

## Tube – Manufacturing Procedure

- 1) **Cut a piece of  $\varnothing 1.0''$  ID X  $\varnothing 1.5''$  OD 6061-T6 aluminum alloy hollow round bar to a length of 6" on the bandsaw. (7:11)**

Tools used: Combination square

### Lathe Operations:

Mount stock in a 3-jaw chuck on the lathe with 4.5" stick-out.

- 2) **Face one side to clean. (9:13)**

Tools used: 6" rule, HSS turning tool, WD-40 lubricant, digital readout

- 3) **Turn  $\varnothing 1.5''$  stock OD MINIMUM to 100% clean surface. Cut at least 4" length. (9:49)**

Tools used: HSS turning tool, digital readout

Flip part around and remount with 3" stick-out. *From this point on, use copper shims between part and chuck jaws to protect machined surfaces.*

- 4) **Face opposite side to clean. (11:52)**

Tools used: 6" rule, HSS turning tool, WD-40 lubricant, digital readout

Remove part, measure length with dial caliper, remount with 3" stick-out.

- 5) **Face to 5.8" overall length. (12:32)**

Tools used: 6" rule, HSS turning tool, WD-40 lubricant, digital readout, dial caliper

- 6) **Turn  $\varnothing 1.38''$  to 2.0" from end. (14:18)**

Tools used: HSS turning tool, WD-40 lubricant, digital readout, 0-1" micrometer

- 7) **Use .002" shim to touch off chamfering tool on  $\varnothing 1.38''$  surface. Blend 45° chamfer at transition between  $\varnothing 1.38''$  and  $\varnothing 1.5''$  surfaces. (19:20)**

Tools used: .002" shim, HSS chamfering tool, WD-40 lubricant

- 8) **Drill  $\varnothing 1.06''$  through center of part at least 4.5" deep. (20:07)**

Tools used: 1-1/16" HSS twist drill, morse taper adapter (if required), WD-40 lubricant

- 9) **Bore  $\varnothing 1.125''$  X 1.00" deep. (21:04)**

Tools used: 5/8" boring bar with CCGX-3(2.5)1 (or -2) carbide insert, WD-40 lubricant, digital readout, 1-2" micrometer, telescoping gage (size B)

- 10) **Break inside edge .015" max. (24:33)**

Tools used: HSS chamfering tool, WD-40 lubricant, digital readout

- 11) **Cut .03" X 45° external chamfer. (25:12)**

Tools used: HSS chamfering tool, WD-40 lubricant, digital readout

Flip part around again and remount with 2" stick-out.

- 12) **Bore  $\varnothing 1.13''$  X 1.5" deep. (25:38)**

Tools used: 5/8" boring bar with CCGX-3(2.5)1 (or -2) carbide insert, WD-40 lubricant, digital readout, 1-2" micrometer, telescoping gage (size B)

- 13) **Bore  $\varnothing 1.265''$  X .588" deep. (27:35)**

Tools used: 5/8" boring bar with CCGX-3(2.5)1 (or -2) carbide insert, WD-40 lubricant, digital readout, 1-2" micrometer, telescoping gage (size B)

WATCH THE VIDEO!

(Lathe Operations)

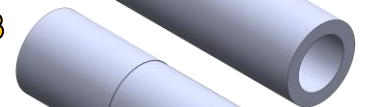


<https://youtu.be/T-IBWwnVPLM>

#2



#3



#4/5



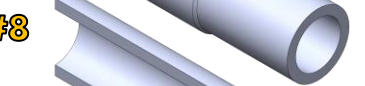
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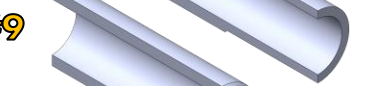
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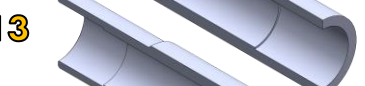
#10/11



#12



#13



**14) Cut .05" X 45° internal chamfer. (28:40)**

Tools used: HSS chamfering tool, WD-40 lubricant, digital readout

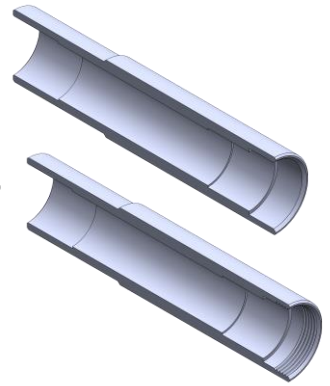
**15) Cut .03" X 45° external chamfer. (28:59)**

Tools used: HSS chamfering tool, WD-40 lubricant, digital readout

**16) Tap 1-5/16-16 UNS 2B threads .3" deep. (29:10)**

Tools used: 1-5/16-16 UNS HSS plug tap, tap handle, spring-loaded tap guide, drill chuck, WD-40 lubricant

#14/15



#16

**Milling Machine Operations:**

Install indexing head on table and ensure it is properly aligned to the table travel. Mount part in chuck with smaller OD in jaws and with 4" stick-out. (Use copper shims!) Lightly support end of part with screw jack on table.

**17) Using edgfinder, touch both sides of part OD to find center and then touch end of part to find edge. Position spindle 3.22" from end of part. Do NOT forget to add radius of edgfinder when locating an edge.**

Tools used: Edgfinder, drill chuck, digital readout

**18) Spot hole for ¼-20 UNC 2B threads.**

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

**19) Drill hole for ¼-20 UNC 2B threads.**

Tools used: #7 HSS drill, drill chuck, WD-40 lubricant, digital readout

**20) Countersink hole for ¼-20 UNC 2B threads.**

Tools used: 1/2" X 90° HSS countersink, drill chuck, WD-40 lubricant, digital readout

**21) Position spindle .775" from end of part.**

Tools used: Digital readout

**22) Spot drill and pre-drill first hole for #6-32 UNC 2B thread.**

Tools used: #3 HSS center drill, #36 HSS drill, drill chuck, WD-40 lubricant, digital readout



#18-20, 25



Loosen screw jack, index part 120 degrees, reapply screw jack and repeat step 23. Then index part another 120 degrees and repeat step 23 again.

**23) Countersink first hole for #6-32 UNC 2B thread.**

Tools used: 1/2" X 90° HSS countersink, drill chuck, WD-40 lubricant, digital readout

Loosen screw jack, index part 120 degrees, reapply screw jack and repeat step 24. Then index part another 120 degrees and repeat step 24 again.

#22-24



**24) Tap first hole for #6-32 UNC 2B thread.**

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

Loosen screw jack, index part 120 degrees, reapply screw jack and repeat step 25. Then index part another 120 degrees and repeat step 25 again.

**25) Tap hole for ¼-20 UNC 2B threads.**

Tools used: ¼-20 HSS plug tap, tap wrench, spring-loaded tap guide, drill chuck, WD-40 lubricant, digital readout