slots.

SWIVEL VISE:

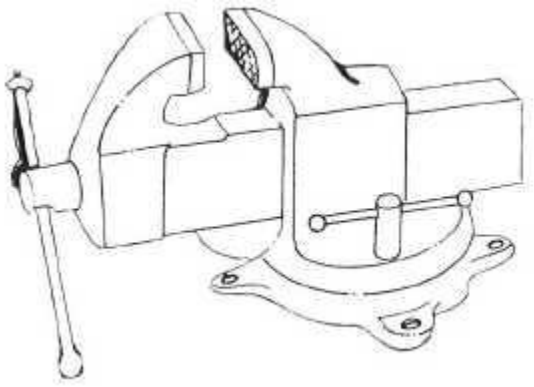


Fig- (1) shows a machinist bench vise with swivel base.

The Swivel Vise can be rotated and contains a scale graduated in degrees at its base to facilitate machining at any angle on a horizontal plane. The vise can secularly fasten castings, forgings and roughed surface work pieces. The jaws can be positioned between the jaws to accommodate work pieces of any shapes and sizes. By loosening the bolt, which is used to clamp the vise to its graduated base, the vise may be moved to hold the work piece at any angle in a horizontal plane. To set the swivel base at the right angle And properly aligned with the spindle a test indicator could be clamped to the machine arbor and check made to determine the setting by transverse or longitudinal feed, depending upon position of vise jaw.

Bench Vise is a work holding device consisting of a pair of movable and fixed jaws. The jaws clamp on to the work-piece using the lateral motion provided to them using a spindle. The spindle with V-THREADS is rotated using a handle (lever). The jaws move closer as the lever is rotated in the clockwise direction and move away when turned in the anticlockwise direction.

The work piece is supported on a base plate with a bore of dia > dia of spindle (space for clearance) the inside, within this bore internal threading is provided for proper engagement of spindle and base plate threads for producing the required motion.

A clamping arrangement to be provided for proper rigid fixture of Vice on tabletop.

The material to be used for the VISE is:		MS.
The base plate dimensions are	:	300mm*110mm*9mm.
The spindle dia	:	16.1mm
The lever dia	:	9mm

The required machining operations to be performed are:

- Facing, chamfering, turning to provide clamping surface to jaws.
- External Square threading on the spindle.
- Drilling, Boring and internal threading on base plate.
- Drilling on the spindle and threading on lever to fit into the spindle for application of manual load.
- C-clamp for clamping the Vice on the table.

Vise Installation

This vise hardware is adaptable for installation in a variety of positions, and on different styles of bench tops. The key to successful installation is careful planning and preparation. Installed properly, your vise will give a lifetime of useful, daily service.

First: Choose vise position and jaw size

This vise can be mounted in a variety of positions, depending on your working style and bench type. Assuming you're right handed, typical mounting positions would be either towards the left of the front edge of your bench, or the right end of your bench. Carvers will probably find the end position most useful, as will those who will most often clamp wide, flat work like doors and wide panels. If the vise will mostly be used to hold small parts, or narrow boards on edge for jointing, the bench's front edge will likely be the best option. Just be sure that the location you choose doesn't interfere with bench legs or aprons.

Jaw size is determined by a combination of bench top thickness and width, the mounting style you choose, and your preference.

Jaw Material: Traditional bench (and vise jaw) materials include European beech and hard maple; where these species are for sale they're usually available in 8/4 thickness. Birch and white oak are also good, tough woods to consider. If you've made your own top, you'll have your own preference.

Jaw Thickness: We recommend that jaws be at least 1-5/8 inches thick, which allows both secure fastening to the hardware, and room to accommodate dog holes (either square or 3/4 inch round) in the front jaw.

Jaw Length: For the small vise, recommended jaw length is 12 to 15 inches. The large vise can accommodate jaws up to 18 inches long; anything longer subjects the vise to excessive racking, which can shorten its life.

Jaw Depth: the starting point for determining jaw depth is throat depth. Throat depth is the vertical distance from the top edge of the jaw (flush with the bench top) down to the top of the ma4n4RcRDw4@fD4gU@dE4rGDs4FGR T@eSD V@sER$4 TF 4444hes is the optimal throat depth range. Any less compromises the size of work you'll be able to handle; much more than 4 inches will mean you're clamping work too far above the main screw, which makes it possible to stress your mounting setup beyond its limits.

For most bench tops, you'll need to mount a spacer between the vise carriage and the bench top in order to get adequate throat depth.

Spacers be built up from thicknesses of MDF, particle board, or Masonite, all of which are relatively crush-resistant

For both large and small vises, throat depth is equal to bench thickness PLUS 1/2444LUS spacer thickness. Spacer thic444sS4iS4aDBuSTeD4tG4gET T@e4ThRFaT4dEPt@4nEDdED.

444e you have spacer thickness and throat depth set, you can determin444aw depth as follows:

Small vise:444fADuE4bAV DDpT@ EPuADs4BeFBh4T`ABkFDsS4PDTS4Rpac444thickness PLUS 1-3/4 inc444444**444444v(Re**:4m(Ji,Pm Ja64d$Pt(4e0Pa,R "@n"@ 4Hi"Bn$Rs PLR 2Pa"@r Ph(Bk.@s24P

PS -04 Hn"@e2

@ .Jt$6o.6r$@r Ja66c.Jf(Bu2@t(Bn2 B 8Ju Ra.P 4@e @d&@ .B 8Bu26b$Bc(6t.6s$Rv$6a26y.Pr Re R *@w,6y.P (@v$6t6B .Pt(Bn2@d @ 2Bi2P (Ri$@ $@g$6b.@r$R 6Hd$6a26y.Pr Ja66d$Pt(6r4Jn(Bg Ph$6f4Hl @e.Bt(6o&6y.Pr Be.Bh Po06 .R 2@m0Hy @t4@c(6a Rt2@p Po Ph$6b.Pt.H $@g$6o&6y.Pr Po0(B .Rd$R 4J ,@k$6t(@ &Ro.P $@g$6o&6y.Pr Be.Bh Po06d$@p @n.Pg(6t.6s$Rv$6a26a Re R *@w.6O4He2Ri2@, Ri,Pl86m Je Br.Jt @n$6r$@r Ja6R 4He Ra,@ 2@z$Bd @t4@c(6t(@ 2@a26j R 4B 4He @x(Rt(Bg Be.Bh Po06e$Be.6

@c.Bd:6M Be Ja6R Jd Bo2@ &Br Ho4Bt(Jg

7O.Be Po4v$7d$Pe2@i.@d Ph$7s(Re Jf Po4R *@w2&@u$7u07t(@ "@a.Js 7i&7n$@d$@) @n$7c4P 4He,7t.7s(Re.7A$@ 0 167i.Bh Po Ph$7d$Pt(7 2J 4@a47t(@ ,Ju.Pe$7j Rs Pr.Pr4@e Rl(Bh4@y @b.Re Ph$7b$Jc(7t.P. 7M Rk Ba6R &Br Bo2@n& B Ro(@ (@v(Bg Rc2@b$7m Rk27o.7y.Pr @n2Pa,@e$7v(Re,7m Be @l,7l Xo4P ,@r*R .J 4@e Re R &@c$7o&7t(@ 2@a27j R. @a2J 7v$Rt(Ba,7c$Bt$Rl(Be Jn Ph$7r$@r Ba6 Bl$7t @ BcBs$@ 4@m0@a4@ @o&B 4@e @777 that represents the throat depth you determined in the last step. With a sharp punch, or awl, carefully mark centers for the guide rod holes and main screw holes. Also mark centers for any additional holes you'll need to bore for mounting the rear jaw to the bench.

Bore jaws:

1) Bore and counter bore for any hardware you'll use to mount the rear jaw to the bench. Be sure to allow for washers if you'll be using lag screws to mount the rear jaw.

2) Clamp the jaws together as they'll be once the jaw is installed. Be especially careful that the ends and the top edges are aligned. 3) On a drill press, bore the three holes for the guide rods and main screw, starting at the rear face of the rear jaw and with a scrap block under the front jaw. The indicated hole diameters allow ample clearance; if you wish to use other diameters measure carefully to be sure you leave clearance.

Typical parts are - Guide Rods, Main Screw

Regular Vise dimensions:		3/4" 1-1/8"
Large Vise	:	1" 1-1/4"

Third: Mount rear jaw

Attach the rear jaw to the bench top with large screws (#12, #14) or 1/4" lag screws, gluing if desired and appropriate. Mount the rear jaw so that its top edge protrudes 1/16" above the bench top. Turn the bench top upside down.

Fourth: Mount carriage, spacer and front jaw

1) Place any spacers and the vise carriage on the bench underside, with the lead screw boss towards the rear jaw.

2) Slide the front jaw onto the guide rods, and then thread the main screw and guide rods into the vise carriage.
3) With the jaws slightly open, move the lead screw boss snug against the back jaw, center the guide rods and main screw in the rear jaw holes, and clamp the vise carriage in place (if no bench holdfast or deep-throated clamps are available, you may have to improvise a clamping caul to do this).
4) Close the vise so front and rear jaws are just in contact, and then tap the front jaw so that its ends and top edge are flush with those of the back jaw.
5) Close the vise firmly and check that the vise carriage is in contact with the rear jaw.
6) Using a sharp punch, awl, or drill bit, mark hole centers for mounting the vise carriage to the bench underside. For 1/4" carriage bolts, bore 7/32" diameter pilot holes.
   Using lag screws and washers, fasten the vise carriage to the bench.
7) Usi888a sharp punch, awl, or drill bit,888rC8hGDe8BeFTeRR FFr8RcRDwAFg8T`E8fRFfT8 88 88jaw888 the faceplate.
   When setting hole depth, take into account faceplate thickness (9/32" for regular vise; 7/16" for large vise).

Fifth: Final fitting and troubleshooting

1) Open vise at least half way. Does it operate smoothly? If not, check for paint or other foreign matter in the threads or in the guide rod holes.
2) Close the vise so the jaws nearly touch again, and check whether the jaws are parallel. If they aren't, loosen the vise carriage mounting screws, close the vise firmly, retighten the screws, and check for parallel again.
3) Remove the vise front, then ta888the front jaw off of the front as888bDP 8DeAVe8ReAR B@w8@fD8vARe8BaRRaAFe8@f8PlAB888 Carefully plane or sand a 2-degree taper on the clamping face of the888ont jaw. This ensures that object888lADpED AF T@e8VaSD ARe8@eDD F@rEDq8@lGFg8ThE8888 ed888888888888e28m X "@ ,@d$8o.8a Pl Je28b88t$@p.Ra2@l88t Bk(Jg @ 4Hi.8s(Hm @l.Jg Ph$8o4Pe28b.Pt.H $@g$8o&8t(@ &Ro.P *@w.8

48 8@d @ (@n$@e Jf Po4R "@o(Be,8a.@ .Bc$8a,@ (R 2@t(Rf Bt.Ry,8p,@n$8t(@ *@w @d&@s Bl4Rh Ri4@ 4He Be.Bh Po0

@i.Pe.@n"@:

Bc Ri.Ba,Hy 11s X, Pw(Be Pe Rl811i.11t(@ 2Pr(Bg @n$11f Hl(11c(@c*11l B 2Br$Rs Br Bo,Ps Ho,@i.B 6@s$11c Rr(@g$11t.11b$Bc(11t.P 4J "@ 2Pr$11t(@y @r$J’411w.Rk(Bg Ho.Re.11U2@n&11m$B .R ,@s.Ji4@ 4J "Pi,@ 8Bu211s0@c$R 6@l,11m(Bi,Hz$11t(@ 2@a2Jn @ ,Jv$@e.P 4@a411s0@e$R 4@i211l.Bs$Ji.B; Rt(@l Ht’R "@s411t.11b$11s4Re Ph(Jg211a2@ 4@g(P $Bw.11t(@r$

Hu"Ri"@t$13t(Re @s Ri4@ ,Hg(P .Hl Br Ra813o"Ba2@o.@l,P;
Ra813g4Hd$13r.@s Bc"@s(Bn Hl8

Ro,@ "Jm,Bn,X 4Re$16v(Re2

) Pi0@ @s$ @e Pi0@ 6Hs$18i218a Rp$Bi @ 0Pr0Bs$18v(Re @e2@g.@d Po Ho,@ 2Ju.@ 2Po"B. 18I418h R (@n&@d Ba6R, Rh(Bh @l,Jw Ph$18u2@r Po Po2Ht(Bn Ph$18w.Rk @n$18t(@n Ho"B (P (B 0Ha"@. Ro,@ 0Hp$18v(Re218h Re @ 2@c4@o.18o&18c(@i.18i.Rt$@d Jf Ba6R &Br Ho,@i.B 4@e Pi0@. Pi0@ 6Hs$s are usually bench mounted. They are used to hold pipe from 1/8 inch to 8 inches in diameter while

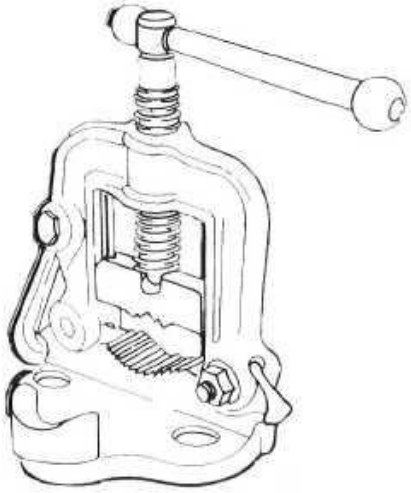


fig (2)- Pipe vise

2) **Bench and Pipe Vise:** The bench and pipe vise is a dual-purpose vise. It has rough jaws and a swivel base similar to the machinist's bench vise. However, it also has built-in pipe jaws. Bench and pipe vises are usually bolted to a workbench or table. They are used for holding or clamping heavy objects, holding pipe for cutting and threading, and for forming and shaping metal

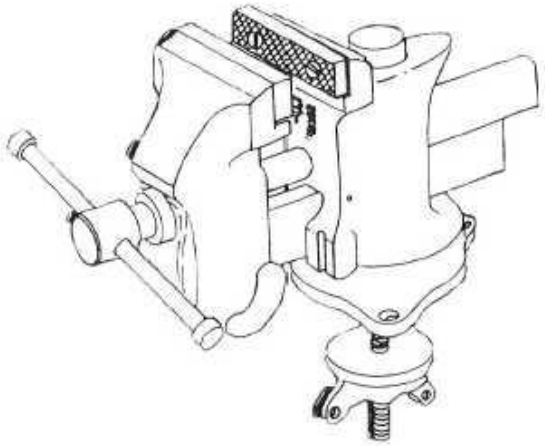
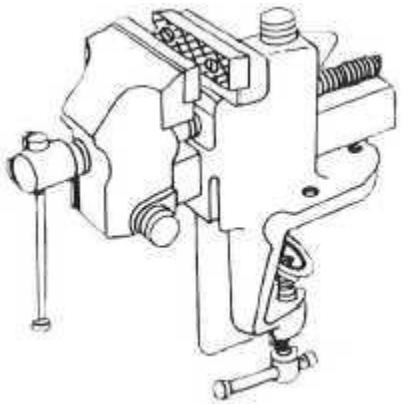


fig (3) –bench and pipe vise

3) **Clamp base Bench Vise:** The clamp base bench vise is a lightweight, portable machinist's vise. It is attached to a table or bench with the mounting clamp. It has rough jaws for holding material and may have a swivel base. Clamp base bench vises are used to hold light materials or in areas where a heavier vise is not available



fig(4)- clamp base bench vise

PROCESS SHEET:

S. No.	Operation	Tool dia (mm)	Spindle speed 'N' (rpm)	Feed 'S' mm/ min	Dept of cut 'A' (mm)	Machining time (hr: min: sec)	Cutting speed (mm/min)
1	FACING	16	450	50	0.2	00:01:56	22.61
2	THREADING	6	71	0.2	0.1	00:09:13	12.25
3	DRILLING	25	1990	100	10	00:04:25	156.24
4	TAPPING	4	71	0.2	0.1	00:03:14	12.25

5	**WELDING**	–	–	–	–	–	–

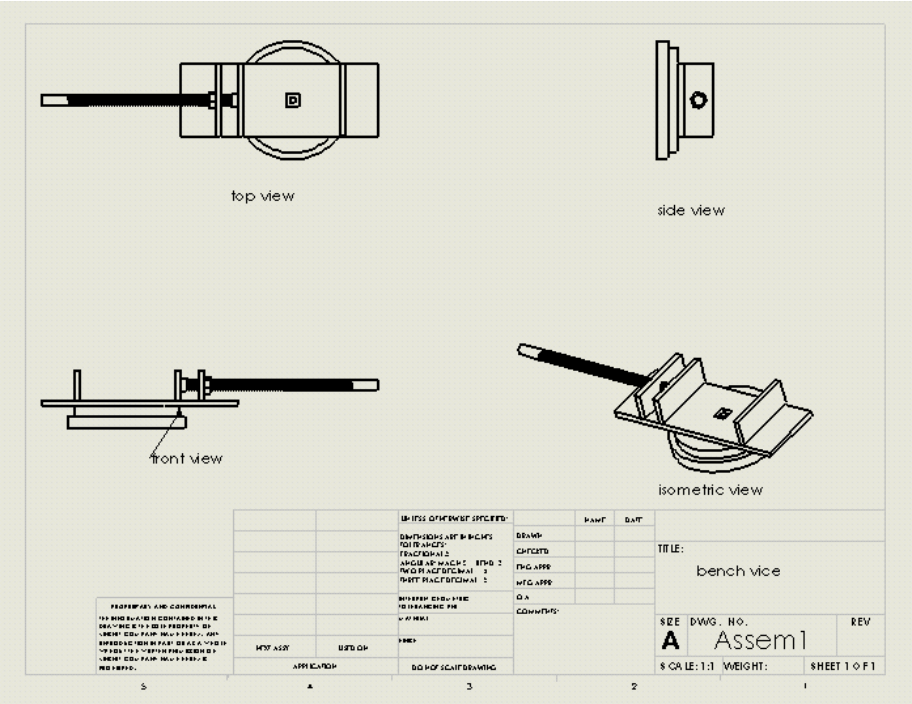


Fig- **shows the drafting of the assembled vise**

STEP-BY-STEP MACHINING PROCESSES DONE:

CUTTING:

A hex-saw blade was used for cutting the material to the required dimensions.

The dimensions of cut parts being:

Name	material	dimension
Jaws	ms	110mm*45mm*8mm
Base plate	ms	300mm*110mm*9mm

Circular Plate	ms	160mm(Dia)*20mm(thickness)& 145mm(Dia)*16mm(thickness)

FACING:

Facing was performed on the spindle/shaft of dia 16mm and 300mm length using the turning tool on the lathe machine. The spindle speed 450 rpm.

THREADING:

The pitch is set at 4 and the speed adjusted to 71 RPM and the threading operation was performed for the length of 260mm, with a feed of 0.2mm for a depth of thread of 2mm. Threading tool was used for this purpose on the lathe machine.

DRILLING:

Drilling was performed on the base plates, drill hole, cut being concentric for both the plates base plates. The drilling was performed for inserting the coupling for allowing the top plate to rotate easily on the base plate and a provision for locking of the same was provided.

TAPPING:

Tapping was performed on the locking nut to create threading for screwing the nut to lock the two base plates. The dimension of the locking nut is 6mm.

WELDING:

All the assembly parts were welded using **arc-welding apparatus.** The vise was welded to the top swivel plate and the welded arrangement was then coupled with the base (stationery plate).

PAINTING:

The apparatus was painted to prevent corrosion of machine parts by rusting.

LUBRICATION AND OILING:

The threaded portions are oiled and lubricated to provide effective engagement of threads and prevent corrosion.

CONCLUSION:

THE BENCH VISE HAS BEEN MADE TO THE SPECIFICATIONS AND THE PROCESS SHEET GENERATED.

SALIENT FEATURES:

THE BENCH VISE HAS NUMEROUS APPLICATIONS AND CAN BE MOUNTED VIA T-BOLTS TO ANY WORK TABLE FOR MILLING AND OTHER MACHINING OPERATIONS.

THE SALIENT FEATURE OF THIS BENCH VISE IS THAT ITS, ANGULAR POSITION CAN BE CHANGED AND ADJUSTED TO ANY DIRECTION DEPENDING ON THE WORK TO BE DONE. THE VISE HAS BEEN CALIBERATED IN DEGRESS FOR THE SAME.

ANALYSIS OF SCREW USING COSMOS EXPRESS

1. Introduction

Summarize the FEM analysis on Part6

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2. File Information

Model name:	Part6
Model location:	C:\Documents and Settings\GANESH-MARUTHI\Desktop\bench\Part6.SLDPRT
Results location:	D:\chandramuki
Study name:	COSMOSXpressStudy (-Default-)

3. Materials

No.	Part Name	Material	Mass	Volume
1	Part6	[SW]Cast Carbon Steel	0.460288 kg	5.90113e-005 m^3

4. Load & Restraint Information

Restraint	
Restraint1 <Part6>	on **1 Face(s)** immovable (no translation).
Description:	

Load	
Load1 <Part6>	on **1 Face(s)** apply normal force **500 N** using uniform distribution
Description:	

5. Study Property

Mesh Information	
Mesh Type:	Solid mesh
Mesher Used:	Standard
Automatic Transition:	Off
Smooth Surface:	On
Jacobian Check:	4 Points
Element Size:	3.8945 mm
Tolerance:	0.19473 mm
Quality:	High
Number of elements:	40074
Number of nodes:	59854

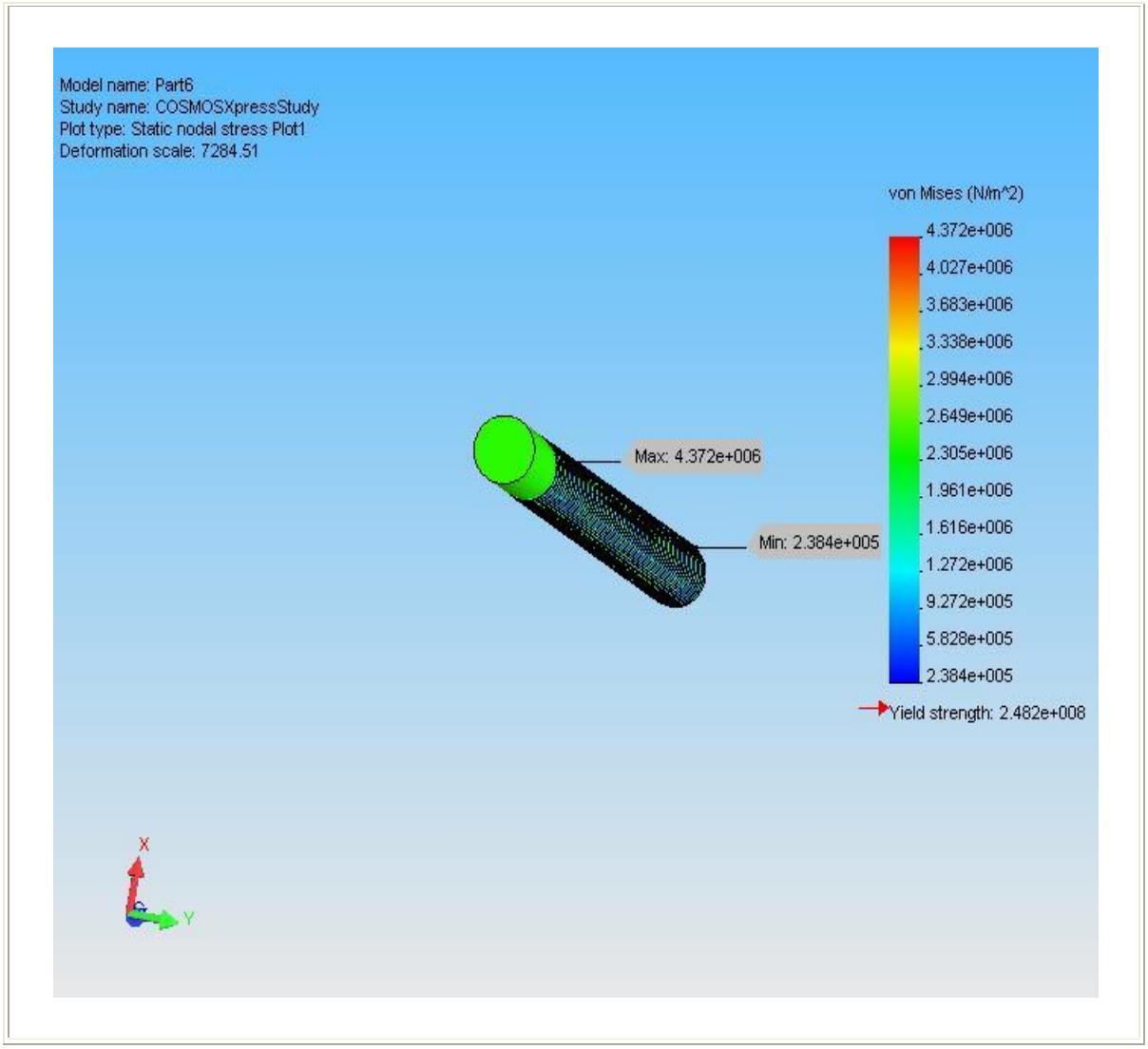
Solver Information	
Quality:	High
Solver Type:	FFE

6. Stress Results

Name	Type	Min	Location	Max	Location
Plot1	VON: von Mises stress	238355 N/m^2	(7.01236 mm, 3.85057 mm, 299.653 mm)	4.37164e+006 N/m^2	(5.84582 mm, 3.85051 mm, 83.2796 mm)

Part6-COSMOSXpressStudy-Stress-Plot1

JPEG

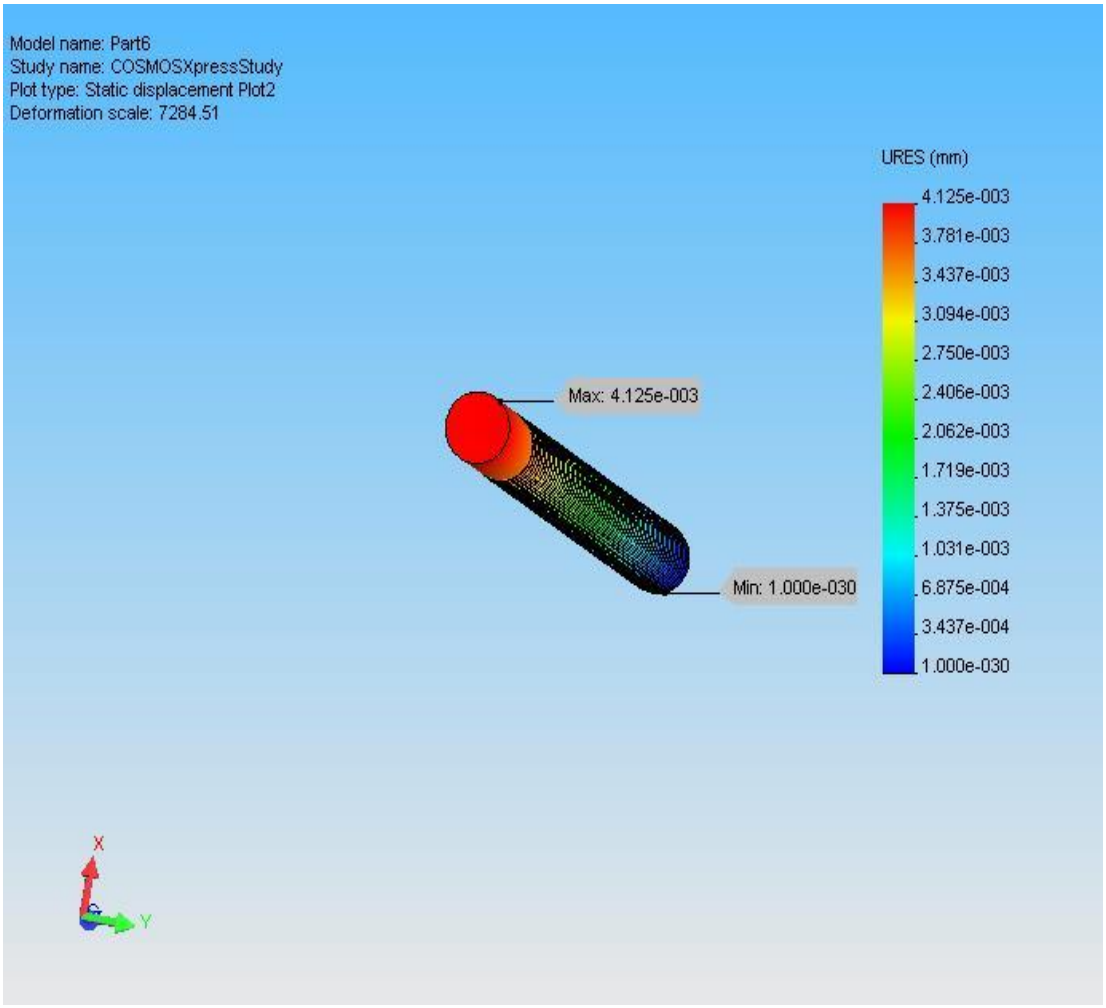


7. Displacement Results

Name	Type	Min	Location	Max	Location
Plot2	URES: Resultant displacement	0 mm	(7.99365 mm, -0.318741 mm, 300 mm)	0.00412484 mm	(6.47214 mm, 4.70228 mm, 0 mm)

Part6-COSMOSXpressStudy-Displacement-Plot2

JPEG

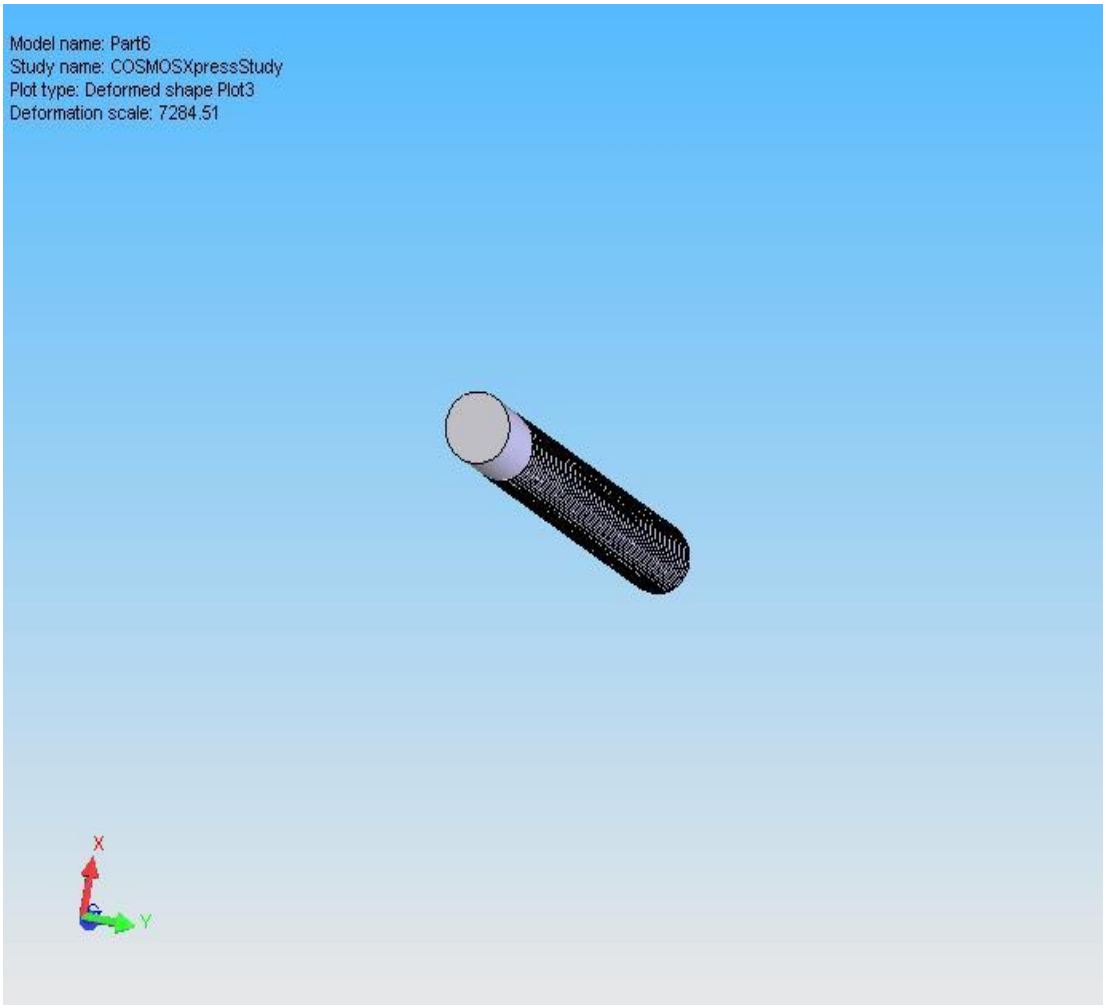


8. Deformation Results

Plot No.	Scale Factor
1	7284.5

Part6-COSMOSXpressStudy-Deformation-Plot3

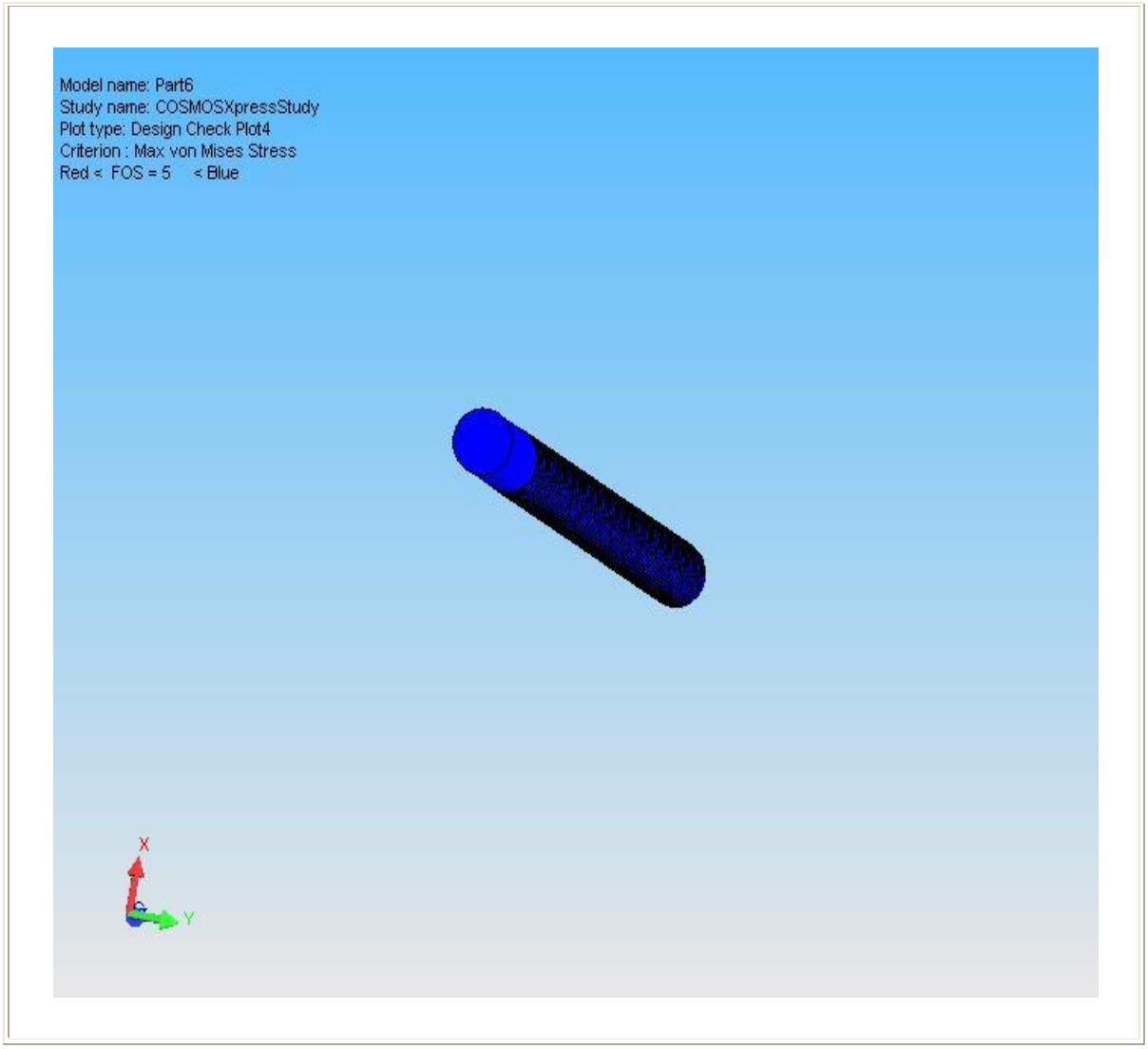
JPEG



9. Design Check Results

Part6-COSMOSXpressStudy-Design Check-Plot4

JPEG



10. Appendix

Material name: [SW]Cast Carbon Steel

Description:

Material Source: Used SolidWorks material

Material Library Name:

Material Model Type: Linear Elastic Isotropic

Property Name	Value	Units

Elastic modulus	2e+011	N/m^2
Poisson's ratio	0.32	NA
Mass density	7800	kg/m^3
Yield strength	2.4817e+008	N/m^2

Note:

COSMOSXpress design analysis results are based on linear static analysis and the material is assumed isotropic. Linear static analysis assumes that: 1) the material behavior is linear complying with Hooke's law, 2) induced displacements are adequately small to ignore changes in stiffness due to loading, and 3) loads are applied slowly in order to ignore dynamic effects.

Do not base your design decisions solely on the data presented in this report. Use this information in conjunction with experimental data and practical experience. Field-testing is mandatory to validate your final design. COSMOS press helps you reduce your time-to-market by reducing but not eliminating field tests.

MANUFACTURING MINI PROJECT

SWIVEL BENCH VISE

SUBMITTED BY:

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