

$C = 1200 \text{ RPM}$ Mount Upper – Manufacturing Procedure

3.169

WATCH THE VIDEO!



https://youtu.be/Z6_zMvk4AZM

- 1) Cut a piece of .75" X 1.25" 6061-T6 aluminum alloy rectangular bar to a length of 3.13" on bandsaw.

Tools used: Combination square

Conventional \rightarrow \uparrow feed table towards rotation

Milling Machine Operations: Climbing \rightarrow \downarrow feed table away rotation

Install mill vise on table and ensure it is properly aligned to the table travel. Clamp part in vise on parallels with 1.25" stock dimension between jaws and about .5" stick-out on left side of jaws

- 2) Side mill one end to clean. (11:15)

Tools used: 6" rule, 1/2" HSS end mill, digital readout

Remove part, rotate 180° and reclamp as before.

- 3) Side mill other end to 3.0" overall length. Use *conventional*, rather than climb, milling technique for roughing cuts. (12:11)

Tools used: 1/2" HSS end mill, dial caliper, digital readout

Remove part from vise.

← Scribed surface
Layout Operations:

center of Dykem fluid 1.25" dimension
0.625"
0.424"

- 4) Scribe lines for vee. *Granite surface plate is for layout and measurement only! It is not for storage or benchwork and must be kept clean!* (12:50)

- Apply Dykem layout fluid to .75" X 1.25" side surface of part on workbench. Use height gauge with scribe on top of surface plate to scribe crosshair lines for intersection of vee surfaces .424" from bottom of part and on center of 1.25" dimension. Set part on special vee block with 90° included angle and 30° tilt angle, set scribe height to center of crosshair and scribe lines for vee surfaces so that they intersect at the crosshair. You will need to flip the part to scribe both lines.

Tools used: Dykem layout fluid, height gauge with scribe, special vee block with 90° included angle and 30° tilt angle, surface plate

Milling Machine Operations:

Parallels are parallel

Reclamp part in mill vise so 3.0" dimension is between jaws, .75" X 1.25" surface with scribed lines (vee facing up) is against moveable jaw, and part is in center of vise. Use digital angle gauge to set part at 30° tilt angle. Set bottom corner of part on parallels so scribed line for vee surface is approx. 1/8" above top of jaw.

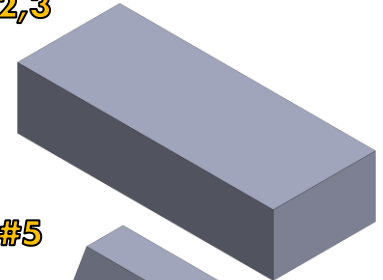
- 5) Mill one vee surface using scribed lines as reference. (16:22)

Tools used: 1/2" HSS end mill, digital readout

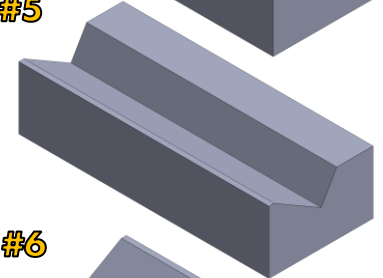
Remove part. Use digital angle gauge to set part at 30° tilt angle in the other direction. Reclamp part as before.

Be careful

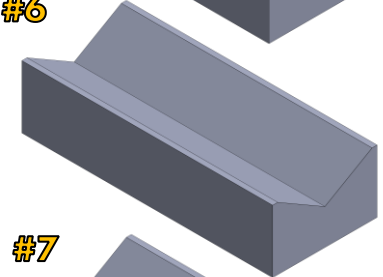
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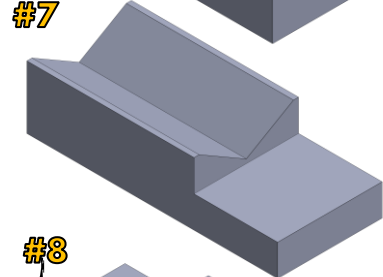
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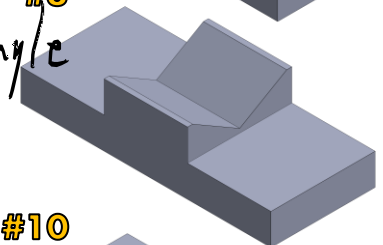
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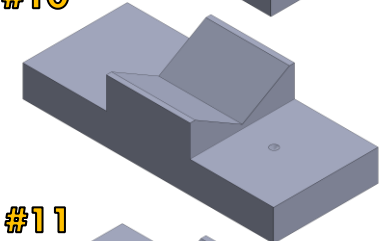
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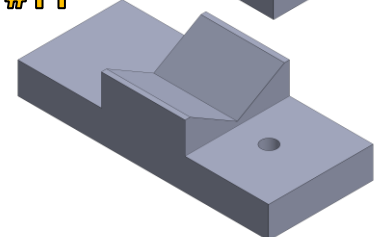
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#10



#11



Be careful

#12

1200 RPM

- 6) Mill other vee surface using scribed lines as reference. Verify depth of vee by measuring from bottom of part to top of $\varnothing.750$ " gage pin (should be 1.23"). (19:40)

Tools used: 1/2" HSS end mill, digital readout

Remove part. Reclamp part in mill vise on parallels so that vee is facing up with minimum 3/8" stick-out above top of jaws. 1.25" dimension is between jaws, and part is in center of vise. Apply vise stop on left side of part as reference.

- 7) Mill step surface .375" from bottom of part and 1.00" from right side of part. (21:34)

Tools used: 1/2" HSS end mill, dial caliper, 0-1" micrometer, digital readout

Remove part, rotate 180° and reclamp part in mill vise against stop as before.

- 8) Mill other step surface .375" from bottom of part and center vee to 1.000" wide. (23:56)

Tools used: 1/2" HSS end mill, 0-1" micrometer, digital readout

- 9) Find left side of part in X and center of part in Y axis. (25:46)

Tools used: Edgfinder, drill chuck, digital readout

- 10) Spot hole at 2.38" from left side of part. (26:25)

Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

- 11) Drill $\varnothing.188$ " hole. (26:29) through

Tools used: 3/16" HSS drill, drill chuck, WD-40 lubricant, digital readout

- 12) Counterbore $\varnothing.32$ " hole .13" deep. (26:36) Install 3/8" collet first

Tools used: 5/16" HSS end mill, drill chuck, WD-40 lubricant, digital readout

Remove part, flip 180° so vee is facing down, and reclamp part in mill vise. Select parallels so part is low enough to contact vise stop. 1 1/8" parallels

- 13) Spot hole at 1.500" from left side of part and center of part in Y axis. (27:07)

Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

- 14) Drill $\varnothing.281$ " hole. (27:52)

Tools used: 9/32" HSS drill, drill chuck, WD-40 lubricant, digital readout

- 15) Counterbore $\varnothing.41$ " hole .25" deep. (28:01) true counterbore tool

Tools used: HSS counterbore for 1/4 screw, drill chuck, WD-40 lubricant, digital readout ~13/32" ? ~3/8"

Reclamp part in mill vise so that .375" X 1.25" surface is facing up, .375" dimension is between jaws, and part is in center of vise. Select parallels so that center vee is just above top of jaw. ~7/8" parallels

- 16) Find center of part in X and Y axes. (29:05)

Tools used: Edgfinder, drill chuck, digital readout

- 17) Spot four holes for #6-32 UNC 2B threads. (30:45)

Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

- 18) Drill four $\varnothing.107$ " holes for #6-32 UNC 2B threads. (31:00) to depth of 0.400"

Tools used: #36 HSS drill, drill chuck, WD-40 lubricant, digital readout

- 19) Countersink four holes for #6-32 UNC 2B threads. (31:54)

Tools used: 1/2" X 90° HSS countersink, drill chuck, WD-40 lubricant, digital readout Countersink to ~0.198", 0-out z-axis for 1st hole

- 20) Tap four holes for #6-32 UNC 2B threads minimum .3" deep. Be very careful

not to overtorque the delicate tap and break it! (32:42) ~9.6 turns

Tools used: #6-32 HSS plug tap, tap wrench, spring-loaded tap guide, drill chuck, WD-40 lubricant, digital readout

#13

scribed surface on left

#14

scribed on right

#15

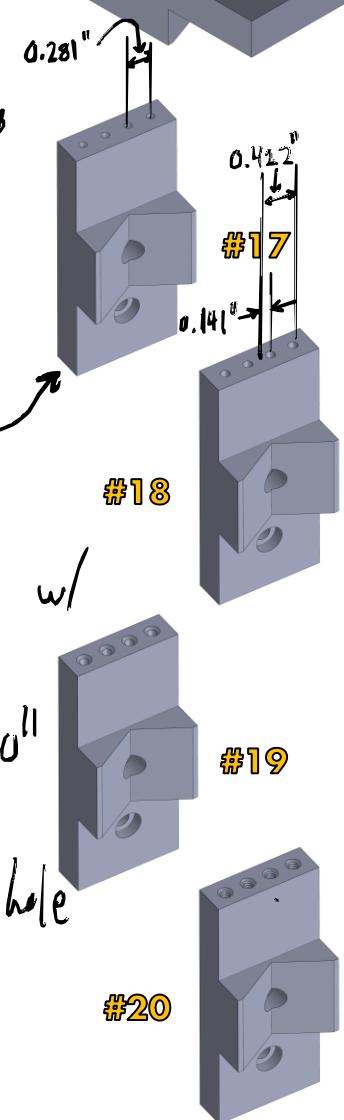
0.281"

#17

#18

#19

#20



$$\sqrt{15} \left| \frac{4 \times 100}{0.41} = 976 \text{ RPM} \right.$$

$$\text{Countersinking} \left| \frac{4 \times 60}{0.5} = 480 \text{ RPM} \right.$$

$$\sqrt{12} \left| \frac{4 \times 100}{0.32} = 1250 \text{ RPM} \right.$$

$$\sqrt{18} \left| \frac{4 \times 120}{0.107} = 4486 \text{ RPM} \right.$$

$$\sqrt{14} \left| \frac{4 \times 120}{0.281} = 1708 \right.$$

$$\begin{array}{r} .975 \\ \times .0219 \\ \hline 0.9969 \end{array} \quad \begin{array}{r} .975 \\ \times .0219 \\ \hline 0.9969 \end{array}$$

$$\sqrt{2, 3, 5, 8} \left| \frac{4 \times 120}{0.5} = 1200 \text{ RPM, Feed rate} = 1200 \times 0.002 \times 2 = 4.8 \right.$$

Edgefinders $\rightarrow 1000 \text{ RPM}$

Center drills $\rightarrow 600 - 1000 \text{ RPM}$

$$\sqrt{13} \left| \frac{4 \times 120}{0.188} = 2553 \text{ RPM} \right.$$

$$\begin{array}{r} 375 \\ \times 216 \\ \hline 0.3966 \end{array} \quad \begin{array}{r} .375 \\ \times .022 \\ \hline 0.397 \end{array} \quad \begin{array}{r} .375 \\ \times .021 \\ \hline 0.396 \end{array}$$

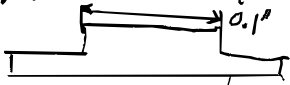
7 - Adjust mill flutes to be able to touch flat portion of top,

- O-out z-axis,

- touch off right side, o-out x-axis

- rough cut along x-axis, leave 0.01" for finish

- measure height w/ 0-1" micrometer set z-axis to this value, then mill to correct depth (0.375")

8 - rough cut along x-axis @ depth of $\sim 0.400''$
 measure middle step width, should be $0.100''$ (final)
 set x-axis to measurement, 
 move to 0.1" along x-axis, 0.775" along z-axis, then mill surface

12

Touch $\frac{9}{16}$ " end mill to bottom of step on
right side (@ 2.38" from left hole),
0-out z-axis
mill to depth of 0.13"

15 Drop counter bore bit through hole (\leftarrow one mark
1.5" from left)
til flutes touch part, 0-out z-axis
Plunge to 0.250"

(Counter sink holes to debur them)
(not center hole)

18 Line up drill so its full diameter is @
top of hole (after slightly drilling it)
Zero-out z-axis, plunge to depth of 0.400"