Tool Holder Balancing and Runout Check (HSK 63F / ISO 30)

1.0 Maintenance Objective & Frequency

The objective of this procedure is to verify and correct the static and dynamic balance of HSK 63F and ISO 30 tool holders, and to measure and adjust the radial and axial runout to within OEM tolerances. This prevents spindle vibration, tool chatter, poor surface finish, and premature bearing failure. Frequency: Every 500 operating hours or immediately after any crash or tool holder impact.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect main power to the CNC machine and apply a personal lock and tag on the disconnect switch.
- Pneumatic Isolation: Close the main air supply valve and bleed residual air from the spindle air purge line.
- Mechanical Isolation: Ensure the spindle is at a complete stop and the tool changer arm is in the home position.
- Mandatory PPE: Safety glasses, cut-resistant gloves, and steel-toed boots.

3.0 Required Tools, Parts & Lubricants

- Tool holder balancing machine (e.g., Haimer, Schunk, or equivalent)
- Dial indicator with magnetic base (0.0001 inch / 0.002 mm resolution)
- Precision test bar (HSK 63F or ISO 30, depending on holder type)
- Balancing rings or set screws (as per holder design)
- Torque wrench (adjustable, 5-50 Nm range)
- Clean lint-free wipes and isopropyl alcohol
- Soft-jaw vise or holder fixture
- Calibrated micrometer (0-1 inch / 0-25 mm range)

4.0 Step-by-Step Maintenance Procedure

1. Clean the tool holder taper, flange face, and pull stud threads with isopropyl alcohol and a lint-free wipe. Inspect for nicks, burrs, or wear. Reject any holder with visible damage.
2. Mount the tool holder in the balancing machine using the appropriate adapter (HSK 63F or ISO 30). Ensure the holder is fully seated and the clamping mechanism is engaged.
3. Set the balancing machine to the required balance grade (G2.5 at the maximum spindle RPM, or as specified by the machine tool builder). Initiate the spin cycle.
4. Read the unbalance value displayed on the balancing machine. Record the magnitude (in g·mm) and angular position.

5. If unbalance exceeds the allowable limit (typically < 1 g·mm for HSK 63F at 20,000 RPM), add or remove material using the balancing rings or set screws. For set screws, loosen the locking nut, rotate the screw to the calculated depth, and re-torque the locking nut to 8 Nm.

6. Repeat the spin cycle and adjust until the unbalance is within tolerance. Document the final balance value.

7. Remove the holder from the balancing machine and mount it in a soft-jaw vise or holder fixture for runout measurement.

8. Install a precision test bar into the tool holder. Tighten the drawbar or collet nut to the manufacturer's specified torque (e.g., 45 Nm for HSK 63F, 25 Nm for ISO 30).

9. Position the dial indicator plunger on the test bar, 10 mm from the holder face. Zero the indicator. Rotate the holder by hand 360 degrees and record the maximum TIR (Total Indicator Reading). Acceptable runout: < 0.0002 inch (0.005 mm) for HSK 63F, < 0.0004 inch (0.010 mm) for ISO 30.

10. If runout exceeds tolerance, check for debris on the taper or flange face, re-clean, and re-measure. If still out of spec, the holder may be bent or damaged and must be replaced.

11. Repeat the runout measurement at 50 mm from the holder face. Acceptable runout: < 0.0005 inch (0.013 mm) for HSK 63F, < 0.001 inch (0.025 mm) for ISO 30.

12. Remove the test bar and clean the holder taper again. Apply a thin film of spindle taper lubricant (if specified by the machine builder) to the holder taper and flange face.

5.0 Verification & Return to Service

1. Reinstall the tool holder into the CNC spindle. Ensure the drawbar engages fully and the tool changer arm clears the holder.

2. Restore pneumatic and electrical power to the machine. Remove all LOTO devices.

3. Jog the spindle to 500 RPM and listen for unusual vibration or noise. If smooth, ramp up to the maximum operating RPM in 1000 RPM increments, pausing for 10 seconds at each step.

4. Run a test cut on a scrap piece of material (e.g., aluminum or mild steel) at typical feed rates and depths of cut. Inspect the surface finish for chatter marks.

5. If the test cut is acceptable and no abnormal vibration is detected, sign off on the PM work order in ServiceGrid. Record the final balance value and runout measurements in the maintenance log.