

JOB SPECIFICATON

JOB TITLE : MILLING MACHINE SETTER OPERATOR, L-3
SECTOR : MECHANICAL ENGINEERING
SUB-SECTOR : METAL MACHINING

1992 (2049.3.31)

The National Skill Standards and test was developed by

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Approved by the Tripartite National Skill Testing Board.(1992)

JOB SPECIFICATION

1.	JOB TITLE : Milling Machine Setter Operator LEVEL : 3
2.	JOB DESCRIPTION Milling machine setter operator L-3 operates milling machine to produce helical gears, bevel gears, worm and spiral cuts to the work piece in addition to L-2 workers.
3.	LIST OF TASKS: <ol style="list-style-type: none">1. Milling a helical gear (simple and differential indexing).2. Spiral milling (simple and differential indexing).3. Milling Bevel gear (simple and differential indexing).4. Milling worm (simple and differential indexing).
4.	QUALIFYING NOTES (entry requirement etc.) Physical requirements: - Normal health, no special physical requirement demanded by this job. Educational requirements: - Able to understand verbal instructions and read workshop manual and/or manufacturer's specification.

TASK SPECIFICATION

5	TASK NO: 1 Milling a helical gear (simple and differential indexing)	JOB TITLE: Milling Machine Setter Operator, L-3
6	TASK ELEMENTS: 1.1 Ascertains job requirements drawing/instructions of other specifications and selects appropriate materials. 1.2 Determines sequences and methods as required by specifications. 1.3 Selects and fixes appropriate cutting tools. 1.4 Positions and secures work piece on machine and sets machine components to the requirement. 1.5 Sets machine controls as required (speed, feed and depth of cut) 1.6 Ensures coolant supply. 1.7 Operates automatic or manual control to feed the work piece. 1.8 Checks accuracy of machine sing measuring instruments. 1.9 Repositions work piece, changes tools and resets machine as necessary.	

TASK SPECIFICATION

7	TASK PERFORMANCE REQUIREMENTS Universal milling machine, Vernier calliper, Height gauge, Dial gauge, Micrometer, Gear tooth micrometer, Mallet, Set of gear. <u>Cutters:-</u> Gear cutters <u>Work & Tools holding Devices:-</u> Plain Mandrel, Screw Mandrel, Indexing head, Milling Arbors. <u>Materials:-</u> Plain steels, Cast Iron, Aluminium, Brass Plastics.	
8	TASK PERFORMANCE STANDARDS Materials selected as specified, Appropriate tools selected and clamped securely, work piece securely clamped and aligned to allow to mill a helical gears, Appropriate speed, feed and depth of cut selected and set, coolant supplied adequately to prevent overheating of work piece an cutting tools, controls operated automatically or manually without causing rough surface, Tool breakage of damage to work piece, Tolerance within specified limit, work piece repositioned, Tools changed and machine set as required. General tolerance ± 0.02 mm. Surface finish 0.8 Microns.	

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
1	1 2 3 4 5 6 7 8 9	<p>Knowledge of milling helical gears.</p> <p>Knowledge of sequential operation involved in producing work piece.</p> <p>Knowledge of gear cutters regarding selection, methods of mounting and positioning.</p> <p>Procedure for securely clamping work piece on suitable mandrels.</p> <p>Setting of indexing head, index plate and gear train including differential indexing.</p> <p>Factors affecting speed, feed and depth of cut and selection of cutter R.P.M.</p> <p>Types and properties of coolants and applicable situations.</p> <p>Knowledge of manual and automatic controls.</p> <p>Use and care of measuring instruments such as Vernier Calliper, Vernier tooth, Micrometer.</p>	<p>Calculation related to helical gear milling.</p> <p>Interprets the table provided to calculate the required cutter R.P.M.</p> <p>Interpretation and computations of numerical units for linear and angular measurements.</p> <p>Calculation of gear train in indexing head.</p>	<p>Interpretation of technical drawing including conventional sketch for milling surfaces, surface finish and tolerance.</p>	<p>Importance of using electrical lockouts to stop machine, use of eye protector in high speed milling.</p> <p>Hazards due to unsecurely clamped milling cutters.</p> <p>Hazards due to unsecurely clamped work piece.</p> <p>Results of improper manipulation & situation like flying broken cutter teeth and excessive chip formation.</p> <p>Importance of eye protection.</p>

TASK PERFORMANCE TEST (skill assessment)			
11	TASK TITLE: MILLING A HELICAL GEAR (SIMPLE AND DEFFERENTIAL INDEXING). TASK NO : 1	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<p>DID THE CANDIDATE ?</p> <p>1.1 Select the specified material.</p> <p>1.2 Select, align and mount the appropriate gear cutter securely.</p> <p>1.3 Tighten and align the work piece to allow helical milling.</p> <p>1.4 Select and set the appropriate speed, feed and depth of cut and machine components.</p> <p>1.5 Arrange the gear train to couple the indexing head with the table.</p> <p>1.6 Select the appropriate controls and manipulate them.</p> <p>1.7 Supply coolants as and if required.</p> <p>1.8 Produce the work piece within specified tolerance and surface finish.</p> <p>1.9 Produce the work piece within specified time.</p>		

TASK SPECIFICATION

5	TASK NO: 2 Spiral milling (simple and differential indexing).	JOB TITLE: MILLING MACHINE SETTER OPERATOR, L-3
6	TASK ELEMENTS: 2.1 Ascertains job requirements from drawing/instructions or other specifications and selects appropriate materials. 2.2 Determines sequences and methods as required by specifications. 2.3 Selects and fixes appropriate cutting tools. 2.4 Positions and secures work piece on machine and sets machine components to the requirement. 2.5 Sets machine controls as required (speed, feed and depth of cut). 2.6 Ensures coolant supply. 2.7 Operates automatic or manual control to feed the work piece. 2.8 Checks accuracy of machine using measuring instruments. 2.9 Grinds milling cutter as required for producing spiral milling. 2.10 Repositions work piece, changes tools and resets machine as necessary.	

TASK SPECIFICATION

7	<p>TASK PERFORMANCE REQUIREMENTS</p> <p>Universal milling machine, Vernier calliper, Height gauge, Dial gauge, Micrometer, Mallet, set of gear. <u>Cutters:-</u> Milling Cutters, End Mills. <u>Work & Tools holding Devices:-</u> Indexing head, Mandrel. <u>Materials:-</u> Plain and Alloy Steels, Cast Iron, Aluminium, Brass, Plastics.</p>
8	<p>TASK PERFORMANCE STANDARDS</p> <p>Materials selected as specified , appropriate cutting tools selected and clamped/mounted securely, work piece securely clamped and aligned to perform spiral milling, appropriate gear train arranged to couple the indexing head with the machine table, Appropriate speed, feed and depth of cut selected and set, coolant supplied adequately to prevent overheating of work piece and cutting tools, controls operated automatically of manually without causing rough surface, Tool breakage or damage to work piece , Tolerance within specified limit, work piece repositioned, tools changed and machine set as required. General tolerance ± 0.02 mm. Surfaces finish 0.8 Microns.</p>

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
2	1	Knowledge of spiral milling operation.	Calculations on spiral milling and arrangement of gear train. Interprets the table to calculate the cutter r.p.m	Interpretation of technical drawing including conventional sketch for milling surfaces, surface finish and tolerance.	Importance of using electrical lockouts to stop machine, use of eye protector in high speed milling. Hazards due to unsecurely clamped cutting tools. Hazard dye to unsecurely clamped work piece. Results of improper manipulation of controls like flying broken cutter teeth and flying swarf.
	2	Knowledge of sequential operation involved in spiral milling.			
	3	Knowledge of spiral cutters, regarding methods of mounting and positioning.			
	4	Knowledge o arrangement of the indexing head & setting o machine table.			
	5	Procedure for securely clamping work piece.			
	6	Factors affecting speed, feed and depth of cut and selection of cutter r.p.m.			
	7	Types and properties of coolants and applicable situations.			
	8	Knowledge of manual and automatic controls.			
	9	Use and care of measuring instruments such as Micrometer, dial gauge, Depth gauge.			

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

11	TASK TITLE : SPIRAL MILLING (SIMPLE AND DEFFERENTIAL INDEXING)	LOCATION OF TEST :	
	TASK NO : 2	CANDIDATE'S NAME :	
		EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<p><u>DID THE CANDIDATE ?</u></p> <p>2.1 Dress in safety clothing. 2.2 Select the specified material. 2.3 Select, align and mount the appropriate cutter/tools securely. 2.4 Tighten and align the work piece to perform the spiral milling. 2.5 Select and set the appropriate speed, feed depth of cut and machine component. 2.6 Arrange the coupling of indexing head with machine table. 2.7 Select appropriate controls and manipulate accordingly. 2.8 Supply coolant adequately. 2.9 Produce the work piece within specified tolerance and surface finish. 2.10 Produce the work piece within specified time.</p>		

TASK SPECIFICATION

	TASK NO: 3	
5	Milling Bevel gear (simple and differential indexing).	JOB TITLE: MILLING MACHINE SETTER OPERATOR, L-3
6	<p>TASK ELEMENTS:</p> <p>3.1 Ascertain job requirements drawing/instructions or other specifications and selects appropriate materials. 3.2 Determines sequences and methods as required by specifications. 3.3 Selects and fixes appropriate cutting tools. 3.4 Positions and secures work piece on machine and sets machine components to the requirement. 3.5 Sets machine controls as required (speed, feed and depth of cut). 3.6 Ensures coolant supply. 3.7 Operates automatic or manual control to feed the work piece. 3.8 Checks accuracy of machine using measuring instruments. 3.9 Repositions work piece, changes tools and resets machine as necessary.</p>	

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

11	TASK TITLE : MILLING BEVEL GEAR (SIMPLE AND DEFFERENTIAL INDEXING) TASK NO : 3	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
<u>DID THE CANDIDATE ?</u> 3.1 Select the specified material. 3.2 Select, align and mount the appropriate gear cutter securely. 3.3 Tighten and align the work piece to allow bevel milling. 3.4 Select and set the appropriate speed, feed and depth of cut and machine component. 3.5 Arrange the gear train to couple the indexing head with the table. 3.6 Select the appropriate control and manipulate them. 3.7 Supply coolants as and if required. 3.8 Produce the work piece within specified tolerance and surface finish. 3.9 Produce the work piece within specified time.			

5	TASK NO: 4 Milling worm (simple and differential indexing). JOB TITTLE: MILLING MACHINE SETTER OPERATOR, L-3		
6	TASK ELEMENTS: 4.1 Ascertain job requirement drawing/instruments of other specifications and selects appropriate materials. 4.2 Determines sequences and methods as required by specifications. 4.3 Selects and fixes appropriate cutting tools. 4.4 Positions and secures work piece on machine and sets machine components to the requirement. 4.5 Sets machine controls as required (speed, feed and depth of cut). 4.6 Ensures coolant supply. 4.7 Operates automatic or manual control to feed the work piece. 4.8 Checks accuracy of machine using measuring instruments. 4.9 Repositions work piece, changes tools and resets machine as necessary.		

TASK SPECIFICATION

7	<p>TASK PERFORMANCE REQUIREMENTS</p> <p>Universal milling machine, Vernier calliper , Height gauge, Dial gauge, Micrometer, Gear tooth Micrometer, Mallet, Sets of gear. <u>Cutters:-</u> Milling cutter, Gear cutters, Hubbing cutters. <u>Work & Tools Holding Devices:-</u> Plain mandrel, Screw mandrel, Indexing head, Milling Arbours. <u>Materials:-</u> Plain steels, Cast Iron, Aluminium, Brass, Plastics.</p>
8	<p>TASK PERFORMANCE STANDARDS</p> <p>Materials selected as specified, Appropriate tools selected and clamped securely, work piece securely clamped and aligned to allow to mill worm gears, Appropriate speed, feed and depth of cut selected and set, coolant supplied adequately to prevent overheating of work piece an cutting tools, controls operated automatically or manually without causing rough surface, Tool breakage or damage to work piece, Tolerance within specified limit, work piece repositioned, Tools changed and machine set as required. General tolerance ± 0.02 mm. Surface finish 0.8 Micro</p>

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
4	1 2 3 4 5 6 7 8 9	Knowledge of milling worm gears. Knowledge of sequential operation involved in producing work piece. Knowledge of gear cutters & hobbing cutter selection, methods of mounting and positioning. Procedure for securely clamping work piece on suitable mandrels. Setting of indexing head, index plate and gear train including differential indexing. Factors affecting speed, feed and depth of cut and selection of cutter R.P.M. Types and properties of coolants and applicable situations. Knowledge of manual and automatic controls. Use and care of measuring instruments such as vernier calliper, vernier tooth micrometer.	Calculation related to worm gear milling. Interprets the table provided to calculate the required cutter R.P.M. Interpretation and computations of numerical units for linear and angular measurements. Calculation of gear train in indexing head.	Interpretation of technical drawing including conventional sketch for milling surfaces, surface finish and tolerance.	Importance of using electrical lockouts to stop machine, use of eye protector in high speed milling. Hazards due to unsecurely clamped milling cutters and work piece. Results of improper manipulation & situation like flying broken cutter teeth and excessive chip formation. Importance of eye protection.

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

11	TASK TITLE: MILLING WORM GEAR (SIMPLE AND DEFFERENTIAL INDEXING).	LOCATION OF TEST :	
	TASK NO : 4	CANDIDATE'S NAME :	
		EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<p><u>DID THE CANDIDATE ?</u></p> <p>4.1 Select the specified material.</p> <p>4.2 Select, align and mount the appropriate gear cutter securely.</p> <p>4.3 Tighten and align the work piece to allow worm milling.</p> <p>4.4 Select and set the appropriate speed, feed and depth of cut and machine components.</p> <p>4.5 Arrange the gear train to couple the indexing head with the table.</p> <p>4.6 Select the appropriate controls and manipulate them.</p> <p>4.7 Supply coolants as and if required.</p> <p>4.8 Produce the work piece within specified tolerance and surface finish.</p> <p>4.9 Produce the work piece within specified time.</p>		