
CNC Router Dust Shoe Maintenance and Brush Replacement

1.0 Maintenance Objective & Frequency

The objective of this procedure is to inspect, clean, and replace the brush assembly on the CNC router dust shoe to ensure effective chip evacuation, maintain spindle cooling airflow, and prevent dust accumulation that can lead to fire hazards or reduced cut quality. This PM is critical for maintaining dust collection efficiency and extending the life of the spindle and vacuum system.

Frequency: Every 200 operating hours or monthly, whichever comes first. Replace brushes when bristle length is less than 50% of original or when visible gaps in the brush perimeter allow dust bypass.

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect main power to the CNC router at the disconnect switch and apply a personal lock and tag.
- **Pneumatic Isolation:** Close the compressed air supply valve to the dust shoe lift cylinder (if equipped) and bleed residual pressure.
- **Vacuum System:** Ensure the dust collection system is turned off and locked out at the source.
- **PPE:** Safety glasses, cut-resistant gloves, and a dust mask (N95 minimum) are mandatory. Hearing protection recommended if vacuum system is nearby.

3.0 Required Tools, Parts & Lubricants

- Replacement brush strip (OEM specified length and bristle material, e.g., nylon or horsehair)
- 3mm hex key (Allen key) or T10 Torx driver (depending on shoe design)
- Flathead screwdriver (small, for prying old brush strip)
- Shop vacuum with HEPA filter and crevice tool
- Clean lint-free rags
- Isopropyl alcohol (99%) for cleaning brush channel
- Digital caliper (for measuring bristle length)
- Torque wrench (if specified by OEM, typically 2-4 Nm for brush retainer screws)

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO as per Section 2.0. Verify zero energy state by attempting to start the spindle and vacuum system.
2. Lower the dust shoe to its operating position (if pneumatic, ensure air is off and cylinder is fully extended).
3. Using the shop vacuum with crevice tool, thoroughly remove all loose dust and debris from the dust shoe housing, brush channel, and surrounding area.

4. Inspect the brush strip for wear: measure bristle length with a digital caliper. If bristles are less than 50% of original length (e.g., original 25mm, now <12.5mm), or if there are missing sections, proceed with replacement. Otherwise, clean and reinstall.
5. Remove the brush retainer screws using the appropriate hex key or Torx driver. Place screws in a magnetic tray to avoid loss.
6. Carefully pry out the old brush strip using a flathead screwdriver. Work from one end to avoid damaging the aluminum channel.
7. Clean the brush channel thoroughly with a lint-free rag dampened with isopropyl alcohol. Remove all adhesive residue, dust, and debris. Allow to dry completely.
8. Insert the new brush strip into the channel, ensuring the bristles face outward (away from the spindle). Press firmly to seat the strip fully into the channel.
9. Reinstall the brush retainer screws. Torque to OEM specification (typically 2-4 Nm). Do not overtighten as this can distort the channel.
10. Visually inspect the brush perimeter for even contact with the material surface. Trim any excessively long bristles with scissors to ensure uniform height (typically 5-10mm protrusion).
11. Reconnect all air lines and electrical connections. Remove LOTO devices.

5.0 Verification & Return to Service

1. Power on the CNC router and dust collection system. Verify the dust shoe lowers and raises smoothly (if pneumatic).
2. Run a dry cycle (no cutting) with the spindle at 50% RPM. Listen for abnormal rubbing or vibration from the brush contacting the material surface.
3. Perform a test cut on a scrap piece of the typical material (e.g., MDF, plywood). Observe dust collection efficiency: minimal dust should escape the brush perimeter.
4. Check the vacuum gauge (if equipped) to ensure static pressure is within 10% of baseline reading.
5. Sign off on the PM work order in ServiceGrid, noting brush condition, replacement date, and any observations.

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.