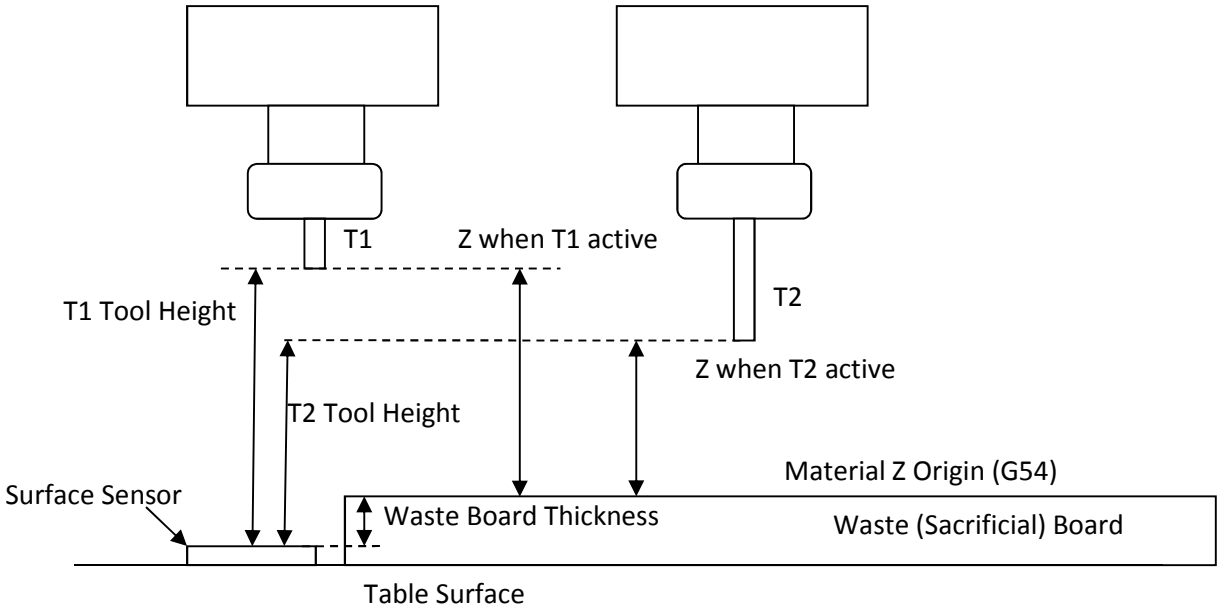
# Function 25 - Set Tool Height

## Overview

This function is used to set the tool height of a specified tool. All tools must have a valid and correct tool height in order to properly run a job. **An incorrect tool height can damage the machine by causing the tool to plunge into the machine bed!**




Each tool that is to be used in a job must have a tool height so that the machine can figure out where it is relative to the Material Z Origin (G54) (surface of the waste or sacrificial board).

The tool height is defined as the ***vertical distance from the Tool Height Sensor to the tip of the selected tool when the z axis is in the machine top position.***

## Valid Entry

Function 25 must specify the tool number to which is applies. Valid tool numbers can be from 1 to 999 therefore entries of function 25.1, 25.2, 25.3… etc to function 25.999 are valid provided the specified tool has been set up in the tool map.

Function 25 or Function 25.0 is not valid and you will get an “Invalid Function” error.

If the tool map only has tools 1, 2, 3, and 4 assigned then only functions 25.1, 25.2, 25.3, and 25.4 are valid. All the remaining function 25 calls are invalid.

## Functionality

Function 25 works in three steps:

1. Change active tool to the specified tool. For example function 25.1 specifies tool 1. Note this part works exactly like function 31.
2. Travel to the surface sensor position
3. Seek the surface sensor.

All three steps must be successfully completed in order to generate a valid tool height for the selected tool.

### Change the Tool to the Specified Tool

Function 25 measures the tool height of the active tool. The active tool is indicated by the tool number shown on the left side of the sub console screen in brackets:

For example **"(T2)"** indicates that the active tool is tool number 2.

If function 25.2 is entered the specified tool (T2) is the ACTIVE tool and the machine will automatically go to step two; travel to surface sensor. However if the specified tool is not the active tool then the machine must change the tool prior to travelling to the surface sensor.

Depending on the type of spindles and tool changing devices the machine comes equipped with the process of changing tools can vary:

1. Collet Tool Change. This type of spindle does not have a tool holder and the tools have to be directly clamped into the collet. All tool changes are manual.
2. Quick Tool Change. This type of spindle does handle tool holders but there is no ATC installed. All tool changes are manual.
3. ATC Tool Change. This means there is an automatic tool changer installed. In this case some tool changes are automatic while others can be manual.

The actual various processes involved with each type of tool change is described in Function 31 documentation.

### Travel to the Surface Sensor

Once the first step described above has changed the active tool to be the specified tool the machine will travel to the surface sensor and show "Press Start". There are several ways to seek the surface sensor described in the next section.

There are two types of surface sensors:

1. Gantry mount surface sensors are mounted on one of the gantry legs, usually the left one, and are typical of machines with automatic tool change systems.

2. Table mount surface sensors are mounted on the table surface, usually near the front right corner close to the origin and are typical of machines without automatic tool change systems.

The machine will travel to the appropriate sensor depending on which type of sensor has been configured.

If the machine has multiple spindle position, “multi-position”, it will place the correct spindle above the surface sensor.

If the machine does not go to the correct position for the F25 touch sensor then the position of the sensor is not correct and must be re-calibrated. This can be done using function 821. See documentation on function 821.

## Seek the Surface Sensor

Once the machine has positioned the spindle over the sensor the display will show “Press Start”. There are three options:

1. Press START and the machine will automatically go down and touch the sensor.
2. Press the Z down jog key to move the tip closer to the sensor manually and then press START. It will go automatically from where START is pressed. The reason to do this is to speed things up as it machine does seek the sensor rather slowly.
3. If the sensor is non-functional you may manually touch off the sensor by pressing first FUNC then using the Z jog keys. This is used to operate the machine if the sensor is not working or there is no sensor installed. You can also use function 24.

The surface sensor will actually be touched twice, once fairly quickly to get an approximate tool length and then very slowly to get an accurate reading.

## Testing the Tool Length

Once you have done a function 25 you can test the tool length by slowly jogging the tool to the surface of the machine. The display Z reading should read zero when you touch the material surface.

If it does not first check the Z origin. Check function 27 and make sure the G55 Z origin is set to zero. Make sure you are in origin G55 by using function 10.

If it still is not zero then your waste board thickness is probably not set correctly. Check function 28.

## Errors

There are a number of error codes associated to function 25:

- E702 – No Tool. This means you have entered either function 25 or 25.0 which indicates there is no tool to get the tool height of.
- E701 – Invalid Tool. This means that the tool you have specified is not in the tool map.

- E703 – No Tool Height. This means that there is no tool height for this tool and you must do a function 25 for this tool before using it.