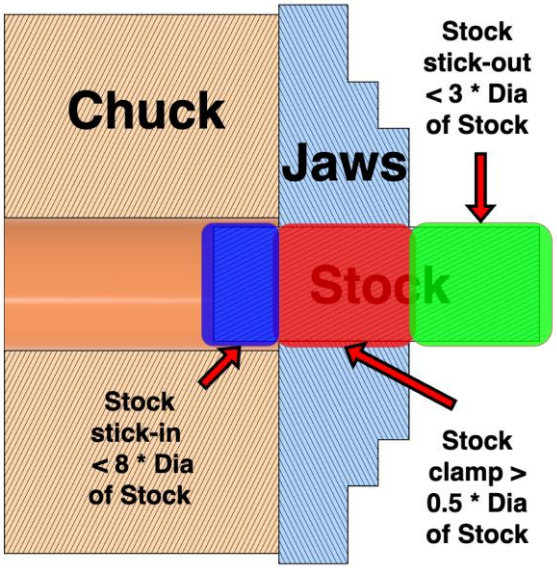
ST20 Standard Operating Procedure

LIMITATIONS

- ❑ This checklist is only for Turning Face, Drilling, Turning Profile Roughing (only OD), Turning Profile Finishing (only OD), Turning Chamfer, Turning Single Grove, Turning Part and Turning Chamfer.
- ❑ This checklist is only for automatic probing, manual probing is beyond the checlist.
- ❑ The checklist is only meant for material ISO grade N, P, M. You can find the ISO grade of your material using the following link: https://www.purdue.edu/bidc/wp-content/uploads/2021/08/ISOGrade.pdf. ISO grade C or unknown materials are not allowed.
- ❑ Stock diameter (D/Dia) needs to be >= ¼" and <= 3¼". The placement needs to respect the rules below:



- ❑ This checklist only covers changing inserts and adding/removing solid drills. The tool holders should also be in the correct spots as shown in the table below. Anything out of this order is non-standard.

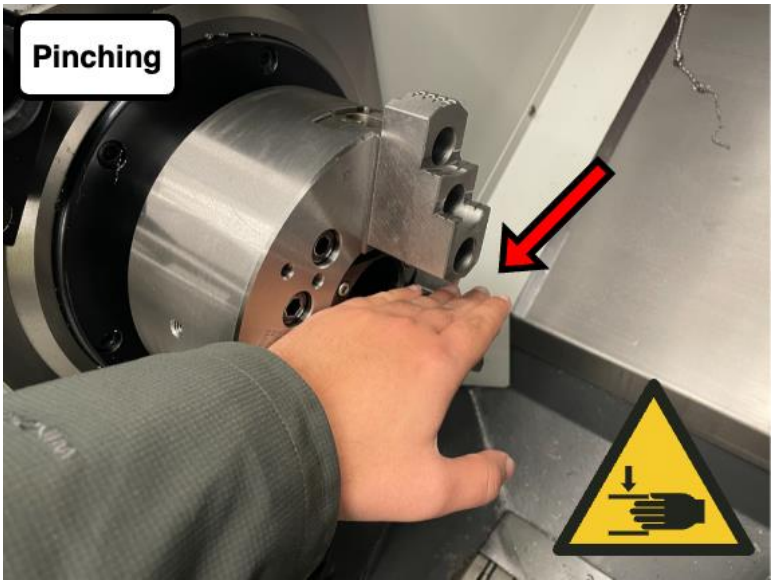
Tool Number	Tool Type
1	Right Hand – KenLoc – C Style
2	KM-50 Axial block for ER32 holders (solid carbide drills), DFR inserted drills, and boring bars
3	Right Hand – KenScrew – V Style
4	KM-50 Axial block for ER32 holders (solid carbide drills), DFR inserted drills, and boring bars
5	Left Hand – KenScrew – V Style
6	KM-50 Axial block for ER32 holders (solid carbide drills), DFR inserted drills, and boring bars
7	Right Hand – OD Threading
8	KM-50 Axial block for ER32 holders (solid carbide drills), DFR inserted drills, and boring bars
9	Right Hand – TopNotch – OD Groving
10	DO NOT USE
11	Right Hand – Beyond Evolution – OD Part Off
12	DO NOT USE

- ❑ This checklist only covers LMC Standard.
- ❑ Anything outside of these limitations like tailstock, live tooling, threading etc. require a supervisor or higher supervising to proceed.

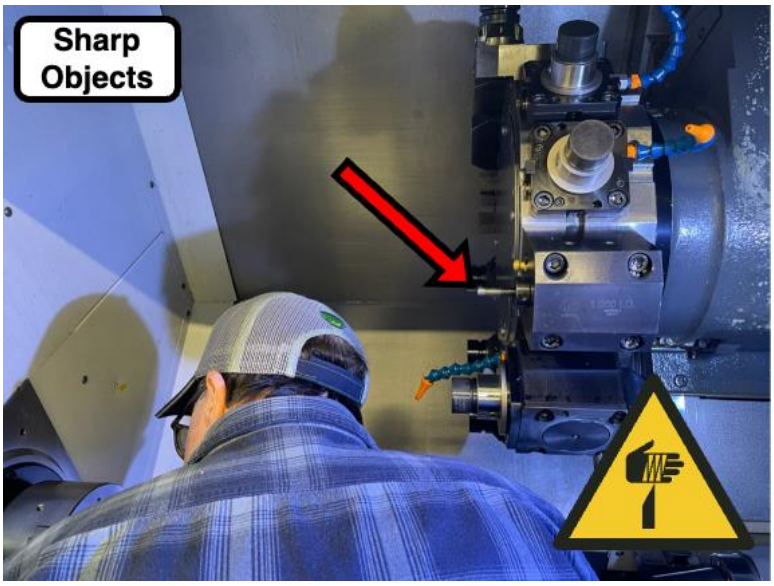
MACHINE SPECIFIC HAZARDS

- Hands can be caught in the rotating spindle or moving chip belt.

- Hands can get pinched on chuck jaws.



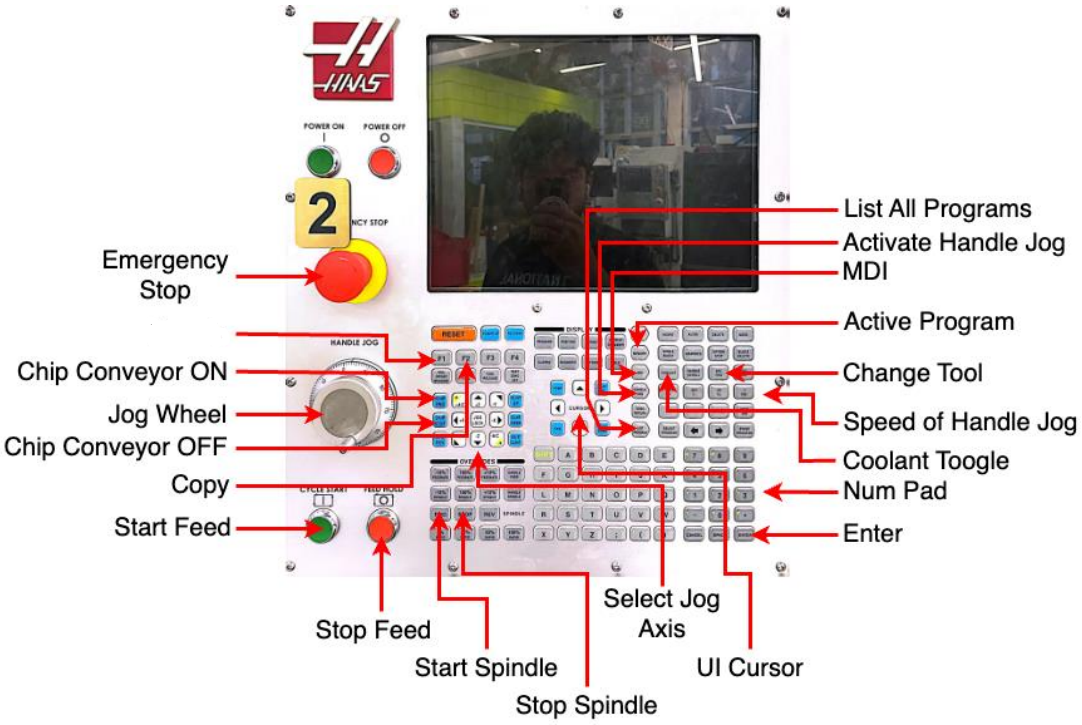
- The tools can cut your hands.



- ❑ Coolant can irritate your skin.

- ❑ Stock, tools and jaws can be heavy.

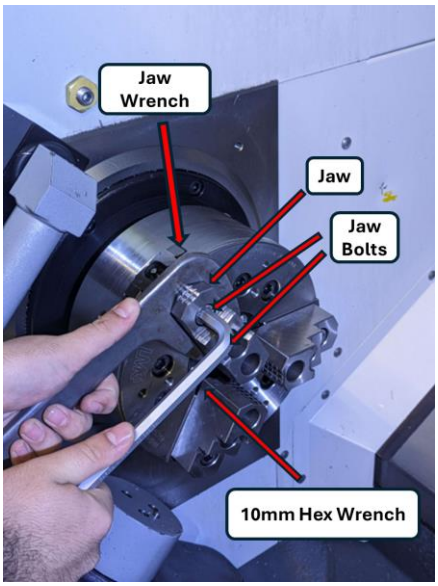
MACHINE CONTROLS


Emergency Stop
Chip Conveyor ON
Jog Wheel
Chip Conveyor OFF
Copy
Start Feed
Stop Feed
Start Spindle
Stop Spindle
Select Jog Axis
UI Cursor
List All Programs
Activate Handle Jog
MDI
Active Program
Change Tool
Speed of Handle Jog
Coolant Toogle
Num Pad
Enter

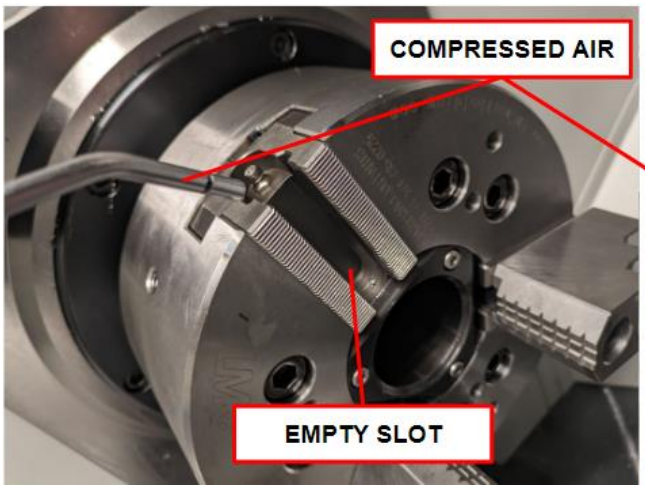
PRE-FLIGHT

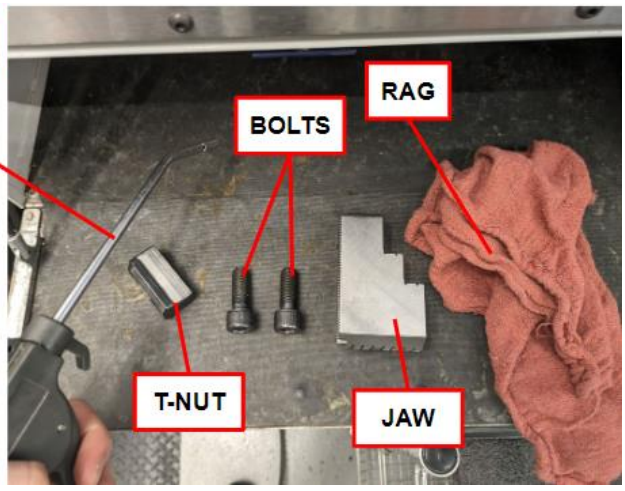
Jaw Assembly

- ❑ Use a 10mm hex **WRENCH** to remove the 2 **BOLTS** from each of the 3 **JAWS**. You may use the **JAW WRENCH** to keep the **JAWS** stationery.

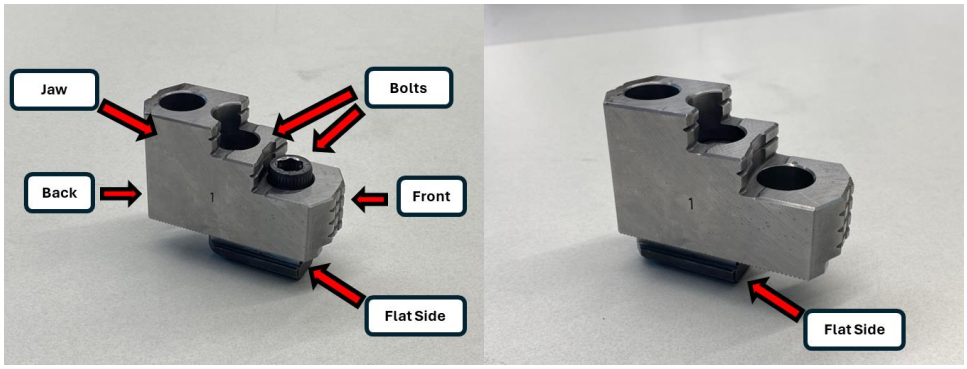


- ❑ Clean the **BOLTS**, **T-NUTS**, **JAWS** and **SLOT** with a **RED RAG** and **COMPRESSED AIR**.

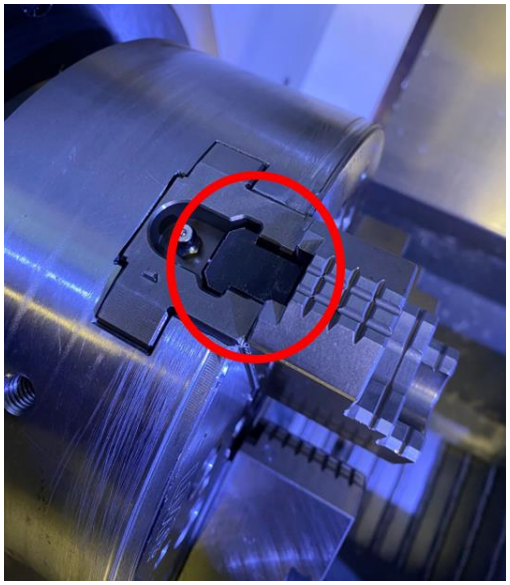


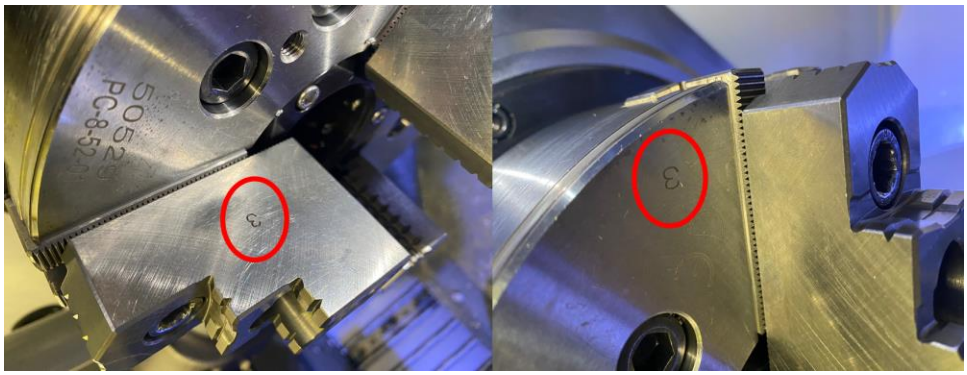


- Partially screw in the **BOLTS** into the **T-NUTS** through the **JAWS**. Ensure the **T-NUTS** are oriented as shown. There are 3 holes in the **JAWS**, use the **FRONT** holes if your stock diameter is <= 2.3”. Otherwise use the **BACK** holes.



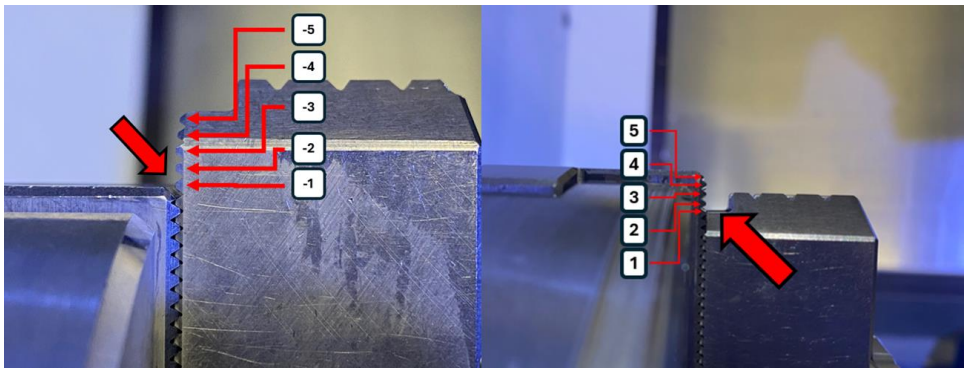
- Place **JAW** and **T-NUT** assembly in the slots. Ensure the orientation of the **T-Nut** is as shown (flat side out). Also make sure that the numbers between **SLOTS** and the **JAWS** match. Make the **BOLTS** finger tight so the assembly does not fall off.





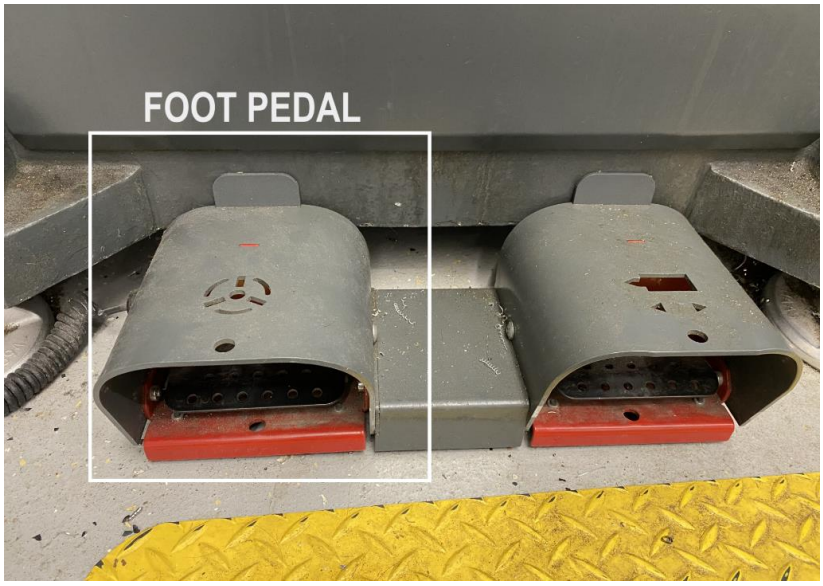
- ❑ Count the number of **TEETH** that are exposed. Use this equation to figure out how many **TEETH** need to be exposed. Negative values are shown in the image below. Ensure all **JAWS** have the exact same **TEETH** count exposed, if not resecure them to match.

TOOTH NUMBER = -7.8 * STOCK DIAMETER +12.75

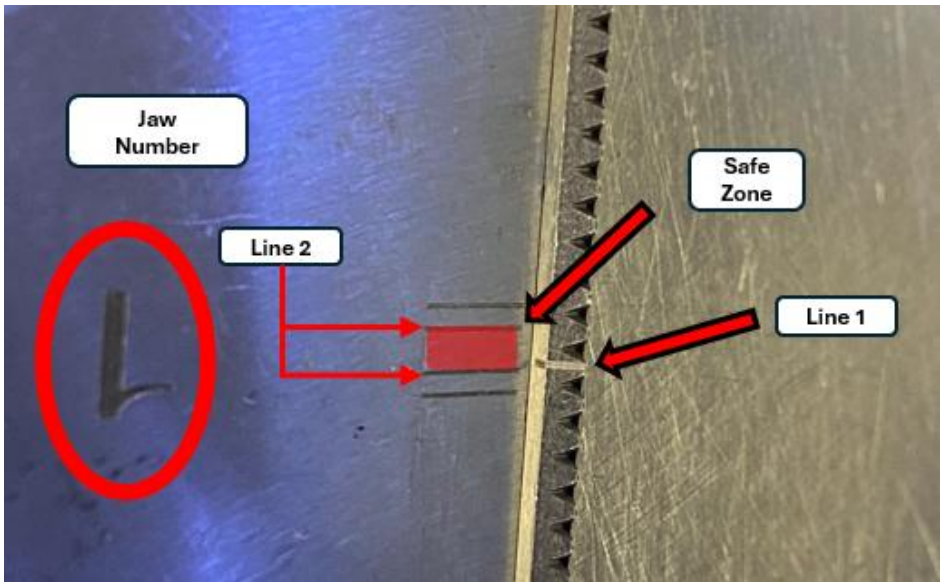


- 5 teeth +5 teeth

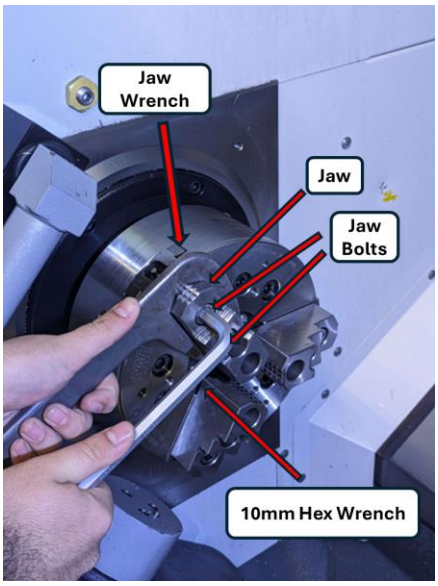
- ❑ Clamp the **STOCK** in the secured **JAWS** using a **FOOT PEDAL**.



- Look at the **INDICATOR** on **JAW #1** to ensure it is within the **CENTRAL BOX**. If not make **TEETH** adjustment.



- With the **STOCK** removed, tighten the **BOLTS** as much as the hex **WRENCH** will allow. You will need to use the **JAW WRENCH** to achieve this.



- You may clamp the **STOCK** now if your **STICK-OUT** is <= 4.5”. If not, you will have to run the program without **STOCK** to probe all the tools and then re-post the program without tool probing and run it with the **STOCK** in the machine. When placing the **STOCK** ensure the placement matches CAD.

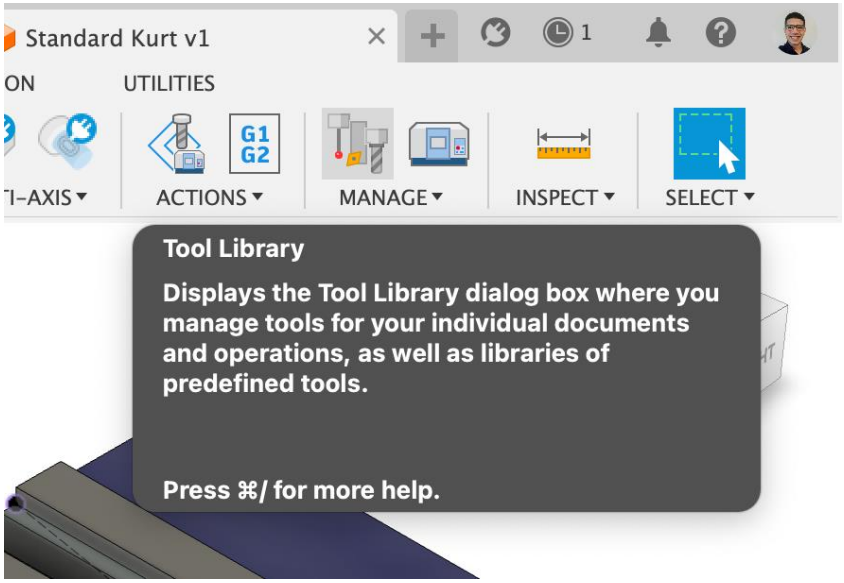
Program Load

- Upload CAM from PC to **NETSHARE** folder in Fusion Team.
- Press **LIST PROGRAM.**

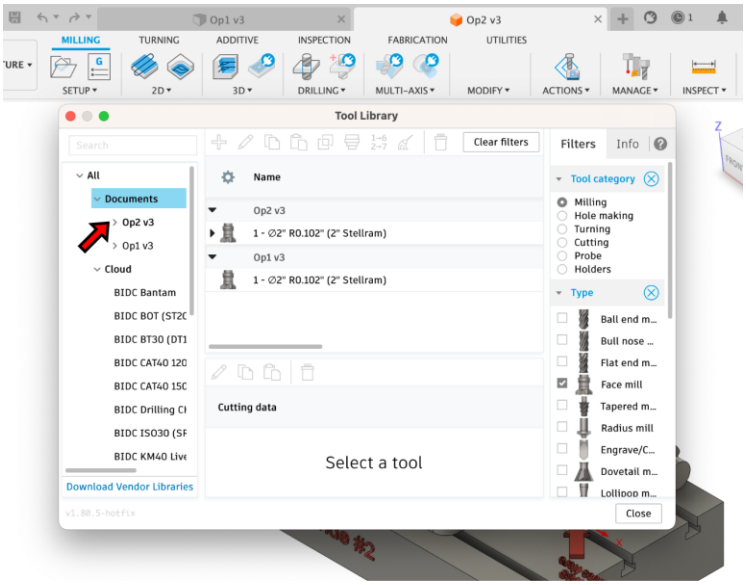
- ❑ Navigate to **NETSHARE** using **CURSOR**.
- ❑ Type program code using **NUM PAD** and press down arrow in the **UI CURSOR** to search for it.
- ❑ Press **ENTER.**
- ❑ Press **F2 / COPY.**
- ❑ Press **ENTER** twice to copy into memory.
- ❑ Press **MEM** to view G-code.
- ❑ Ensure loaded program is accurate.

Insert Placement

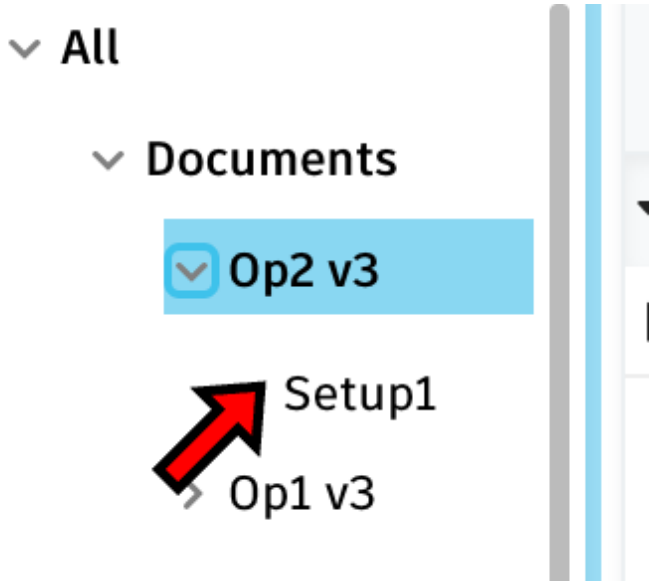
- ❑ Open **TOOL LIBRARY** in Fusion 360.



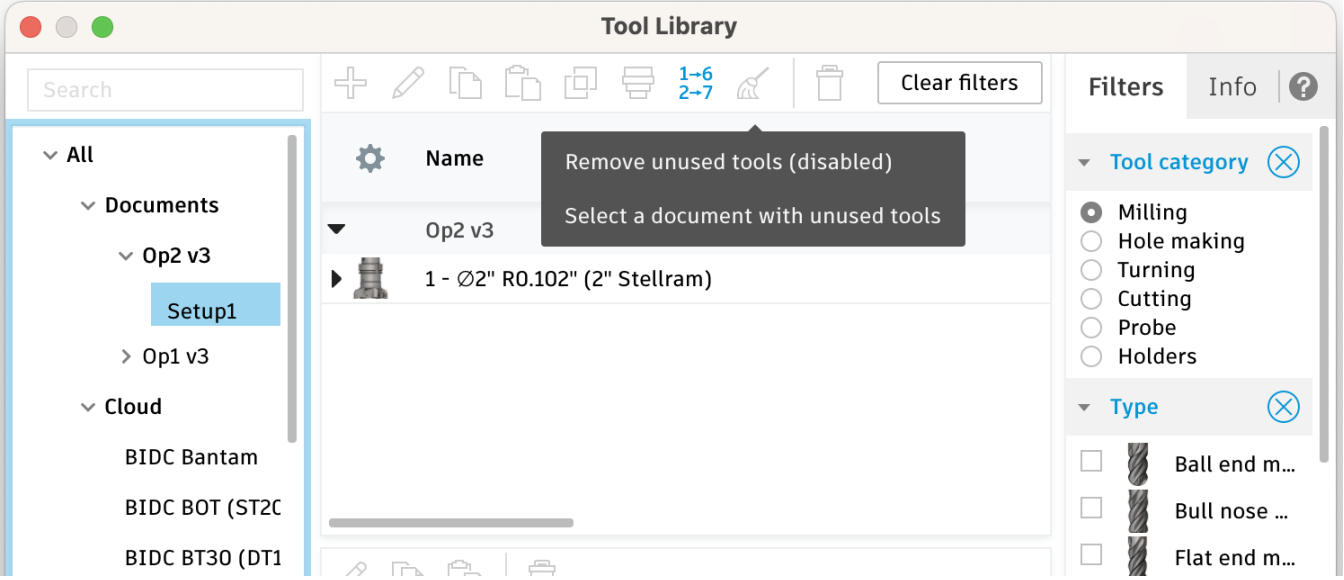
- ❑
- ❑ Navigate to tools for current document.



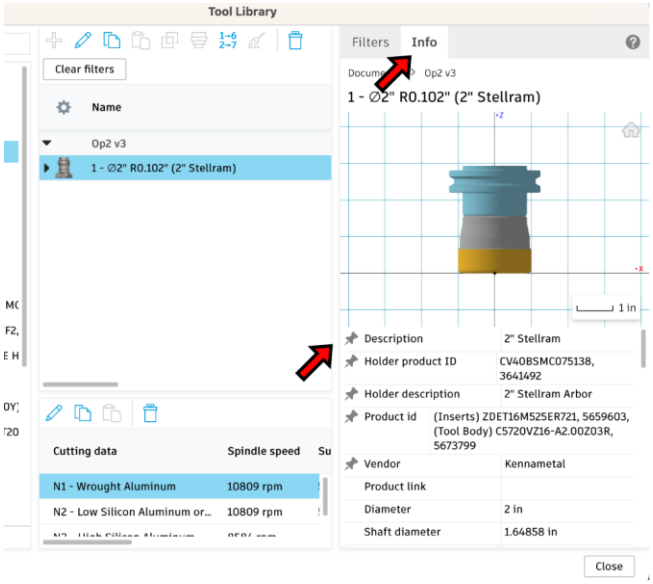
- ❑ Navigate to the current setup.



- ❑ Press **REMOVE UNUSED TOOLS** and accept the popup.

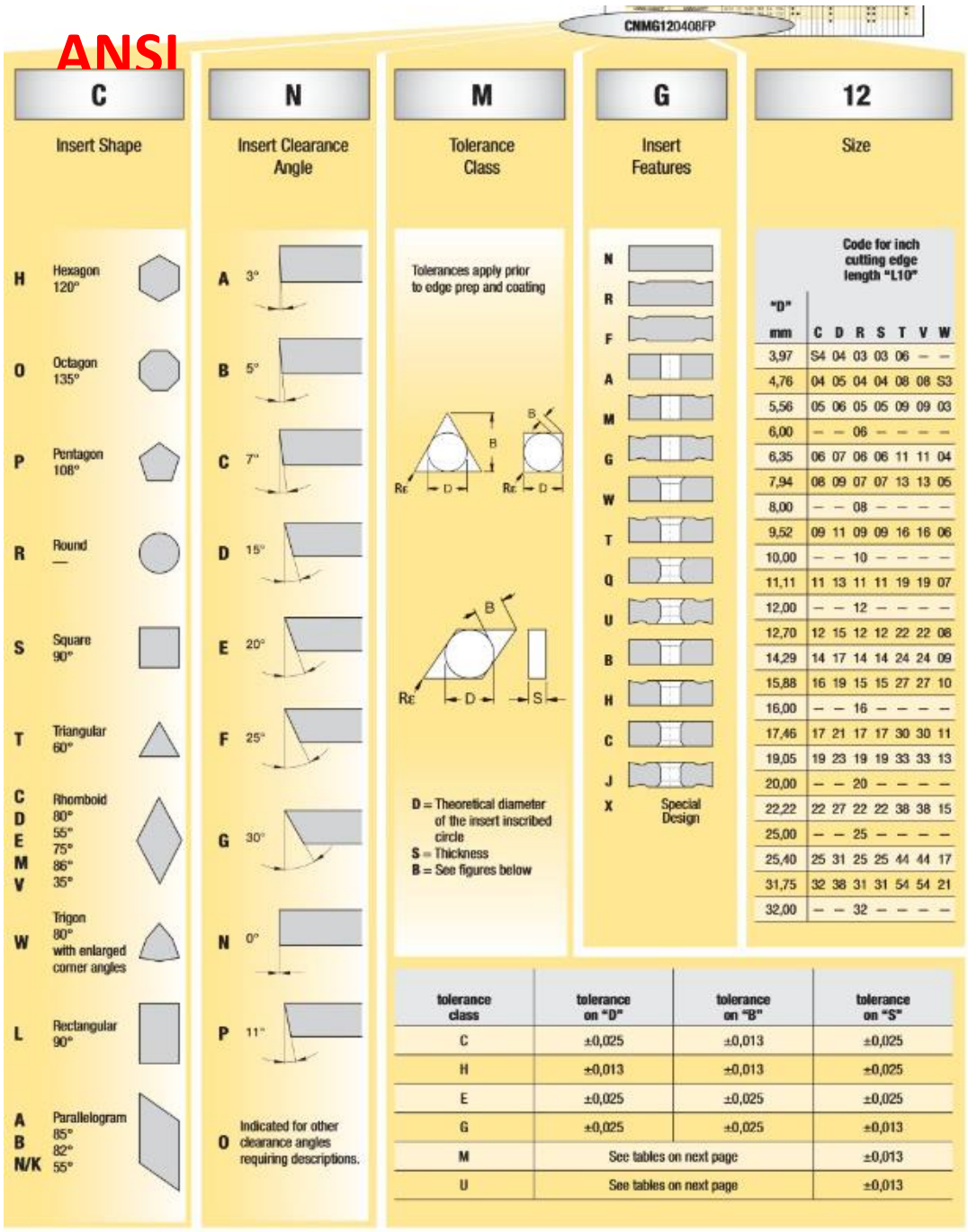


- ❑ Select tool in list so **INFO** bar on right populates with information.
- ❑ Check tool under **DESCRIPTION** and **PRODUCT ID** if necessary.



- ❑ Find the **INSERT** in the **INSERT** drawers which match **PRODUCT ID**. Keep in mind the **ANSI** code describes the geometry (there may be different inserts with same geometry), the **GRADE** describes the material (there may be different inserts made with same material), the **SAP CODE** (7 digit numeric) is unique. **ANSI** (alpha numeric) with **GRADE** (alpha numeric) is also unique.

- The information below may be useful in understanding the codes:



tolerance class	tolerance on "D"	tolerance on "B"	tolerance on "S"
C	±0,025	±0,013	±0,025
H	±0,013	±0,013	±0,025
E	±0,025	±0,025	±0,025
G	±0,025	±0,025	±0,013
M	See tables on next page		±0,013
U	See tables on next page		±0,013

ANSI CODE

CNMG120408FP

04	08			FP
Thickness S	Corner Radius "Rε"	Hand of Insert *(optional)*	Cutting Edge *(optional)*	Chipbreaker *(optional)*

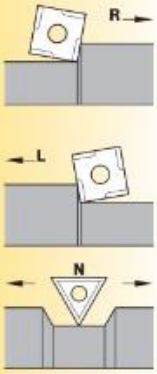
symbol	thickness
mm	mm
—	0,79
T0	1,00
01	1,59
T1	1,98
02	2,38
03	3,18
T3	3,97
04	4,76
05	5,56
06	6,35
07	7,94
9	9,52
11	11,11
12	12,70

symbol	corner radius	
mm	mm	
X0	0,04	
01	0,1	
02	0,2	
04	0,4	
08	0,8	
12	1,2	
16	1,6	
20	2,0	
24	2,4	
28	2,8	
32	3,2	
00		round insert
M0		
—		

R = Right hand

L = Left hand

N = Neutral



F — Sharp

E — Rounded

T — Chamfered

S — Chamfered and Rounded

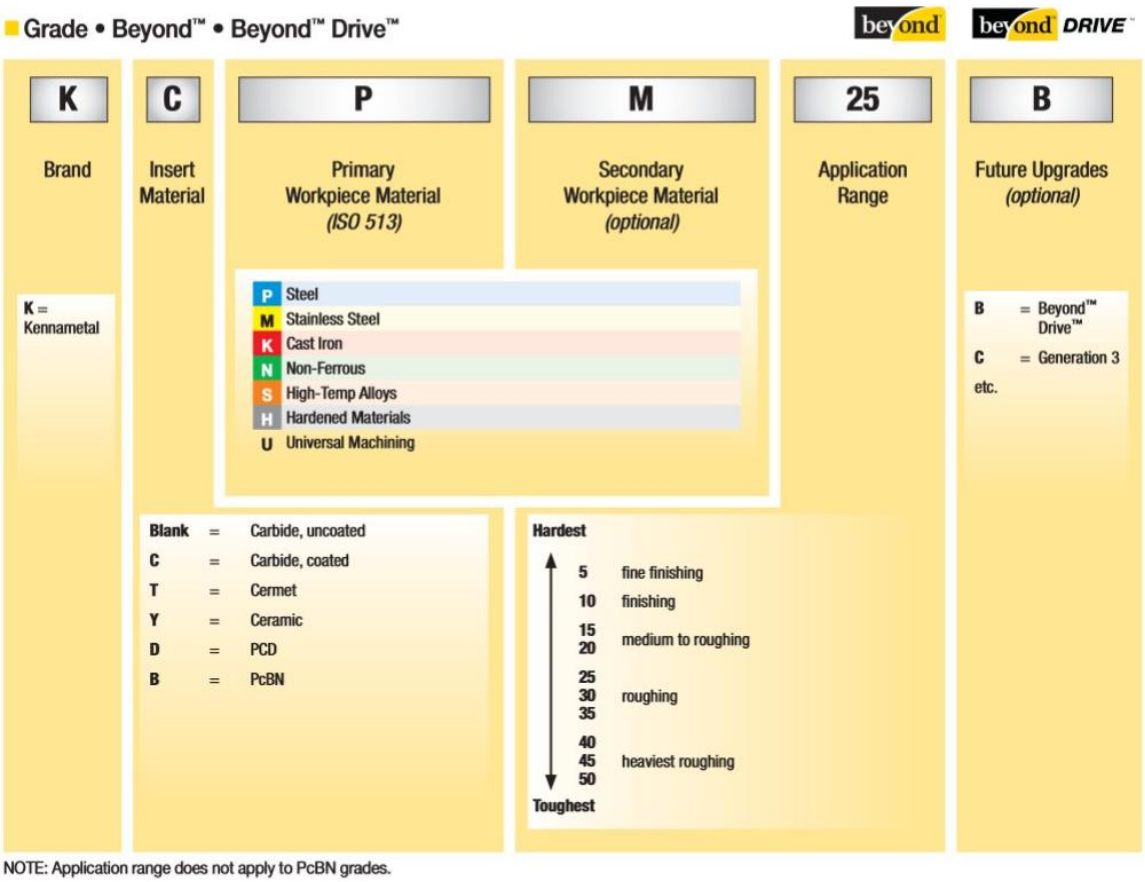
K — Double-Chamfered

P — Double-Chamfered and Rounded

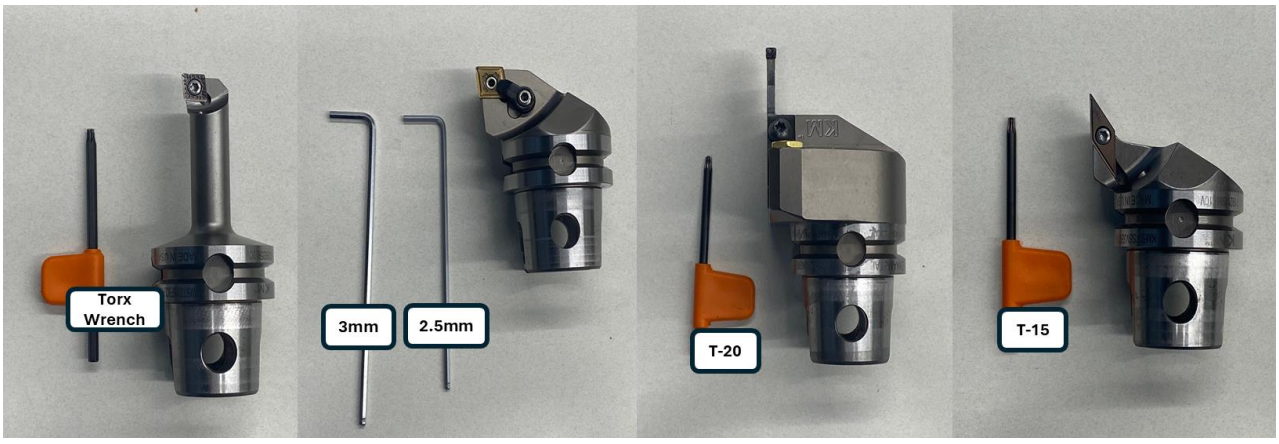
F	=	Sharp
FF	=	Fine Finishing
FN	=	Finishing Negative
MN	=	Medium Negative
MR	=	Medium Roughing
RN	=	Roughing Negative
UN	=	Universal Medium
FP	=	Finishing Positive
MP	=	Medium Positive
RP	=	Roughing Positive
RM	=	Roughing Medium
RH	=	Roughing Heavy
FW	=	Finishing Wiper
MW	=	Medium Wiper
FS	=	Finishing Sharp
MS	=	Medium Sharp
RW	=	Roughing Wiper
HP	=	High Positive
UP	=	Universal Positive
K	=	Light-Feed Chip Control
UF	=	Ultra-Fine Finishing
LF	=	Light Finishing
MF	=	Medium Finishing
E	=	Hone Only
T	=	Negative Land
S	=	Negative Land Plus Hone
MP-K	=	Medium Positive
MG-P	=	Medium Positive

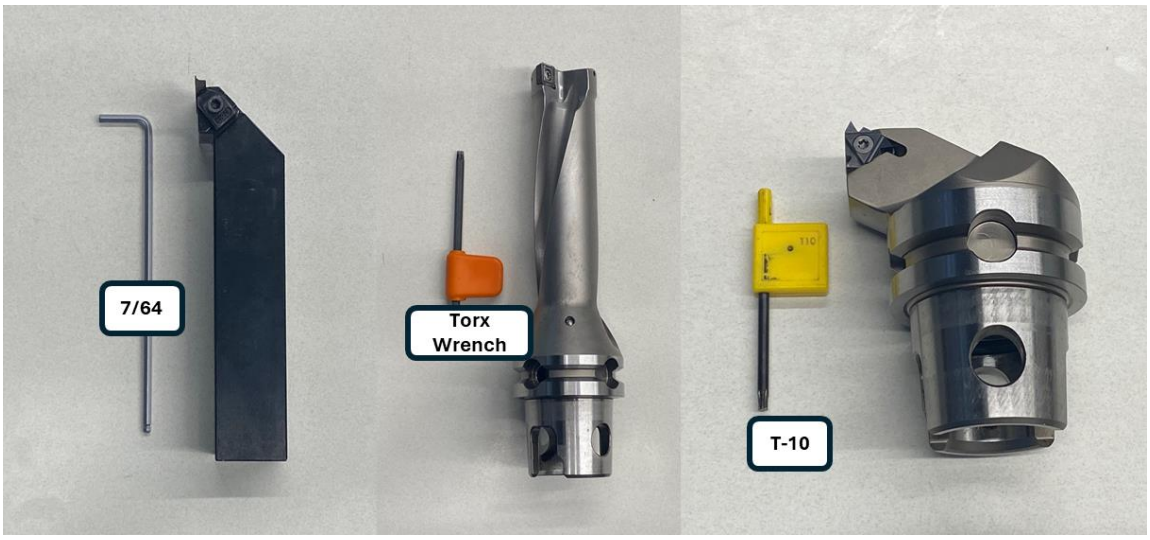
	± Tolerance on "D"			
	Class M Tolerance			Class U Tolerance
"D"	Shapes S, T, C, R, & W	Shape D	Shape V	Shapes S, T, & C
mm	mm	mm	mm	mm
3,97	0,05	–	–	–
4,76	0,05	–	–	0,08
5,56	0,05	0,05	0,05	0,08
6,35	0,05	0,05	0,05	0,08
7,94	0,05	0,05	0,05	0,08
9,52	0,05	0,05	0,05	0,08
11,11	0,08	0,08	0,08	0,13
12,70	0,08	0,08	0,08	0,13
14,29	0,08	0,08	0,08	0,13
15,88	0,10	0,10	0,10	0,18
17,46	0,10	0,10	0,10	0,18
19,05	0,10	0,10	0,10	0,18
22,22	0,13	–	–	0,25
25,40	0,13	–	–	0,25
31,75	0,15	–	–	0,25

	± Tolerance on "B"			
	Class M Tolerance			Class U Tolerance
"D"	Shapes S, T, C, R, & W	Shape D	Shape V	Shapes S, T, & C
mm	mm	mm	mm	mm
3,97	0,08	–	–	–
4,76	0,08	–	–	0,13
5,56	0,08	0,11	–	0,13
6,35	0,08	0,11	–	0,13
7,94	0,08	0,11	–	0,13
9,52	0,08	0,11	0,18	0,13
11,11	0,13	0,15	–	–
12,70	0,13	0,15	0,25	0,20
14,29	0,13	0,15	–	–
15,88	0,15	0,18	–	0,27
17,46	0,15	0,18	–	0,27
19,05	0,15	0,18	–	0,27
22,22	0,15	–	–	0,38
25,40	0,18	–	–	0,38
31,75	0,20	–	–	0,38



- ❑ Once you have acquired the correct **INSERT** compare it against the **INSERT** in the machine. If they match, then you can proceed to the next tool.
- ❑ If not, then change the **INSERT** as shown in the images below.

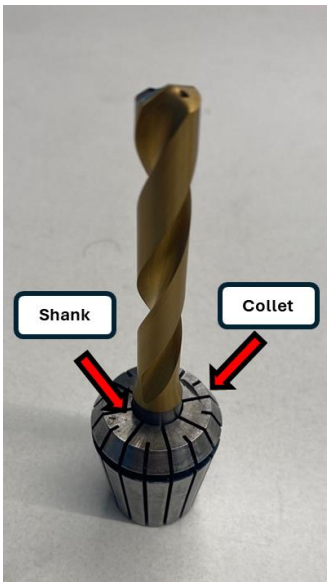




- While changing ensure you check to make sure the **SHIMS**, **SEATS** and **SCREWS** are in good condition.

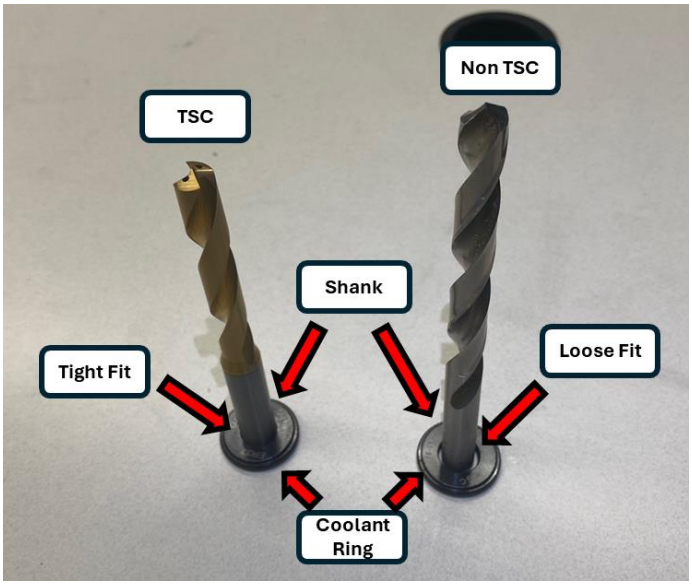
Solid Drill Placement

- ❑ Obtain **DESCRIPTION, PRODUCT ID** and **LENGTH BELOW HOLDER** from the **INFO** tab as shown above.
- ❑ Select an ER32 **COLLET** based on the diameter of the **SHANK**. The **COLLET** should never expand when you place your tool in it.

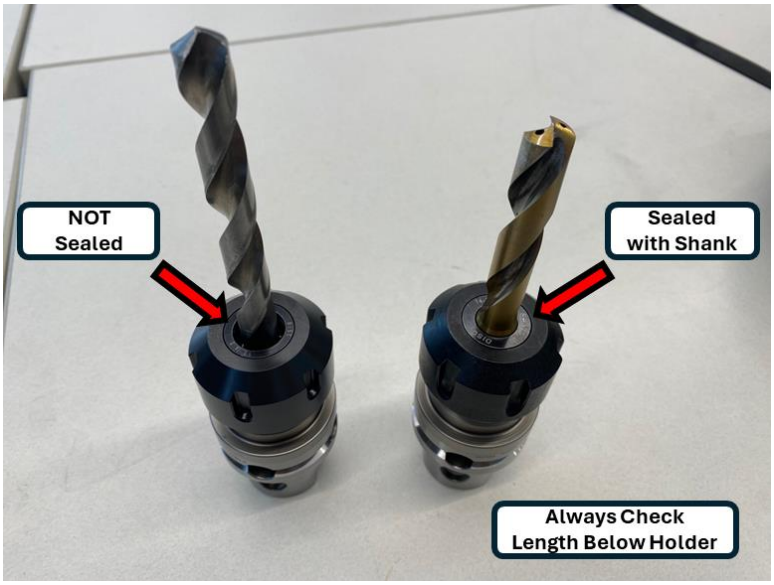


- ❑ Select a **COOLANT RING** for the tool. If the tool has no **TSC** capability use a ring that leaves an 1/8” gap around the tool. Otherwise pick one that seals on the tool **SHANK**.

- ❑ Get a ring compatible ER32 **NUT**. Clean SHANK, NUT, TAPER, COLLET and COOLANT RING.



- ❑ Assemble as shown:



OPERATE

- ❑ Press **CYCLE START / START FEED.** Hover hand over **FEED HOLD / STOP FEED**.
- ❑ Load tools based on instructions from above and tool numbers from CAM.

- ❑ Tools will probe automatically, notify Supervisor if the control throws an error.
- ❑ Check CAM for the current toolpath, before every operation, and **know the trajectory**.
- ❑ Press **FEED HOLD / STOP FEED** if machine operation deviates from expected (breakages, abnormal loud sounds, etc.)
- ❑ Check tools and parts after every operation.

POST-FLIGHT

- ❑ Disassemble all solid drills and return **COLLET**, **COOLANT RING** and **TOOL**.
- ❑ Remove **STOCK**.
- ❑ Use **CUT GLOVES** to remove **LONG CHIPS** and place them in the **METAL SCRAPS**.

- ❑ Press **Chip FWD** and use chip conveyor if necessary.
- ❑ Mop up any coolant drops that might be on the floor.
- ❑ Complete assigned 5-minute shop job at the end of your reservation.