



The Manufacturers Association

JOB QUALIFICATION STANDARD (JQS)

Occupation: TOOLMAKER

Work Process: CNC Machining

Practical Hours: 1000 hrs.

DOL Standard: CNC Safe Work Habits: Apply a working knowledge for setting up and operating computerized numerically controlled (CNC) machines.

Performance Objective: Demonstrate the ability to identify safety hazards which may occur during the setup or operation of CNC machines.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to apply CNC safe work habits by wearing protective clothing to setup and operate CNC machines.	
Demonstrate the ability to apply CNC safe work habits by using protective equipment and gear when setting up and operating CNC machines.	
Demonstrate the ability to apply CNC safe work habits by practicing good housekeeping rules when cleaning chips and fluids around the CNC machine work area.	
Demonstrate the ability to apply CNC safe work habits during start-up and shutdown procedures, including special attention to machine guarding.	
Demonstrate the ability to apply CNC safe work habits by securing and stabilizing the workpiece and cutting tools.	
Demonstrate the ability to apply CNC safe work habits when working with lubricants when setting up and operating CNC machines.	
Demonstrate the ability to apply CNC safe work habits by adhering to lock-out/tag-out procedures when required during CNC maintenance or setup.	
Demonstrate the ability to apply CNC safe work habits by adhering to tagging procedures when CNC equipment breaks down or is faulty.	



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DOL Standard: CNC Technology and CNC Machining Methodologies: Apply a working knowledge for the mechanics of Computer Numerical Controls (CNC) machines that execute milling or turning operations to meet required specifications.

Performance Objective: Demonstrate the ability to describe operating principles and applications for the CNC turning and machining centers.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to describe CNC machines (types of equipment, capabilities, operating principles, controls, editing, program path ability, machine control unit, personal computer systems and direct/distributed numerical control systems).	
Demonstrate the ability to identify and describes functions of a CNC turning center (turret, work envelope, holding devices, alarms, safety interlock, live tooling, accessories, reliability, accuracy and repeatability).	
Demonstrate the ability to identify and describes functions of a CNC machining center (work envelope, tool changer, holding devices, safety interlock, part program, repeatability, accuracy, reliability, resolution and accessories).	
Demonstrate the ability to describe features and functions of CNC controls (feeds, speeds, overrides, axis selection, mode selection, manual data input, handle controls, emergency stop buttons, cancel switches, cycle start, feed hold, single block, dry run, machine lock, auxiliary function lock and graphic display).	

Performance Objective: Demonstrate the ability to describe CNC dimensioning for multiple axes machining.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to describe the Cartesian Coordinate System for a specific turning or machining center (quadrant notation, point location in X-Y plan, point location in Z-X plane and point location in Y-Z plane).	
Demonstrate the ability to identify a CNC machine's tool axis designation (primary linear axis, secondary linear axis and axis orientation).	
Demonstrate the ability to identify a CNC machine's zero point location (fixed zero point, full zero shift or floating zero).	
Demonstrate the ability to determine a CNC machine's set-up point locations (machine home position, program zero position and tool touch-off points).	
Demonstrate the ability to determine a CNC machine's capabilities of positioning and contouring (linear interpolation or circular interpolation).	



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Demonstrate the ability to determine a CNC machine's programming dimensioning practice (incremental or absolute).	
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Performance Objective: Demonstrate the ability to identify and describe the individual components of a CNC part program.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to identify the components of a part program manuscript (sequence numbers, preparatory functions, axis motion, feed rates, spindle speeds, tool numbers, miscellaneous functions, manual programming, CAM systems and conversational programming).	
Demonstrate the ability to identify additional work and block structures that exist with CNC part program code (leading zero suppression, trailing zero suppression, decimal point programming, block delete, block skip and comments).	

Performance Objective: Demonstrate the ability to monitor the CNC machining process by interrupting machining, measuring or checking dimensions, and making adjustments to machine feeds, speeds, and offsets, so that the dimensions, shape, and tolerances of the machined workpiece are maintained during machining in conformance job specifications.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to apply CNC safe work habits when operating CNC machines.	
Demonstrate the ability to describe features and functions of CNC controls which controls axis moves, tool changes, settings, automatic modes, set-up elements and coolant operation.	
Demonstrate the ability to read and interpret blueprint for CNC Machining Operations.	
Demonstrate the ability to identify, select, and set up CNC cutting tools and tooling (tool holders, end and face mills, carbide insert tools, center-drill, drill, taps, reamers, counter bores, and boring head) to pre-determined reference points outlined from the prepared sequence sheets and tool lists, to ensure that the tools and tooling selected are the correct ones to machine the workpiece efficiently and safely.	
Demonstrate the ability to monitor the CNC machining process and making adjustments to machine feeds, speeds, and offsets, so that the dimensions, shape, and tolerances of the machined workpiece are maintained during machining in conformance job specifications.	
Demonstrate the ability to monitor CNC tool wear.	
Demonstrate the ability to interpret various CNC machine alarms and how to cancel each alarm.	



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Demonstrate the ability to maintain the maximum quality and production of finished pieces.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the sawed workpiece to conform to the engineering drawings and job specifications.	

Apprentice Signature:	Completed: MM/DD/YY
Mentor Signature:	Completed: MM/DD/YY
Supervisor Signature:	Completed: MM/DD/YY
Comments:	