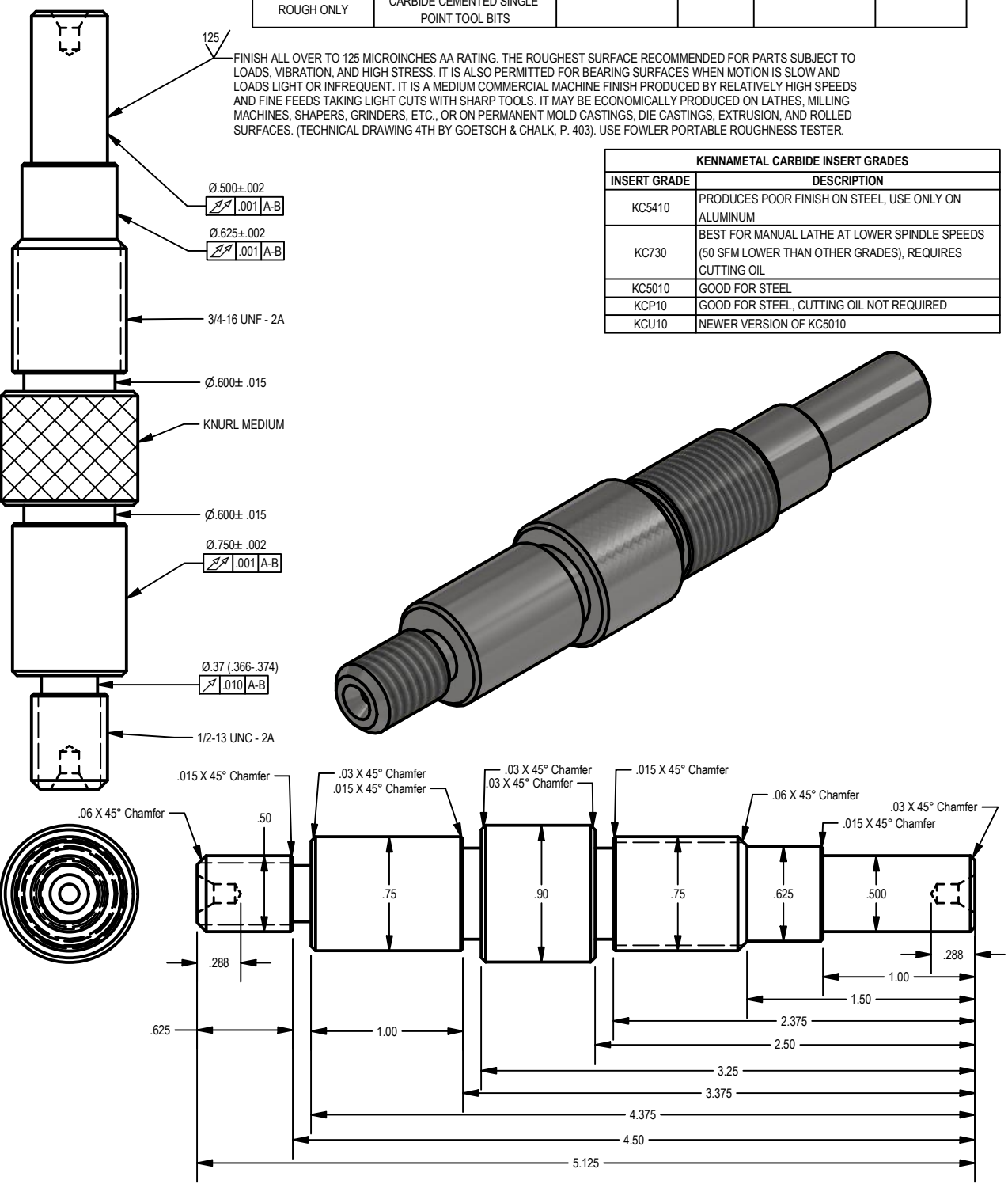


FEEDS AND SPEEDS (SHARP GT-1640S MANUAL LATHE)					
CUTTING TYPE	INSERT GEOMETRY	DEPTH OF CUT	RPM	FEED RATE (in/rev)	MATERIAL
ROUGH		0.040"	540		
FINISH	POSITIVE -LF, GRADE KC730	0.006-0.060"		0.0025 - 0.010	
ROUGH 1" DIA	GRADE KC5010	0.050"	700	#6 ICSY	
ROUGH 1" DIA	GRADE KC5410	0.040"	1000	#1 IATX (0.0012)	C-1018
FINISH 1" DIA	GRADE KC5010	0.040"	1000	#6 ICSY	
FINISH 1" DIA	GRADE KC5410	0.020"	1000	#1 IATX (0.0012)	C-1018
ROUGH 0.75" DIA	GRADE KC5010	0.050"	1000	IASX	
FINISH 0.75" DIA	GRADE KC5010	0.050"	1600	#1 IATX (0.0012)	
FINISH 0.50" DIA	GRADE KC5010	0.050"	2000	#1 IATX (0.0012)	
ROUGH ONLY	CARBIDE CEMENTED SINGLE POINT TOOL BITS				

FINISH ALL OVER TO 125 MICROINCHES AA RATING. THE ROUGHEST SURFACE RECOMMENDED FOR PARTS SUBJECT TO LOADS, VIBRATION, AND HIGH STRESS. IT IS ALSO PERMITTED FOR BEARING SURFACES WHEN MOTION IS SLOW AND LOADS LIGHT OR INFREQUENT. IT IS A MEDIUM COMMERCIAL MACHINE FINISH PRODUCED BY RELATIVELY HIGH SPEEDS AND FINE FEEDS TAKING LIGHT CUTS WITH SHARP TOOLS. IT MAY BE ECONOMICALLY PRODUCED ON LATHES, MILLING MACHINES, SHAPERS, GRINDERS, ETC., OR ON PERMANENT MOLD CASTINGS, DIE CASTINGS, EXTRUSION, AND ROLLED SURFACES. (TECHNICAL DRAWING 4TH BY GOETSCH & CHALK, P. 403). USE FOWLER PORTABLE ROUGHNESS TESTER.

KENNAMETAL CARBIDE INSERT GRADES	
INSERT GRADE	DESCRIPTION
KC5410	PRODUCES POOR FINISH ON STEEL. USE ONLY ON ALUMINUM
KC730	BEST FOR MANUAL LATHE AT LOWER SPINDLE SPEEDS (50 SFM LOWER THAN OTHER GRADES), REQUIRES CUTTING OIL
KC5010	GOOD FOR STEEL
KCP10	GOOD FOR STEEL, CUTTING OIL NOT REQUIRED
KCU10	NEWER VERSION OF KC5010



SCHEDULE OF OPERATIONS / ORDER OF OPERATIONS / PROCESS PLAN				OPERATION DESCRIPTION	
NO.	TOOL ID	TIME min	Running Time (h:m)		
0	BANDSAW	5		CUT RAW STOCK, DIAMETER 1", LENGTH 7.25" TO 7.75"	
1.1		1		PLACE IN LATHE WITH 2.50" EXPOSED	
1.2	H1-S2-B1	4	0:30	TURN LENGTH OF 2" TO MAX DIAMETER 0.75" UNTIL WORK PIECE IS ROUND. ROUGHING CUT 700RPM, 0.050" DEPTH OF CUT, FEED 0.0088 (IARX). THIS PART WILL EVENTUALLY BE HELD IN THE CHUCK AND CUT OFF. FEED #6 ICSY PRODUCED GOOD FINISH, ALSO #5 IATX (0.0017) WORKED. (IASX) 0.0024	
1.3				THREADING SETUP QUICK CHANGE TOOL POST - TOOL HOLDER HEIGHT IS SAME AS LIVE CENTER. HAD PROBLEM USING THE FISH TAIL AND CHIPPING THE END OF THE CARBIDE BIT. TO MAINTAIN RIDGE SETUP - ENSURE NO OVERHAND ON COMPOUND REST. IF GETTING A POOR FINISH WHEN TURNING WITH NEGATIVE INSERTS, SLIGHTLY ADJUST TOOL HEIGHT UP OR DOWN.	
2.1		2		FLIP WORKPIECE AROUND WITH 0.5" EXPOSED	
2.2	H1-S3-B1	2		FACE UNTIL SMOOTH. TAKE 0.015" OFF AT 700 RPM, FEED 0.0017 (#5 IATX) ONLY PRODUCED OK FINISH	
2.3	H4-00-B4	2		CENTER DRILL #4 DEPTH 0.288" AT 200 RPM	
3.1		2		EXTEND WORKPIECE OUT A LENGTH 5.75" WITH 1.0" HELD IN 3-JAW CHUCK ON WORKPIECE'S TURNED SURFACE. SUPPORT END WITH LIVE CENTER IN THE TAIL STOCK. USE GAGE INDICATOR TO ENSURE CONCENTRICITY BETWEEN TURNED SURFACES (NOT WITH UNFINISHED SURFACE) AND ADJUST 3-JAW CHUCK AS NEEDED. SETUP COMPOUND REST ROTATED AT 29.5 DEGREES (BETWEEN 29 AND 30) FOR THREADS	
3.1a				TURN BETWEEN CENTERS - NEED TO PURCHASE A FACEPLATE. MAKE DEAD CENTER WITH ALUMINUM STOCK, COMPOUND ROTATED TO FACE HEAD STOCK, THEN ROTATE +30 DEGREES. FEED INTO WORKPIECE WITH COMPOUND TO CREATE 60 DEGREE DEAD CENTER.	
3.2	H1-S2-B1	5	1:00	TURN LENGTH BETWEEN 0 TO 5.750" LENGTH TO DIAMETER 0.9101". 1000 RPM, FEED RATE 0.0088 IN/REV (IARX). FINAL LENGTH IS 5.125" AT STEP 6.1.	
4.1	H3-00-B5	10	0:42	RELIEF CUTS WITH PARTING TOOL (WIDTH 0.125") USE 160 (95-200) RPM AND MANUALLY HAND FEED WITH CROSS SLIDE. IF PARTING BLADE NOT CUTTING BUT RUBBING METAL, CHECK HEIGHT IS AT OR SLIGHTLY BELOW HORIZONTAL AXIS OF WORKPIECE AND SHARPEN PARTING BLADE ON GRINDING WHEEL.	
4.2				BETWEEN 2.375" & 2.500" TO DIAMETER 0.600". MEASURE WITH DIGITAL CALIPERS. GRIND PARTING BIT TO PRODUCE SQUARE BOTTOM FOR THREAD RELIEF. REMOVE CHIPS EVERY 0.010-0.020" CUT DEPTH.	
4.3				BETWEEN 3.250" & 3.375" TO DIAMETER 0.600"	
4.4				BETWEEN 4.375" & 4.500" TO DIAMETER 0.375"	
4.5	H3-00-B5	3	1:45	CUT MARK BETWEEN 5.25 & 5.125" TO DIAMETER MAX 0.300" - FINAL LENGTH OF WORKPIECE TO BE PARTED OFF LATER. USE RED KYKEM LAYOUT FLUID TO PAINT SHOULDER EDGE - EASILY IDENTIFY PART END	
5.1			1:38	TURN LENGTH BETWEEN 0 TO 2.5" LENGTH TO DIAMETER -7438 WITH MAX 0.7485" (NOMINAL 0.750") AT 1000 RPM, FEED IATX (0.0017). FINAL PASS FOR 0.25" AT 0.753", STOP CUTTING, MEASURE DIAMETER AND ADJUST, THEN START CUTTING ENTIRE 2.5". WILL ENSURE TOLERANCE MEET.	
5.2				TURN LENGTH BETWEEN 0 TO 1.5" LENGTH TO DIAMETER 0.625". FINAL PASS FOR 0.25" AT 0.630", STOP CUTTING, MEASURE DIAMETER AND ADJUST, THEN START CUTTING ENTIRE 1.5". WILL ENSURE TOLERANCE MEET.	
5.3			1:56	TURN LENGTH BETWEEN 0 TO 1.0" LENGTH TO DIAMETER 0.500". FINAL FOR 0.25" AT 0.505", STOP CUTTING, MEASURE DIAMETER AND ADJUST CROSSFEED, THEN START CUTTING ENTIRE 1.0"	
5.4			2:08	TURN LENGTH BETWEEN 3.25 TO 5.5" LENGTH TO DIAMETER 0.750". ISSUE GETTING TOOLBIT TO FIT, NEED TO SLIGHTLY ROTATE TOOL HOLDER.	
5.5			2:25	TURN LENGTH BETWEEN 4.375 TO 5.75" LENGTH TO DIAMETER 0.4931 MAX 0.4985" (NOMINAL 0.500").	
5.6				ENSURE CONCENTRICITY WITH 0.75", 0.625" AND 0.500" DIAMETERS	
6.0				CHAMFER - LENGTH IS EITHER X OR Y DISTANCE, NOT DIAGONAL, SINCE ANGLE IS 45DEG X=Y. CUT WITH Z SADDLE APRON INSTEAD OF X CROSS SLIDE. HOLD TOOL BIT WITH ONLY 3 OF 4 SCREWS SO IT IS EXTENDED FURTHER THEN WON'T HAVE ISSUE WITH TOOL HOLDER HITTING LIVE/DEAD CENTER IN THE TAILSTOCK.	
6.1			10	CHAMFER (45°) LEFT EDGES 0.06" X 45 deg at 2 locations, 0.03" X 45 deg at 4 locations, and break all sharp edges 0.015 max at 4 locations. 60DEG CARBIDE INSERT CUTS CHAMFERS POORLY. 700 RPM.	
6.2			10	CHAMFER (45°) RIGHT EDGES	
7.0	NTP3P KC5025			THREADING SETUP 1) ENSURE CARBIDE INSERT IS SECURE, 2) REMOVE BACKLASH/LOOSENESS IN GEARS BY TURNING COMPOUND REST DIAL FORWARD AND THEN ZERO OUT DIAL READING (BELIEVE THIS IS THE REASON WHY THREADS ARE OFF 0.006), 3) PLACE STICKER ON THREAD DIAL, 4) SQUARE TOOLPOST WITH CHUCK AND LIVE CENTER.	
7.1	H1-S6-B4		15	THREAD 3/4"-16 TPI UNF-2A BETWEEN 1.5 AND 2.5". ENSURE THREADING TOOL BIT AT CENTER (CHECK ON TAILSTOCK WITH LIVE CENTER). FEED FROM THE COMPOUND REST (USES RADIUS) NOT THE CROSS SLIDE (USES DIAMETERS). COMPOUND REST 1ST CUT 0.010", 2ND CUT 0.010", 3RD CUT 0.080", 4TH CUT 0.070", 5TH CUT 0.050", 6TH CUT 0.050", 7TH CUT 0.030", 8TH CUT SPRING PASS. MEASURE WITH THREAD MIC. KEEP CROSS SLIDE AT 0. RUN LATHE AT 160 RPM (30 RPM TOO SLOW TEARS METAL AND 200 TOO FAST TO ENGAGE HALF NUT). THREAD DIAL EVEN# (VERY IMPORTANT EXACTLY ON NUMBER WHEN ENGAGED). (SKIP - LAST PASS MOVE THE CROSS SLIDE (NOT COMPOUND) 0.001 TO MACHINE BOTH SIDES OF THE THREAD). HOLD WORKPIECE WITH 3/4" COLLET.	
7.2	H1-S6-B4			THREAD 1/2"-13 TPI UNC-2A BETWEEN 4.375" TO 5.125". RUN LATHE AT 70-95 RPM. THREAD DIAL ODD#. HOLD WORKPIECE WITH 29/32" COLLET.	
8.0				REMOVE WORKPIECE AND CUT OFF EXTRA ON BAND SAW	
9.1				HOLD WORKPIECE IN 0.900" COLLET.	
9.2				FACE UNTIL 5.125" LENGTH	
9.3				CHAMFER	
9.4				CENTER DRILL	
10.1				HOLD WORKPIECE IN 0.750" COLLET AND USE LIVE CENTER IN TAIL STOCK	
10.2				KNURL MEDIUM ON NOMINAL 0.90" DIAMETER. SPINDLE SPEED 200 RPM, FEED 0.0192 (IARX1), NOTE ICSY FEED IS A LITTLE TOO FAST. CROSS FEED ADVANCE 0.021" ONCE KNURL TOUCHES WORKPIECE. KNURL WHEEL SHOULD NEVER LEAVE THE WORKPIECE WHEN KNURLING. SMALL SHARP LATHE (1340VS) SETUP WITH COLLET AND GEARS 26/127/52 AT FEED B3 (0.0057). NO NEED TO USE A LIVE CENTER IN THE TAILSTOCK. DORIAN TOOL (24 TEETH PER INCH, DIAGONAL KNURL DIES SW4R-25 AND SW4L-25) LATHE SETUP: 1A) 200 RPM, 1B) FEED RATE BETWEEN 0.003-0.006 IN/REV, 1C) THREAD DIRECTION TO LEFT (FROM TAILSTOCK TO HEADSTOCK), 1D) ATTACH DORIAN KNURL TOOL SO BOTH WHEELS LIGHTLY TOUCH THE WORKPIECE (MOST IMPORTANT STEP IF DONE WRONG WILL ONLY GET HALF A DIAMOND PATTERN OR KNURL IN ONLY ONE DIRECTION), 1E) APPLY CUTTING FLUID BEFORE EACH PASS OF THE KNURLING TOOL. KNURLING PROCEDURE: 2) 30 DEG (1/12) TURN ON KNURL NUT, 3) ENGAGE LATHE CLUTCH AND HALF-NUT LEVER, 4) WHEN KNURL WHEELS ARE NO MORE THAN 50% OFF THE END OF THE KNURL DISENGAGE LATHE CLUTCH WHILE KEEPING THE HALF-NUT LEVER ENGAGED, 5) REVERSE THREAD DIRECTION TO RIGHT (HEADSTOCK TO TAILSTOCK) AND ENGAGE CLUTCH - DON'T ADJUST KNURL NUT - TAKING A SPRING PASS. DO 3-5 PASSES (FORWARD & REVERSE) EACH TIME ADDING OIL AND ADDING 1/12TH TURN ON KNURL NUT. TOO FAST - 412 RPM, 97 ft/min and feed rate 0.003-0.006 in/rev (see www.carbidedepot.com/formulas-turning.htm and http://www.accu-trak.com/holders_cutttype/speedsandfeeds.html)	
11				WASH CLEAN AND POLISH	
12				HEAT TREATMENT - ANNEALING	
13				SURFACE TREATMENT - ZINC PLATING MOST ECONOMICAL FOR CORROSION PROTECTION, BLACK OXIDE OR HARD CHROMIUM PLATING OR THERMAL SPRAY COATING	
14				SUBMIT TO NIMS MET-TEC COMMITTEE FOR EVALUATION	

Name	Material Description	Unit Price	URL
12L14	Cold Drawn Carbon Round Bar - better machinability (still not as good as aluminum) due to its added Lead content	\$6.50/ft D=1"	<a href="https://www.onlinemetals.com/">https://www.onlinemetals.com/</a>
A2	A-2 Drill Rod.	\$42.75/ft D=1"	<a href="https://www.onlinemetals.com/">https://www.onlinemetals.com/</a>
A36	ASTM A36 hot rolled carbon steel HOT-ROLLED CARBON STEEL BAR/ROUNDS		Pacific Steel
C-1018	COLD-DRAWN C-1018 STEEL (STEEL IDENTIFY BY END PAINTED GREEN)	\$2.35/ft D=1"	Pacific Steel
AISI 4140	Chromemolly. Wyatt Wood uses 4140 TGP (turned, ground, polished)	\$8.10/ft D=1"	
AISI 4130PH	Preharden (PH)		

PART: NIMS MACHINIST TOOLS  
JOB DUTY 2.3 TURNING BETWEEN CENTERS JASON

PART NO.: MACHINIST TOOL & PART LIST

INCLUDES WWW.CSI.EDU TOOLS 12

MATERIAL: 12  
WEIGHT: N/A  
THIRD ANGLE PROJECTION

TOLERANCES UNLESS OTHERWISE STATED

GEOMETRIC TOLERANCE SYMBOLS  
FEATURE CONTROL

SHEET: 4 OF 5