

OCCUPATIONAL STANDARD

Machine tool operator, level 4

The occupational standard is a document that describes the job and competence requirements, i.e. a set of skills, knowledge and attitudes required for successful job performance in a particular occupation.

The occupational standard of a machine tool operator, level 4 serves as the basis for preparation of vocational education and in-service training curricula and assessment of professional competence of people.

Occupational qualification title	Level of the Estonian Qualification Framework (EQF)
<i>Machine tool operator, level 4</i>	<i>4</i>
Possible specialisations and titles on the certificate	
Specialisation	Title on the certificate
Machining work pieces on a conventional and CNC milling machine	Miller, level 4
Machining work pieces on a conventional and CNC lathe	Turner, level 4

Part A

JOB DESCRIPTION

A.1 Job description

Machine tool operators are mainly employed in mechanical engineering companies that perform metalworking by means of turning and milling.

Depending on the vocational training of the operator, the work is carried out by means of a lathe or milling machine, on which he/she machines the work pieces in accordance with the drawings and control programme. The main tasks of a machine tool operator are machining, threading and drilling various profiled surfaces using conventional as well as CNC machine tools. (CNC – Computer Numerical Control.)

He/she sets up the machine tool in accordance with the provided technical documentation or works on pre-set machine tools. The machine tool operator ensures the quality of the machined work piece.

A machine tool operator can specialise in two fields:

- a) miller
- b) turner

These specialities contain the skills and knowledge required for working on both conventional and CNC machine tools.

The main task of a **miller** is the manufacture of work pieces by machining surfaces, openings, treads and grooves using a milling machine.

The main task of the **turner** is mainly the production of rotary type work pieces: machining and threading surfaces, treads, openings and grooves on a lathe.

A.2 Units

A.2.1 Preparation of work process

- 2.1.1 Examining working drawings and documents
- 2.1.2 Organising a proper workplace
- 2.1.3 Verifying the good condition of the machine tool
- 2.1.4 Checking the compliance of the blank

A.2.2 Performing maintenance work of machine tools

- 2.2.1 Performance of regular maintenance and cleaning work
- 2.2.2 Registration of technical problems

UNITS OF SPECIALISATION

A.2.3 Machining work pieces on a conventional and CNC milling machine

- 2.3.1 Setting up a conventional milling machine for the manufacture of work pieces
- 2.3.2 Manufacture of work pieces on a conventional milling machine
- 2.3.3 Setting up and preparing a CNC milling machine for work
- 2.3.4 Manufacture of work pieces on a CNC milling machine
- 2.3.5 After treatment of work pieces and storage within the limits of the work place

A.2.4 Machining work pieces on a conventional and CNC lathe

- 2.4.1 Setting up a conventional lathe for the manufacture of work pieces
- 2.4.2 Manufacture of work pieces on a conventional lathe
- 2.4.3 Setting up and preparing a CNC lathe for work
- 2.4.4 Manufacture of work pieces on a CNC lathe
- 2.4.5 After treatment of work pieces and storage within the limits of the work place

A list of tasks, “Units and tasks”, related to the units is presented in Annex 1.

A.3 Working environment and specific aspects of work

The working time of CNC machine tool operators is generally fixed. According to the work organisation of the company, the work may be also performed based on a flexible working schedule. Depending on the production segment (serial or piece production), the work can be routine or alternating, pace of work is generally moderate. The working environment is located indoors and is noisy.

Metal dust and vapours of coolants in the working environment may cause allergic reactions. Since work is performed by means of machines, failure to follow safety requirements may cause accidents at work. Thus, it is mandatory to follow strictly the occupational safety requirements and use the required personal protective equipment.

A.4 Tools

Universal and special jigs, measuring instruments, hand tools (e.g. file, scraper, abrasive stone, etc.), lifting equipment, personal protective equipment

A.5 Personal characteristics necessary for this job: abilities and personality traits

Sense of responsibility and honesty, diligence, punctuality, skill to plan work independently, spatial thinking, calmness, good eyesight and hearing, good physical fitness. Ability to concentrate, ability to cope with routine, coordination, mathematical skills.

A.6 Occupational training

Usually, people working in this profession have professional education or acquired professional skills via practical work experience or in-service training.

A.7 Possible job titles

Turner, miller

Part B

COMPETENCE REQUIREMENTS

B.1. The structure of the occupational qualification

The occupational standard of machine tool operators consists of two mandatory (B.2.1 and B.2.2), two specialisation-related (B.2.3, B.2.4) and transversal (B.2.5) competencies.

The occupational qualification of a machine tool operator is based on specialisation and it is possible to specialise in two fields:

- a) operator of conventional and CNC machine tools, miller;
- b) operator of conventional and CNC machine tools, turner.

In order to obtain **the occupational qualification of a miller, level 4**, the applicant must verify competencies B.2.1, B.2.2, B.2.3 and B.2.5.

In order to obtain **the occupational qualification of a turner, level 4**, the applicant must verify competencies B.2.1, B.2.2, B.2.4 and B.2.5.

B.2 Competencies

MANDATORY COMPETENCIES

B.2.1 Preparation of work process	EQF level 4
<u>Performance indicators:</u>	
<ol style="list-style-type: none"> 1. Examines the working drawings and necessary documents (e.g. work order, delivery notes, technical requirements) and ensures that all necessary documents are present, clear and understandable. If required, asks for additional information. 2. Ensures that the approximate vicinity of the working place is in order and safe. Checks that the personal protective equipment (e.g. goggles, gloves, etc.) is present and in order. Ensures by visual inspection that the machine tool is in order and cleaned before work. 3. Turns the machine tool on and monitors that there are no deviations in its work. In case of deviations, reacts according to authorisations fast and relevantly, and, if required, informs the specialist or his or her immediate manager about the problems. 4. Checks the compliance of the blank with working drawings by using measuring instruments. 	
<u>Supporting knowledge:</u>	
<ol style="list-style-type: none"> a) operating principles, modes and technical options of conventional and CNC machine tools; b) coordinate axes, instrument correction; c) structure and functions of a control programme; d) technical drawing; e) materials science: various metallic and non-metallic materials, their differences (physical and mechanical properties, heat treatment of steel, marking, most common EN and ISO material standards, etc.); f) basis of tolerating (fits and tolerances); g) basis of machining; h) methods of monitoring the operation of a CNC machine tool; signs referring to failure; i) most common failure types, methods for their prevention; j) safety rules, safety measures and personal protective equipment required when using the machine / machine tool; 	

<p>k) documentation related to work;</p> <p>l) measuring instruments necessary for work (e.g. calliper, angle meter, micrometer, etc.) and their principles of use;</p> <p>m) general knowledge about slinging and lifting equipment.</p>
<p><u>Assessment method(s):</u> combined method containing verification of theoretical knowledge as well as practical skills.</p>

B.2.2 Performing maintenance work of machine tools	EQF level 4
<p><u>Performance indicators:</u></p> <ol style="list-style-type: none"> 1. Performs regular maintenance and cleaning work according to the user manual of a machine tool and uses the required tools. 2. Registers all occurred technical problems and informs the specialist or immediate manager. 	
<p><u>Supporting knowledge:</u></p> <ol style="list-style-type: none"> a) operating principles, modes and technical options of conventional and CNC machine tools; b) methods of monitoring the operation of a machine tool; signs referring to failure; c) most common failure types, their prevention; d) safety rules, safety measures and personal protective equipment required when using the machine / machine tool; e) documentation related to work. 	
<p><u>Assessment method(s):</u> combined method containing verification of theoretical knowledge as well as practical skills.</p>	

COMPETENCIES RELATED TO SPECIALISATION

Machining work pieces on a conventional and CNC milling machine	
B.2.3 Machining work pieces on a conventional and CNC milling machine	EQF level 4
<p><u>Performance indicators:</u></p> <ol style="list-style-type: none"> 1. Examines the working drawing and sets the conventional milling machine for manufacture of work pieces: fixes the blank to the machine tool by selecting proper fixtures. Selects required cutting instruments based on the detail drawing and verifies their good working condition. Based on the detail drawing, material of the blank and cutting instrument to be used, determines the optimum cutting modes and sets the machine tool accordingly. Enters the actual dimensions of cutting instruments to the control system of the machine tool. If required, adjusts the selected cutting modes with possibilities of the tool. Analyses the measuring chains specified on the working drawing and calculates necessary measures. 2. Manufactures work pieces (planes and flat contours, contours milled with a form cutter, polyhedrons and straight grooves milled with a indexing head) on a conventional milling machine based on the prescribed detail drawings, which conform to the precision requirements IT 12 of ISO standard. 3. Examines the working drawing and control programme and sets the CNC milling machine for manufacture of work pieces: fixes the blank to the machine tool by selecting proper fixtures. Inserts cutting instruments to the instrument holder and determines the required zero points. If required, prepares the control programmes for drilling and milling of flat contours (e.g. grooves, circles, rectangles, squares, etc.) and treads by using the sub-programmes in control systems of the machine tool. 4. Verifies the correctness of the control programme and its conformity to detail drawing. Manufactures work pieces based on detail drawing using a CNC milling machine. Monitors the work process – in case of a failure, knows how to stop the work or operation of the machine tool 	

so that the caused damage (technical condition, raw material consumption, etc.) would be as minor as possible. Checks the quality of finished work piece and its conformance to the technical documentation.

5. Cleans the finished work pieces, trims the metal and removes other machining waste. Stores finished work pieces based on the requirements of the arrangement of working place. Cleans the machine tool and arranges the working place after work.

Supporting knowledge:

- a) technological processes of making standard work pieces;
- b) cutting instruments used at milling;
- c) milling machines, their operating principles, structure and control system;
- d) general knowledge on maintenance of milling machines (lubricants and coolants, filters, etc.);
- e) various accessories, tools, setting and fixing jigs;
- f) technological modes of milling machines, basis for their selection;
- g) terminology related to milling (in native language and at least in one foreign language);
- h) coordinate systems of machine tools;
- i) control systems of machine tools;
- j) purpose and options of sub-programmes;
- k) basis for preparation of control programmes.

Assessment method(s):

combined method containing verification of theoretical knowledge as well as practical skills.

Machining work pieces on a conventional and CNC lathe

B.2.4 Machining work pieces on a conventional and CNC lathe

EQF level 4

Performance indicators:

1. Examines the working drawing and sets the machine tool for manufacture of work pieces: fixes the blank by means of proper fixtures. Selects required cutting instruments based on the detail drawing and verifies their good working condition. Based on the detail drawing, material of the blank and cutting instrument to be used, determines the optimum cutting modes and sets the machine tool accordingly. Enters the actual dimensions of cutting instruments to the control system of the machine tool. Adjusts the selected cutting modes with the possibilities of the tool. Analyses the measuring chains specified on the working drawing and calculates the missing measures.
2. Manufactures work pieces (turning of conic and cylindrical surfaces, machining of inside and outside threads, drilling, etc.) based on the prescribed detail drawings, which conform to the precision requirements IT 10 of ISO standard.
3. Examines the working drawings and control programmes, sets the machine tool for manufacture of work pieces: fixes the blank. Inserts cutting instruments to the instrument holder and determines the required zero points. If required, prepares the control programme for turning of conic and cylindrical surfaces, machining of inside and outside threads, drilling and machining of radial transition.
4. Verifies the correctness of the control programme and its conformity to detail drawing. Manufactures work pieces based on detail drawing using a CNC lathe. Monitors the work process – in case of a failure, knows how to stop the work or operation of the machine tool so that the caused damage (technical condition, raw material consumption, etc.) would be as minor as possible. Checks the quality of finished work piece and its conformance to the technical documentation.
5. Cleans the finished work pieces, trims the metal and removes other machining waste. Stores finished work pieces based on the requirements of the arrangement of working place. Cleans the

<p>machine tool and arranges the working place after work.</p>
<p><u>Supporting knowledge:</u></p> <ul style="list-style-type: none"> a) technological processes of making standard work pieces; b) cutting instruments used at turning; c) lathes, their operating principles, structure and control system; d) general knowledge on maintenance of lathes (lubricants and coolants, filters, etc.); e) various accessories, tools, setting and fixing jigs – their use and maintenance; f) technological modes of lathes, basis for their selection; g) terminology related to turning (in native language and at least in one foreign language); h) coordinate systems of machine tools; i) control systems of machine tools; j) purpose and options of sub-programmes; k) basis for preparation of control programmes.
<p><u>Assessment method(s):</u> combined method containing verification of theoretical knowledge as well as practical skills.</p>

TRANSVERSAL COMPETENCIES

<p>B.2.5 Transversal competencies of the occupational qualification of a machine tool operator, level 4</p>	<p>EQF level 4</p>
<p><u>Performance indicators:</u></p> <ol style="list-style-type: none"> 1. A machine tool operator makes high-quality products that conform to the prescribed technical requirements. He or she meets the deadlines and technological route. 2. He or she uses the working time effectively, works systematically and in an organised manner and follows the prescribed instructions, procedures and safety requirements. 3. A machine tool operator uses all the acquired knowledge and skills specific to his/her field to achieve the work goals. He/she shares one's knowledge and specificity of the field with colleagues and develops professional knowledge through continuous professional development. 4. He/she thinks fast and acquiring new tasks, methods and techniques is not difficult for him or her. Uses opportunities for self-development and improving one's skills. 5. While working, analyses his/her activities and presents ideas and innovation proposals for improvement of work. 6. A machine tool operator is a team worker. He or she is aware of the work and functions of different departments of the organisation and he or she communicates with people on all levels, expresses clearly one's opinion and does not hide any information. If required, copes with conflict situations. 7. Takes criticism reasonably and is able to make conclusions and learn from it. 8. Communicates in professional activities in Estonian at least on level B. Masters professional terminology in at least one foreign language (English is recommended). 9. Computer skills: modules 1–4, module 7, module 12. 	
<p><u>Assessment method(s):</u> Assessment of transversal competences is integrated within other competences of this standard.</p>	

Part C

GENERAL INFORMATION AND ANNEXES

C.1 Information on the preparation and approval of the occupational standard, on the body awarding occupational qualifications, and reference to the location of the occupational standard in classifications	
1. Designation of the occupational standard in the register of occupational qualifications	10-16092014-1.2/5k
2. The occupational standard is compiled by	Andres Pählapuu - <i>Hismekano Eesti OÜ</i> Allan Märk - <i>AS NORMA</i> Anu Kull - <i>Tallinna Lasnamäe Mehaanikakool</i> Veiko Pöldmaa - <i>Tallinna Tööstushariduskeskus</i> Anu Tuuksam - <i>SA Innove</i>
3. The occupational standard is approved by	Mechanical industry, Metallurgical industry and Instrument engineering Skills Sector Council
4. Number of the decision of the Sector Skills Council	9
5. Date of the decision of the Sector Skills Council	16.09.2014
6. The occupational standard is valid until (date)	15.09.2019
7. Version number of the occupational standard	5
8. Reference to the Classification of Occupations (ISCO 08)	7223 Machine tool adjusters and operators
9. Reference to the European Qualification Framework (EQF)	4
C.2 Title of occupational qualification in foreign languages	
In English – CNC machine operator Turner - CNC turning machine operator, CNC lathe operator Miller - CNC milling machine operator	
C.3 Annexes	
Annex 1 Comparative table of units and tasks of occupational qualifications of machine tool operators Annex 2 Descriptions of language skills levels Annex 3 Computer skills	

Comparative table of units and tasks of occupational qualifications of machine tool operators

UNITS AND TASKS	Conventional machine tool operator, level 3	Machine tool operator, level 4	Machine tool operator, level 5
MANDATORY UNITS AND TASKS			
1. Preparation of work process			
Examining working drawings and documents	X	X	X
Organising a proper workplace	X	X	X
Verifying the good condition of the machine tool	X	X	X
Checking the compliance of the blank	X	X	X
2. Performing maintenance work of machine tools			
Performance of regular maintenance and cleaning work	X	X	X
Registration of technical problems	X	X	X
3. Work arrangement and supervising			
Planning the activities			X
Planning and organising the resources			X
Minimising the material consumption			X
Monitoring the observance of deadlines			X
Using the various functions of the machine tool			X
Delegation of work			X
Supervising of employees, making proposals for in-service training			X
Making proposals for improving the organisation of work			X
OPTIONAL COMPETENCIES			
4. Machining work pieces on a conventional milling machine			
Setting up a conventional milling machine for the manufacture of work pieces	X		
Manufacture of work pieces on a conventional milling machine	X		
After treatment of work pieces and storage within the limits of the work place	X		
5. Machining work pieces on a conventional lathe			
Setting up a conventional lathe for the manufacture of work pieces	X		
Manufacture of work pieces on a conventional lathe	X		
After treatment of work pieces and storage within the limits of the work place	X		
6. Machining work pieces on a conventional grinding machine			
Setting up a conventional grinding machine	X		

ESF programm „Kutsete süsteemi arendamine“

for the manufacture of work pieces			
Manufacture of work pieces on a conventional grinding machine	X		
After treatment of work pieces and storage within the limits of the work place	X		
COMPETENCIES RELATED TO SPECIALISATION			
7. Machining work pieces on a conventional and CNC milling machine			
Setting up a conventional milling machine for the manufacture of work pieces		X	
Manufacture of work pieces on a conventional milling machine		X	
Setting up and preparing a CNC milling machine for work		X	
Manufacture of work pieces on a CNC milling machine		X	
After treatment of work pieces and storage within the limits of the work place		X	
8. Machining work pieces on a conventional and CNC lathe			
Setting up a conventional lathe for the manufacture of work pieces		X	
Manufacture of work pieces on a conventional lathe		X	
Setting up and preparing a CNC lathe for work		X	
Manufacture of work pieces on a CNC lathe		X	
After treatment of work pieces and storage within the limits of the work place		X	
9. Machining work pieces on a CNC milling machine			
Setting up and preparing a CNC milling machine for work			X
Manufacture of work pieces on a CNC milling machine			X
After treatment of work pieces and storage within the limits of the work place			X
10. Machining work pieces on a CNC lathe			
Setting up and preparing a CNC lathe for work			X
Manufacture of work pieces on a CNC lathe			X
After treatment of work pieces and storage within the limits of the work place			X