OCCUPATIONAL STANDARD

Machine tool operator, level 5

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 5 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)**
Machine tool operator, level 5	*5*

Possible specialisations and titles on the certificate	
Specialisation	**Title on the certificate**
Machining work pieces on a CNC milling machine	CNC milling machine operator, level 5
Machining work pieces on a CNC lathe	CNC lathe operator, level 5

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 specialisation of the operator, work is carried out on a CNC lathe or CNC milling machine (CNC – Computer Numerical Control), on which he/she machines the work pieces according to the drawings and control programme. The main tasks of a machine tool operator are machining, threading and drilling various profiled surfaces.

A machine tool operator of level 5 sets up the machine tool in accordance with the provided technical documentation or works on pre-set machine tools. If required, he/she changes the existing settings or independently draws up control programmes in the CAD/CAM system. Depending on the organisation of work, he/she can also supervise less experienced co-workers or arrange the work of a small team.

The occupational qualification of a machine tool operator, level 5 is based on specialisation:

- **CNC milling machine operator, level 5**
- **CNC lathe operator, level 5**

The tasks of a **miller** include the manufacture of work pieces by means of machining surfaces, treads and grooves on a milling machine.
The task of a **turner** is mainly the manufacture of rotary type work pieces by means of machining and threading surfaces, treads 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
A.2.3 Work arrangement and supervising
2.3.1 Planning the activities
2.3.2 Planning and organising the resources
2.3.3 Minimising the material consumption
2.3.4 Monitoring the observance of deadlines
2.3.5 Using the various functions of the machine tool
2.3.6 Delegation of work
2.3.7 Supervising of employees, making proposals for in-service training
2.3.8 Making proposals for improving the organisation of work

UNITS OF SPECIALISATION
A.2.4 Machining work pieces on a CNC milling machine
2.4.1 Setting up a CNC milling machine for the manufacture of work pieces
2.4.2 Manufacture of work pieces on a CNC milling machine

2.4.3 After treatment of work pieces and storage within the limits of the work place **A.2.5 Machining work pieces on a CNC lathe** 2.5.1 Setting up a CNC lathe for the manufacture of work pieces 2.5.2 Manufacture of work pieces on a CNC lathe 2.5.3 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, machine tool operators of this level have professional basic education and have passed the relevant in-service training but the professional skills may be acquired with long-term work experience and professional 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 a machine tool operator, level 5 consists of three mandatory (B.2.1–B.2.3), four specialisation-related (B.2.4–B.2.5) and transversal (B.2.6) competencies. The occupational qualification of a machine tool operator of level 5 is based on specialisation and it is possible to specialise in two fields: 1. CNC milling machine operator, level 5 2. CNC lathe operator, level 5 In order to obtain **the occupational qualification of a CNC milling machine operator, level 5,** the applicant must verify competencies B.2.1, B.2.2, B.2.3, B.2.4 and B.2.6. In order to obtain **the occupational qualification of a CNC lathe operator, level 5,** the applicant must verify competencies B.2.1, B.2.2, B.2.3, B.2.5 and B.2.6.

B.2 Competencies

MANDATORY COMPETENCIES

B.2.1 Preparation of work process	**EQF level 4**
Performance indicators: 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 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.	
Supporting knowledge: a) operating principles, modes and technical options of CNC machine tools; b) structure of control programmes (ISO codes, etc.); c) technical drawing; d) materials science: various metallic and non-metallic materials, their differences (physical and mechanical properties, heat treatment, marking, most common EN and other material standards, etc.); e) basis of tolerating (fits and tolerances); f) basis of machining; g) methods of monitoring the operation of a CNC machine tool; signs referring to failure; h) most common failure types, methods for their prevention; i) safety rules, safety measures and personal protective equipment required when using the machine / machine tool; j) documentation related to work; k) measuring instruments necessary for work (e.g. calliper, angle meter, micrometer, etc.) and their	

principles of use; l) general knowledge about slinging and lifting equipment.
Assessment method(s): combined method containing verification of theoretical knowledge as well as practical skills.

B.2.2 Performing maintenance work of machine tools	**EQF level 4**
Performance indicators: 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.	
Supporting knowledge: a) operating principles, modes and technical options of CNC machine tools; b) methods of monitoring the operation of a machine tool; signs referring to failure; c) most common failure types, methods for their prevention; d) safety rules, safety measures and personal protective equipment required when using the machine / machine tool; e) documentation related to work.	

B.2.3 Organisation of work and supervision of co-workers	**EQF level 5**
Performance indicators: 1. Plans ahead activities of one’s field of activity guided by the prescribed work schedule and internal work procedure rules of the company. 2. Based on the work organisation of the company, plans, takes into account and organises resources (time, materials, working time of employees, tools, etc.) for performance of tasks and reports on course of work. Determines, which resources are needed and makes proposals for their provision. 3. Minimises material consumption by adhering strictly to work instructions and using rational work practices. 4. Monitors the meeting of deadlines of the production schedule and uses his/her working time effectively. 5. Uses the various technological possibilities of the machine tool to save time and ensure quality. 6. Based on the work organisation of the company, delegates work relevantly and justly. 7. Organises the work of the supervised, supervises them at work and assesses their work. Makes proposals regarding the need of additional training. 8. Makes proposals within the limits of one’s competence for improvement of work organisation.	
Supporting knowledge a) role of his/her structural unit and connections with other units of the company; b) basis of labour laws; c) basics of records management and administration; d) principles of teamwork; e) working environment and occupational safety requirements.	
Assessment method(s): combined method containing verification of theoretical knowledge as well as practical skills.	

COMPETENCIES RELATED TO SPECIALISATION

MACHINING WORK PIECES ON A CNC MILLING MACHINE	
B.2.4 Machining work pieces on a CNC milling machine	**EQF level 5**

Performance indicators:

1. Examines the working drawings and control programmes, sets the machine tool with three and more axles 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 in CAD/CAM system or changes the existing ones.
2. Verifies the correctness of the control programme and its conformity to detail drawing. Manufactures work pieces based on the detail drawing conforming to precision requirements IT 7 of ISO standard. 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.
3. 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.

Supporting knowledge:

a) materials used in mechanical engineering, their properties and marking;
b) technological processes of manufacturing of work pieces, ISO quality requirements IT 7;
c) machining;
d) different cutting instruments, principles of their use and maintenance;
e) basis for determining of tolerances;
f) multi-axle machine tools, their operating principle, structure and control system;
g) setting and fixing jigs of work pieces on a CNC machine tool;
h) line and angular measuring instruments used for work;
i) technological modes, basis for their selection;
j) technical documentation used for work;
k) general knowledge about slinging and lifting equipment;
l) occupational health and safety requirements;
m) most common occupation-specific terminology in English;
n) coordinate systems of CNC machine tools;
o) controlling system of CNC machine tool;
p) purpose and options of sub-programmes;
q) 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 CNC LATHE

B.2.5 Machining work pieces on a CNC lathe	**EQF level 5**

Performance indicators:

1. Examines the working drawings and control programmes, sets the machine tool for manufacture of work pieces: fixes the blank by selecting proper fixtures; Inserts cutting instruments to the instrument holder and determines the required zero points. If required, prepares the control programmes in CAD/CAM system or changes the existing ones.
2. Verifies the correctness of the control programme and its conformity to detail drawing. Manufactures work pieces based on the detail drawing conforming to precision requirements IT 7 of ISO standard. 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.

3. 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.
Supporting knowledge: a) materials used in mechanical engineering, their properties and marking; b) technological processes of manufacturing of work pieces, ISO quality requirements IT 7; c) basis of machining; d) different cutting instruments; e) basis for determining of tolerances; f) CNC lathes, their operating principles, structure and control system; g) general knowledge about maintenance of machine tools; h) line and angular measuring instruments used for work; i) technological modes, basis for their selection; j) technical documentation used for work; k) general knowledge about slinging and lifting equipment; l) occupational health and safety requirements; m) most common occupation-specific terminology in English; n) coordinate systems of CNC machine tools; o) controlling system of CNC machine tool; p) purpose and options of sub-programmes; q) basis for preparation of control programmes.
Assessment method(s): combined method containing verification of theoretical knowledge as well as practical skills.

TRANSVERSAL COMPETENCIES

B.2.6 Transversal competencies of the occupational qualification of a machine tool operator, level 5	**EQF level 5**
Performance indicators: 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. 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. Uses professional terminology in at least one foreign language (English is recommended). 9. Computer skills: modules 1–4, module 7, module 12.	
Assessment method(s): Assessment of transversal competences is integrated within other competences of this	

standard.

Part C
GENERAL INFORMATION AND ANNEXES

C.1 Information about preparing and certification of the professional standard, the authority awarding the profession and reference to the location of the professional standard in classifications	
1. Designation of the occupational standard in the register of occupational qualifications	10-16092014-1.3/5k
2. The occupational standard is compiled by	Andres Pählapuu - *Hissmekano Eesti OÜ* Allan Märk - *AS NORMA* Anu Kull - *Tallinna Lasnamäe Mehaanikakool* Veiko Põldmaa - *Tallinna Tööstushariduskeskus* Anu Tuuksam - *SA Innove*
3. The occupational standard is approved by	Mechanical industry, Metallurgical industry and Instrument engineering Sector Skills 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)	5
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	

Annex 1

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**		

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**