Haas Technical Documentation

Lathe Tips to Prevent Chatter

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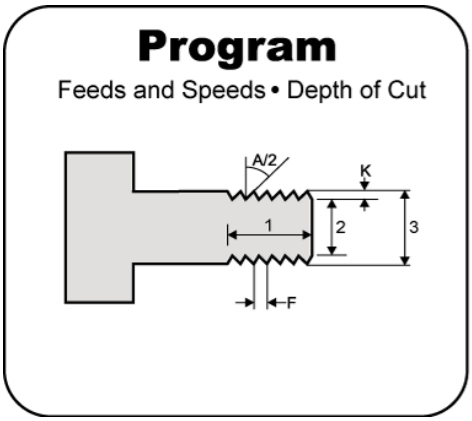
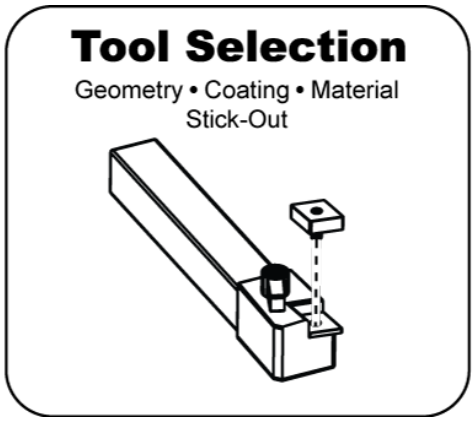
INTRODUCTION

Consider the overall job when you have a problem with chatter. Chatter always comes down to these aspects of the application:





Compromises required in one aspect of the job will require adjustments to the other aspects of the job.

Program

Incorrect Spindle Speed or Feedrate

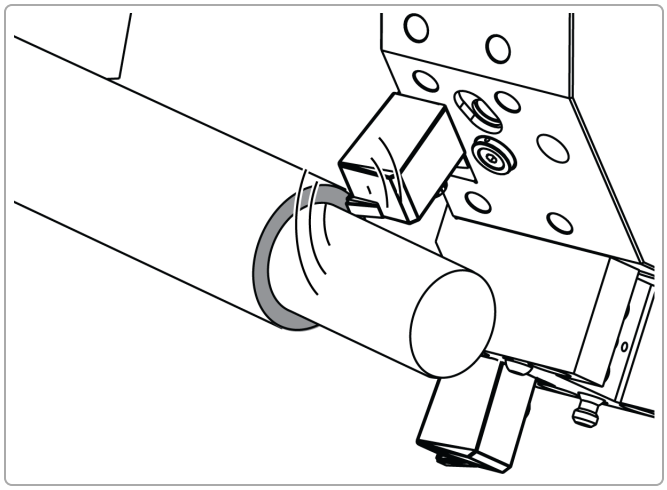
Cut parameters: the spindle speed and the cutting feedrate, taken together, define a cut's chip load. An incorrect chip load can chatter.

For example, if the chip load is too low, the tool can start to "skip" on the workpiece and begin to resonate. If the chip load is too high, any part of the setup that is not sufficiently rigid or stable can begin to resonate.

Use the feed and speed overrides to adjust the cut parameters to find a good combination. Consult with your cutting tool vendor for advice on the correct chip loads for the tools that you use.

Depth of Cut

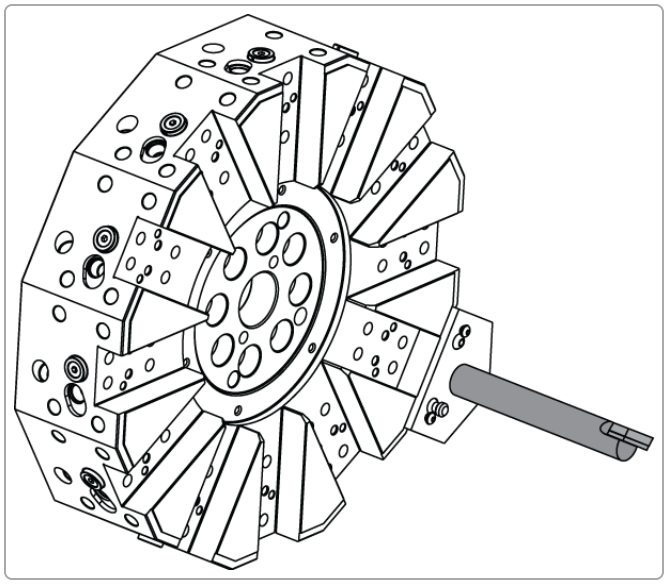
During a deep cut, the cutting forces generated can start chatter. Also, as you remove material and the diameter-to-length ratio of your workpiece decreases, you must also decrease the depth-of-cut to compensate for the workpiece’s reduced stability.



Spindle Speed Variation (SSV)

Spindle Speed Variation lets you oscillate the spindle RPM by a specific amount over a specific duration. When you vary the spindle speed in this way, you break up the harmonic vibrations that cause chatter. Try to resolve chatter issues with tooling, workholding, and programming solutions before you use SSV. Refer to Lathe - Spindle Speed Variation (SSV) for more information.

Tool Selection



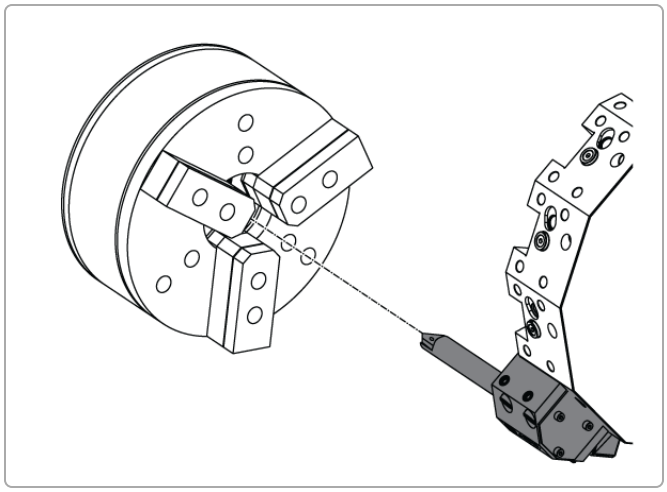
Tool Stick-Out

Longer tools are less stiff, and thus less stable. However, small changes to tool length can have a significant effect on stiffness: A 10% reduction in tool length increases tool stiffness by up to 25%.

Note: If you must use a longer toolholder, consider using a Haas Twin Turn (example pictured) or Extended Twin Turn BOT holder. You can get these holders on parts.haascnc.com.

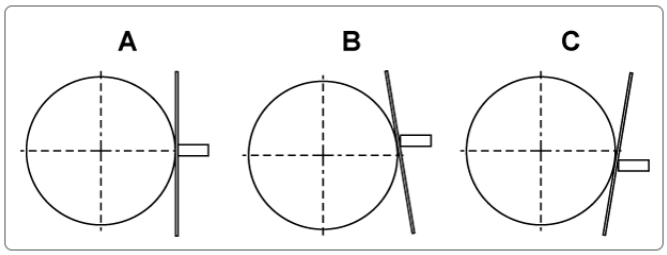
For boring bars, the material type of the bar can affect stability. A steel boring bar is stable up to a stick-out of 3 times the diameter. A carbide boring bar is stable at a length up to 5 times its diameter. If you must exceed these limits, you must compromise your other cut parameters—change the depth-of-cut, feedrate, or spindle speed to compensate.

Note: Special vibration-dampening boring bars are available when you need an extreme length-to-diameter ratio to machine a bore.



The Tool is Not on the Spindle Centerline

If the tool’s cutting edge is not on the spindle centerline, excessive cutting forces can cause chatter, as well as problems with accuracy and reduced tool life.



One way to check your tool's alignment with the spindle centerline:

1. Put a machinist's scale or other thin, flat piece of metal next to the workpiece.
2. Jog the tool over to the scale and gently "pin" it against the workpiece.
3. The end view in this illustration shows you what the scale looks like when the tool is on center [A], above the centerline [B], or below the centerline [C].

To correct a misaligned tool, use an insert seat that puts the tool in the correct position.

Note: On a Y-Axis lathe, you can use the Y-Axis tool offset to center the tool.

Also, be sure to always use stick tools that are the correct size for the turret or tool holder.

Note: If your tooling is correct but still off-center, the machine geometry may be out of specfication. Contact your Haas Factory Outlet to have your lathe’s geometry inspected and corrected if necessary.

Tool Type

Insert selection is critically important for a stable cut. The chipbreakers, coatings, radius sizes, geometry, and carbide grade must be designed for the workpiece material. Improper inserts can cause reduced tool life, chatter, and surface finish problems.

Consult with your cutting tool vendor to select the proper tool for your application.

Workholding

Insufficient Grip

Incorrectly bored chuck jaws, excessive chuck pressure, or loose chuck jaws let the part move in the chuck under cutting forces. This can cause chatter near the chuck.

Make sure that the chuck is sufficiently lubricated. A dry chuck loses clamping force.

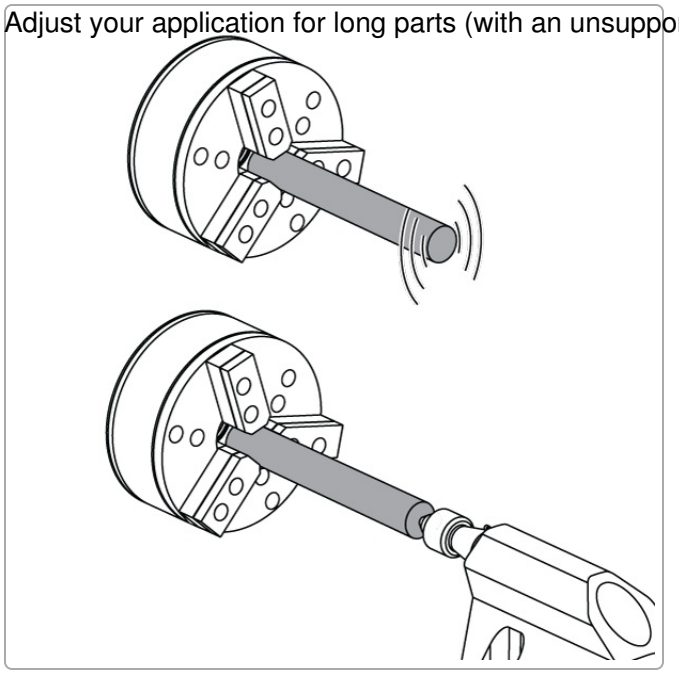
Refer to these videos for more information about preparing soft jaws:

Fundamentals and OD Gripping - Video

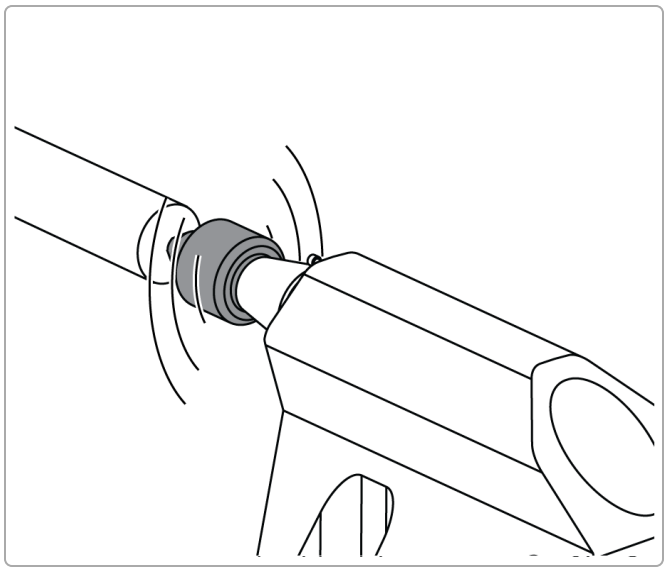
ID Gripping, Re-cutting, and Adding a Taper - Video

Insufficient Workpiece Support

Adjust your application for long parts (with an unsupported length-to-width ratio of more than 3:1): Lower the cutting load through adjustments to the tool selection or program. Stiffen the workholding with supports, if possible. If your lathe has workpiece support equipment, such as a tailstock or a steady rest, be sure to use it.



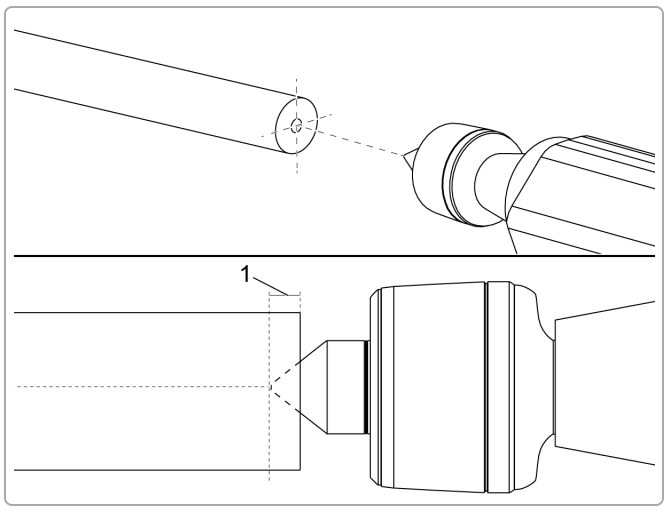
Refer to Tailstock Fundamentals - Video for more information.



Worn or Damaged Live Center

A worn or damaged live center can introduce vibrations or let the part move. This can cause chatter, surface finish, and tool life issues. Inspect the live center and replace it if necessary.

Note: Live centers have a service life and a maintenance schedule. Refer to the live center manufacturer's documentation for this information.



Incorrect or Damaged Center-Drilled Hole

If the center-drilled hole has the wrong angle, is too small or too shallow, or is damaged, the live center does not have sufficient contact with the workpiece to properly stabilize the cut. This causes chatter, accuracy, and tool life issues. The center-drilled hole must be in the exact center of the part, and it must let the talistock quill engage at a sufficient depth [1].