



NATIONAL OCCUPATIONAL STANDARD

12UY0101-5

NC/CNC MACHINE TOOLS OPERATOR & SERVICEMAN

LEVEL 5

REVISION NO: 01

VOCATIONAL QUALIFICATION AUTHORITY
Ankara, 2013

PREFACE

This reference guide, namely National Qualification of NC/CNC Machine Tools Operator & Serviceman (Level 5) was prepared in accordance with the provisions of the “Regulation on Vocational Qualifications Testing and Certification” issued pursuant to the Vocational Qualifications Authority (VQA) Law no 5544.

Draft Qualification was prepared by TIAD- Association of Machine Tools Industrialists and Businessmen, based upon the protocol signed on 30th March, 2012. After assessing opinions of the relevant organizations and institutions, the draft has been amended accordingly. The final draft was evaluated by the VQA’s **Metal Industry Committee**, which deemed it suitable. It was approved by the Board of Directors of the VQA through its decision no **2012/49** of **12.07.2011** and decided to be placed within the National Qualification Framework (NQF).

NC/CNC Machine Tools Operator and Serviceman (Level 5) national Qualification was revised by VQA Board of Directors Decision dd. 10th April 2013 and numbered 2013/27.

We would like to extend our gratitude to all people, organizations and institutions that have expressed their opinions and contributed to the preparation, examination and verification processes of the qualification. We would like to offer it to the service of all likely beneficiaries.

Vocational Qualification Authority

INTRODUCTION

The key criteria referred to in the national qualification preparation process, the relevant sector committees' review and the VQA's Board of Directors' approval processes are set in the Regulation on Vocational Qualification, Testing and Certification.

National qualification is defined by,

- a) Name and level of the qualification,
- b) Aim and rationale of the qualification,
- c) Occupational standard, occupational standard units or qualification units which form the basis for the qualification,
- ç) Training and experience criteria (form, content, duration etc) necessary for the qualification,
- d) Learning outcomes necessary to acquire the qualification,
- e) Assessment procedures and principles to be applicable to in the acquisition of the qualification, minimum testing materials and assessor criteria necessary for assessment,
- f) Validity of the qualification certificate, renewal conditions, supervision of the certificate holder if deemed necessary,
- g) Institution developing the qualification and Sector Committee verifying the Qualification.

National qualifications are built according to the relevant national occupational standard if there is one or to the relevant international occupational standard if there is none at the national level.

National qualifications are set in cooperation with below mentioned organizations;

- Formal and non-formal education and training institutions,
- Authorized Certification Bodies,
- Institutions having preapplied for certification to the authority,
- Institutions having drawn up national occupational standard,
- Professional organizations.

**12UY00101-5 NC/CNC MACHINE TOOLS OPERATOR & SERVICEMAN
NATIONAL QUALIFICATION**

1	NAME OF QUALIFICATION	NC/CNC MACHINE TOOLS OPERATOR & SERVICEMAN
2	REFERENCE CODE	12UY0101-5
3	LEVEL	5
4	INTERNATIONAL CLASSIFICATION CODE	ISCO 08: 3139
5	TYPE	-
6	CREDIT VALUE	-
7	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	01
	C) REVISION DATE	10/04/2013
8	AIM	Aim of this national qualification is to determine if employees and candidates are qualified and having the qualities required for being successful in the profession of NC/CNC Machine Tools Operator and Serviceman Level 5 and to provide them with the opportunity to prove their adequacy in this profession with valid and reliable certificate. This study is also a reference for education system and examination and certification institutions, as well.
9	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
	12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD	
10	Requirements to take a qualification test	
	-	
11	STRUCTURE OF QUALIFICATION	
	11-a) Compulsory Units	
	12UY0101-5/A1 OHS & ENVIRONMENTAL SAFETY IN NC/CNC MACHINE TOOLS 12UY0101-5/A2 QUALITY MANAGEMENT SYSTEM 12UY0101-5/A3 WORK ORGANIZATION 12UY0101-5/A4 NC/CNC MACHINE TOOLS TECHNOLOGY 12UY0101-5/A5 QUALIFICATION UNIT FOR PRE/POST-SALE APPLICATIONS AND CONSULTANCY IN NC/CNC MACHINE TOOLS 12UY0101-5/A6 QUALIFICATION UNIT FOR END USER TRAINING IN NC/CNC MACHINE TOOLS	
	11-b) Elective Units	
	-	
	11-c) Alternatives for Grouping of Units and Additional Learning Outcomes	
	Candidate has to be successful in all compulsory qualification items in order to get qualification certificate.	
12	ASSESSMENT	

For the occupation of NC/CNC Machine Tools Operator and Serviceman (Level 5); the candidate who applies for the test and certification should succeed according to the criteria defined in each of the units described in the national occupational standard for certifying his occupational qualification. Two types of assessment and evaluation; theoretical (written) and/or performance-based (applied); are carried out to fulfill the performance criteria of the learning outcomes described in each unit.

Written tests are prepared to include the learning outcomes related to each of the qualification units. The candidates are tested for the learning outcomes tested by application and evaluated over the control lists in the applied tests.

The candidates who succeed in one of the written units; however, fail in the other unit of the test are awarded the certificate of achievement related to the unit he succeeds and in case he applies to the test within a year, he is exempted from the units he has succeeded in. The candidate shall be deemed to succeed on the condition that he gets 70 points over 100 for each of the theoretical test units. The candidate shall be deemed to succeed on the condition that he succeeds in all the control criteria in the applied tests. In case of applied examinations, the candidate should be successful in all control criteria.

For the occupation of NC/CNC Machine Tools Operator and Serviceman (Level 5); the test for the performance evaluation of the candidate who applies for the certification of occupational qualification is carried out in the real work environment or the environment arranged for the test before NC/CNC machine tools or via simulator/simulation software. The performance tests of A5 and A6 qualification units are performed concurrently. It's ensured that the candidates use PPE (Personal Protective Equipment) in accordance with the occupational safety rules for protection against unavoidable risks during the performance test.

The point scoring averages of the occupational qualification units of NC/CNC Machine Tools Operator and Serviceman (Level 5) in the general evaluation related to the occupational qualification as the basis for certification are applied as follows:

The questions based on performance may be in formats such as applications for the assessment of process and results, scenarios fictionalized as per the criteria if required and cases with critical conditions. The records of observation, evaluation and point scoring related to the learning outcomes required by the qualification unit and scores, outcomes and/or process steps, times (if required) and critical performances to meet the performance criteria are kept on the control lists which are defined and prepared as per the number of questions stated in the units and estimated performance.

The minimum number of questions related to the theoretical and performance tests over which the candidate shall be evaluated according to the qualification units are stated as follows:

Qualification Items		Number of Questions	
		Theoretical	Performance
A1	OHS & Environmental Safety in CNC Machine Tools	10	Control lists to be prepared based on the performance criteria
A2	Quality Management System	5	
A3	Working Organization	5	
A4	NC/CNC Machine Tools Technology	10	
A5	Pre-Sale/Post-Sale application and Consultancy in CNC Machine Tools	15	
A6	Providing Training For End Users In CNC Machine Tools	10	
Total		55	

13	VALIDITY OF CERTIFICATE	The validity of certificate is totally five (5) years as of the certificate's date of issue.
14	FREQUENCY OF SURVEILLANCE	The certified person is supervised at least once for determining the continuity of his performance within the validity of certificate by the Testing and Certification Body.
15	ASSESSMENT METHODS TO BE FOLLOWED IN RENEWAL OF EXPIRED CERTIFICATES	a) Only applied test is performed at the end of the first 5 years as of the date of initial certification. b) Written test with limited scope and including up-to-date information and applied test are performed at the end of the second 5 years.
16	QUALIFICATION DEVELOPMENT INSTITUTION(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TİAD)
17	SECTOR COMMITTEE TO VERIFY QUALIFICATION	MYK METAL SECTOR COMMITTEE
18	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval :	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Revision 1: 10.04.2013 – 2013/27

12UY0101-5/A1 OHS & ENVIRONMENTAL SAFETY IN NC/CNC MACHINE TOOLS

1	NAME OF QUALIFICATION UNIT	QUALIFICATION ITEM FOR OHS & ENVIRONMENTAL SAFETY IN NC/CNC MACHINE TOOLS
2	REFERENCE CODE	12UY0101-5/A1:
3	LEVEL	5
4	CREDIT VALUE	-
5	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	01
	C) REVISION DATE	10/04/2013
6	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD		
7	LEARNING OUTCOMES	
Learning Outcome 1: Takes OHS measures in the work environment.		
<p>Performance Criteria</p> <ol style="list-style-type: none"> 1.1. Properly defines the OHS rules in the work processes according to the safety instructions/rules and general OHS rules in the machine tools. 1.2. Determines and properly uses the basic PPE (Personal Protective Equipment) for the performance of services. 1.3. Properly uses the warning signs/boards required to be used during the performance of services. 1.4. Properly defines the potential hazards/risks arising from machine, material, process based on the work to be performed under the given/defined conditions. 1.5. Properly applies the basic measures related to the hazards/risks arising from machine, material, process based on the work to be performed under the given/defined conditions. 1.6. Properly defines the conditions and/or applications with the possibility of static electricity and/or spark generation. <p>Context:</p> <ul style="list-style-type: none"> • Safety standards in the machine tools • Basic PPE used in the performance of services like overalls, steel toe shoes, protective glasses, heat resistant gloves and etc. • Basic warnings signs and boards used in the performance of services like slicline sign, breakdown sign, electric shock sign and etc. • Risky and hazardous material and supplies, risky and hazardous equipment and components of NC/CNC machine tools and risk and hazards occurred in the processes carried out by using NC/CNC machine tools, conditions and application with the possibility of static electricity and/or spark generation; earthing issues, spark arc in part processing in the performance of services. 		
Learning Outcome 2: Defines the Emergency Procedures.		
<p>Performance Criteria</p> <ol style="list-style-type: none"> 2.1. Properly defines the critical measures to be taken in the machine tools and in the work environment in case of possible emergency within the scope of performance of services for NC/CNC machine tools. 2.2. Properly defines the ways of notification in accordance with the instructions in case of a described occupational accident in the performance of services. 2.3. Properly defines the exit/escape procedures in emergency cases. 2.4. Properly defines the justified basic/emergency response procedures for fire in case of a possible fire within the scope of his duties. 		

<p>Context: Emergency cases; fire, occupational accident, machine tool breakdowns, procedures for legal notice of occupational accident, procedures for fire fighting.</p> <p>Learning Outcome 3: Takes the environmental safety measures in the work environment.</p> <p>Performance Criteria</p> <p>3.1. Properly defines the effects of waste materials occurred/to occur during the performance of services and to pose risk to the environmental safety.</p> <p>3.2. Properly defines the justified processes related to the disposal of waste materials occurred/to occur during the performance of services and to pose risk to the environmental safety.</p> <p>Context:</p> <ul style="list-style-type: none"> • Procedures for the disposal of boron oil (coolant) emulsion wasted in the machine, cutting oil, metal chips and waste materials generated within the scope of NC/CNC machine tools processes.

8	ASSESSMENT
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8 a) Theoretical Examination

T1 Multiple choice, 4 choices, written test

Minimum 10 questions are asked in the T1 test to be performed by the closed book method. The difficulty levels of assessment instrument are determined by occupational level and cognitive level. An average period of 1.5-2 minutes is allotted for each question. No penalty shall be applied for wrong answers.

The candidate should succeed 70% to succeed in the assessment of this unit's theoretical test.

8 b) Performance based Examination

P1 Performance assessment test

The application based test should be designed to enable the candidates to show their performances during processing in the virtual and/or real production environment. The test is performed by using the "application control list" developed by associating to the performance criteria defined in the unit's learning outcomes.

The candidates use the personal protective equipment provided for them in order to be protected against the unavoidable risks during the performance test.

The candidate should succeed in all the control criteria to succeed in this unit's performance test assessment.

8 c) Other Assessment related conditions

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9	QUALIFICATION DEVELOPMENT INSTITUTION(S)/ORGANIZATIONS(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TIAD)
10	SECTOR COMMITTEE TO VERIFY QUALIFICATION UNIT	METAL INDUSTRY COMMITTEE
11	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval :	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Rev 01: 10.04.2013 – 2013/27

ANNEXES

ANNEX [A1]-1: Information on Recommended Training to Earn a Qualification Unit

The information and skills included in the learning outcomes of the qualification unit for “OHS & Environmental Safety” can be acquired within the courses and lessons of non-formal and formal vocational training programs related to the machine training. On the other hand, such training is provided for the employees working in the enterprises with applied trainings or on-the-job trainings provided by the trainers comprised of chief/leader/occupational safety specialists of the related unit.

It's recommended that for the success of the candidates who shall take the occupational certification test to be performed based on the national qualifications they shall have a minimum 2 years experience in the enterprises providing maintenance, installation and consultancy services for NC/CNC machine tools.

12UY0101-5/A2 QUALIFICATION UNIT FOR QUALITY MANAGEMENT SYSTEM

1	NAME OF QUALIFICATION UNIT	QUALITY MANAGEMENT SYSTEM
2	REFERENCE CODE	12UY0101-5/A2
3	LEVEL	5
4	CREDIT VALUE	-
5	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	01
	C) REVISION DATE	10/04/2013
6	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
	12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD	
7	LEARNING OUTCOMES	
	<p>Learning Outcome 1: Defines the quality standards related to the performance of services for CNC machine tools.</p> <p>Performance Criteria</p> <ol style="list-style-type: none"> 1.1. Properly defines the general principles of machine tools' authorized services. 1.2. Properly defines the primary objectives of customer satisfaction standards. 1.3. Properly defines the permitted geometrical and dimensional tolerance standards according to the national/international standards. 1.4. Properly defines the performance nonconformities under the defined working conditions. <p>Context:</p> <ul style="list-style-type: none"> • User and maintenance manuals for CNC machine tools, standards of authorized service principles for machine tools, customer satisfaction standards. <p>Learning Outcome 2: Defines the applications in the work processes regarding the quality standards related to the performance of services for CNC machine tools.</p> <p>Performance Criteria</p> <ol style="list-style-type: none"> 2.1. Defines the justified quality procedures to be applied for the defined works. 2.2. Defines the justified quality system application procedures to be applied in the defined works. 2.3. Determines the quality nonconformities related to the described work/environment and defines the corrective actions. <p>Context:</p> <ul style="list-style-type: none"> • User and maintenance manuals for CNC machine tools, standards of authorized service principles for machine tools, customer satisfaction standards. 	
8	ASSESSMENT	
	8 a) Theoretical Examination	
	<p>T1 Multiple choice, 4 choices, written test</p> <p>Minimum 5 questions are asked in the T1 test to be performed by the closed book method. The difficulty levels of assessment instrument are determined by occupational level and cognitive level. An average period of 1.5-2 minutes is allotted for each question. No penalty shall be applied for wrong answers.</p> <p>The candidate should succeed 70% to succeed in the assessment of this unit's theoretical test.</p>	

8 b) Performance based Examination		
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8 c) Other Assessment related conditions		
-		
9	QUALIFICATION DEVELOPMENT INSTITUTION(S)/ORGANIZATIONS(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TÍAD)
10	SECTOR COMMITTEE TO VERIFY QUALIFICATION UNIT	METAL INDUSTRY COMMITTEE
11	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval :	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Rev 01: 10.04.2013 – 2013/27

ANNEXES

EK [A2]-1: Information on Recommended Training to Earn a Qualification Unit

The information and skills included in the learning outcomes of the qualification unit for “OHS & Environmental Safety” can be acquired within the courses and lessons of non-formal and formal vocational training programs related to the machine training. On the other hand, such training is provided for the employees working in the enterprises with applied trainings or on-the-job trainings provided by the trainers comprised of chief/leader/occupational safety specialists of the related unit.

It's recommended that for the success of the candidates who shall take the occupational certification test to be performed based on the national qualifications they shall have minimum 2 years experience in the enterprises providing maintenance, installation and consultancy services for NC/CNC machine tools.

12UMS0101-5/A3 QUALIFICATION UNIT FOR WORKING ORGANIZATION

1	NAME OF QUALIFICATION UNIT	WORK ORGANIZATION
2	REFERENCE CODE	12UY0101-5/A3
3	LEVEL	5
4	CREDIT VALUE	-
5	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	00
	C) REVISION DATE	10/04/2013
6	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD		
7	LEARNING OUTCOMES	
Learning Outcome 1: Organizes the work processes.		
<p>Performance Criteria</p> <ul style="list-style-type: none"> 1.1. Properly creates the work schedule according to the defined work orders. 1.2. Controls the soundness of tools and equipment used during the processes. 1.3. Properly determines the tools and equipment required to be used for the defined work/s. 1.4. Properly determines the area design to be worked at for the defined work/s. <p>Context: Operating instructions, service standards, technical documents of work tools and equipment</p>		
Learning Outcome 2: Directs the personnel by works.		
<p>Performance Criteria</p> <ul style="list-style-type: none"> 2.1. Properly determines the routing according to the defined work orders, program, personnel status and service standards. 2.2. Properly determines the working teams according to the defined work orders and personnel status. 2.3. Properly determines the distribution of tasks according to the defined work orders and personnel status. 2.4. Properly defines the results of the works performed according to the defined work schedule. 2.5. Properly determines the information-skills and training requirements of the personnel for the defined status. <p>Context: Operating instructions, service standards, personnel job descriptions</p>		
Learning Outcome 3: Records and reports the work processes.		
<p>Performance Criteria</p> <ul style="list-style-type: none"> 3.1. Properly defines the justified work record, archiving and information-record safety requirements. 3.2. Prepares the service report of NC/CNC machine tools to include the details of processes carried out. 3.3. Properly analyzes the service report prepared according to the defined data and information. <p>Context: Operating instructions and record system, knowledge and skills of data reading and interpretation, service standards</p>		
Learning Outcome 4: Carries out the customer relations in the work processes.		

Performance Criteria		
<p>4.1. Properly defines the customer satisfaction standard requirements.</p> <p>4.2. Properly defines the status and responsibilities of the service personnel within the customer relations management system.</p> <p>4.3. Analyzes the problems with the customer according to the defined case/s and defines the suitable solutions.</p>		
Context: Operating instructions, Customer satisfaction standard, basic customer relations management information, communication skills, problem solving skills		
8	ASSESSMENT	
8 a) Theoretical Examination		
<p>T1 Multiple choice, 4 choices, written test</p> <p>Minimum 5 questions are asked in the T1 test to be performed by the closed book method. The difficulty levels of assessment instrument are determined by occupational level and cognitive level. An average period of 1.5-2 minutes is allotted for each question. No penalty shall be applied for wrong answers.</p> <p>The candidate should succeed 70% to succeed in the assessment of this unit's theoretical test.</p>		
8 b) Performance based Examination		
<p>P1 Performance assessment test</p> <p>The application based test should be designed to enable the candidates to show their performances during processing in the virtual and/or real production environment. The test is performed by using the "application control list" developed by associating to the performance criteria defined in the unit's learning outcomes.</p> <p>The candidates use the personal protective equipment provided for them in order to be protected against the unavoidable risks during the performance test.</p> <p>The candidate should succeed in all the control criteria to succeed in this unit's performance test assessment.</p>		
8 c) Other Assessment related conditions		
-		
9	QUALIFICATION DEVELOPMENT INSTITUTION(S)/ORGANIZATIONS(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TiAD)
10	SECTOR COMMITTEE TO VERIFY QUALIFICATION UNIT	METAL INDUSTRY COMMITTEE
11	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval : SAYISI	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Revision No. 01: April 10, 2013 – 2013/27 10.04.2013 - 2013/27

ANNEXES

ANNEX [A3]-1: Information on Recommended Training to Earn a Qualification Unit

The information and skills included in the learning outcomes of the qualification unit for "OHS & Environmental Safety" can be acquired within the courses and lessons of non-formal and formal vocational training programs related to the machine training. On the other hand, such training is provided for the employees working in the enterprises with applied trainings or on-the-job trainings provided by the trainers comprised of chief/leader/occupational safety specialists of the related unit.

It's recommended that for the success of the candidates who shall take the occupational certification test to be performed based on the national qualifications they shall have a minimum 2 years experience in the enterprises providing maintenance, installation and consultancy services for NC/CNC machine tools.

12UY0101-5/A4 QUALIFICATION UNIT FOR NC/CNC MACHINE TOOLS TECHNOLOGY

1	NAME OF QUALIFICATION UNIT	NC/CNC Machine Tools Technology
2	REFERENCE CODE	12UY0101-5/A4
3	LEVEL	5
4	CREDIT VALUE	-
5	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	01
	C) REVISION DATE	10/04/2013
6	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD		
7	LEARNING OUTCOMES	
Learning Outcome 1: Distinguishes the types of NC/CNC machine tools.		
<p>Performance Criteria</p> <ol style="list-style-type: none"> 1.1. Properly classifies the types of NC/CNC machine tools by their manufacturing processes. 1.2. Properly classifies NC/CNC machine tools by their control types. <p>Context: Manufacturing processes, classification standards for machine tools.</p>		
Learning Outcome 2: Defines the technical specifications of NC/CNC machine tools by their capacities.		
<p>Performance Criteria</p> <ol style="list-style-type: none"> 2.1. Properly defines the specifications of NC/CNC machines tools according to the physical properties (shape, weight and etc.) of the part to be manufactured. 2.2. Properly defines the specifications and performance of NC/CNC machine tools by the production rate and production processes. <p>Context: Capacity properties (rate, size, travel range and etc.) of NC/CNC machine tools, part production rate, part production processes.</p>		
Learning Outcome 3: Carries out the basic operational processes of NC/CNC machine tools.		
<p>Performance Criteria:</p> <ol style="list-style-type: none"> 3.1. Carries out the start-stop processes of NC/CNC machine tools, safely. 3.2. Controls the compatibility of warning and boot parameters by the specifications of machine tools via the screens of NC/CNC machine tools. 3.3. Safely runs the testing programs of NC/CNC machine tools. <p>Context: Technical documents of NC/CNC machine tools</p>		
Learning Outcome 4: Uses the basic measuring and control devices in the NC/CNC machine tools.		
<p>Performance Criteria:</p> <ol style="list-style-type: none"> 4.1. Properly measures the balance level of NC/CNC machine tools by using appropriate measuring devices. 4.2. Properly measures the geometrical measurements and tolerance values of NC/CNC machine tools by using appropriate measuring devices. 4.3. Properly carries out the maintenance of tools and equipment he used during the performance of work. <p>Context: Precision balance, comparator, precision measuring devices (geometric tolerance templates, calliper, and etc.) and methods of measurement by using these devices.</p>		
8	ASSESSMENT	

8 a) Theoretical Examination		
T1 Multiple choice, 4 choices, written test Minimum 10 questions are asked in the T1 test to be performed by the closed book method. The difficulty levels of assessment instrument are determined by occupational level and cognitive level. An average period of 1.5-2 minutes is allotted for each question. No penalty shall be applied for wrong answers. The candidate should succeed 70% to succeed in the assessment of this unit's theoretical test.		
8 b) Performance based Examination		
P1 Performance assessment test The application based test should be designed to enable the candidates to show their performances during processing in the virtual and/or real production environment. The test is performed by using the "application control list" developed by associating to the performance criteria defined in the unit's learning outcomes. The candidates use the personal protective equipment provided for them in order to be protected against the unavoidable risks during the performance test. The candidate should succeed in all the control criteria to succeed in this unit's performance test assessment.		
8 c) Other Assessment related conditions		
-		
9	QUALIFICATION DEVELOPMENT INSTITUTION(S)/ORGANIZATIONS(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TIAD)
10	SECTOR COMMITTEE TO VERIFY QUALIFICATION UNIT	METAL INDUSTRY COMMITTEE
11	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval :	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Rev 01: 10.04.2013 – 2013/27

ANNEXES

ANNEX [A4]-1: Information on Recommended Training to Earn a Qualification Unit

Some of the information and skills included in the learning outcomes of the qualification unit for "NC/CNC Machine Tools Technology" can be acquired within the courses and lessons of non-formal and formal vocational training programs related to the machine training. The technical details requiring specialization related to the qualification unit are provided by the applied trainings or on-the-job trainings provided by the trainers comprised of chief/leader/occupational safety specialists of the related unit of the enterprises operating in the sector.

It's recommended that for the success of the candidates who shall take the occupational certification test to be performed based on the national qualifications they shall have a minimum 2 years experience in the enterprises providing maintenance, installation and consultancy services for NC/CNC machine tools.

**12UY0101-5/A5 QUALIFICATION UNIT FOR PRE/POST-SALE APPLICATIONS AND CONSULTANCY IN
NC/CNC MACHINE TOOLS**

1	NAME OF QUALIFICATION UNIT	12UY0101-5/A5 QUALIFICATION UNIT FOR PRE/POST-SALE APPLICATIONS AND CONSULTANCY IN NC/CNC MACHINE TOOLS
2	REFERENCE CODE	12UY0101-5/A5
3	LEVEL	5
4	CREDIT VALUE	-
5	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	01
	C) REVISION DATE	10/04/2013
6	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD		
7	LEARNING OUTCOMES	
<p>Learning Outcome 1: Recognizes the production processes in NC/CNC machine tools.</p> <p>Performance Criteria</p> <ol style="list-style-type: none"> 1.1. Properly reads the technical drawings of given/shown/defined parts. 1.2. Properly defines the phases of part manufacturing processes in NC/CNC machine tools. 1.3. Properly defines the specifications of NC/CNC machine tools by using the catalogue information. 1.4. Properly defines the specifications of the material to be processed by using the catalogue information. <p>Context:</p> <ul style="list-style-type: none"> • Manufacturing procedures. <p>Learning Outcome 2: Recognizes the tools, apparatus and materials used in NC/CNC machine tools.</p> <p>Performance Criteria</p> <ol style="list-style-type: none"> 2.1. Properly selects the appropriate tools and apparatus for chip removal on the given/shown/defined parts. 2.2. Properly carries out the reset processes of the given/shown/defined part/s and tools. 2.3. Selects the optimum processing parameters for processing the given/shown/defined part/s in terms of surface quality and processing time. 2.4. Reads the definition information on the card/s of given/shown/defined material/s. <p>Context:</p> <ul style="list-style-type: none"> • Technical documents of NC/CNC machine tools, catalogues of tools and apparatus, catalogues and standards related to the metal/non-metal/polymer/composite materials processed in NC/CNC machine tools. <p>Learning Outcome 3: Commissions NC/CNC machine tools.</p> <p>Performance Criteria</p> <ol style="list-style-type: none"> 3.1. Properly carries out the parametric settings of NC/CNC machine tools in accordance with the end user's requests. 3.2. Carries out the precision controls of parallel operating parts on NC/CNC machine tools by using the appropriate equipment. 3.3. Carries out the distortion control in the spindle on NC/CNC machine tools by using the appropriate equipment. 3.4. Carries out tolerance control by the application of test piece processing. 3.5. Informs the end user on the periodic maintenance of NC/CNC machine tools. 3.6. Defines the cases within/out of the scope of guarantee by the described situation. <p>Context:</p> <ul style="list-style-type: none"> • Maintenance and installation documents of NC/CNC machine tools, operational service procedures. 		

Learning Outcome 4: Provides pre- and post-sale consultancy services.**Performance Criteria**

- 4.1. Properly determines the manufacturing processes (machine, fixing, material, cutting tool and etc.) according to the given/defined end user manufacturing data.
- 4.2. Properly calculates the cutting parameters and manufacturing processes by using the given data, related formulas for the defined part.

Context:

- Manufacturing procedures, calculation data for production parameters, occupational mathematics information.

Learning Outcome 5: Carries out and ensures that product processing applications are carried out in NC/CNC machine tools.**Performance Criteria**

- 5.1. Determines the types/manners of fixing (fixture, shoe, clamp) by the given/defined machine and part.
- 5.2. Prepares processing schedules by the given/defined part.
- 5.3. Manufactures and directs the operator to manufacture the sample of given/defined part according to its technical drawing in CNC machine tool.

Context:

- Technical documents of NC/CNC machine tools, types/manners of fixing (fixture, shoe, clamp), part technical drawing/s, NC/CNC programming documents.

8	ASSESSMENT
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8 a) Theoretical Examination

T1 Multiple choice, 4 choices, written test
 Minimum 15 questions are asked in the T1 test to be performed by the closed book method. The difficulty levels of assessment instrument are determined by occupational level and cognitive level. An average period of 1.5-2 minutes is allotted for each question.
 tanınır. No penalty shall be applied for wrong answers.
 The candidate should succeed 70% to succeed in the assessment of this unit's theoretical test.

8 b) Performance based Examination

P1 Performance assessment test
 The application based test should be designed to enable the candidates to show their performances during processing in the virtual and/or real production environment. The test is performed by using the "application control list" developed by associating to the performance criteria defined in the unit's learning outcomes.

 The candidates use the personal protective equipment provided for them in order to be protected against the unavoidable risks during the performance test.

 The candidate should succeed in all the control criteria to succeed in this unit's performance test assessment.

8 c) Other Assessment related conditions

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9	QUALIFICATION DEVELOPMENT INSTITUTION(S)/ORGANIZATIONS(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TİAD)
10	SECTOR COMMITTEE TO VERIFY QUALIFICATION UNIT	METAL INDUSTRY COMMITTEE
11	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval :	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Rev 01: 10.04.2013 – 2013/27

ANNEXES

EK [A5]-1: Information on Recommended Training to Earn a Qualification Unit

Some of the information and skills included in the learning outcomes of the qualification unit for “NC/CNC Machine Tools Technology” can be acquired within the courses and lessons of non-formal and formal vocational training programs related to the machine training. The technical details requiring specialization related to the qualification unit are provided by the applied trainings or on-the-job trainings provided by the trainers comprised of chief/leader/occupational safety specialists of the related unit of the enterprises operating in the sector.

It's recommended that for the success of the candidates who shall take the occupational certification test to be performed based on the national qualifications they shall have a minimum 2 years experience in the enterprises providing maintenance, installation and consultancy services for NC/CNC machine tools.

12UY0101-5/A6 QUALIFICATION UNIT FOR END USER TRAINING IN NC/CNC MACHINE TOOLS

1	NAME OF QUALIFICATION UNIT	NC/CNC TAKIM TEZGÂHLARINDA SON KULLANICI EĞİTİMİ VERME
2	REFERENCE CODE	12UY0101-5/A6
3	LEVEL	5
4	CREDIT VALUE	-
5	A) DATE OF PUBLICATION	15/11/2012
	B) REVISION NO	01
	C) REVISION DATE	10/04/2013
6	OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION	
12UMS0261-5 CNC MACHINE TOOLS OPERATOR & SERVICEMAN NATIONAL OCCUPATIONAL STANDARD		
7	LEARNING OUTCOMES	
Learning Outcome 1: Makes the preparations for end user training.		
<p>Performance Criteria</p> <p>1.1. Properly defines the context of training program for the end user to be trained for using NC/CNC machine tool equipment and whose knowledge level is defined.</p> <p>1.2. Properly defines the context of training program for the end user to be trained for using NC/CNC machine tool equipment and whose knowledge level is defined.</p> <p>1.3. Properly determines the training processes according to the end user's knowledge level related to NC/CNC machine tools and equipment.</p> <p>1.4. Makes the functional controls of NC/CNC machine tool before the training.</p> <p>1.5. Properly controls the measuring devices (calliper, micrometer, surface gauge and etc.) to be used in the training before use.</p> <p>Context: Trainer skills, User and programming manuals of NC/CNC machine tool.</p>		
Learning Outcome 2: Provides end user training.		
<p>Performance Criteria</p> <p>2.1. Properly provides the training within the scope of the context specified related to NC/CNC machine tool and/or equipment within the time given.</p> <p>2.2. Defines the ways of efficiency assessment of the training provided.</p> <p>Context: Trainer skills, User and programming manuals of NC/CNC machine tool.</p>		
8	ASSESSMENT	
8 a) Theoretical Examination		
<p>T1 Multiple choice, 4 choices, written test</p> <p>Minimum 10 questions are asked in the T1 test to be performed by the closed book method. The difficulty levels of assessment instrument are determined by occupational level and cognitive level. An average period of 1.5-2 minutes is allotted for each question.</p> <p>No penalty shall be applied for wrong answers.</p> <p>The candidate should succeed 70% to succeed in the assessment of this unit's theoretical test.</p>		
8 b) Performance based Examination		

P1 Performance assessment test		
The application based test should be designed to enable the candidates to show their performances during processing in the virtual and/or real production environment. The test is performed by using the “application control list” developed by associating to the performance criteria defined in the unit’s learning outcomes.		
The candidates use the personal protective equipment provided for them in order to be protected against the unavoidable risks during the performance test. The candidate should succeed in all the control criteria to succeed in this unit’s performance test assessment.		
8 c) Other Assessment related conditions		
-		
9	QUALIFICATION DEVELOPMENT INSTITUTION(S)/ORGANIZATIONS(S)	MACHINE TOOLS INDUSTRIALISTS AND BUSINESSMEN ASSOCIATION (TIAD)
10	SECTOR COMMITTEE TO VERIFY QUALIFICATION UNIT	METAL INDUSTRY COMMITTEE
11	DATE AND NUMBER OF APPROVAL BY VQA BOARD OF DIRECTORS Initial Approval :	November 15, 2012 – 2012/84 15.11.2012 – 2012/84 Rev 01: 10.04.2013 – 2013/27

ANNEXES

EK [A6]-1: Information on Recommended Training to Earn a Qualification Unit

Some of the information and skills included in the learning outcomes of the qualification unit for “NC/CNC Machine Tools Technology” can be acquired within the courses and lessons of non-formal and formal vocational training programs related to the machine training. The technical details requiring specialization related to the qualification unit are provided by the applied trainings or on-the-job trainings provided by the trainers comprised of chief/leader/occupational safety specialists of the related unit of the enterprises operating in the sector.

It’s recommended that for the success of the candidates who shall take the occupational certification test to be performed based on the national qualifications they shall have a minimum 2 years experience in the enterprises providing maintenance, installation and consultancy services for NC/CNC machine tools.

QUALIFICATION ANNEXES

ANNEX 1: Qualification Items

12UY0101-5/A1 OHS & ENVIRONMENTAL SAFETY IN NC/CNC MACHINE TOOLS

12UY0101-5/A2 QUALITY MANAGEMENT SYSTEM

12UY0101-5/A3 WORK ORGANIZATION

12UY0101-5/A4 NC/CNC MACHINE TOOLS TECHNOLOGY

12UY0101-5/A5 QUALIFICATION UNIT FOR PRE/POST-SALE APPLICATIONS AND CONSULTANCY IN NC/CNC MACHINE TOOLS

12UY0101-5/A6 QUALIFICATION UNIT FOR END USER TRAINING IN NC/CNC MACHINE TOOLS

ANNEX 2: Terms, Symbols and Abbreviations

ALARM: Error messages by CNC machine tool.

SWITCH: Limit and/or locking switch.

ANALYSIS: Examining in detail by disintegration.

EQUIPMENT: Part and/or connection apparatus supplied or optionally supplied with CNC machine tool.

FACE: CNC machine tool part connecting the cylindrical work piece to CNC machine, designed for tightening with desired force.

MAINTENANCE: Works including replacement, lubrication, cleaning and setting of wearing, periodically changed or dead parts of the related machine, equipment, device or systems according to the technical instructions and user manuals.

SKILLS: Skill to fulfill the duties and responsibilities related to a certain work,

CAD: Computer Aided Design.

CAD/CAM PROGRAM: Computer software used for preparation of process codes to design the parts to be processed and manufactured in CNC machines.

CAM: Computer Aided Manufacturing.

CNC: Computerized Numerical Control.

CNC MACHINE TOOL: The machine operated by sending signals to the machine control unit and associated units due to the program without direct human control other than start signals, written as per material geometry to be processed by the assistance of keys and screen and recorded in the memory.

ENVIRONMENTAL PROTECTION: Using environmentally friendly materials and processes in the performance of works or proper disposal of hazardous wastes.

DIALOGUE PROGRAMMING: Software enabling preparation of processing program by establishing interaction with the interactive menus created as question-answer between CNC machine tool and user.

ELECTROMECHANICS: Mechanical systems operated and controlled by electrical components.

RECYCLE: Recycling the materials directly or after process and management of related processes.

VOLTAGE: Potential difference in electrical charge between the two points of a conductor.

TAILSTOCK: Auxiliary apparatus used to apply support to the longitudinal rotary axis of a work piece being machined on the engine lathe.

HYDRAULIC: Technology related to transmission, control and use of power by compressed liquids.

ISCO: International Standard Classification of Occupations.

ISO CODING: International standard coding language no. ISO 6983-1: 2009 (Automation Systems and Integration – Numerical Control of Machines – Program Format and Definitions of Address Words) defined for CNC machine tools.

FEED RATE: The rate in mm at which the cutting tool and workpiece move in relation to one another.

OHS: Occupational Health and Safety,

PROCESSING PROGRAM: The software which is installed in the control units of CNC machines and enables controlling, ranging, recording, recalling of chip removal processes from the control panel.

OPERATING SYSTEM: The software operating PLC control unit in CNC machine tools.

CALIBRATION: Reporting of measurement results by comparing a reference measuring device which is certified to be accurate (traceable) and a measuring device which is not certified to be accurate.

TOOL HOLDER: The tool used in connecting the cutting tool ends to the machine tool.

CUTTING TOOL: In the context of machining, a **cutting tool** (or **cutter**) is any tool that is used to remove material from the work piece by means of shear deformation.

CUTTING SPEED: The cutting tool's speed of relative motion in meters per a minute around the workpiece or cutting tool's peripheral speed per minute.

SHEAR TEST: Chip removal process and work piece processing to test precision of CNC machine tool and geometrical tolerance.

PERSONAL PROTECTIVE EQUIPMENT (PPE): All kinds of tools, instruments, appliances and devices which are worn, put on or hold by the worker and which protect the worker from one or more hazards arising from the work and effect the health and safety of the worker, and which are designed to suit such purpose.

COMPARATOR: Comparative measuring assembly used for indicating the compatibility of dimensions of work pieces to the geometrical tolerances based on an established unit measurement value; with the analog and digital types.

DRILL CHUCK: Part of CNC machine tool, where drilling tools are installed and which is designed for robust tightening.

GAUGE: Measuring instrument used for determining whether the dimensions of the processed part is compatible or not by using comparative methods.

NC: Numerical Control.

PLC: Programmable logic controllers which operate as rapidly scanning the input data in milliseconds and responding to the matching output data almost in real time.

PNEUMATIC: Technology related to transmission, control and use of power by compressed gasses.

POST-PROCESSING: Database used for enabling synchronous communication between CAM programs and CNC machine tools.

REFRACTOMETER: Instrument used for measuring mixture rate and refractive index in liquids.

RISK: Means probability of occurrence of a hazardous event and combination of results.

DEVIATION: The difference between the measurement value and actual value.

RESET: Determination of reference location of the part to be processed.

COOLANT: In the context of machining; the liquid used for maintaining the high temperature generated by friction between the work piece and cutting tools at a reasonable level.

TOOL HOLDER: The apparatus used in connecting the cutting tool ends and precision gauges to the machine tool.

MACHINING METHODS: Manufacturing methods including; cutting of mechanical parts in appropriate metal cutting machines (turning lathe, milling machine and etc.) and shaping by using the specified cutting tools.

TURRET: The part in CNC machine tools where the tools are installed via holders and connection apparatus.

DANGER: Potential of damage or injury likely to affect the worker or work place and likely to exist in the workplace or to be caused externally

TOLERANCE: Acceptable limit values of a measurement.

KEYPAD: Set of buttons used for controlling CNC machine tool.

SEMI-PRODUCT: A manufactured article that must go through one or several stages of processing before it becomes a finished article suitable for personal or industrial use.

ANNEX 3: Ways of Horizontal and Vertical Progress At Occupation

The occupation of NC/CNC Machine Tools Operator and Serviceman; is the horizontal progression phase of NC/CNC Machine Tools Mechanical Serviceman and NC/CNC Machine Tools Electricity/Electronics Serviceman.

ANNEX 4: Assessor Criteria

The Testing Board to be assigned in the assessment processes related to the occupational qualifications of NC/CNC Machine Tools Operator and Serviceman (Level 5) is formed of minimum one (1) person. The assessor(s) to be assigned shall have at least one of the following qualifications.

- Engineer or technical instructor shall have minimum 3 years of experience in CNC Machine Tools and shall be graduated from the Mechanics, Industry, Mechatronics, Machining, Grading, Manufacturing, Machinery Drawing Construction Technology or Design Construction Technology Departments of the Faculties of Engineering, Technology and Technical Training or
- Shall be graduated from the Departments of Mechanics, Grading, Machine Drawing Construction, Mechatronics of the Vocational School or
- NC/CNC Machine Tools Operator and Serviceman (Level 5) shall have an occupational qualification certificate and minimum 5 years of experience.

On the other hand; in addition to the abovementioned qualifications the assessor shall be trained in assessment and evaluation, shall have knowledge of national occupational qualifications and standards.