



National Institute for Metalworking Skills, Inc.

Credentialing Achievement Record

**Screw Machining
Level III**

**Set Up and Operate with
Multiple Spindles**

National Institute for Metalworking Skills
3251 Old Lee Highway, Suite 205
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<http://nims-skills.org>



SCREW MACHINING CREDENTIALING PROGRAM

LEVEL III CREDENTIALING ACHIEVEMENT RECORD (CAR)

and

Official Performance CHECKLISTs (Skill Checks)

☒ Please print

NAME:	Reg. No.	Job Title:
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Site Name:	Site No.
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STATUS:	<i>Non-Completer</i> <input type="checkbox"/>	<i>Candidate has Successfully Completed all NIMS Performance Requirements in the Following Credentialing Area:</i>
	Reason:	Duty Cluster Name: SETUP MULTIPLE SPINDLE SCREW MACHINE Date Completed: _____

Directions

This *Credentialing Achievement Record (CAR)* is the official training and performance document for the above named NIMS credentialing candidate. The CAR is used by the trainer/supervisor and candidate as a record (or logbook) of individual on-the-job performance. The CAR is the *vehicle* that will allow eligible candidates to take the NIMS written credentialing examination(s). Supervisors, trainers, and candidates should take care of this record and be sure that it is accurate, kept up to date, filled out correctly, and properly stored. All information recorded in the *CAR* should be considered **CONFIDENTIAL**.

Candidates may select as many credentialing Duty Clusters as applicable to the facility or appropriate to the job. There are separate CAR booklets for each credentialing Duty Cluster. The CAR opens with a list of Critical Work Activities (or experience statements) that must be acknowledged and documented. However, actual performance is assessed two ways: 1) by fulfilling these general experience and historical statements and 2) by an examiner administering *Skill Checks* (or performance assessments). Skill Checks required for credentialing are clearly marked with the title - **CAR SKILL CHECK**. With the exception of the Opportunity Observations required for troubleshooting and maintenance, Skill Checks must be successfully completed two times. Candidate performance is documented by a on each Examiner's CHECKLIST. All successful Skill Check attempts must be co-signed and dated by the trainer/supervisor and candidate. Work Activity (experiential) statements must be co-initialed by the trainer/supervisor or manager and the candidate then dated. If a particular Skill Check step or standard does not apply at your facility, check-off the applicable *NA* box and continue. Skill Checks may require the candidate to perform work a bit differently than your his normal procedure or learn how to do something that may not be part of his typical day-to-day responsibilities. However, you may only check-off a *NA* box if the process-standard does not apply because the equipment or tooling is not available or the machining process itself does not require this activity.

For additional information about administering *CAR* Skill Checks , see the CAR Administration Guide or consult with your facility Credentialing Coordinator.



SCREW MACHINING CREDENTIALING PROGRAM
LEVEL II CREDENTIALING ACHIEVEMENT RECORD (CAR)

Setup a Multiple Spindle Screw Machine

Level III Automatic Bar and Chucking Machine

Critical Work Activities & Experience	Date Completed	Supervisor Initials	Trainer Initials	Trainee Initials
All of the following statements must be completed prior to submission of the CAR		and	/or	
Multiple Spindle Screw Machining				
Candidate has successfully completed all required safety training/courses as specified by the work facility or required by OSHA. Candidate has working knowledge of applicable OSHA, ISO, and ANSI regulations and guidelines.				
Candidate has successfully completed the probationary period for this position (job title) as specified by the work facility.				
Candidate has met the attendance policy of the facility over the last 12 consecutive months.				
Candidate has had no company documented safety violations within the last 12 consecutive months.				
Candidate has no reported incidents of non-conforming parts contaminating quality parts over the last three (3) consecutive months.				
Candidate has demonstrated the ability to maintain a clean and orderly work area in compliance with facility housekeeping policies and has no reported violations for a period of three (3) consecutive months.				
Candidate demonstrated expert ability recognizing and explaining the type of screw machine and its function (including controls, mechanical devices, tooling, and auxiliaries/electronics if applicable).				
Candidate can explain applied concepts of heat, shock, and friction; zone of distortion; cutting theory, geometry and interface; metallurgy and material properties; lubricants and coolants; and chip-breaking capabilities.				



Critical Work Activities & Experience	Date Completed	Supervisor Initials	Trainer Initials	Trainee Initials
Given specific duties, written instructions, and necessary documentation/forms, candidate has demonstrated the ability to locate, read and use information to setup, operate, and control a machining process to defined quality standards.				
Candidate has demonstrated expert abilities in basic decision making and problem solving.				
Candidate has demonstrated competency when linking <i>cause and effect</i> to solve simple to complex problems.				
Candidate has demonstrated appropriate social and communicative skills (written and verbal) in resolving conflicts with supervisors, engineers, and/or co-workers or when presenting new ideas or constructive feedback.				
Candidate has worked cooperatively with others and has contributed to company efforts with ideas, suggestions, and/or feedback to improve a process, resolve a problem, or improvise a new method.				
Candidate can recognize codes of conduct and values in the workplace and has exhibited honesty, integrity, and responsibility on the job.				
Candidate has demonstrated expert ability in interpreting blueprints and/or technical drawings (Standard and GDT orthographics, geometric dimensioning and tolerancing, etc.)				
Candidate has applied knowledge of precision measuring instruments and has used those devices to determine work piece compliance along selected dimensions (as per blueprints, technical drawings and/or reference part).				
Candidate has demonstrated ability to perform and use applied mathematical calculations (geometry, algebra, trigonometry) applicable to perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity, positioning, and solving for unknown angles.				
Candidate has demonstrated ability working with metrics and is able to convert metric measurements to/from American Standard measurement units.				

Skill Checks begin on next page

NOTE: Further details and specifics regarding worker competencies, see Duties & Standards for Screw Machining Skills - Level II & III, National Institute for Metalworking Skills/Precision Machined Products Association



NIMS SCREW MACHINING SKILL CHECK
Level III

Candidate:	Date: 199
Examiner:	(For examiner use only) Results: Pass <input type="checkbox"/> Yes Date:

Work Activity **Setup, Verify and Operate an Automatic, Multiple Spindle Screw Machine**

Performance Conditions

Setting: Shop, bench, and QC area(s). Candidate will perform pre-setup and job planning activities, setup an automatic multiple-spindle screw machine for a new job, verify operations, inspect parts for quality (*setup and in-process frequency inspections required*), and run the process for at least 1 hour (*or up until and after the first QC inspection*) while continually monitoring operations. Two (2) successful Skill Check attempts are required for on-the-job performance recognition.

The machine is shutdown. However, the previous job has not been removed for this changeover. The setup job to be demonstrated has already been approved as a “new run.”

In addition, the candidate will respond to in-process problems, troubleshoot (isolate) the cause of those problems, and perform appropriate corrective actions necessary to maintain equipment function, process integrity, and quality control. Candidate may also participate in preventive maintenance activities.

To take these Skill Checks, the metal piece-parts to be made must have (at minimum) the following attributes and characteristics:

- a Cut-Off
- a Formed OD
- a Shaved OD
- a Reamed or Drilled Hole, and
- an ID or OD Thread.

Safety Equipment:

- Personal Protection Equipment/Clothing (*PPE/PPC*)
- Lockout/Tagout and/or Safety Blocks (if applicable)



Tools, Equipment and Materials:

- Bar Stock/Raw Material
- Common Hand/Setup Tools
- Setup Changeover Tooling and Parts
- Cutting Oil/ Lube Oil
- Grease/Grease Gun
- Tote Pans
- Chip/Part Containers
- Shop Wipes and Lint Free Wipes
- Optical Charts/Overlays
- Prints, Charts, Drawings
- Flashlight/Mirror
- Watch/Stop Watch
- Housekeeping Supplies
- Vacuum/Blow-Down Air
- Containers
- Manufacturer’s Operations Manual
- Layout and QC Documentation

Measuring Instruments:

- Scales
- Feeler Gages
- Micrometer
- Dial Calipers
- Dial Indicators
- Thread Gages
- Plug Gages
- Functional/Fixture Gages
- Profilometer
- SPC Input
- Optical Comparator or CMM/Vision System

Attainment Standards

1. 100% of all applicable procedural steps and process standards (without assistance and within company-specific time limit) following all shop and OSHA safety requirements, ISO/QS standards, equipment manufacturer specifications, and plant-specific processes, practices and procedures.
2. 100% conformance with all QC/SPC standards, customer expectations, and NIMS final product criteria.

Trainee Directions

The above referenced tools, equipment, materials and supplies may be used to Setup, Verify, and Operate a Non-CNC Multiple Spindle Automatic Screw Machine. All safety and plant-specific procedures must be followed. The examiner will evaluate the process used, the outcomes attained, and the final result. Process steps should be performed in sequence according to your SOPs, Job Aids, Layout Sheet, or Setup/Process Plan. However, all applicable outcomes (product standards) must meet equipment-specific criteria, customer specifications, SPC tolerances, and NIMS criteria for successful completion.

The Level III Skill Check you are about to take is a hands-on performance assessment administered as part of the credentialing process. This assessment will enable you to verify your experience and demonstrate your competency by completing practical job tasks. The Skill Check will cover areas that you should know and problems you should be able to solve. If you need any additional materials or experience any problems with equipment during the assessment, notify the examiner immediately.




Examiner Instructions

For successful completion of this Skill Check, the candidate must demonstrate the ability to successfully complete the work activity under controlled assessment conditions. All work must be completed to standard.

Before administering the Skill Check:

- ◆ Read/review the CAR *Administration Guide* developed for the program.
- ◆ Ensure that you have a copy of this Skill Check for the candidate to review prior to demonstrating the job. Be sure all applicable equipment and supplies are available.

Do not provide assistance during the Skill Check. Monitor work in-progress and evaluate for *process standard*. Assess the completed work for conformance with *final product* criteria. Mark *NA* if a process-product is not appropriate.

 **Stop the Skill Check immediately if the candidate violates a safety/environmental regulation or procedure or if there is any possibility of personal injury or damage to equipment.**

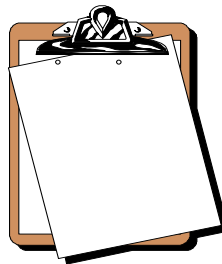
Before assessment, the examiner may discuss appropriate safety requirements and loss potential issues (*i.e., Lock and Tag/Zero Energy, HAZMAT/HAZCOM, personal protection equipment/devices, pinch points, compressed air/fluid, high or residual voltage, E-Stops, OSHA-1910 Loss Potential, etc.*).

EXAMINER: Read aloud the *Skill Check Script* from the *Administration Guide* (*verbatim*).

When the candidate indicates that he/she has completed the Skill Check or when your maximum time allowed has run out, assess Final Product Standards and follow the closing procedures outlined in the *Administration Guide*.

Checklist

Scoring Procedures: Observe the candidate's performance for each Process Step and mark the *CHECKLIST* whether or not the *Process-Product* Standards were attained (*Do not rely on your memory*). *Process-Product* Standards are to be marked as each element is completed.





Examiner's CHECKLIST SKILL CHECK #1

Setup a Non-CNC Multiple Spindle Automatic Screw Machine

Part 1

Process Steps	Process-Product Standards			
START DATE:		Yes	No	NA
A - PRE-SETUP, JOB PLANNING & STAGING				
1. Obtain Setup Documentation, Charts, Prints, and Logs.	• Read and understood layout sheet requirements, setup/process plan and statistical process controls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Correct and current prints/drawing obtained and any print revisions noted and acknowledged.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Machine selected was appropriate for, or assigned to the job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Work or job order/number matched print number and/or equipment number.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Gage checklist obtained and reviewed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Verified availability of tooling, accessories, and raw material.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Bench cleared and tools staged.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Coolant/lubricant supplied and verified for job (type, application, viscosity, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Demonstrated good coolant/lubricant handling and application techniques.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Gage calibration control tags correct for date.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Part pans and production tags/tickets prepared.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Chip and part containers positioned.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• No loose objects lying in/around machine.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Chips removed/exited from machine.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Remove Previous Job and Clean Machine	• No tooling in machine (all previous tooling removed without damaging tools or holders).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Tools removed were separated and identified, or stored to the previous job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Damaged tooling identified and prepared for refurbishing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Documentation and gages from previous job handled, stored, or submitted properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Tooling zones, nozzles, lines, sump screen, splashguards, and chip area clean.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• No setup parts left on bench or in/by machine.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
A - PRE-SETUP, JOB PLANNING & STAGING				
<i>Continued</i>				
3. Stage Tooling, Tool Holders and Cutting Tools	<ul style="list-style-type: none"> • Certified job gages matched layout/job number. <input type="checkbox"/> • New tooling and tool holders clean and showing no damage or excessive wear. <input type="checkbox"/> • Tooling verified and appropriate for job. <input type="checkbox"/> • Tooling and tool sequence conforms to layout and process plan requirements. <input type="checkbox"/> • Tooling clean, sharp, and showing no damage or excessive wear. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Identify and Request Raw Material/Bar Stock	<ul style="list-style-type: none"> • Material tag/code matched layout/setup plan (type, metallurgy, size, finish, quantity, etc.). <input type="checkbox"/> • Material verified and staged at job site (material ID tag controlled if applicable). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS				
1. Install Equipment Components (Service Set)	<ul style="list-style-type: none"> • Gears assembled and set to clearance specifications. <input type="checkbox"/> • Cams set to roll clearance. <input type="checkbox"/> • Dead/Positive Stops sequentially backed-off. <input type="checkbox"/> • Collets tight per sequenced procedure. <input type="checkbox"/> • Pusher changed and secure. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Load Bar Stock and Set Chucking	<ul style="list-style-type: none"> • Feedout set per sequenced procedure. <input type="checkbox"/> • Bar(s) locked and loaded in machine. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Install Cut-Off and Set Stock	<ul style="list-style-type: none"> • Cut-off distance from collet set to correct specification. <input type="checkbox"/> • Cut-off “on center.” <input type="checkbox"/> • Stock-stop distance from cut-off set to correct specification. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Set Drill(s) in Jog Mode	<ul style="list-style-type: none"> • Standard and clean drill holder(s) positioned, installed and secured. <input type="checkbox"/> • High speed drilling attachment cleaned, installed, and secured (if applicable). <input type="checkbox"/> • Drill set to correct diameter and depth. <input type="checkbox"/> • Demonstrated ability manipulating equipment and tooling in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Set Reamer in Jog Mode	<ul style="list-style-type: none"> • Standard and clean floating holder installed. <input type="checkbox"/> • Accelerated reaming attachments clean and properly installed. <input type="checkbox"/> • Reamer set to correct diameter and depth. <input type="checkbox"/> • Reamer will cut-to-size. <input type="checkbox"/> • Demonstrated ability manipulating equipment and tooling in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
6. Set Form Tool in Jog Mode	<ul style="list-style-type: none"> • Clean form holder(s) installed. <input type="checkbox"/> • Tool installed and secured in holding device. <input type="checkbox"/> • Cutting edge sharp and “on center.” <input type="checkbox"/> • Forming tool diameter set to layout (includes positive stop). <input type="checkbox"/> • Demonstrated ability manipulating equipment and form tools in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Install Shaving/Size Tool in Jog Mode.	<ul style="list-style-type: none"> • Fixture clean and showing no damage or excessive wear. <input type="checkbox"/> • Shave fixture bench-set for diameter. <input type="checkbox"/> • Fixture secured in holder. <input type="checkbox"/> • Holder set/adjacent to center. <input type="checkbox"/> • Shave tool set to layout. <input type="checkbox"/> • Demonstrated ability manipulating equipment and tools. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Install Tap	<ul style="list-style-type: none"> • Clean tap positioned and set in holder. <input type="checkbox"/> • Tap set to minimum full thread depth and showing no damage or excessive wear. <input type="checkbox"/> • Threads matched print callout. <input type="checkbox"/> • Demonstrated ability manipulating equipment and taps in jog mode or under full power. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Install Threading Attachment(s)	<ul style="list-style-type: none"> • Chasers installed. <input type="checkbox"/> • Thread rolls installed. <input type="checkbox"/> • Threading head pre-set at bench. <input type="checkbox"/> • Threads matched print callout/layout and met industrial standards. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Set Turning Tool in Jog Mode	<ul style="list-style-type: none"> • Clean turning holder installed. <input type="checkbox"/> • Turning tool clean and showing no damage or excessive wear. <input type="checkbox"/> • Tool set to center. <input type="checkbox"/> • Turn diameter matched print callout/layout. <input type="checkbox"/> • Demonstrated ability manipulating equipment and turning devices in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Set Recess in Jog Mode	<ul style="list-style-type: none"> • Angular recess installed to setting requirement. <input type="checkbox"/> • Swing-type recess installed. <input type="checkbox"/> • Recess set to center. <input type="checkbox"/> • Recess diameter and/or centerline matched print/layout. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
12. Cycle Machine for Dry Run	<ul style="list-style-type: none"> • Stock feedout disengaged (or bar removed) and collet empty. <input type="checkbox"/> • Selected proper mode of operation (machine active and cycling/indicator light “On”). <input type="checkbox"/> • Ran 10 cycles with +/- 2.5% of process plan. <input type="checkbox"/> • Machine running in proper time. <input type="checkbox"/> • Splashguards and/or safety devices functioning. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Make Trial/First Piece-Part Under Full Power	<ul style="list-style-type: none"> • Selected proper mode of operation (machine cycling and indexing @ full power). <input type="checkbox"/> • No smoke, unusual odors, belt squeal/banging, or excessive vibration and noise present (<85dB). <input type="checkbox"/> • CAM and tooling mechanisms operational. <input type="checkbox"/> • Bar in position and collet tension correct. <input type="checkbox"/> • Feed engaged and piece-parts machined. <input type="checkbox"/> • One first piece-part made <i>per</i> spindle. <input type="checkbox"/> • Trail piece-parts kept in order or sequence. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Inspect Trial/First Piece-Part Using Hand Held Measuring Devices	<ul style="list-style-type: none"> • IDs/ODs conform to diameter specifications. <input type="checkbox"/> • OAL in conformance with part specifications. <input type="checkbox"/> • Threads within specifications (major/minor/pitch). <input type="checkbox"/> • IO/OD depths conform to print specifications. <input type="checkbox"/> • Surface (and/or micro) finishes matched print, customer, or quality specifications. <input type="checkbox"/> • Demonstrated proficiency using and reading hand-held precision measuring instruments. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Evaluate Initial Attributes and Inspect for Damage	<ul style="list-style-type: none"> • No glazing, rubbing, or withdrawal marks present on piece. <input type="checkbox"/> • No flaking, tearing, or pitting present. <input type="checkbox"/> • No burrs, nicks, chipping, or chatter present. <input type="checkbox"/> • All appropriate finish areas smooth. <input type="checkbox"/> • Features conform to print requirements. <input type="checkbox"/> • Completed all QC/SPC documentation accurately and legibly (including sign-offs). <input type="checkbox"/> • Process adjusted until part is in conformance (initial process reliability attained). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
16. Inspect Machined Setup Parts for Dimensional Characteristics Using Optical Comparator <div style="border: 1px solid black; padding: 2px; width: fit-content;"> CMM or Vision System may be used in addition to, or in lieu of an optical comparator </div>	<ul style="list-style-type: none"> • One sample part made <i>per</i> spindle. <input type="checkbox"/> • Sample piece-parts kept in order or sequence. <input type="checkbox"/> • Hands clean before instrument use. <input type="checkbox"/> • Part(s) cleaned and inspected for damage prior to viewing. <input type="checkbox"/> • Turned on instrument and verified operation for function (lamp on, controls work, screen active, etc.). <input type="checkbox"/> • View screen and lens clean (no scratches, dust or film present on screen or lens). <input type="checkbox"/> • Magnification /focus adjusted to viewing requirements. <input type="checkbox"/> • Part properly staged and positioned in/on optical comparator/instrument. <input type="checkbox"/> • Instrument focused @ 20/20 and image clear. <input type="checkbox"/> • Part manipulated and all angles and radius/radii are within +/- tolerances and specifications. <input type="checkbox"/> • Accurately checked profiles/control limits as specified as Quality Plan or SPC. <input type="checkbox"/> • Achieved part dimensional conformance or notified proper authority of any non-conformance profiles. <input type="checkbox"/> • Turned off instrument (screen, lens, surface area, work holder(s), and inspection site left clean and undamaged). <input type="checkbox"/> • Completed/submitted setup QC documentation (1 piece part <i>per</i> spindle). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Prepare for Hand Off	<ul style="list-style-type: none"> • Tool sequence, clearance and position is correct (tooling will cut rather than rub). <input type="checkbox"/> • No previous, broken, non-compliance or setup parts present in or around machine. <input type="checkbox"/> • Floor clean and dry (No standing oil, coolant, water, chips, debris, etc.) <input type="checkbox"/> • Pressurized lines are not leaking oil, coolant, or air. <input type="checkbox"/> • No air present in coolant (not foaming). <input type="checkbox"/> • Coolant lines/nozzles pointed at the work area and will provide adequate flow. <input type="checkbox"/> • Screens are clean (sufficient flow and no smoke). <input type="checkbox"/> • Spindles will run and all safety guarding secure. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
Hand Off <i>continued</i>	<ul style="list-style-type: none"> • Lubrication system functioning (flows and pressure adequate for application). <input type="checkbox"/> • Collet closed completely on bar(s) <input type="checkbox"/> • No unusual sounds, odors, smoke, or excessive vibration present. <input type="checkbox"/> • No alarms activated or leakage present. <input type="checkbox"/> • Equipment checked for maintenance. <input type="checkbox"/> • Machine production and process ready. <input type="checkbox"/> • Determined/communicated frequency of in-process part inspections. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C - PRODUCTION OPERATIONS & PROCESS CONTROL <i>(1 hour of operation run time required or until first in-process frequency inspection)</i>				
1. Re-Start Equipment or Start Production Cycle	<ul style="list-style-type: none"> • Selected proper mode of operation (Machine cycling/indexing, indicator light “On”). <input type="checkbox"/> • Coolant lines bathing work area with sufficient flow and pressure. <input type="checkbox"/> • Piece parts machined on an on-going basis. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Monitor Running Processes <i>(Machine Parts)</i>	<ul style="list-style-type: none"> • Slides operating smoothly (no chatter or jerking). <input type="checkbox"/> • Cycle time (%) is correct. <input type="checkbox"/> • Chips pulled and/or evacuating unit (sump is not plugging up). <input type="checkbox"/> • Machine properly indexing (no slamming, jamming, banging, etc.) and running efficiently. <input type="checkbox"/> • Parts sequentially machined on a continuous basis to % productivity standards (e.g., “parts-per-minute”). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Inspect Parts <i>In-Process</i> Using Hand-Held Precision Measurement Devices	<ul style="list-style-type: none"> • ID/OD conforms to diameter specifications. <input type="checkbox"/> • OAL in conformance with part specifications. <input type="checkbox"/> • Threads within specifications (major/minor/pitch). <input type="checkbox"/> • ID/OD depths conform to print specifications. <input type="checkbox"/> • Surface (and/or micro) finishes met print or quality specifications. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
First in-process frequency inspection	<ul style="list-style-type: none"> • Demonstrated proficiency using and reading hand-held precision measuring instruments. <input type="checkbox"/> • Parts pulled immediately after sample (no cross contamination). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
C - PRODUCTION OPERATIONS & PROCESS CONTROL <i>continued</i>				
4. Inspect <i>In-Process</i> Parts for Dimensional Characteristics Using an Optical Comparator. <div style="border: 1px solid black; padding: 2px; width: fit-content;"> CMM or Vision System may be used in addition to, or in lieu of an optical comparator </div>	<ul style="list-style-type: none"> • Hands clean before use. <input type="checkbox"/> • Part(s) cleaned prior to viewing. <input type="checkbox"/> • Turned on instrument and functioning (lamp on, controls work, screen active, etc.). <input type="checkbox"/> • View screen and lens clean (no scratches or film present on screen or lens). <input type="checkbox"/> • Magnification adjusted to enlargement dimensions with clear viewing requirements. <input type="checkbox"/> • Part properly staged and positioned in/on optical comparator. <input type="checkbox"/> • Instrument optics focused and image sharp. <input type="checkbox"/> • Part manipulated and all angles and radius/radii are within +/- tolerances and specifications. <input type="checkbox"/> • Accurately checked profiles/control limits as specified in Quality/Sample Plan or by SPC. <input type="checkbox"/> • Maintained part conformance or notified proper authority of any non-conformance profiles. <input type="checkbox"/> • Turned off instrument (screen, lens, surface area, work holder(s), and inspection site left clean and undamaged). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Maintain Process and Service Machine	<ul style="list-style-type: none"> • Coolant/lubricant @ indicated levels and flowing (screens clear - no leakage/blockage). <input type="checkbox"/> • No smoke, excessive vibration, or unusual odors/sounds present. <input type="checkbox"/> • Maintenance and servicing items noted (See Part 2 for troubleshooting and maintenance performance options). <input type="checkbox"/> • Chip containers maintained and not over flowing. <input type="checkbox"/> • Part/chip containers replaced when full (no cross contamination). <input type="checkbox"/> • Adhered to tool change and inspection frequency requirements. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DATE FINISHED:	<ul style="list-style-type: none"> • Floor clean, dry and free of debris. Successfully handed-off to operator, shutdown equipment, or continued self-directed operations. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



FINAL PRODUCT STANDARDS

“Work is Done As Expected When:”

- a. All written/verbal instructions, checklists, and guidelines were followed and candidate demonstrated safe workplace practices in materials handling, tool installations and sequencing, machine setup and operations, guarding, and coolant applications.
- b. Condition of each tool was verified prior to operations and acceptable tolerances established (minimum accuracy levels @ $\leq \pm 1/16^{\text{th}}$ on most factions and/or $\leq + .006 - .000$ on drilled diameters required).
- c. All quality control inspections were performed at proper intervals to Quality Plan criteria (procedures), results within SPC requirements, and accurately recorded compliance within the part’s required profile(s), tolerances, and dimensions.
- d. Following the setup/layout plan, machine was verified for function and safety. Demonstrated effective communication skills during hand-off and while monitoring operations.
- e. Parts were machined and inspected under setup conditions and on an on-going basis without contaminating good/bad parts.
- f. Current prints and tangible part features, characteristics and processes met specified or implied needs as per usability, reliability, maintainability, and economics.
- g. Candidate shows ability to link cause and effect in simple to complex problems and dig for root cause skillfully to isolate or correct the problem.
- h. All shop safety and housekeeping practices and procedures have been followed.

COMMENTS

Candidate: _____

Examiner: _____

Equipment Model/Machine Type Used

Signatures: _____ Date: _____
(Examiner/Advisor)

_____ Date: _____
(Monitor/Trainer)

_____ Date: _____
(Candidate)



Examiner's CHECKLIST SKILL CHECK #2

Setup a Non-CNC Multiple Spindle Automatic Screw Machine

Part 1

Process Steps	Process-Product Standards			
START DATE:		Yes	No	NA
A - PRE-SETUP, JOB PLANNING & STAGING				
1. Obtain Setup Documentation, Charts, Prints, and Logs.	<ul style="list-style-type: none"> • Read and understood layout sheet requirements, setup/process plan and statistical process controls. • Correct and current prints/drawing obtained and any print revisions noted and acknowledged. • Machine selected was appropriate for, or assigned to the job. • Work or job order/number matched print number and/or equipment number. • Gage checklist obtained and reviewed. • Verified availability of tooling, accessories, and raw material. • Bench cleared and tools staged. • Coolant/lubricant supplied and verified for job (type, application, viscosity, etc.) • Demonstrated good coolant/lubricant handling and application techniques. • Gage calibration control tags correct for date. • Part pans and production tags/tickets prepared. • Chip and part containers positioned. • No loose objects lying in/around machine. • Chips removed/exited from machine. 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. Remove Previous Job and Clean Machine	<ul style="list-style-type: none"> • No tooling in machine (all previous tools removed without damaging tool or holder). • Tools removed were separated and identified, or stored to the previous job. • Damaged tooling identified and prepared for refurbishing. • Documentation and gages from previous job handled, stored, or submitted properly. • Tooling zones, nozzles, lines, sump screen, splashguards, and chip area clean. • No setup parts left on bench or in/by machine. 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
A - PRE-SETUP, JOB PLANNING & STAGING				
<i>Continued</i>				
3. Stage Tooling, Tool Holders and Cutting Tools	<ul style="list-style-type: none"> • Certified job gages matched layout/job number. <input type="checkbox"/> • New tooling and tool holders clean and showing no damage or excessive wear. <input type="checkbox"/> • Tooling verified and appropriate for job. <input type="checkbox"/> • Tooling and tool sequence conforms to layout and process plan requirements. <input type="checkbox"/> • Tooling clean, sharp, and showing no damage or excessive wear. <input type="checkbox"/> • Steel grade/hardness and design of tooling appropriate for the job. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Identify and Request Raw Material/Bar Stock	<ul style="list-style-type: none"> • Material tag/code matched layout/setup plan (type, metallurgy, size, finish, quantity, etc.). <input type="checkbox"/> • Material verified and staged at job site (material ID tag controlled if applicable). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS				
1. Install Equipment Components (Service Set)	<ul style="list-style-type: none"> • Gears assembled and set to clearance specifications. <input type="checkbox"/> • Cams set to roll clearance. <input type="checkbox"/> • Dead/Positive Stops sequentially backed-off. <input type="checkbox"/> • Collets tight per sequenced procedure. <input type="checkbox"/> • Pusher changed and secure. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Load Bar Stock and Set Chucking	<ul style="list-style-type: none"> • Feedout set per sequenced procedure. <input type="checkbox"/> • Bar(s) locked and loaded in machine. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Install Cut-Off and Set Stock	<ul style="list-style-type: none"> • Cut-off distance from collet set to correct specification. <input type="checkbox"/> • Cut-off “<i>on center</i>.” <input type="checkbox"/> • Stock-stop distance from cut-off set to correct specification. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Set Drill(s) in Jog Mode	<ul style="list-style-type: none"> • Standard and clean drill holder(s) positioned, installed and secured. <input type="checkbox"/> • High speed drilling attachment cleaned, installed, and secured (if applicable). <input type="checkbox"/> • Drill set to correct diameter and depth. <input type="checkbox"/> • Demonstrated ability manipulating equipment and tooling in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Set Reamer in Jog Mode	<ul style="list-style-type: none"> • Standard and clean floating holder installed. <input type="checkbox"/> • Accelerated reaming attachments clean and properly installed. <input type="checkbox"/> • Reamer set to correct diameter and depth. <input type="checkbox"/> • Reamer will cut-to-size. <input type="checkbox"/> • Demonstrated ability manipulating equipment and tooling in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
6. Set Form Tool in Jog Mode	<ul style="list-style-type: none"> • Clean form holder(s) installed. <input type="checkbox"/> • Tool installed and secured in holding device. <input type="checkbox"/> • Cutting edge sharp and “on center.” <input type="checkbox"/> • Forming tool diameter set to layout (includes positive stop). <input type="checkbox"/> • Demonstrated ability manipulating equipment and form tools in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Install Shaving/Size Tool in Jog Mode.	<ul style="list-style-type: none"> • Fixture clean and showing no damage or excessive wear. <input type="checkbox"/> • Shave fixture bench-set for diameter. <input type="checkbox"/> • Fixture secured in holder. <input type="checkbox"/> • Holder set/adjacent to center. <input type="checkbox"/> • Shave tool set to layout. <input type="checkbox"/> • Demonstrated ability manipulating equipment and tools. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Install Tap	<ul style="list-style-type: none"> • Clean tap positioned and set in holder. <input type="checkbox"/> • Tap set to minimum full thread depth and showing no damage or excessive wear. <input type="checkbox"/> • Threads matched print callout. <input type="checkbox"/> • Demonstrated ability manipulating equipment and taps in jog mode or under full power. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Install Threading Attachment(s)	<ul style="list-style-type: none"> • Chasers installed. <input type="checkbox"/> • Thread rolls installed. <input type="checkbox"/> • Threading head pre-set at bench. <input type="checkbox"/> • Threads matched print callout/layout and met industrial standards. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Set Turning Tool in Jog Mode	<ul style="list-style-type: none"> • Clean turning holder installed. <input type="checkbox"/> • Turning tool clean and showing no damage or excessive wear. <input type="checkbox"/> • Tool set to center. <input type="checkbox"/> • Turn diameter matched print callout/layout. <input type="checkbox"/> • Demonstrated ability manipulating equipment and turning devices in jog mode. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Set Recess in Jog Mode	<ul style="list-style-type: none"> • Angular recess installed to setting requirement. <input type="checkbox"/> • Swing-type recess installed. <input type="checkbox"/> • Recess set to center. <input type="checkbox"/> • Recess diameter and/or centerline matched print/layout. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
12. Cycle Machine for Dry Run	<ul style="list-style-type: none"> • Stock feedout disengaged (or bar removed) and collet empty. <input type="checkbox"/> • Selected proper mode of operation (machine active and cycling/indicator light “On”). <input type="checkbox"/> • Ran 10 cycles with +/- 2.5% of process plan. <input type="checkbox"/> • Machine running in proper time. <input type="checkbox"/> • Splashguards and/or safety devices functioning. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Make Trial/First Piece-Part Under Full Power	<ul style="list-style-type: none"> • Selected proper mode of operation (machine cycling and indexing @ full power). <input type="checkbox"/> • No smoke, unusual odors, belt squeal/banging, or excessive vibration and noise present (<85dB). <input type="checkbox"/> • CAM and tooling mechanisms operational. <input type="checkbox"/> • Bar in position and collet tension correct. <input type="checkbox"/> • Feed engaged and piece-parts machined. <input type="checkbox"/> • One first piece-part made <i>per</i> spindle. <input type="checkbox"/> • Trail piece-parts kept in order or sequence. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Inspect Trial/First Piece-Part Using Hand Held Measuring Devices	<ul style="list-style-type: none"> • IDs/ODs conform to diameter specifications. <input type="checkbox"/> • OAL in conformance with part specifications. <input type="checkbox"/> • Threads within specifications (major/minor/pitch). <input type="checkbox"/> • IO/OD depths conform to print specifications. <input type="checkbox"/> • Surface (and/or micro) finishes matched print, customer, or quality specifications. <input type="checkbox"/> • Demonstrated proficiency using and reading hand-held precision measuring instruments. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Evaluate Initial Attributes and Inspect for Damage	<ul style="list-style-type: none"> • No glazing, rubbing, or withdrawal marks present on piece. <input type="checkbox"/> • No flaking, tearing, or pitting present. <input type="checkbox"/> • No burrs, nicks, chipping, or chatter present. <input type="checkbox"/> • All appropriate finish areas smooth. <input type="checkbox"/> • Features conform to print requirements. <input type="checkbox"/> • Completed all QC/SPC documentation accurately and legibly (including sign-offs). <input type="checkbox"/> • Process adjusted until part is in conformance (initial process reliability attained). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
16. Inspect Machined Setup Parts for Dimensional Characteristics Using Optical Comparator <div style="border: 1px solid black; padding: 2px; width: fit-content;"> CMM or Vision System may be used in addition to, or in lieu of an optical comparator </div>	<ul style="list-style-type: none"> • One sample part made <i>per</i> spindle. <input type="checkbox"/> • Sample piece-parts kept in order or sequence. <input type="checkbox"/> • Hands clean before instrument use. <input type="checkbox"/> • Part(s) cleaned and inspected for damage prior to viewing. <input type="checkbox"/> • Turned on instrument and verified operation for function (lamp on, controls work, screen active, etc.). <input type="checkbox"/> • View screen and lens clean (no scratches, dust or film present on screen or lens). <input type="checkbox"/> • Magnification /focus adjusted to viewing requirements. <input type="checkbox"/> • Part properly staged and positioned in/on optical comparator/instrument. <input type="checkbox"/> • Instrument focused @ 20/20 and image clear. <input type="checkbox"/> • Part manipulated and all angles and radius/radii are within +/- tolerances and specifications. <input type="checkbox"/> • Accurately checked profiles/control limits as specified as Quality Plan or SPC. <input type="checkbox"/> • Achieved part dimensional conformance or notified proper authority of any non-conformance profiles. <input type="checkbox"/> • Turned off instrument (screen, lens, surface area, work holder(s), and inspection site left clean and undamaged). <input type="checkbox"/> • Completed/submitted setup QC documentation (1 piece part <i>per</i> spindle) <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Prepare for Hand Off	<ul style="list-style-type: none"> • Tool sequence, clearance and position is correct (tooling will cut rather than rub). <input type="checkbox"/> • No previous, broken, non-compliance or setup parts present in or around machine. <input type="checkbox"/> • Floor clean and dry (No standing oil, coolant, water, chips, debris, etc.) <input type="checkbox"/> • Pressurized lines are not leaking oil, coolant, or air. <input type="checkbox"/> • No air present in coolant (not foaming). <input type="checkbox"/> • Coolant lines/nozzles pointed at the work area and will provide adequate flow. <input type="checkbox"/> • Screens are clean (sufficient flow and no smoke). <input type="checkbox"/> • Spindles will run and all safety guarding secure. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
B- SETUP SCREW MACHINE, TOOLING ACCESSORIES & CONTROLS <i>Continued</i>				
Hand Off <i>continued</i>	<ul style="list-style-type: none"> • Lubrication system functioning (flows and pressure adequate for application). <input type="checkbox"/> • Collet closed completely on bar(s) <input type="checkbox"/> • No unusual sounds, odors, smoke, or excessive vibration present. <input type="checkbox"/> • No alarms activated or leakage present. <input type="checkbox"/> • Equipment checked for maintenance. <input type="checkbox"/> • Machine production and process ready. <input type="checkbox"/> • Determined/communicated frequency of in-process part inspections. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C - PRODUCTION OPERATIONS & PROCESS CONTROL <i>(1 hour of operation run time required or until first in-process frequency inspection)</i>				
1. Re-Start Equipment or Start Production Cycle	<ul style="list-style-type: none"> • Selected proper mode of operation (Machine cycling/indexing, indicator light “On”). <input type="checkbox"/> • Coolant lines bathing work area with sufficient flow and pressure. <input type="checkbox"/> • Piece parts machined on an on-going basis. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Monitor Running Processes <i>(Machine Parts)</i>	<ul style="list-style-type: none"> • Slides operating smoothly (no chatter or jerking). <input type="checkbox"/> • Cycle time (%) is correct. <input type="checkbox"/> • Chips pulled and/or evacuating unit (sump is not plugging up). <input type="checkbox"/> • Machine properly indexing (no slamming, jamming, banging, etc.) and running efficiently. <input type="checkbox"/> • Parts sequentially machined on a continuous basis to % productivity standards (e.g., “parts-per-minute”). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Inspect Parts <i>In-Process</i> Using Hand-Held Precision Measurement Devices	<ul style="list-style-type: none"> • ID/OD conforms to diameter specifications. <input type="checkbox"/> • OAL in conformance with part specifications. <input type="checkbox"/> • Threads within specifications (major/minor/pitch). <input type="checkbox"/> • ID/OD depths conform to print specifications. <input type="checkbox"/> • Surface (and/or micro) finishes met print or quality specifications. <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
First in-process frequency inspection	<ul style="list-style-type: none"> • Demonstrated proficiency using and reading hand-held precision measuring instruments. <input type="checkbox"/> • Parts pulled immediately after sample (no cross contamination). <input type="checkbox"/> 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Process Steps	Process-Product Standards			
	Yes	No	NA	
C - PRODUCTION OPERATIONS & PROCESS CONTROL <i>continued</i>				
4. Inspect <i>In-Process</i> Parts for Dimensional Characteristics Using an Optical Comparator. CMM or Vision System may be used in addition to, or in lieu of an optical comparator	<ul style="list-style-type: none">• Hands clean before use. <input type="checkbox"/>• Part(s) cleaned prior to viewing. <input type="checkbox"/>• Turned on instrument and functioning (lamp on, controls work, screen active, etc.). <input type="checkbox"/>• View screen and lens clean (no scratches or film present on screen or lens). <input type="checkbox"/>• Magnification adjusted to enlargement dimensions with clear viewing requirements. <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none">• Part properly staged and positioned in/on optical comparator. <input type="checkbox"/>• Instrument optics focused and image sharp. <input type="checkbox"/>• Part manipulated and all angles and radius/radii are within +/- tolerances and specifications. <input type="checkbox"/>• Accurately checked profiles/control limits as specified in Quality/Sample Plan or by SPC. <input type="checkbox"/>• Maintained part conformance or notified proper authority of any non-conformance profiles. <input type="checkbox"/>• Turned off instrument (screen, lens, surface area, work holder(s), and inspection site left clean and undamaged). <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Maintain Process and Service Machine	<ul style="list-style-type: none">• Coolant/lubricant @ indicated levels and flowing (screens clear - no leakage or blockage). <input type="checkbox"/>• No smoke, excessive vibration, or unusual odors/sounds present. <input type="checkbox"/>• Maintenance and servicing items noted (See Part 2 for troubleshooting and maintenance performance options). <input type="checkbox"/>• Chip containers maintained and not over flowing. <input type="checkbox"/>• Part/chip containers replaced when full (no cross-contamination). <input type="checkbox"/>• Adhered to tool change and inspection frequency requirements. <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DATE FINISHED:	<ul style="list-style-type: none">• Floor clean, dry and free of debris. Successfully handed-off to operator, shutdown equipment, or continued self-directed operations. <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



FINAL PRODUCT STANDARDS

“Work is Done As Expected When:”

- a. All written/verbal instructions, checklists, and guidelines were followed and candidate demonstrated safe workplace practices in materials handling, tool installations and sequencing, machine setup and operations, guarding, and coolant applications.
- b. Condition of each tool was verified prior to operations and acceptable tolerances established (minimum accuracy levels @ $\leq \pm 1/16^{\text{th}}$ on most factions and/or $\leq + .006 - .000$ on drilled diameters required).
- c. All quality control inspections were performed at proper intervals to Quality Plan criteria (procedures), results within SPC requirements, and accurately recorded compliance within the part’s required profile(s), tolerances, and dimensions.
- d. Following the setup/layout plan, machine was verified for function and safety. Demonstrated effective communication skills during hand-off and while monitoring operations.
- e. Parts were machined and inspected under setup conditions and on an on-going basis without contaminating good/bad parts.
- f. Current prints and tangible part features, characteristics and processes met specified or implied needs as per usability, reliability, maintainability, and economics.
- g. Candidate shows ability to link cause and effect in simple to complex problems and dig for root cause skillfully to isolate or correct the problem.
- h. All shop safety and housekeeping practices and procedures have been followed.

COMMENTS

Candidate: _____

Examiner: _____

Equipment Model/Machine Type Used

Signatures: _____ Date: _____
(Examiner/Advisor)

_____ Date: _____
(Monitor/Trainer)

_____ Date: _____
(Candidate)



Part 2a

<i>Opportunity, situational, or simulated demonstrations</i>	Opportunity Observations	Successfully Done	Not Done
TROUBLESHOOT IN-PROCESS OPERATIONS	<i>Candidate must successfully demonstrate (Identify and respond to the problem then isolate the cause of the problem) at least <u>10</u> of the following troubleshooting situations to be credentialed in the Duty Cluster</i>	Yes 	No NA
In-Process Equipment Problems and Non-Conformance Situations <i>“Out of Spec”</i>	<ol style="list-style-type: none"> 1. Diagnose burrs on parts. 2. Analyze the cause of chatter. 3. Determine the cause of a broken sheer pin. 4. Analyze why a bore is not concentric to OD. 5. Diagnose a diameter variation. 6. Determine why a tool is excessively wearing out. 7. Respond to a lock-up/seize-up condition. 8. Diagnose why threads are torn. 9. Evaluate the cause if stretched leads. 10. Respond to a catastrophic failure. 11. Diagnose why a tool is breaking. 12. Analyze taper problems (OD - hole - ID). 13. Determine the cause of an “out of round” condition. 14. Track cause of overall length variations. 15. Determine why a part has a rough finish. 16. Isolate the cause of smoke. 17. Determine why a cutoff is “walking.” 18. Analyze cause of tapered threads (OD/ID). 19. Determine why a part is breaking off. 20. Diagnose cause of spiral withdrawal marks (ID/OD). 21. Assess why there are hole size variations. 22. Respond to excessive chips (too much scrap). 23. Determine the cause of excessive play in CAM shaft. 24. Respond to “belt squeal.” 25. Respond to spindle carrier not indexing or locking. 	<ol style="list-style-type: none"> 1. <input type="checkbox"/> 2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/> 5. <input type="checkbox"/> 6. <input type="checkbox"/> 7. <input type="checkbox"/> 8. <input type="checkbox"/> 9. <input type="checkbox"/> 10. <input type="checkbox"/> 11. <input type="checkbox"/> 12. <input type="checkbox"/> 13. <input type="checkbox"/> 14. <input type="checkbox"/> 15. <input type="checkbox"/> 16. <input type="checkbox"/> 17. <input type="checkbox"/> 18. <input type="checkbox"/> 19. <input type="checkbox"/> 20. <input type="checkbox"/> 21. <input type="checkbox"/> 22. <input type="checkbox"/> 23. <input type="checkbox"/> 24. <input type="checkbox"/> 25. <input type="checkbox"/> 	<ol style="list-style-type: none"> 1. <input type="checkbox"/> 2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/> 5. <input type="checkbox"/> 6. <input type="checkbox"/> 7. <input type="checkbox"/> 8. <input type="checkbox"/> 9. <input type="checkbox"/> 10. <input type="checkbox"/> 11. <input type="checkbox"/> 12. <input type="checkbox"/> 13. <input type="checkbox"/> 14. <input type="checkbox"/> 15. <input type="checkbox"/> 16. <input type="checkbox"/> 17. <input type="checkbox"/> 18. <input type="checkbox"/> 19. <input type="checkbox"/> 20. <input type="checkbox"/> 21. <input type="checkbox"/> 22. <input type="checkbox"/> 23. <input type="checkbox"/> 24. <input type="checkbox"/> 25. <input type="checkbox"/>

Notes:



Part 2b

<i>Opportunity, PM, situational, or simulated demonstrations</i>	Opportunity Observations	Successfully Done	Not Done
MAINTAIN EQUIPMENT & IN-PROCESS OPERATIONS	<i>Candidate must successfully demonstrate at least <u>10</u> maintenance work activities from the following list to be credentialed in the Duty Cluster</i>	Yes 	No NA
General In-Process Maintenance Preventive Maintenance Corrective Maintenance Shop/Bench Work or Routine Servicing	<ol style="list-style-type: none"> 1. Replaced a CAM rolling pin. 2. Bled lines and valves. 3. Adjusted spindle clutches. 4. Adjusted chain or belt tension. 5. Adjusted threading clutch. 6. Replaced chucking levelers/fingers. 7. Replaced CAM follower. 8. Replaced broken collets or feed fingers.. 9. Locked and tagged-out equipment (Zero energy on mechanical and electrical). 10. Adjusted/reset shut-off linkage. 11. Replaced/madeup a hose or tubing $\leq 2''$. 12. Replaced eccentric pins/screws. 13. Replaced a shear pin. 14. Cleaned filters and screens. 15. Adjusted gibbs. 16. Installed an additional coolant line. 17. Adjusted CAM shaft worm and wheel for play. 18. Changed/replaced EZ access low-voltage fuse. 19. Grind a cutting or forming tool. 20. Refurbished a tool holder. 21. Replaced/verified a defective workholding device. 22. Adjusted play in, or calibrated a micrometer. 23. Adjusted spindle bearings. 24. Adjusted carrier endplay. 25. Changed and adjusted a drive belt or chain. 26. Replaced brake. 27. Adjusted and reset side stops. 28. Replaced stock chucking shoes. 29. Replaced a low voltage control (indicator) panel light 30. Replaced slide springs. 31. Replaced a coolant pump in-kind. 32. Successfully performed a refractometer (viscosity) analysis. 33. Successfully tested material for hardness (e.g., Rockwell B test). 	<ol style="list-style-type: none"> 1. <input type="checkbox"/> 2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/> 5. <input type="checkbox"/> 6. <input type="checkbox"/> 7. <input type="checkbox"/> 8. <input type="checkbox"/> 9. <input type="checkbox"/> 10. <input type="checkbox"/> 11. <input type="checkbox"/> 12. <input type="checkbox"/> 13. <input type="checkbox"/> 14. <input type="checkbox"/> 15. <input type="checkbox"/> 16. <input type="checkbox"/> 17. <input type="checkbox"/> 18. <input type="checkbox"/> 19. <input type="checkbox"/> 20. <input type="checkbox"/> 21. <input type="checkbox"/> 22. <input type="checkbox"/> 23. <input type="checkbox"/> 24. <input type="checkbox"/> 25. <input type="checkbox"/> 26. <input type="checkbox"/> 27. <input type="checkbox"/> 28. <input type="checkbox"/> 29. <input type="checkbox"/> 30. <input type="checkbox"/> 31. <input type="checkbox"/> 32. <input type="checkbox"/> 33. <input type="checkbox"/> 	<ol style="list-style-type: none"> 1. <input type="checkbox"/> 2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/> 5. <input type="checkbox"/> 6. <input type="checkbox"/> 7. <input type="checkbox"/> 8. <input type="checkbox"/> 9. <input type="checkbox"/> 10. <input type="checkbox"/> 11. <input type="checkbox"/> 12. <input type="checkbox"/> 13. <input type="checkbox"/> 14. <input type="checkbox"/> 15. <input type="checkbox"/> 16. <input type="checkbox"/> 17. <input type="checkbox"/> 18. <input type="checkbox"/> 19. <input type="checkbox"/> 20. <input type="checkbox"/> 21. <input type="checkbox"/> 22. <input type="checkbox"/> 23. <input type="checkbox"/> 24. <input type="checkbox"/> 25. <input type="checkbox"/> 26. <input type="checkbox"/> 27. <input type="checkbox"/> 28. <input type="checkbox"/> 29. <input type="checkbox"/> 30. <input type="checkbox"/> 31. <input type="checkbox"/> 32. <input type="checkbox"/> 33. <input type="checkbox"/>



Part 2a & 2b

COMMENTS

Troubleshoot and Maintain Multiple Spindle Screw Machine

Candidate: _____

Examiner: _____

Signatures: _____ Date: _____
(Examiner/Advisor)
_____ Date: _____
(Monitor/Trainer)
_____ Date: _____
(Candidate)

<p>Machine Models/Manufacturer(s) Used for Troubleshooting & Maintenance</p>



Affidavit of Successful Completion
NIMS Level III Screw Machining Credentialing Program

👉 **Credentialing Achievement Record** 👈

🖨 Please print

Candidate Name	Reg. No.	Date Completed:
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The credentialing candidate named above has completed all necessary CAR requirements for NIMS Level III OJT recognition.

Site Name and Address:	Site No.
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Indicate in the number of Skill Checks completed and dates of successful performance for each Skill Check

Duty Cluster Name	Required Skill Checks	Number of Skill Checks Completed
SETUP MULTIPLE SPINDLE SCREW MACHINE	2	
Successful Skill Check Attempt #1	Date:	
Successful Skill Check Attempt #2	Date:	
Work activity experience-eligibility statements have been completed, dated, and co-initialed.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Site Coordinator/Manager Signature _____
Date 19

Supervisor/Trainer Signature _____
Date 19

Candidate Signature _____
Date 19

Make a copy of the completed *Affidavit of Successful Completion* for your records and send original CAR to:



National Institute for Metalworking Skills Inc.
3251 Old Lee Highway, Suite 205
Fairfax, VA 22030
<http://www.nims-skills.org>



**COMMENTS, SPECIAL AWARDS, OR OTHER PROFESSIONAL
ACKNOWLEDGMENTS**

See attachments if provided