

SAMARYA ENGINEERING SERVICES

Office : Plot no.- 90/11, Sector – 16 , Sankalp Vihar , PCNTDA , Chikhali , Pune – 412114

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GST No.- 27BOKPP9768RIZG

VMC 3 / 4th Axis Setting Process Flow

1. Preparation Phase

- **Review Setup Document/Drawings:** Obtain and review the technical drawings, tool list, and setup instructions.
- **Check Workpiece and Fixtures:** Inspect the workpiece for dimensions and quality. Confirm availability and condition of fixtures and clamps.

2. Machine Preparation

- **Clean the Machine Table:** Remove any chips, coolant, or debris from the table.
- **Inspect the Rotary Table:** Check for wear or damage on the 4th axis rotary table.
- **Install the 4th Axis Rotary Table:** Mount the rotary table securely onto the machine's table using T-slots and bolts.
- **Connect Wiring and Air Supply:** Attach the rotary table's electrical and pneumatic connections to the machine.

3. Fixture Setup

- **Mount the Fixture:** Attach the fixture to the rotary table. Ensure it is properly aligned.
- **Align Using Dial Indicator:** Use a dial indicator to ensure the fixture is perpendicular and aligned with the machine axis.
- **Secure the Fixture:** Tighten the bolts and re-check alignment.

4. Tool Setup

- **Load Tools into Tool Changer:** Insert the required tools into the tool magazine based on the setup sheet.
- **Set Tool Length Offset:** Measure and input the tool length offsets into the machine controller.
- **Check Tool Probing (Optional):** Use the tool probe system for automatic offset measurement if available.

5. Workpiece Mounting

- **Load the Workpiece:** Mount the workpiece securely onto the fixture or rotary table.
- **Align the Workpiece:** Use indicators or alignment pins to align the workpiece as per the setup requirements.
- **Tighten Clamps:** Secure the workpiece using clamps, ensuring it does not shift during machining.

6. Coordinate System Setup

- **Set Workpiece Zero (WCS):**
 - Use an edge finder or probe to locate the zero point on the workpiece.
 - Set the zero point in the machine controller (G54, G55, etc.).
- **Set 4th Axis Zero Point:**
 - Rotate the 4th axis to its starting position.
 - Use a dial indicator or probing system to set the zero point of the rotary axis.

7. Program Loading and Verification

- **Upload the CNC Program:** Load the machining program into the controller.
- **Verify Program:** Simulate or dry-run the program to check for errors.
- **Check 4th Axis Movements:** Ensure the rotary axis moves as expected during the dry run.

8. Final Checks

- **Coolant and Lubrication Check:** Confirm sufficient coolant and proper machine lubrication.
- **Safety Inspection:** Verify all guards and safety measures are in place.

9. Machining Phase

- **Run the Program:** Start the machining process.
- **Monitor Operations:** Keep an eye on tool wear, machining accuracy, and 4th axis movements.

10. Post-Machining Activities

- **Inspect the Workpiece:** Measure critical dimensions and verify tolerances.
- **Remove Workpiece:** Unload the machined part carefully.
 - **Clean the Machine:** Clean the table, rotary table, and surrounding area to prepare for the next job.

Preventive and Predictive Maintenance Checkpoints for 4th Axis VMC Machine

1. Daily Maintenance Checklist

- Check the coolant level and replenish if required.
- Clean the machine's exterior and working area.
- Inspect hydraulic oil level.
- Verify spindle and axis movements for smooth operation.
- Inspect tools and tool holders for wear or damage.
- Monitor machine temperature during operation.
- Ensure the emergency stop and safety interlocks are functioning.

2. Weekly Maintenance Checklist

- Clean and inspect the 4th axis rotary table.
- Lubricate moving parts like guideways and ball screws as recommended.
- Check all electrical connections for tightness.
- Inspect air filters and replace if dirty.
- Inspect belts and pulleys for wear.
- Test backup systems for machine settings and program storage.

3. Monthly Maintenance Checklist

- Conduct a detailed cleaning of the machine interior, including chip conveyors.
- Inspect hydraulic system components for leaks or wear.
- Calibrate the 4th axis alignment if necessary.
- Check for software updates for the controller.
- Inspect coolant lines and nozzles for blockages.
- Test lubrication system performance and top-up oil reservoirs.

4. Quarterly Maintenance Checklist

- Perform full alignment checks of the 4th axis rotary table.
- Check and clean all servo motors and encoders.
- Inspect spindle bearings and monitor spindle run-out.
- Analyze and document machine vibrations.
- Test backlash compensation for all axes.
- Replace hydraulic oil if due.

5. Yearly Maintenance Checklist

- Conduct a comprehensive inspection of all mechanical components.
- Replace coolant and flush the system.
- Replace all filters, including hydraulic and air filters.
- Check and tighten all structural bolts and fasteners.
- Overhaul the 4th axis rotary table, if needed.
- Perform machine geometry alignment and laser calibration.
- Inspect electrical wiring and connections for aging or damage.
- Verify overall machine performance and document deviations.

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6. Predictive Maintenance Actions

- Use thermal imaging to detect overheating components.
- Monitor spindle and rotary axis vibrations using a vibration analyzer.
- Perform oil analysis for hydraulic and lubrication oils.
- Track power consumption trends to identify anomalies.
- Analyze machine error logs and take corrective actions.
- Schedule service calls for components nearing wear thresholds based on usage data.