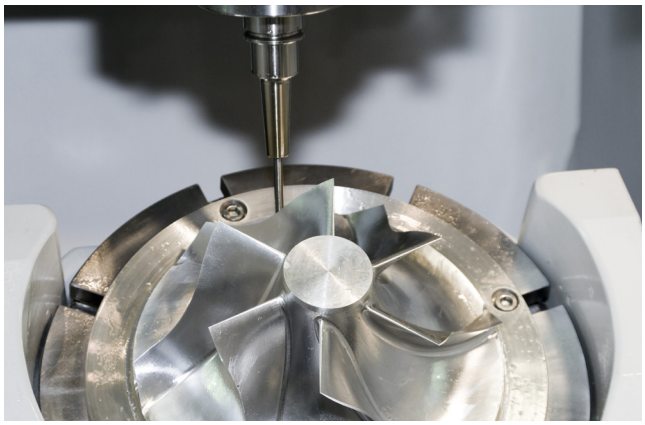
MITSUBISHI ELECTRIC

5-AXIS MACHINING

M750 Series CNC Control



For high quality machining with smoother finish and faster performance

5-axis machining gives you the ability to machine complex parts in a single setup. This helps reduce operator error. Additionally, the single setup saves you time and money.

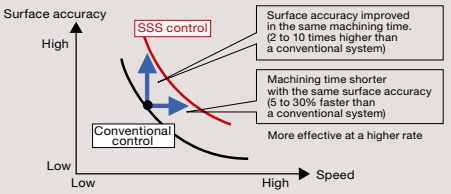
Mitsubishi Electric's 5-Axis Machining functions have been enhanced to provide high-end performance. These advanced features include:

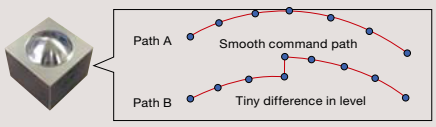
- Super Smooth Surface (SSS) Control
- Tool Center Point Control
- Inclined Surface Machining
- Tool Handle Feed & Interruption
- 3D Machine Interference Check
- OMR-FF Control
- R-Navi

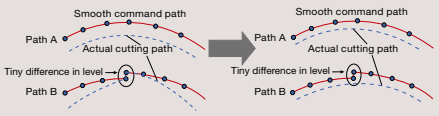
Mitsubishi's Advanced Functions

SSS Control

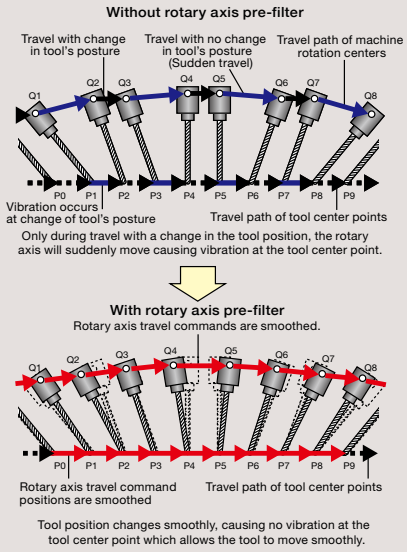
By judging part program paths, unnecessary deceleration is reduced, even when fine steps in the program exist. This provides a smooth finish without deviation for die-mold machining.







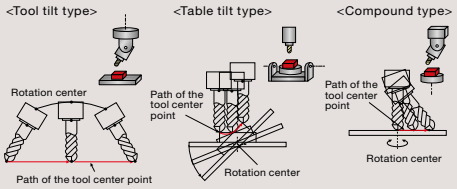
This function suppresses the vibrations of the tool by moving the rotary axis smoothly. Even when this function is active, the Tool Center Point path moves according to the command program path. SSS Control can be used during simultaneous five-axis machining.



Tool position changes smoothly, causing no vibration at the tool center point which allows the tool to move smoothly.

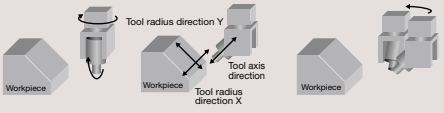
Tool Center Point Control

High-accuracy machining is realized by controlling each axis so that the tool center point moves linearly at a commanded feed rate even if the rotary axis moves in linear interpolation.



Tool Handle Feed & Interruption

With five-axis machining, the tool handle feed and interruption function enables you to perform a multiple axis movement while in a handle and/or manual jog movement. The tool position can be changed without moving the tool tip.



It is possible to move in the tool axis direction in both X & Y radius directions.

Without moving the tool tip, it is possible to change the tool's position.

What is 5-Axis Cutting?

Five-axis cutting requires the movement of the standard axes (X, Y and Z) along with two rotary axes (A, B or C). The rotary axes depend on the particular set up of the machine. This allows the machine to cut very intricate parts. The key is that these axes must move *simultaneously* to attain the cut needed. Most standard controls can handle multi-axis movement but not all at the same time.

What type of CAD/CAM software is best to use?

Many types of software packages are available that will provide the correct program to cut all five axes simultaneously. Posts are created for each machine and allow the software to customize the program to each situation or machine. This is created by the software companies to fit each customer's needs (machine size, control, table or head axes configuration). Some of the leading CAD/CAM systems are:

- Mastercam®
- ESPRIT®
- Edgecam®
- SURFCAM®

Do any CAD/CAM software packages have difficulty with the Mitsubishi M750 controller?

Currently all packages work with the M750 control platform. If there are any issues, we can work with the software package company to find a solution.

What needs to be done if the table is taken off of the machine?

Once the table is taken off of the machine, certain PLC switches could be set to ignore the 4th and 5th axes. This will allow the machine to be run in its standard XYZ mode. Once the table is put back on the machine, the PLC switches can be turned back on. There is one series of parameters that would need to be checked to make sure the distances from home are accurate.

Is any special tooling required?

The only special tooling that would be required would be extended tools to help get certain areas of the part cut properly. These would be on a job to job basis.

Are lighter cuts required?

Cutting restrictions are not governed by the Mitsubishi M750 control but by the machine tool being used.

Does your NAVI-MILL software have the ability to do 5-axis programming?

Currently, NAVI-MILL does not have the capabilities to create a simultaneous 5-axis cutting program.

Are there speed vs. accuracy issues?

When coupled with our high speed/high accuracy (HS/HA) and SSS abilities, there are no speed or accuracy issues.

Can the machine still cut properly if the HS/HA or SSS are not turned on?

The control will still make the required cuts to create the part. The two areas that may be different are the cycle time and the surface finish of the part.

- Are HS/HA or SSS options?
  This is determined by the machine tool builder.
- Are these options available for purchase?
  Yes, HS/HA and/or SSS can be purchased. The price is determined by the machine tool builder.

Is a higher RPM spindle necessary?

Standard spindles will work with ease. Higher RPMs might be needed for smoother finishes. This will be based on the type of tooling used.

SSS-3G Control OFF

Machining time: 42.2min/blade

SSS-3G Control ON

Machining time: 31.8min/blade
25% shorter time

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