

COLLISION AVOIDANCE SYSTEM

OSP-P300LA/SA (LATHE)

TRAINING GUIDE

The topics and procedures mentioned in this guide are intended to be for reference only. Always refer to the books provided by Okuma specific to your machine for details on any material covered in this guide. Many of the functions listed are machine and controller specific. Hartwig cannot be held responsible for the misinterpretation of this guide.

Throughout this document, you will find QR codes that will navigate you to additional content. The content is often viewable from a smartphone or able to be forwarded to an email for use on a desktop PC. In addition, each QR code is clickable for digital copies of this document to allow for easy navigation from a computer or smartphone. This first QR is a link to the digital copy of this document.

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OUTLINE

Okuma's Collision Avoidance system offers OSP users the ability to actively monitor the machining environment and allow the machine to detect collisions before they occur. Though this function is optional on some machines, it comes standard on most multi-axis or multi-turret machines and when used properly can allow for more confident use of the Okuma line. This guide will cover topics commonly encountered by CAS users. Since CAS is a commonly used function on the OSP, you can find several resources online. Consider taking the time to review these videos.

CAS Overview by Okuma:



CAS Multus U3000 by Charlie with Gosiger:



OPERATING CAS

To access CAS, you will need to look to the vertical function keys which can be found on the right side of the screen.

The screenshot displays a CNC control interface with the following sections:

- Header:** S.T.M, 2018/01/31, 12:43:21, Home icon.
- Mode:** AUTO OPERATION, A-MTD.
- Program:** Imm(PROGRAM), ACT POSIT, WK SETUP.
- Actual Position (Work):**

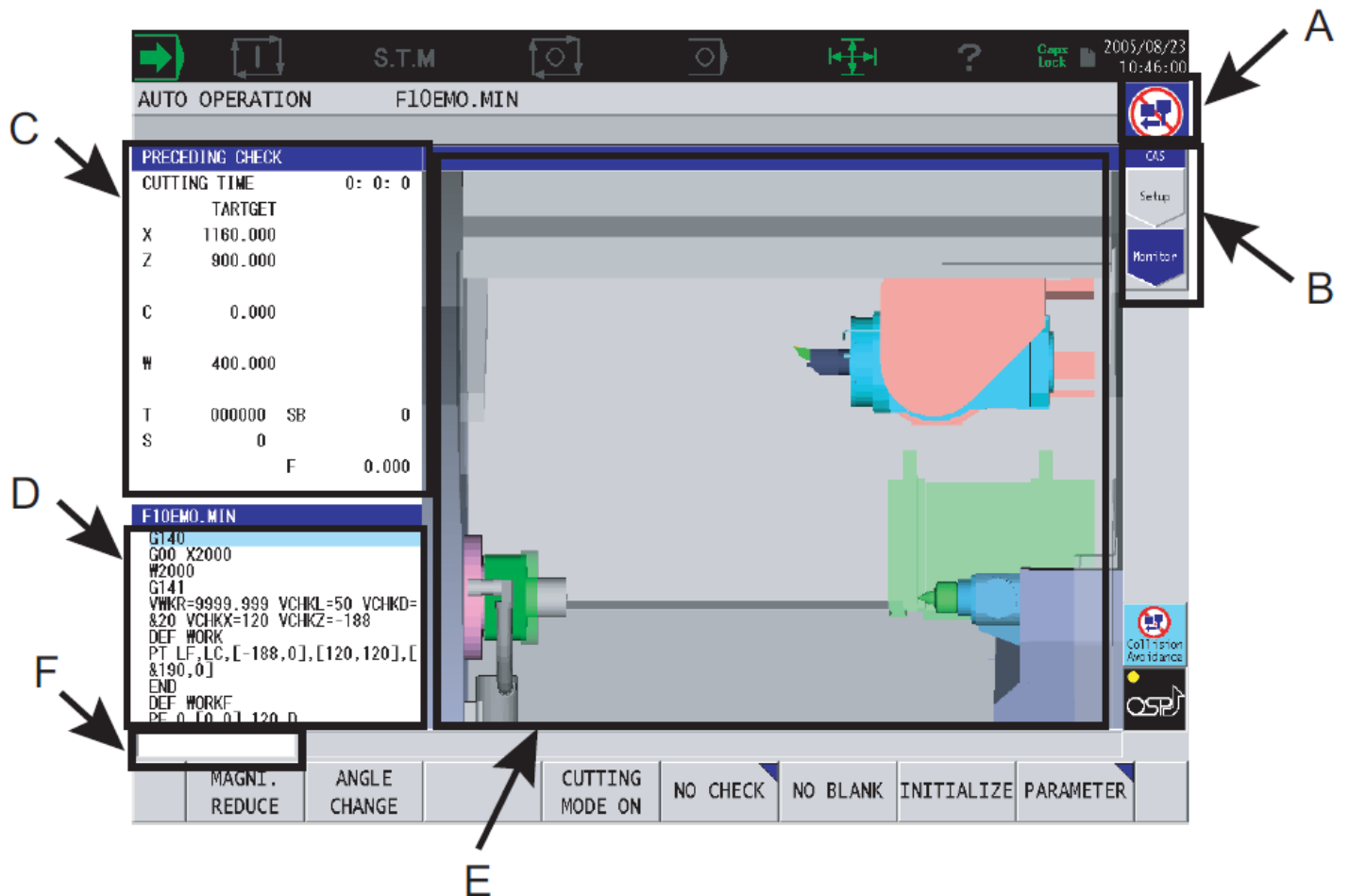
	POSITION	DISTANCE	TARGET
X	0.199	0.000	0.199
Y	-281.000	0.000	-281.000
Z	461.000	0.000	461.000
- Animated Simulation (Real 3D):** G.Co 0, HIGH DRAW, TRACE, MATERIAL, SECTION, TRANSPARENT, CUTTING TIME 0: 0: 0.
- Main/Sub Program (Exec):** N 1
- Machine Status:**

		M15	M139	M511
G00	G266	M115	M133	M331
G17		M131	M927	M402
G23		M914	M913	M605
G53		M135	M326	M633
G90		M137	M900	M676
G94				
- Vertical Toolbar (Right Side):** Includes icons for STOP, DSP, and other functions. A red box highlights this toolbar, and a red arrow points to external icons.
- Bottom Panel:** PROGRAM SELECT, ACT POSI ENLARGE, RESTART, NUMBER SEARCH, NUMBER STOP, POSI SET RELATIVE, QUICK EDIT, WINDOW CHANGE.

External icons on the right include:

- Collision Avoidance (blue icon with a red circle and slash)
- OSP (black icon with white text)

SCREEN EXPLANATION



(A) Collision Avoidance System status indicator

Indicates whether the interference check is valid or invalid. (Blue is CAS active, Yellow is No Check on, Red is CAS disabled)

(B) Optional Operation Key

Used to select operations from the Collision Avoidance System screen.

Press the "Setup" key to input a 3D model.

Press the "Monitor" key to perform operations such as checking the interference location or setting the interference check conditions.

(C) Current Position Display Area

Displays the machine's current position and the program's command value.

(D) NC Program Display Area

Displays the program that an interference check is being performed on in automatic operation.

(E) Graphic Display Area

Graphically displays the machine's operating status.

(F) Data Input Column

Displays data that are currently being input.

OPTIONAL OPERATION KEYS

As previously mentioned, there are two operation modes. Pressing the screen will activate one of the two modes. Several of these functions will be discussed in more detail later.



SETUP

If the “Setup” key has been selected, the following functional keys are accessible.

[F1] (DELETE MODELS)

Deletes the blank model, jig model and tool model used in the interference check temporarily, releasing them from the object of the interference check. It will return to its original state when the power is switched on again. This is also used when changing the blank, jigs, and tools.

[F3] (ADJUST MODEL POS.)

Adjust the positions of the 3D models of the virtual machine that is provided for a collision check.

[F6] (CAS SYSTEM PARAMETER)

Activates or deactivates the collision check function with the use of a password. Re-supply the power to make this setting effective.

MONITOR

If the “Monitor” key has been selected, the following functional keys are accessible.

[F1] (MAGNI.REDUCE)

Use the Page key to enlarge or reduce the size of the graphic display or use the cursor keys to move the graphic display area.

[F2] (ANGLE CHANGE)

Use the cursor keys to change the viewing angle of the graphic display.

[F4] (CUTTING MODE ON)

This is used in the case of cutting in the manual operation mode.

[F5] (NO CHECK)

This is used to release the display from the blank, jig, or tool 3D model from being the object of the interference check.

[F6] (NO BLANK)

Deletes the blank from the graphic display and releases it from being subject to the interference check.

[F7] (INITIALIZE)

Returns the blank model, jig model, and tool model to their initial state and displays that.

[F8] (PARAMETER)

Sets all the different parameters used in the interference check.

IGNORE INTERFERENCE /NO CHECK

It is possible to individually exclude 3D models of a blank or jigs from interference checks. Please be aware, as indicated, no interference with the selected items will be checked. This will still check machine interference with the tooling such as a cutting tool interfering with the machine casting or sheet metal. This should only be used by setup personnel as needed for testing methods. These items can be selected by selecting Monitor mode and pressing F5 for the NO CHECK screen.

PARTS NOT CHECKED FOR INTERFERENCE		
	PARTS CHECKED FOR INTERFERENCE	
WORKPIECE	<input checked="" type="button" value="INCLUDE"/>	<input type="button" value="NOT INCLUDE"/>
CHUCK	<input type="button" value="INCLUDE"/>	<input type="button" value="NOT INCLUDE"/>
JAW	<input type="button" value="INCLUDE"/>	<input type="button" value="NOT INCLUDE"/>
TAILSTOCK CENTER	<input type="button" value="INCLUDE"/>	<input type="button" value="NOT INCLUDE"/>

Highlight the item you wish to ignore from the CAS check method and press F1 for MENU, then F3 for NOT INCLUDE. You must press F7 for OK to accept the new settings. The items selected will now be ignored by CAS. Once performed the "Collision Avoidance System status indicator" will now be yellow indicating one or more items in CAS are being ignored.

SETTING INTERFERENCE CHECK PARAMETERS

Several CAS Parameters may be accessed through the Monitor screen and by pressing F8.

PARAMETER			
COORDINATE AXIS	<input type="button" value="DISPLAY"/>	<input checked="" type="button" value="NOT DISPLAY"/>	
AUTO OPR DRAWING MODE	<input type="button" value="PRECEDE"/>	<input type="button" value="MACHINE"/>	<input type="button" value="W/O DRAW"/>
COLLISION CLEARANCE	<input type="text" value="5"/>		
COLLISION CHECK MODE	<input type="button" value="MODE OFF"/>	<input type="button" value="MODE ON"/>	
RATIO OF MAGNI.	<input type="text" value="4"/>		
MOVING UNIT	HORIZONTAL <input type="text" value="0"/>	VERTICAL	<input type="text" value="0"/>
ANGLE UNIT	LONGITUDE <input type="text" value="0"/>	LATITUDE	<input type="text" value="0"/>
MACHINE MODEL	<input type="button" value="Stdyrest"/>	<input type="button" value="W/O"/>	
COLLISION CHECK WAY BETWEEN TURRETS (AUTO/MDI OPR)			
	<input type="button" value="BARRIER"/>	<input type="button" value="PRECEDE"/>	
INPOSITION LINEAR AXIS	<input type="text" value="0.100"/>		
INPOSITION C AXIS	<input type="text" value="0.100"/>		
COORDINATE OF C AXIS	<input type="button" value="MACHINE"/>	<input type="button" value="PROGRAM"/>	

Through this screen and by using the page up / Page down keys, the following parameters may be adjusted. Please note that changes to these parameters may result in unexpected results. Please contact your local AE before changing the parameters to discuss any alternative solutions.

Item	Details	Setting Method
Coordinate axis vector	This sets whether a coordinate axis is displayed in the graphic display area. When the power is switched on, "NOT DISPLAY" is set.	Press the function key [F1] (MENU) and select [F2] or [F3]. Then press the function key [F7] (OK).
AUTO OPR DRAWING MODE	Sets the automatic or MDI operation drawing method in the graphic display area with the following options: Preceding Check: Displays the machine state in the block being checked for interference. Machine: Draws the current state of the machine. W/O Draw: Nothing is drawn. When the control reaches the top of the block where interference is detected, the interfering position is displayed.	Press the function key [F1] (MENU) and select the method with [F2] to [F4]. Then, press the function key [F7] (OK).
COLLISION CLEARANCE	In axial motion during manual operation, this sets the clearance distance for the stop position from the interference position if interference is detected.	Press the function key [F1] (SETTING) and enter the required value (in metric/inch).
COLLISION CHECK MODE	This sets whether to cancel or not cancel the interference check function in auto operation and MDI operation. When the power is switched ON, "MODE ON" is set.	Press the function key [F1] (MENU) and select [F2] or [F3]. Then press the function key [F7] (OK).
RATIO OF MAGNI.	This sets the zoom rate in the graphic display area immediately after the power is switched ON.	Press the function key [F1] (SETTING) and enter the required value (in metric/inch).
MOVING UNIT	This sets the amount of movement of the area displayed in the graphic display immediately after the power is switched ON.	Same as above.
ANGLE UNIT	This sets the amount of shift of the viewing angle of the graphic display immediately after the power is turned ON.	Same as above.
MACHINE MODEL (Only when more than one machine model is used as defined by Okuma)	When there are several machine models such as the one with removable steady rest, select the model to be used. Example) Steady rest: Steady rest model is used; otherwise, a model lacking steady rest is used.	Press the function key [F1] (MENU) and select [F2] or [F3]. Then press the function key [F7] (OK). The machine model changes to the selected one after re-supplying the power.
COLLISION CHECK WAY BETWEEN TURRETS (AUTO/MDI OPR for Multi-saddle lathes only)	Selects the method of detecting interference between turrets in automatic/MDI operation.	Press the function key [F1] (MENU) and select [F2] or [F3]. Then press the function key [F7] (OK).
IN POSITION LINEAR AXIS	Sets the in-position amount for the linear axis.	Press the function key [F1] (SETTING) and enter the required value (in metric/inch).
IN POSITION C AXIS	Sets the in-position amount for the C axis.	Press the function key [F1] (SETTING) and enter the required value (degrees).
COORDINATE OF C AXIS	Selects the coordinate system from between machine and program to express the C-axis the angle used for the C-axis interference check.	Press the function key [F1] (MENU) and select [F2] or [F3]. Then press the function key [F7] (OK).

DISABLING CAS

Due to the system resources consumed by some functions of the Okuma machine, CAS may need to be disabled during its use. Some of these include Hi-Cut Pro, Super Nurbs, and Hyper Nurbs, NC-B Axis Mode. If they are enabled during the operation of CAS, an alarm will occur which states “Alarm B 2058 Error Occurred while CAS works” which will stop the machine. In addition, it is never recommended to disable Okuma CAS unless necessary. This should only be done under the advisement of management and on proven sections of the code.

TEMPORARY DISABLE WITH M CODE

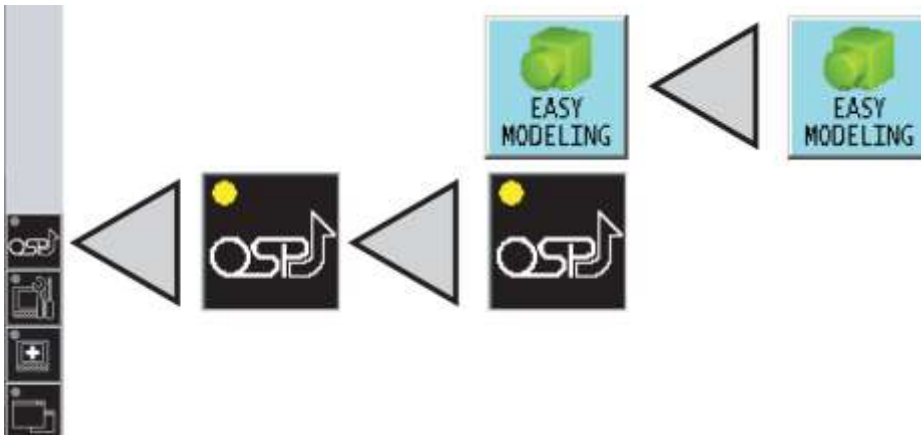
To temporarily disable CAS during the operation of these functions, use M867 (Disable CAS) and M866 (Enable CAS) as needed.

TEMPORARY DISABLE WITH PARAMETER

As mentioned in the “SETTING INTERFERENCE CHECK PARAMETERS” Section of this manual. You may disable CAS up until the machine’s next power cycle.

OPERATING EASY MODELING

Start the easy modeling function from the vertical row of function keys.



WORKING WITH THE MACHINING ENVIRONMENT

During the operation of CAS and the different approaches found in this guide, you may find that your machine differs from how the guide defines it. This could be due to several things such as options, machine zeros, and machine configurations. If at any point, a topic is not clear, please reach out to an Application Engineer for additional guidance. Okuma’s Collision Avoidance System is very complex, and it would not be efficient to cover every possible situation in one guide.

TOOL MODEL IMPORT IN CAS

Okuma has allowed us to import models into its collision avoidance system to save us time as well as increase model accuracy. With that said, it can still be very beneficial to draw models using easy modeling. Some models such as drills, boring bars, and standard

stick tooling can be drawn very quickly using the easy modeling system and will be covered later in this document. For holders that have unique adapter technology or unusual mounting block shape, you may find it beneficial to import the model provided by the tool manufacturer. Most of the time these models will need to have adjustments made to them regarding zero points, orientation, scale (inch vs metric), and file size reduction.

MACHINE ZERO POINT

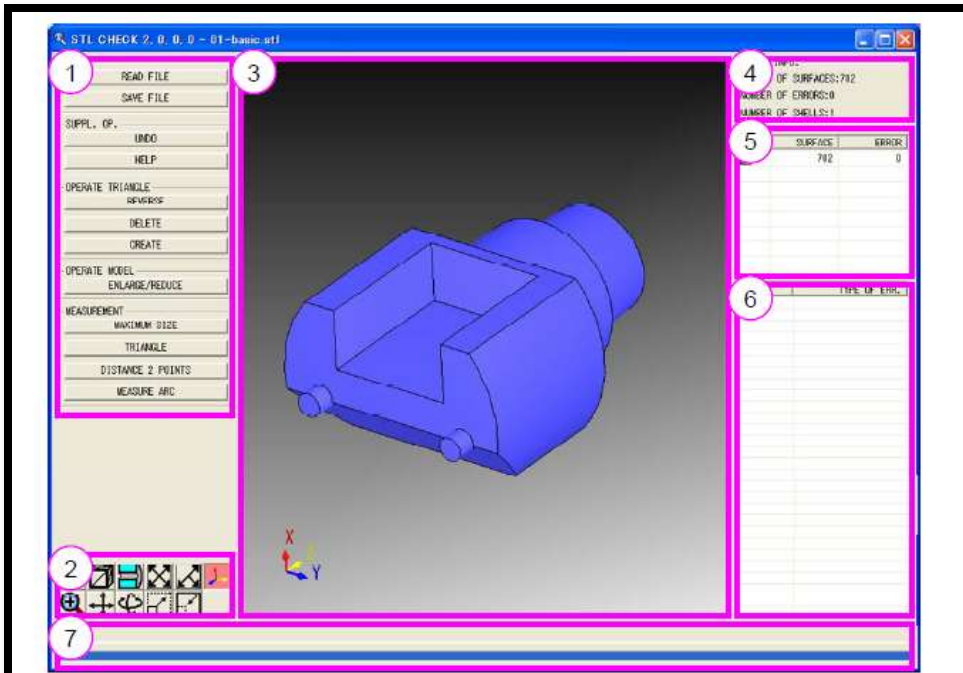
On both turret and milling head machines, they have a corresponding mounting position. This position is generally set from the factory as a specific position on the head or turret. However, some may find that their zero point is different for several reasons. If you use a reference tool setup, this point will be relative to the reference tool and must be calculated into the setup. Since this can be done on the machine and is generally machine specific, it is recommended that you follow this guide for zero-point setup and adjust on the machine if needed.

STL CHECK

STL Check is software that allows you to assess issues that an STL file might have before attempting to load it onto the machine. This software runs on a desktop PC and includes a few useful tools for navigating and checking the file. This benefits the user as the OSP cannot handle CAD modifications and has the following restrictions.

- Cannot contain multiple bodies (shells) in one file.
- Must be stored in millimeter scale (STL files cannot differentiate between metric and imperial scaling)
- Does not contain open bodies (closed shell only)
- Does not contain misaligned endpoints (some CAD STL translators allow for numerical error in the model and are repaired during processing. The OSP does not)

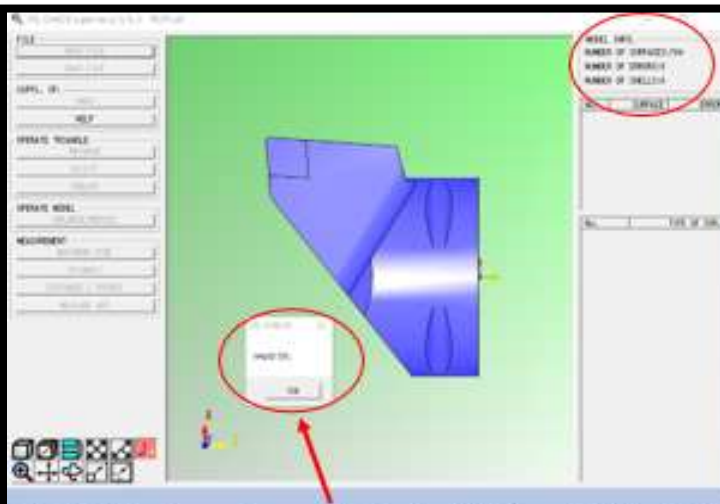
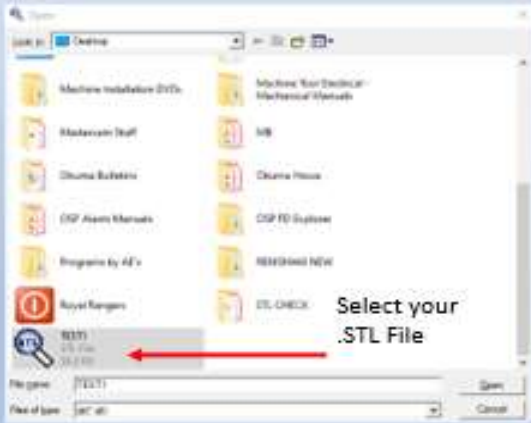
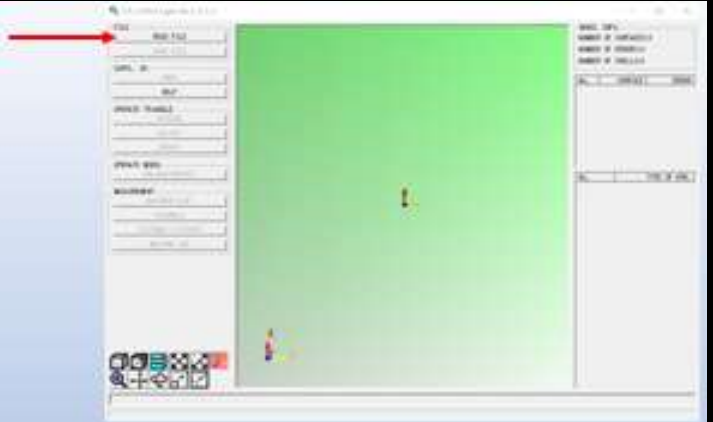
The STL check software will help identify these errors before discovering them while attempting to load them onto the OSP.



The STL Check Tool screen consists of the following areas (1) to (7) and the dialogs which pop up for each function.

- (1) Operation button
Used for file operation or model editing.
- (2) Auxiliary control button
Used for changing the graphic display method.
- (3) Graphic display
Used to display the STL model with shades or wires.
- (4) Model information display
Used to display the number of triangles, the number of erroneous triangles, and the number of shells.
- (5) List of shells
The list of shells is displayed with the number of triangles and the number of errors.
- (6) List of triangles with an error
The list of the triangles having an error is displayed according to the kind of errors.
- (7) Guidance display
Displays the operation guidance and the progress of processing.

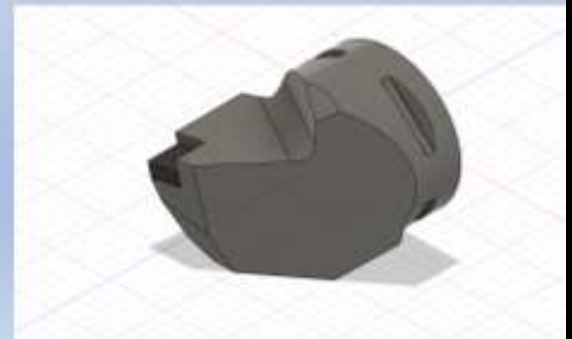
Read (OPEN) to find the folder or directory that your .STL file is in.



Number of Surfaces:
Try to keep this below 2000

You can see in this .STL Model that I have removed the CAPTO Shank, Insert, Insert Clamp and Clamp Screw.

This .STL File is now "acceptable" to the CAS/Easy Modeling System.



VALID .STL MODEL

Number of Surfaces is extremely too high...
 This is due to several reasons but again keeping it below 2000 is ideal

We have 5 bodies in this .STL Model.
 CAS/Easy Modeling will only support 1 body, so it must be combined in either your CAD/CAM System, IF you need CAS to support the features on the tool.

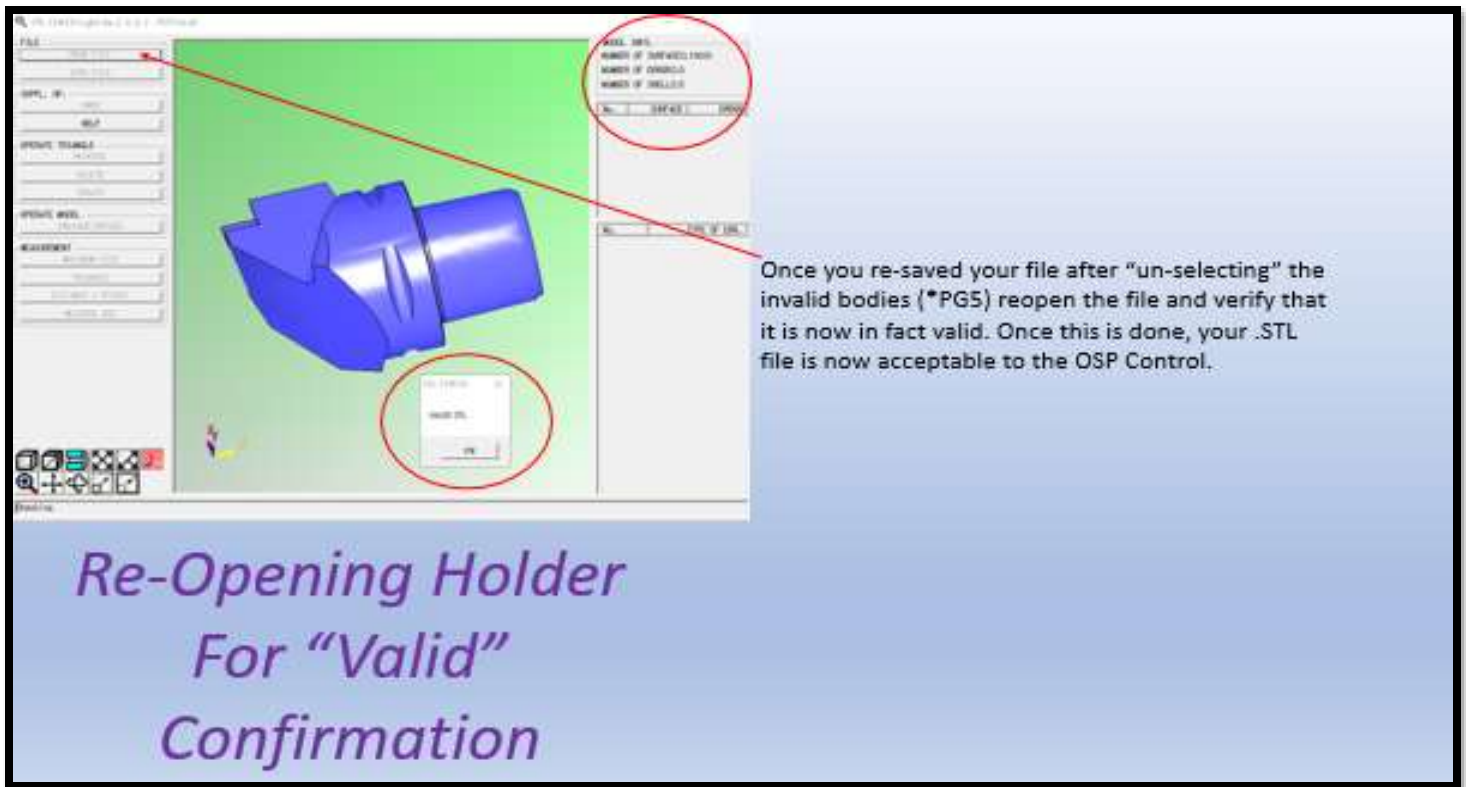
- (1. Holder Body)
- (2. Cutting Insert)(Okuma does not support bringing the insert in, so there is no point in doing so..)
- (3. Insert Clamp)
- (4. Clamp Screw)
- (5. Insert Seat)

INVALID .STL MODEL

Uncheck the bodies that are not the "tool holder".

"SAVE" the .STL Model after unchecking the other bodies so that it will only save the "1" tool holder body. This is a very useful tool in the STL Checker.

Saving Holder Into "1" Body



SOLID MODEL PREPARATIONS

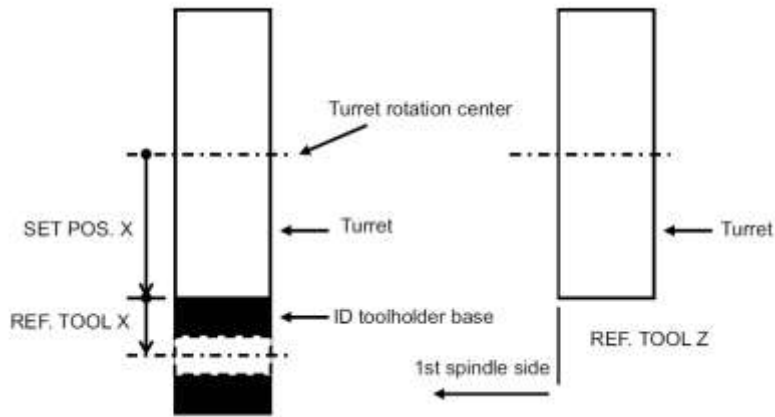
Many tool manufacturers will provide you with a detailed model of the holder for engineering and simulation purposes. Different companies will share their files with different formats, most commonly STEP file formats. You will require a CAD system to convert, align, scale, and detail these models. It's also recommended that if the tooling provider offers different levels of detail, it is much easier to use the simplified version. Details such as bolt holes, coolant nozzles, and screws. Here is a list of functions that may need to be performed on a model before importing it into the OSP control.

ORIENTATION AND ZERO POINT

Each model must be orientated in a way that aligns with your CAS. This orientation may change based on machine configuration (IE Turret, Head). Please keep in mind that Okuma does have tools that can help orientate the holder, however, most people have a preference to orientate the model prior to loading it into the machine.

TURRET OFFSET (LB, LU, LT, GENOS L, & MULTUS WITH LOWER TURRET)

Turret machines require an offset value for the CAS model. This value allows the Okuma machine to correctly position the model relative to the offset of the tool. This offset is referred to as the reference tool position.

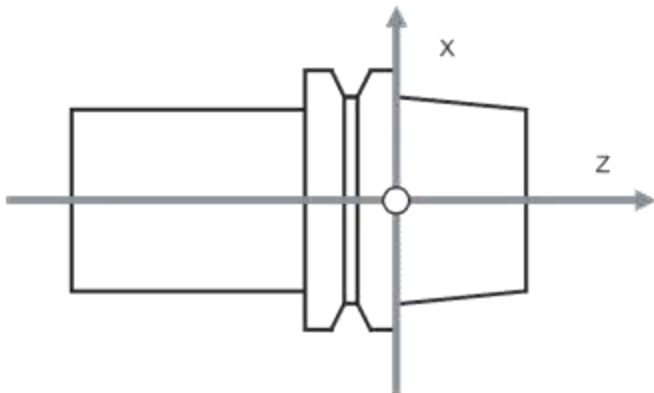


Hartwig Video on setting reference tool position



ATC MACHINES/ MILLING HEAD MACHINES (MULTUS & VTM)

The tool holder model in the STL format should be created with the following reference points and orientation. Note that on Capto and HSK style holders, the face depicted here as Z zero is generally set up as such with the holder center or rotation aligned with X and Y.



CREATING HOLDERS

Converting and Orienting Tool holder for Capto machine by Charlie with Gosiger:



CREATING TOOLS

Insert Drill definition by Charlie with Gosiger:



SHARING MODELS WITH OTHER MACHINES

Sharing CAS data by Charlie with Gosiger:

