

SCM Morbidelli CNC Spindle Replacement Procedure

1.0 Maintenance Objective & Frequency

The objective of this procedure is to replace the main machining spindle on an SCM Morbidelli CNC router to restore cutting accuracy, eliminate excessive runout, and prevent catastrophic bearing failure. This procedure is performed on an as-needed basis when spindle vibration, noise, or runout exceeds OEM tolerances (typically >0.01 mm TIR).

Frequency: As-needed (triggered by condition monitoring or after 8,000–10,000 operating hours as recommended by SCM).

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect main power at the machine disconnect switch and apply a personal lock and tag. Verify zero voltage with a multimeter at the spindle drive input.
- **Pneumatic Isolation:** Close the main compressed air supply valve to the machine. Bleed residual air from the spindle air seal line.
- **Mechanical Lockout:** Ensure the spindle is at a complete stop and the machine is in a safe, locked-out state before proceeding.
- **Mandatory PPE:** Safety glasses, cut-resistant gloves, steel-toed boots, and hearing protection.

3.0 Required Tools, Parts & Lubricants

- Replacement spindle assembly (SCM OEM part number or approved equivalent)
- Torque wrench (0–100 Nm range)
- Hex key set (metric, 4mm–10mm)
- Dial indicator with magnetic base (0.001 mm resolution)
- Clean lint-free rags
- Isopropyl alcohol (99%) for cleaning mating surfaces
- Anti-seize compound (nickel-based, high-temperature)
- Spindle puller tool (if required by spindle design)
- Multimeter (for verifying electrical isolation)
- Crane or hoist rated for spindle weight (typically 20–50 kg)

4.0 Step-by-Step Maintenance Procedure

1. Perform full LOTO as described in Section 2.0. Verify zero energy state before proceeding.
2. Remove the spindle access cover(s) from the machine head using the appropriate hex key. Set aside hardware in a labeled container.
3. Disconnect the spindle power cable and encoder cable (if equipped) from the spindle. Label each cable for reconnection.
4. Disconnect the air line for the spindle air seal. Cap the open fitting to prevent contamination.

5. Using the crane or hoist, support the spindle weight. Remove the spindle mounting bolts (typically 4–6 bolts, M10 or M12). Apply penetrating oil if bolts are seized.
6. Carefully slide the spindle out of the mounting bore or bracket. Use the spindle puller tool if the spindle is stuck. Lower the spindle onto a clean workbench.
7. Clean the spindle mounting bore and mating surfaces on the machine head with isopropyl alcohol and a lint-free rag. Inspect for burrs or damage.
8. Apply a thin layer of anti-seize compound to the mounting bolts and the spindle mounting flange (if specified by OEM).
9. Position the new spindle into the mounting bore. Ensure alignment with any locating pins or keyways. Hand-tighten the mounting bolts.
10. Torque the mounting bolts in a cross-pattern to the OEM specification (typically 45–60 Nm for M10 bolts). Use the torque wrench.
11. Reconnect the spindle power cable, encoder cable, and air line. Ensure all connections are secure and properly routed to avoid pinching.
12. Reinstall the spindle access cover(s) and tighten all fasteners to the specified torque.

5.0 Verification & Return to Service

1. Remove all LOTO devices and restore power to the machine. Verify that the spindle drive powers up without fault codes.
2. Perform a spindle run-in cycle at low RPM (e.g., 2,000 RPM) for 10 minutes to seat the bearings. Monitor for unusual noise or vibration.
3. After run-in, measure spindle runout at the tool holder taper using a dial indicator. Acceptable runout is less than 0.01 mm TIR.
4. Run a test cut on a scrap piece of material (e.g., MDF or aluminum) at typical operating parameters. Verify cut quality and dimensional accuracy.
5. If all checks pass, sign off on the PM work order in ServiceGrid and update the spindle replacement history.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.