Machining

Troubleshooting: Diagnosing Spindle Problems

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Your spindle is the heart of your machine. But just like the human heart, it is only one part of a system. Servo and ball screws, variable frequency drives, air-supply quality, and coolants can all have a major impact on the health of spindle and machine performance. If you are having unusual problems with your spindle or machine, do not hesitate to call our experts in the MSC Machinery Group for troubleshooting assistance.

What are signs that spindle is failing?

- Vibration felt within the machine.
- Chatter marks showing on the parts/poor finish.
- Producing out of tolerance profile size, taper, roundness of the part.
- Inability to properly dress the grinding wheel.

What is causing spindle to vibrate?

- Excessive spindle vibrations may be due to a variety of factors such as: unbalanced collet nuts and tooling, tooling being broken or missing inserts, and tool extensions being too long for the operating speed (reference operator manual; as length becomes greater the operating speeds must decrease).

I just installed spindle, and it is turning backwards!

- This is common with 3-phase motors with terminal blocks. Switch any two power leads and the spindle will run in the proper direction.

Spindle jerks/vibrates badly on startup and performs poorly.

- This is an indication of single phasing. Verify connections at spindle, VFD, and any connectors.
- Send spindle to MSC for motor diagnostics and repair.

I am receiving an 'over current' or similar fault on my VFD.

- Verify connections at spindle, VFD, and any connectors are clean, tight, and secure.
- Verify VFD parameter settings.
- If winding is shorted or insulation broken down, send to MSC for evaluation and repair.

I just replaced my VFD, and it keeps tripping out.

- Start by verifying these basic drive parameters are set according to your spindle. **Note:** This only applies to asynchronous motors.
- Verify connections at spindle, VFD, and any connectors are clean, tight, and secure.
- If motor winding is shorted, send to MSC for repair.

Spindle will not turn.

- Attempt to turn spindle by hand. If it rotates freely, proceed. If not, it has been actuated while running or the bearings are severely damaged. Call MSC for further assistance.
- Verify sensor logic is correct and reading properly.
- Check that the tool clamp/unclamp valve is not leaking.

Spindle is running hot.

- Verify that your cooling system (liquid, compressed air, electric fan) is operational.
- Monitor current draw during the cut. Higher than normal current indicates a dull tool or excessive feed rate.
- If the spindle is noisy to rotate by hand, it is likely a bearing problem. Send to MSC for further diagnostics.

Spindle has been running fine, and now it is completely locked up.

- If no other performance issues present, check the solenoid that controls the spindle clamp/unclamp for air leaks. A leaking valve can cause the rotating spindle components to contact the stationary actuator. This friction welds the parts together and is not usually repairable without disassembly. Send to MSC for full diagnostics and repair.

Spindle seems to be leaking air out of the front.

- This is common with many spindles and is part of the system that keeps contaminants out of the bearings. It is normal.

Spindle is breaking clamping fingers on tool changer.

- Check machine offsets for each axis.
- Check timing of tool-change routine.

Tool is not clamping/unclamping or not holding tool tightly.

- Verify pull studs are the correct type for your spindle.
- Verify sensor logic is correct and reading properly.
- Check for broken clamp group (gripper segments).
- Drawbar/spring pack assembly could be damaged. Send to MSC for evaluation.

Spindle stops over tool but will not pick up.

- This often is caused by the 'Tool Open' sensor (often S2) not reading correctly. Verify proper ejection stroke before attempting to adjust sensor.

Spindle will not release tool (HSK taper).

- Verify adequate air pressure at spindle.
- Verify sensor logic. The 'Tool Open' sensor (often S2) not reading correctly can cause this.
- HSK tapers operate on a slight interference principle between the tool and the spindle taper.
- Maintain a light coat of Lusin G31 on the tool to improve release. Order using PDS P/N 999-090-G31.

Spindle will not release tool (ISO or CAT tapers).

- Verify adequate air pressure at spindle.
- Verify sensor logic. The 'Tool Open' sensor (often S2) not reading correctly usually causes this.
- Bent or malfunctioning drawbar assembly.

Sensors are not working properly.

- Before making any adjustment to sensors, look for other root causes that could change the system.
- Verify proper ejection stroke of drawbar/clamp group set. This specification varies by manufacturer but can be found in your machine tool manual.
- Verify adequate air pressure at spindle.
- Verify pull studs are the correct type for your spindle.
- If drawbar is in adjustment, attempt to adjust sensor according to machine tool manual.
- If no reading from the sensor can be obtained, remove sensor and test against any metallic object. If still no reading, contact MSC for replacement and assistance.

OTHER CONDITIONS

High Radial Load

- The failure that occurs when the machine feed rate is too fast for the material being cut or when high feeds are pushing a tool with chipped or very dull cutting edges. This is determined by the failure of the first of the front bearing pair.

High Axial Load

- The failure that occurs when the spindle suffers a high axial impact, such as plunging into the material rather than ramping in or crashing into the worktable. This failure is determined by the failure of the second of the front bearing pair.

Unbalanced Tooling

- Failures occur when the tooling used is not properly balanced or exceeds the recommended advised tool dimensions or weight limitations. This failure symptom is observed in the damage to the rear bearing pair.

Actuation While Running

- The failure that occurs when the piston of the actuator contacts the drawbar while the spindle is still rotating. This can be caused by operator or programming errors. The failure or adjustment of the proximity sensors to read the position of the drawbar or the sensor or relay that senses shaft motion can also cause it. Another possible cause is contamination of the actuator. This failure is determined by the witness marks on the end faces of the actuator piston rod and the drawbar nut.

Shorted Winding

- This failure normally occurs when the spindle is not receiving the proper input power. In most cases, it is a result of the parameters of the frequency inverter not corresponding properly to the electrical characteristics of the spindle. This is normally determined by conferring with the customer.

Tool Sticking in Taper

- This is normally due to the transfer of heat caused by an oversized tool. It can also be caused by an improper ejection stroke of the drawbar due to contamination in the actuator or broken springs in the drawbar assembly. This is normally determined by the examination of the drawbar.

Tool Slipping in Taper

- This is normally due to the transfer of heat from long heavy cuts, resulting in a thermally expanded or contracted tool taper. It can also be caused by an improper ejection stroke of the drawbar due to contamination within the actuator or broken springs in the drawbar assembly. This is normally determined by the examination of the drawbar.

Crash

- This normally is caused by operator or programming errors. This failure occurs when the spindle is driven into the worktable or surrounding components on robot applications. This is determined by the physical damage of the shaft taper and spindle body.

Other

- Spindle fails due to unusual circumstances, such as shipping damage, electric fan failure, electronic box malfunction, etc.

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