

Duties and Standards
for
SCREW MACHINING SKILLS

Level II & Level III

Single-and Multiple-Spindle Automatic Bar and Chucking Machines

Approved by



The National Institute for Metalworking Skills, Inc.

**Prepared by members of
The Precision Machined Products Association**



Duties and Standards
for
Screw Machining Skills-Level II

Single-and Multiple-Spindle Automatic Bar and Chucking Machines

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Screw Machining-Level II

Figure 1 Industry Framework chart

Overview-Occupational Description and Benchmarks

This standard applies to what are commonly known in the industry as screw machines. A screw machine is the traditional terminology for single-and multiple spindle automatic bar and chucking machines in which all tool movement is controlled by the machine. The machine is an adaptation of the traditional horizontal engine lathe and operates on similar machining principles.

For the purposes of this standard and to facilitate understanding, descriptions will use the traditional terminology of what is commonly known as an automatic screw machine.

Occupational Description

Level II skills are used by skilled tradespersons who have achieved proficiency in the operation of screw machines and related tooling and equipment, quality skills related to screw machining, and some planning and job control skills related to screw machine work.

The following are the general areas of competency:

- Care and use of tooling
- Handling, use, and installation of materials and related fluids
- Inspection and quality assurance skills
- Work planning and job control
- Teamwork

Safety is a responsibility that cuts across all competencies. Each competency has its own level of related safety. Skilled operators are expected to know and execute correctly all matters related to safety for these competencies. Skilled screw machine operators may have modest training and supervision responsibilities for other operators or production workers. Screw machinists commonly perform their tasks as team members. Highly skilled machinists may have team leadership responsibilities.

Tooling Skills

- Identify tooling.
- Stage tooling.
- Evaluate and maintain tooling.

Materials Handling and Related Fluids Skills

- Move materials with lift trucks, hoists, and cranes.
- Mount materials.
- Perform lubrication of screw machines.
- Install and deploy coolants on screw machines.

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Inspection and Quality Assurance Skills

- Document inspection of in-process operation.
- Inspect compound angles to required precision.
- Use precision measuring instruments.

Work Planning and Job Control Skills

- Monitor and troubleshoot processes.

Framework for Screw Machining Level II Skills

This figure represents the two proposed sets of expectations that comprise Screw Machining Level II Skills. The left-hand column is a listing of the duties that are expected to constitute Level II jobs. The right-hand column is a listing of the abilities, skills, knowledge, and other characteristics that are needed to perform the duties.

Occupational Duties	Knowledge, Skills, Abilities, and Other Characteristics
1. Job Planning 1.1 Industrial Safety and Environmental Protection	1. Written and Oral Communications 1.1 Reading 1.2 Writing 1.3 Speaking 1.4 Listening
2. Preproduction 2.1 Preventive Maintenance 2.2 Tooling Maintenance 2.3 Preproduction Start-Up	2. Mathematics 2.1 Arithmetic 2.2 Applications of Geometry
3. Production 3.1 Production Operation 3.2 Production Maintenance 3.3 Tooling Maintenance 3.4 Part Inspection and Correction 3.5 Process Control	3. Decision Making and Problem Solving 3.1 Applying Decision Rules 3.2 Basic Problem Solving
4. Quality Control and Inspection 4.1 Part Inspection 4.2 Inspection: Optical Comparator 4.3 Inspection: Manual Coordinate Measuring Machine	4. Group Skills and Personal Qualities 4.1 Group Participation 4.2 Personal Qualities
	5. Engineering Drawings and Sketches 5.1 Standard Orthographic Blueprints 5.2 GDT Orthographic Blueprints
	6. Measurements 6.1 Basic Measuring Instruments 6.2 Precision Measuring Instruments
	7. Metalworking Theory 7.1 Cutting Theory 7.2 Tooling 7.3 Material Properties 7.4 Machine Tools 7.5 Cutting Fluids and Coolants

Duty Area: 1. Job Planning
Duty Title: 1.1 Industrial Safety and Environmental Protection

Duty:

Develop a plan for implementing the assigned responsibilities in the operation of a screw machine while adhering to safe practices in accordance with OSHA requirements and company safety procedures. Document safety activities as required.

Performance Standard:

Given written and verbal safety instructions and the appropriate checklists and guidelines, demonstrate safe workplace practices in materials handling, machine operations, and coolant handling and application.

Accuracy Level:

N/A

Assessment Equipment and Material:

Workstation: Screw machine

Material: N/A

Tooling: N/A

Measuring Instruments: N/A

Reference: OSHA regulations, company safety guidelines, and Machinery's Handbook

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KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performing the Industrial Safety and Environmental Protection Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry	X	7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Tooling
	2.4 Applications of Trigonometry	X	7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving		7.5 Cutting Fluid and Coolants
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 2. Preproduction
Duty Title: 2.1 Preventive Maintenance

Duty:

Inspect and assess the general condition of the assigned machine tool. Make routine adjustments as necessary and as authorized.

Performance Standard:

Given preventive maintenance procedures and schedules for a given machine tool, carry out routine maintenance and complete history forms for future tracking of maintenance needs.

Accuracy Level:

N/A

Assessment Equipment and Material:

Workstation: Screw machine

Material: N/A

Tooling: Hand tools and grease gun

Measuring Instruments: 6" rule

Reference: Machinery's Handbook

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Preventive Maintenance Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry		7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Tooling

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	1. Written and Oral Communications		5. Engineering Drawings and Sketches
	2.4 Applications of Trigonometry		7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving	X	7.5 Cutting Fluids and Coolants
	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 2. Preproduction
Duty Title: 2.2 Tooling Maintenance

Duty:

Inspect and assess the condition of the tooling. Refurbish if possible. Refer tooling for repair or regrind where appropriate.

Performance Standard:

Prior to production, verify the condition of the tooling; determine if and what correction is needed in order to produce parts within acceptable tolerances.

Accuracy Level:

+/- 1/64th on all fractions; +.006 - .000 on drilled diameters

Assessment Equipment and Material:

Workstation: Screw machine

Material: As specified in process plan

Tooling: Workbench, pedestal grinder, and hand tools

Measuring Instruments: N/A

Reference: Machinery's Handbook and machine manual

KSAO

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Tooling Maintenance Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic		7. Metalworking Theory
X	2.2 Applications of Geometry	X	7.1 Cutting Theory
	2.3 Applications of Algebra	X	7.2 Tooling
	2.4 Applications of Trigonometry		7.3 Material Properties

Screw Machining-Level II

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving		7.5 Cutting Fluids and Coolants
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 2. Preproduction
Duty Title: 2.3 Preproduction Start-Up

Duty:

Conduct a first-piece trial run.

Performance Standard:

Secure all safety guarding, verify lubricant and coolant flow, and produce a first piece to verify machine function. Inspect the part for compliance to the blueprint and job specifications. Report any part noncompliance to supervisor. When the first piece is acceptable repeat the process for each spindle and verify all parts are to specifications. Record the results of all data as required.

Accuracy Level:

Blueprint and process plan specifications

Assessment Equipment and Material:

Workstation: Screw machine

Material: As specified in process plan

Tooling: Hand tools

Measuring instruments: Micrometers, dial calipers, appropriate gages, and optical comparator

Reference: Machinery's Handbook and process plan

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing of the Preproduction Start-Up Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry	X	7.1 Cutting Theory
	2.3 Applications of Algebra	X	7.2 Tooling
	2.4 Applications of Trigonometry	X	7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving	X	7.5 Cutting Fluids and Coolants
X	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 3. Production
Duty Title: 3.1 Production Operation

Duty:
 Stock machine and verify collet tension.

Performance Standard:
 Following the process plan, stock machine and verify collet tension and material flow. Adjust as needed for a smooth and continuous run.

Accuracy Level:
 Process plan

Assessment Equipment and Material:

- Workstation:** Screw machine
- Material:** Material stock specified in process plan
- Tooling:** Hand tools
- Measuring Instruments:** N/A
- Reference:** Machinery's Handbook and machine operating manual

KSAO:
 This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing of the Production Operation Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurement
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry		7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Tooling
	2.4 Applications of Trigonometry		7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools

Screw Machining-Level II

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
	3. Decision Making and Problem Solving		7.5 Cutting Fluids and Coolants
X	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 3. Production
Duty Title: 3.2 Production Maintenance

Duty:

During a production run, verify collet and tension performance, check cams and slides and adjust as necessary. Adjust collet tension if needed.

Performance Standard:

During a production run, verify collet and spingle performance, check cams and slides and adjust as required for a smooth and continuous run.

Accuracy Level:

As specified in process plan and on part dimensions

Assessment Equipment and Material:

Workstation: Screw machine

Material: As specified in process plan

Measuring Instruments: Dial indicator, appropriate inspections tools, and feeler gages

Tooling: Hand tools

Reference: Machinery's Handbook

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Production Maintenance Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measuring Instruments
	2. Mathematics		6.2 Precision Measuring Instruments
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry	X	7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Material Properties
	2.4 Applications of Trigonometry	X	7.3 Lubricants, Cutting Fluids, and Coolants
	2.5 Applications of Statistics		
	3. Decision Making and Problem Solving		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Participation		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 3. Production
Duty Title: 3.3 Tooling Maintenance

Duty:

Insect and assess the condition of the tooling. Refurbish the tooling where appropriate. Refer tooling for repair or regrind where appropriate.

Performance Standard:

Grind and sharpen drills, taps, cut-off tools, reamers, form tools, and all other tooling as needed and as authorized. The operator must demonstrate the ability to recognize when a cutter should be referred to a tool and cutter grinder.

Accuracy Level:

N/A

Assessment Equipment and Material:

Workstation: Screw machine

Material: Existing production run

Tooling: Flashlight, mirror, and appropriate hand tools

Measuring Instruments: N/A

Reference: Machinery's Handbook

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Tooling Maintenance Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measuring Instruments
	2. Mathematics		6.2 Precision Measuring Instruments
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry	X	7.1 Cutting Theory
	2.3 Applications of Algebra	X	7.2 Material Properties
	2.4 Applications of Trigonometry		7.3 Lubricants, Cutting Fluids, and Coolants
	2.5 Applications of Statistics		
	3. Decision Making and Problem Solving		
X	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	4. Group Decisions and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 3. Production
Duty Title: 3.4 Part Inspection and Correction

Duty:

Inspect sample parts using precision measuring instruments. Record part inspection results.

Performance Standard:

Given an inspection plan, inspect sample parts during a production run, following a written inspection plan using precision measuring instruments. Make necessary adjustments to maintain dimensions as specified in the process plan.

Accuracy Level:

As specified on part prints and in inspection plan

Assessment Equipment and Material:

Workstation: Screw machine

Material: As specified in production plan

Tooling: N/A

Measuring Instruments: Precision micrometers, go/no go gages, pull gages, calipers, and dial indicator

Reference: Machinery's Handbook

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Part Inspection and Correction Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry		7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Tooling
	2.4 Applications of Trigonometry		7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving		7.5 Cutting Fluids and Coolants
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Decisions and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: **3. Production**
Duty Title: **3.5 Process Control**

Duty:

Following a sample plan, inspect samples for required dimensions and enter the data in appropriate records as called for in the process plan. Graph the data. Make appropriate corrections indicated by the recorded data as needed.

Performance Standard:

Given a process plan for a part, all special instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan called for in the process plan. Take the stop-and-go actions as specified in the process plan to bring results within the requirements of the process control chart. Report changes made and explain the reason for those changes to a supervisor.

Accuracy Level:

As specified on part prints and in process plan specifications

Assessment Equipment and Material:

Workstation: Screw machine

Material: As specified in process plan

Tooling: N/A

Measuring Instruments: Precision micrometers, go/no go gages, pull gages, dial indicators, and calipers

Reference: Machinery's Handbook

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Process Control Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Arithmetic	X	6.2 Precision Measurements
X	2.1 Arithmetic		7. Metalworking Theory
X	2.2 Applications of Geometry		7.1 Cutting Theory
	2.3 Applications of Algebra	X	7.2 Tooling
	2.4 Applications of Trigonometry		7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving		7.5 Cutting Fluids and Coolants
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Participation and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 4. Quality Control and Inspection

Duty Title: 4.1 Part Inspection

Duty:

Given a process plan, inspect sample parts using precision measuring devices and techniques.

Performance Standard:

Given part specifications, the number of parts to be verified, and the frequency of inspection, select the proper measuring instruments and perform the required inspection procedure. Record the results and recommend acceptance or rejection of the parts produced. Verify the condition and calibration of measuring instruments to be used.

Accuracy level:

As specified on part prints and process plan specifications

Assessment Equipment and Material:

Workstation: Workbench

Material: Finished parts from a current production run

Tooling: N/A

Measuring Instruments: Precision micrometers, go/no go gages, pull gages, dial indicators, and calipers

Reference: Machinery's Handbook

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be required in performing of the Part Inspection Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic		7. Metalworking Theory
X	2.2 Applications of Geometry		7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Tooling
	2.4 Applications of Trigonometry		7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving		7.5 Cutting Fluids and Coolants
	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	4. Group Participation and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

Duty Area: 4. Quality Control and Inspection
Duty Title: 4.2 Inspection: Optical Comparator

Duty:

Set up and perform the inspection of profiles in shadow and in reflection.

Performance Standard:

Given a finished part, process plan, blueprint, and an optical comparator, inspect the part's profiles. Record compliance within the part's required profile.

Accuracy Level:

Part specifications as given on drawings, blueprints, and sketches

Assessment Equipment and Material:

Workstation: Optical comparator

Material: Finished part

Tooling:: Necessary drafting supplies, vellum or tracing paper, and holding devices as required by the part for presentation to the comparator

Measuring Instruments: Precision tools used as parts of the comparator and necessary for operation

Reference: Machinery's Handbook

Screw Machining-Level II

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in performing the Optical Comparator Inspection Duty.

	1. Written and Oral Communications		5. Engineering Drawings and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
	2.1 Arithmetic		7. Metalworking Theory
	2.2 Applications of Geometry		7.1 Cutting Theory
	2.3 Applications of Algebra		7.2 Tooling
	2.4 Applications of Trigonometry		7.3 Material Properties
	2.5 Applications of Statistics		7.4 Machine Tools
	3. Decision Making and Problem Solving		7.5 Cutting Fluids and Coolants
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
	4.1 Group Participation		
	4.2 Personal Qualities		

- KSAO Area:** **1. Written and Oral Communications**
KSAO: **1.1 Reading**

KSAO Definitions:

Locates, understands, and interprets written technical and non technical information in documents commonly found in the metalworking industry. These documents contain short and simple sentences, paragraphs and passages, phrases, quantitative information, specialized vocabulary, graphs, charts, schedules, simple instructions, and multi-step directions. All documents are written in standard English.

Performance Requirement:

Given a specific duty to perform and the necessary written information contained on relevant documents and information sheets, locate and read the necessary information and use this information to plan, execute, and evaluate the duty and answer questions about the content or meaning of the written information.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Reading KSAO.

Duty Area	Task	Activity
1. Job planning	Review a process plan.	Read blueprints. Read tool inventory. Read <u>Machinery's Handbook</u> .
2. Job execution	Benchwork Layout	Read blueprints
3. Quality and inspection	Part inspection	Read blueprints. Read inspection plan. Read sampling plan. Read charting instructions.
4. Process improvement	Participation in improvement	Read blueprints. Read process plan. Read team documents.
5. Maintenance	Screw machine preventive maintenance Tooling maintenance	Read checklists. Read manuals.

- KSAO Area:** **1. Written and Oral Communications**
KSAO: **1.2 Writing**

KSAO Definitions:

Communicates technical and non-technical information, messages, and ideas in writing using standard English commonly found in the metalworking industry. This writing includes the completion of forms, information sheets, reports, group meeting materials, and short memos.

Performance Requirement:

Given a specific duty to perform and the necessary instructions, forms, and materials to complete the writing requirements for that duty, complete the writing requirement.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Writing KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review the process plan.	Record steps to be taken in operation of the project.
2. Job execution	Benchwork Layout	Write a record of job activities.
3. Quality and inspection	Part inspection	Write a record of inspection activities.
4. Process improvement	Process adjustment	Write a record of adjustment and improvement activities.
5. Maintenance	Screw machine maintenance Tooling maintenance	Write a record of maintenance activities. Fill out history forms.
6. Safety and environment	Operations and handling HazMat handling and storage Material storage	Write a record of the activities involving the handling and storage of standard and hazardous materials.

KSAO Area: 1. Written and Oral Communications
KSAO: 1.3 Speaking

KSAO Definitions:

Communicates technical and non-technical detailed information, messages, multi-step directions, and ideas through oral communication using standard English and related cues and communication aids in conversations, discussions, and group meetings. Understands and responds to listener feedback and asks questions when needed in two-way and group conversations.

Performance Requirement:

Given a specific duty to perform and the necessary instructions, written documents, and communication aids and materials to complete the speaking requirements for that duty, complete the speaking requirement.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Speaking KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review a process plan.	Verbally explain the process plan.
2. Job execution	Benchwork Layout Operate screw machines	Explain job execution activities.
3. Quality and inspection	Part inspection	Explain inspection procedures. Explain control charts and their role in process control.
4. Process improvement	Process adjustment and improvement	Propose process remedies. Explain corrective actions.
5. Maintenance	Housekeeping Screw machine maintenance Tooling maintenance	Explain condition of a screw machine and the maintenance requirements.
6. Safety and environment	HazMat handling and storage Material storage	Explain actions bearing on safe practices.

KSAO Area: 1. **Written and Oral Communications**
KSAO: 1.4 **Listening**

KSAO Definitions:

Listens for, receives, interprets, and recalls specific details, ideas, and multi-step instructions in verbal presentations, conversations, discussions, and group meetings conducted in standard English and supported by written materials and other communication cues and aids. Uses active listening skills in comprehending simple technical and non-technical verbal information.

Performance Requirement:

Given a specific duty to perform and the necessary written information contained on relevant documents and information sheets, listen for, comprehend, and incorporate oral information in the performance of the duty and answer questions about the content or meaning of the oral information.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Listening KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review a process plan.	Listen to verbal instructions.
2. Job execution	Benchwork Layout Operate screw machines	Listen to verbal instructions.
3. Quality and inspection	Part inspection	Listen to verbal instructions.
4. Process improvement	Process adjustment	Listen to verbal instructions.
5. Maintenance	Housekeeping Screw machine preventive maintenance Tooling maintenance	Listen to verbal instructions.
6. Safety and environment	Operations and handling HazMat handling and storage	Listen to verbal instructions.

KSAO Area: 2. Mathematics
KSAO: 2.1 Arithmetic

KSAO Definitions:

Performs addition, subtraction, multiplication, and division of whole numbers without a calculator and performs calculation of fractions and decimals, as well as conversion to metric measurement with or without a calculator.

Performance Requirement:

Given a specific duty to perform requiring arithmetic operations, conduct arithmetic operations.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Arithmetic KSAO.

Duty Area	Task	Activity
1. Job comprehension	Start-up	Calculate speeds and feeds.
2. Job execution	Benchwork Layout	Calculate necessary dimensions from the blueprint.
3. Quality and inspection	Part inspection	Calculate necessary dimensions from the blueprint Calculate statistics required by the control charts.

KSAO Area: **2. Mathematics**
KSAO: **2.2 Applications of Geometry**

KSAO Definitions:

Understands and applies basic geometric concepts and terminology that form the analytical foundation of job planning and execution including planes perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity, and symmetry.

Performance Requirement:

Given a specific duty to perform requiring the understanding and use of geometric concepts and terminology, perform the required duty and answer questions about the meaning and use of the geometric principles.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Geometry KSAO.

Duty Area	Task	Activity
1. Job comprehension	Start-up	Apply geometry to select and sequence operations.
2. Job execution	Benchwork Layout Operate screw machine	Apply geometry to hold work appropriately. Apply geometry to produce surfaces correctly.
3. Quality and inspection	Part inspection	Apply geometry to locate surfaces and centerlines.

KSAO Area: 3. Decision Making and Problem Solving
KSAO: 3.1 Applying Decision Rules

KSAO Definitions:

Can follow a set of instructions laid out in a sequence. Can interpret and follow "if...then..." instructions.

Performance Requirement:

Given a specific duty to perform requiring a checklist of sequential instructions, carry out the duty making appropriate entries on the checklist.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Applying Decision Rules KSAO.

Duty Area	Task	Activity
1. Job comprehension	Start-up	Sequence operations.
2. Job execution	Benchwork Layout Operate screw machines	Follow the process plan, deviating according to decision rules where necessary.
3. Quality and inspection	Part inspection	Follow the quality plan, deviating according to decision rules where necessary.

KSAO Area: **3. Decision Making and Problem Solving**
KSAO: **3.2 Basic Problem Solving**

KSAO Definitions:

Can establish new responses to unexpected problems of a simple nature. Can formulate the new responses into a sequence of instructions or a set of "if ... then" rules.

Performance Requirement:

Given a specific duty to perform and being furnished with a checklist of sequential instructions, carry out the duty according to the checklist responding appropriately to problems. Formulate those responses into "if ... then" rules.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Basic Problem Solving KSAO.

Duty Area	Task	Activity
1. Job comprehension	Start-up	Sequence operations, providing alternatives according to availability of tooling and equipment.
2. Job execution	Benchwork Layout Operate screw machines	Follow a process plan, improvising new methods where unavailability of tooling makes the plan obsolete.

KSAO Area: 4. Group Skills and Personal Qualities
KSAO: 4.1 Group Participation

KSAO Definitions:

Identifies and demonstrates the appropriate group skills and related personal qualities in the performance of major duties requiring cooperative relations with supervisors, team leaders, and team members.

Performance Requirement:

Work cooperatively with others and contribute to group efforts with ideas, suggestions, and positive feedback to group members. Demonstrate appropriate social and communicative skills in resolving conflicts with supervisors, team leaders, and team members.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Group Participation KSAO.

Duty Area	Task	Activity
2. Job execution	Operate screw machines	Work cooperatively by responding to the need to share common space.
4. Process improvement	Process adjustment and improvement	Work cooperatively in work groups to develop process improvements.

KSAO Area: 4. Group Skills and Personal Qualities
KSAO: 4.2 Personal Qualities

KSAO Definitions:

Identifies and demonstrates the appropriate personal qualities in performing major job duties and maintaining positive employment relations.

Performance Requirement:

Recognize and demonstrate appropriate codes of conduct and value in the workplace and demonstrate honesty and integrity in exhibiting appropriate workplace behaviors. Assume responsibility and demonstrate strong work ethic by exerting effort and perseverance in doing work tasks according to high standards. Maintain high standards of attendance, punctuality, and involvement in all major tasks.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Personal Qualities KSAO.

Duty Area	Task	Activity
2. Job execution	Operate screw machines	Demonstrate honesty and integrity in reporting the findings of inspection processes.
4. Process improvement	Participation in improvement	Demonstrate attendance and punctuality in attending meetings for the development of process improvement.

KSAO Area: 5. Engineering Drawings and Sketches
KSAO: 5.1 Standard Orthographic Blueprints

KSAO Definitions:

Interprets orthographic blueprints.

Performance Requirement:

Given a standard blueprint and a finished part from that print, prepare a checklist of dimensions necessary to determine the part's compliance.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Standard Orthographic Blueprints KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review process plan.	Gather the geometric and dimensional data from a blueprint to sequence operations.
2. Job execution	Layout	Gather the geometric and dimensional data from a blueprint to perform a layout.
3. Quality and inspection	Part inspection	Gather the geometric and dimensional data from a blueprint to perform the inspection on a finished part.

KSAO Area: 5. Engineering Drawings and Sketches
KSAO: 5.2 GDT Orthographic Blueprints

KSAO Definitions:

Interprets GDT orthographic blueprints.

Performance Requirement:

Given a GDT blueprint and a finished part from that print, prepare a checklist of dimensions necessary to determine the part's compliance.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the GDT Orthographic Blueprints KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review process plan.	Gather geometric and dimensional data from a GDT blueprint to sequence operations.
2. Job execution	Benchwork Layout Operate screw machines	Gather geometric and dimensional data from a GDT blueprint to perform a layout.
3. Quality and inspection	Part inspection	Gather geometric and dimensional data from a GDT blueprint to perform the inspection of a finished part.

KSAO Area: 6. Measurements
KSAO: 6.1 Basic Measuring Instruments

KSAO Definitions:

Recognizes and applies basic measuring instruments such as rules, protractors, and basic transfer tools such as simple inside and outside calipers.

Performance Requirement:

Given a blueprint and a finished part from that print, as well as a selection of appropriate basic measuring instruments, determine a part's compliance along selected dimensions.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Basic Measuring Instruments KSAO.

Duty Area	Task	Activity
2. Job execution	Benchwork Layout Operate screw machines	Set the length of layout tools using basic instruments.
3. Quality and inspection	Part inspection	Inspect dimensions that call for the use of basic measuring tools on a finished part.

KSAO Area: 6. Measurements
KSAO: 6.2 Precision Measuring Instruments

KSAO Definitions:

Recognizes and applies precision measuring instruments such as micrometers, vernier, dial, and electronic calipers; dial indicators; and precision transfer tools such as telescoping gages and adjustable parallels.

Performance Requirement:

Given a blueprint and a finished part from that print, as well as a selection of appropriate precision tools, determine a part's compliance along selected dimensions.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Precision Measuring Instruments KSAO.

Duty Area	Task	Activity
2. Job execution	Benchwork Layout Operate screw machines	Determine the concentricity of a turned part using an indicator.
3. Quality and inspection	Part inspection	Inspect the dimensions of a finished part that calls for the use of precision measuring tools.

KSAO Area: **7. Metalworking Theory**
KSAO: **7.1 Cutting Theory**

KSAO Definitions:

Understands and can explain the ideas of heat, shock, friction, zone of distortion, cutting interface, machinability, cutter presentation, cutter geometry, and chip-holding capacity as they relate to screw machining operations.

Performance Requirement:

Given a blueprint and a part to be made, select speeds, feeds, and appropriate tooling to carry out the manufacture of the part.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Cutting Theory KSAO

Duty Area	Task	Activity
1. Job comprehension	Review process plan.	Determine speeds and feeds.
2. Job execution	Benchwork Layout Operate screw machines	Select cutters appropriate to machine operations.

KSAO Area: 7. Metalworking Theory

KSAO: 7.2 Tooling

KSAO Definitions:

Recognizes a wide variety of cutting tools, tool-holding devices, and work-holding devices. Understands the appropriate application of these cutters and devices.

Performance Requirement:

Given a blueprint and a part to be made, select appropriate tooling, tool-holders, and work-holding devices to carry out the manufacture of the part.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Tooling KSAO.

Duty Area	Task	Activity
2. Job execution	Benchwork Layout Operate screw machines	Select cutters, tool-holders, and work-holders appropriate to machine operation.

KSAO Area: 7. Metalworking Theory
KSAO: 7.3 Material Properties

KSAO Definitions:

Recognizes common materials and their principal properties relevant to machining tasks.
 Recognizes differences between ferrous, non-ferrous, magnetic, and ductile materials.
 Understands the changes that heat-treat imparts to materials.

Performance Requirement:

Given a blueprint and a part to be manufactured, predict part's machinability based upon its appearance, call-out on the print, and supplied hardness value.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Material Properties KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review process plan.	Predict speeds and feeds, as well as tooling requirements, based on known properties of a material.
2. Job execution	Benchwork Layout Operate screw machines	Respond to cutting conditions imposed by material properties as predicted by the process plan and actually experienced in machining the material.

KSAO Area: 7. Metalworking Theory
KSAO: 7.4 Machine Tools

KSAO Definitions:

Recognizes the common classes of screw machines, understands the functions of the subsections of the machine, and selects and applies components appropriately.

Performance Requirement:

Given a blueprint and a part to be machined, select the appropriate machine. Explain that selection and what distinguished that choice from the other possibilities.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Machine Tools KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review process plan.	Select appropriate screw machine for a given set of operations.
2. Job execution	Benchwork Layout Operate screw machines	Operate screw machine to produce a selected part.
3. Quality and inspection	Part inspection	Participate in a machine capability study.

KSAO Area: 7. Metalworking Theory
KSAO: 7.5 Cutting Fluids and Coolants

KSAO Definitions:

Recognizes, selects, and applies appropriate coolant and coolant delivery systems.

Performance Requirement:

Given a set of screw machine operating conditions, identify the appropriate coolant and coolant delivery system.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Cutting Fluids and Coolants KSAO.

Duty Area	Task	Activity
1. Job comprehension	Review process plan.	Select the appropriate coolant and delivery system for a given screw machine operation.
2. Job execution	Operate screw machines	Operate a screw machine in making a specified part using the correct coolant and coolant delivery system.

Screw Machining-Level II

Appendix A

Other Standards in this Series

Screw Machining - Level III

Machining Skills Level I

Machining Skills Level II

Machining Skills Level III

Metalforming Skills - Stamping Level II

Metalforming Skills - Stamping Level III

Metalforming Skills - Roll Forming Level II

Metalforming Skills - Spinning-Level II

Machine Building Skills - Level II (Available Summer 1996)

Machine Building Skills - Level III (Available Summer 1996)

Press Brake Skills-Level II (Available Summer 1996)

Press Brake Skills-Level III (Available Summer 1996)

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