

# OCCUPATIONAL QUALIFICATION STANDARD

## Welder, EstQF Level 4

An occupational qualification standard is a document which describes the set of skills, knowledge and attitudes, i.e. competence requirements, needed to successfully accomplish duties. Occupational qualification standards are used for compiling curricula and awarding qualifications.

Occupational title	Level of Estonian Qualifications Framework (EstQF)
Welder, EstQF Level 4	4

Possible partial professional qualifications and titles on occupational qualification certificate	
Title of partial professional qualification	Level of Estonian Qualifications Framework (EstQF)
Manual arc welder, EstQF Level 4	4
Semi-automatic welder, EstQF Level 4	4
TIG-welder, EstQF Level 4	4

## Part A DESCRIPTION OF WORK

<p><b>A.1 Description of work</b></p> <p>A welder usually works in an enterprise that produces metal products and constructions and performs construction, installation, maintenance and repair work. Their main job is preparing welding work, constructing structures according to technical drawings, making and performing the post-processing of welded joints and checking the results. Their job requires an ability to read technical drawings and knowledge of processing technology and the properties of materials.</p> <p>Two occupational standards have been developed for the occupation: Welder, Level 3 Welder, Level 4</p> <p>This occupational qualification standard describes the vocational competences of Welder, Level 4. A welder at this level constructs and welds a variety of welded products, parts and building structures. In the case of more complex works (requiring inspection) they consult and cooperate with their line manager, coordinator or foreman.</p> <p>Welder, Level 4 uses the following welding methods in their work: manual metal arc welding (MMA 111); semi-automatic welding (MIG 131, MAG 135, 136, 138); and TIG welding (141, 142).</p> <p>The following partial professional qualifications with limited competences can be acquired as part of the qualification of Welder, Level 4: Manual Metal Arc Welder, Level 4 Semi-automatic Welder, Level 4 TIG Welder, Level 4</p>
<p><b>A.2 Tasks</b></p> <p>A.2.1 Organising the workplace and selecting and preparing production equipment and accessories</p> <ol style="list-style-type: none"> <li>1. Familiarising themselves with technical drawings, work instructions and the technological chart (WPS).</li> <li>2. Selecting work equipment.</li> <li>3. Selecting welding equipment.</li> <li>4. Configuring the welding equipment and selecting a mode.</li> </ol>

5. Organising the workplace as required.
6. Selecting personal protective equipment.

#### A.2.2 Preparation and construction of parts and assemblies

1. Preparing and checking parts.
2. Setting up assemblies for welding and checking them.

#### A.2.3 Quality control and repairing imperfections

1. Checking welds.
2. Checking the assembly.
3. Repairing imperfections.
4. Conducting a final check.

### Elective areas of work

#### A.2.4 Manual metal arc welding and post-processing of parts

1. Manual metal arc welding.
2. Conducting in-process checks.
3. Post-processing of the finished product.

#### A.2.5 Semi-automatic welding and post-processing of parts

1. Semi-automatic welding.
2. Conducting in-process checks.
3. Post-processing of the finished product.

#### A.2.6 TIG welding and post-processing of parts

1. Welding metals using TIG technology.
2. Conducting in-process checks.
3. Post-processing of the finished product.

The partial professional qualification of Manual Metal Arc Welder, Level 4 comprises the following parts of work:

A.2.1, A.2.2, A.2.3, A.2.4.

The partial professional qualification of Semi-automatic Welder, Level 4 comprises the following parts of work: A.2.1, A.2.2, A.2.3, A.2.5.

The partial professional qualification of TIG Welder, Level 4 comprises the following parts of work: A.2.1, A.2.2, A.2.3, A.2.6.

### A.3 Work environment and specific nature of work

A welder works in both indoor and outdoor conditions, their working hours are usually fixed, but work may also be in shifts, depending on the enterprise. The work is moderately paced and duties vary. A welder must be prepared to work in uncomfortable or forced positions, endure temperature changes and withstand heights, vibration, noise and dust. Work may be done in dangerous environments, e.g. in tanks, at heights on construction or industrial sites, etc. Welders must be familiar with the safety technology related to their profession and safety technology for using electrical equipment, use proper safety equipment and know the hazards to human health of welding (burn hazards, vision impairment, etc.).

The gases emitted during welding and the stone and metal dust in the work environment may cause allergic reactions.

### A.4 Tools

A welder uses welding, flame-cutting, metal-cutting and lifting equipment, electric, mechanical and pneumatic hand tools (milling machine, chisel, hammer, grindstone, etc.), accessories (fixtures, tilting tables, mechanised welding equipment, carbon arc, etc.) and measuring instruments (templates, square, measuring tape, calliper, etc.).

### A.5 Personal qualities required for work: abilities and characteristics

A welder must be able to plan their work independently and be prepared to engage in teamwork. The job requires being very responsible, careful and precise as it involves working with valuable materials. The welder must also have spatial abilities, good coordination and precision in movement, good physical shape and vision, the ability to concentrate and stability.

#### **A.6 Professional preparation**

Welder, Level 4 generally has specialised vocational education. Professional competence may be acquired through in-service training and/or practical work experience.

#### **A.7 Most common occupational titles**

Welder, welder-assembly mechanic, welder-assembler.

#### **A.8 Regulations governing profession**

§ 12 and § 14 of the Fire Safety Act.

## **Part B** **COMPETENCY REQUIREMENTS**

#### **B.1 Structure of occupation**

All mandatory competences (B.2.1-B.2.3) and recurring competences (B.2.7-B.2.12) and at least two optional competences (among competences B.2.4-B.2.6) must be certified when applying for the qualification of Welder, Level 4.

To obtain the partial professional qualification of Manual Metal Arc Welder, Level 4, the following competences must be certified:

- all mandatory competences (B.2.1-B.2.3);
- all recurring competences (B.2.7-B.2.12);
- competence B.2.4 manual metal arc welding and post-processing of parts.

To obtain the partial professional qualification of Semi-automatic Welder, Level 4, the following competences must be certified:

- all mandatory competences (B.2.1-B.2.3);
- all recurring competences (B.2.7-B.2.12);
- competence B.2.5 semi-automatic welding and post-processing of parts.

To obtain the partial professional qualification of TIG Welder, Level 4, the following competences must be certified:

- all mandatory competences (B.2.1-B.2.3);
- all recurring competences (B.2.7-B.2.12);
- competence B.2.6 TIG welding and post-processing of parts.

#### **B.2 Competences**

### **MANDATORY COMPETENCES**

<b>B.2.1 Organising the workplace and selecting and preparing production equipment and accessories</b>	<b>EstQF Level 4</b>
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Performance indicators

1. Familiarises themselves with technical drawings, work instructions and the technological chart (WPS).
2. Chooses the necessary equipment, materials (assemblies, parts, elements, etc.), tools and accessories based on the nature of the work and production conditions. Chooses a welding method and type of welded joint based on the technical drawing and technological chart.
3. Chooses the necessary welding equipment (welding wire, welding electrode, protective gas, backing, etc.) based on the WPS.
4. Configures the welding machine to the mode specified in the WPS and assesses the conformity of the weld on the sample part.
5. Organises the workplace in their work stage as required and in accordance with fire safety requirements before commencing work. Removes any hindering, excessive or flammable items from the vicinity of the workplace. Covers flammable surfaces in the surrounding area with a suitable cover material.

6. Ensures that they have all of the required personal protective equipment and that it is in working order before commencing work.

Knowledge:

- a) equipment and accessories used in welding;
- b) construction and operating principles of welding current sources;
- c) materials;
- d) properties of metals and their alloys;
- e) markings of welding and base materials;
- f) properties, markings and handling of welding gases;
- g) flame-cutting equipment and its operation;
- h) welding modes;
- i) welding terminology;
- j) weld markings on technical drawings;
- k) safety requirements (correct work methods, principles of providing first aid, main requirements of working environment, etc.);
- l) WPS (Welding Procedure Specification);
- m) principles of standard EN-3834 of quality requirements for welding work;
- n) standards of welder qualifications.

#### **B.2.2 Preparation and construction of parts and assemblies**

**EstQF Level 4**

Performance indicators

1. Prepares parts for welding – cleans and, if necessary, chamfers the edges to be welded, using the appropriate methods (e.g. manually or mechanically). Preheats parts based on the WPS and work instructions. Measures the parts to ensure that their measurements comply with the technical drawing.
2. Constructs assemblies (using spot or tack welding) based on the technical drawing and the WPS and checks the compliance of the assembly to the drawing. Fixes the assemblies using fixtures, if necessary.

Knowledge:

- a) flame-cutting equipment and its operation;
- b) general knowledge of flame-welding and relevant equipment;
- c) joint types and edge shapes;
- d) meanings of symbols on technical drawings;
- e) deformation of parts and change of dimensions during welding;
- f) methods and equipment for checking measurements;
- g) part imperfections;
- h) chamfering equipment and its operating principles;
- i) safety requirements (correct work methods, principles of providing first aid, main requirements of working environment, etc.);
- j) general knowledge of preheating parts;
- k) quality levels for imperfections (EVS-EN-ISO 5817).

#### **B.2.3 Quality control and repairing imperfections**

**EstQF Level 3**

Performance indicators

1. Visually checks the welds they have made and ensures that they comply with the requirements of the technical drawing.
2. Checks and measures the assembly and ensures that it complies with the technical drawing and given requirements.
3. Repairs weld imperfections and form deviations in the assembly in the course of the inspection.
4. After repairing the imperfections, conducts a final check of the welds and the assembly and ensures that they comply with standards and quality requirements.

Knowledge:

- a) causes of weld imperfections and ways of preventing them;
- b) causes of form deviations in the assembly and ways of preventing and eliminating them;
- c) quality control methods of welds: destructive testing methods (break, tensile, bend and other tests);
- d) quality control methods of welds: non-destructive testing methods (visual, penetrant, magnetic particle, X-ray, ultrasound tests, etc.);
- e) control measurement equipment (templates, ruler and calliper) and their principles of use;

- f) imperfections characteristic of welding processes, their prevention and their repair;  
g) quality levels for imperfections (EVS-EN-ISO 5817).

## OPTIONAL COMPETENCES

<b>B.2.4 Manual metal arc welding and post-processing of parts</b>	<b>EstQF Level 4</b>
<p>Performance indicators</p> <ol style="list-style-type: none"> <li>1. Fillet-welds steel plates in positions PA, PB, PC and PF and butt-welds in positions PA, PC and PF. Does this based on technical drawings and/or the WPS and at level B. Cleans the edges of the filling run welds manually or mechanically, if necessary.</li> <li>2. Ensures with a visual check and using the appropriate measuring equipment that the welds are faultless (without pores, cracks, etc.). Repairs any imperfections.</li> <li>3. Post-processes the finished assemblies by clearing surfaces of spatter, slag, etc. Cleans the welds.</li> </ol> <p>Knowledge:</p> <ol style="list-style-type: none"> <li>a) properties of metals and their alloys;</li> <li>b) ways of decreasing deformations;</li> <li>c) weldability, heat input, preheating and post-heating of metals;</li> <li>d) preparations for welding parts and structures (constructions);</li> <li>e) equipment and accessories used in manual metal arc welding;</li> <li>f) construction and operating principles of welding current sources;</li> <li>g) markings of welding and base materials;</li> <li>h) properties, markings and handling of welding gases;</li> <li>i) flame-cutting equipment and its operation;</li> <li>j) modes of wire welding;</li> <li>k) weld markings on technical drawings;</li> <li>l) safety requirements (correct work methods, principles of providing first aid, main requirements of working environment, fire and electrical safety requirements, etc.);</li> <li>m) specificities of welding thick parts;</li> <li>n) ways of preheating metals and measuring the temperature, the effect of cooling time;</li> <li>o) basics of heat treatment of metals.</li> </ol>	
<b>B.2.5 Semi-automatic welding and post-processing of parts</b>	<b>EstQF Level 4</b>
<p>Performance indicators</p> <ol style="list-style-type: none"> <li>1. Fillet-welds steel plates in positions PA, PB, PC and PF and butt-welds in positions PA, PC and PF using the MIG or MAG method. Does this based on technical drawings and/or the WPS and at level B. Cleans the edges of the filling run welds manually or mechanically, if necessary.</li> <li>2. Checks the interpass temperature in the course of the work. Ensures with a visual check and using the appropriate measuring equipment that the welds are faultless (without pores, cracks, etc.). Repairs any imperfections.</li> <li>3. Post-processes the finished assemblies by clearing surfaces of spatter, slag, etc. Cleans the welds.</li> </ol> <p>Knowledge:</p> <ol style="list-style-type: none"> <li>a) properties of metals and their alloys;</li> <li>b) ways of decreasing deformations;</li> <li>c) weldability, heat input, preheating and post-heating of metals;</li> <li>d) preparations for welding parts and structures (constructions);</li> <li>e) equipment and accessories used in MAG welding;</li> <li>f) equipment and accessories used in MIG welding;</li> <li>g) construction and operating principles of welding current sources;</li> <li>h) markings of welding and base materials;</li> <li>i) properties, markings and handling of welding gases used in MIG welding;</li> <li>j) properties, markings and handling of welding gases used in MAG welding;</li> <li>k) flame- and plasma-cutting equipment and their operation;</li> <li>l) modes of wire welding;</li> <li>m) weld markings on technical drawings;</li> </ol>	

n) safety requirements (correct work methods, principles of providing first aid, main requirements of working environment, fire and electrical safety requirements, etc.);  
o) cleaning and passivating welds of stainless steel.

#### **B.2.6 TIG welding and post-processing of parts**

**EstQF Level 4**

##### Performance indicators

1. Fillet-welds steel plates in positions PA, PB, PC, and PF, butt-welds in positions PA, PC and PF and tube-seams in position PA (rotating tube). Does this based on technical drawings and/or the WPS and at level B. Cleans the edges of the filling run welds manually or mechanically, if necessary.
2. Checks the interpass temperature in the course of the work. Ensures with a visual check and using the appropriate measuring equipment that the welds are faultless (without pores, cracks, etc.). Repairs any imperfections.
3. Post-processes the finished assemblies and cleans the welds.

##### Knowledge:

- a) properties of metals and their alloys;
- b) ways of decreasing deformations;
- c) weldability, heat input, preheating and post-heating of metals;
- d) preparations for welding parts and structures (constructions);
- e) equipment and accessories used in TIG welding;
- f) construction and operating principles of welding current sources;
- g) markings of welding and base materials;
- h) properties, markings and handling of welding gases;
- i) flame- and plasma-cutting equipment and their operation;
- j) modes of wire welding;
- k) weld markings on technical drawings;
- l) safety requirements (correct work methods, principles of providing first aid, main requirements of working environment, fire and electrical safety requirements, etc.);
- m) welding with backing, including gas backing;
- n) use of tungsten electrodes.

## **RECURRING COMPETENCES**

#### **B.2.7 Following work instructions and technology and quality requirements**

**EstQF Level 3**

##### Performance indicators

1. Uses all acquired field-specific knowledge and skills to achieve their professional goals.
2. Observes quality requirements when making products.
3. Understands and is able to assess the possible consequences of low-quality work. Pays heed to deadlines and technological manuals.

#### **B.2.8 Observing occupational health and safety requirements**

**EstQF Level 4**

##### Performance indicators

1. Strictly observes occupational health and safety requirements when planning work, preparing the workplace, working and organising the workplace to prevent occupational accidents.
2. In the event of an occupational accident, performs first aid, calls for professional help and informs their line manager or employer of the accident.

#### **B.2.9 Participation in team work**

**EstQF Level 4**

##### Performance indicators

1. Participates in teamwork. Is cooperative, shares with others all information that is necessary and useful for work and works towards achieving the best common result.
2. Has the skill and courage to present and defend their opinions in a well-argued way and to present ideas and suggestions for improving work.
3. Takes employees doing other work into account when working.

#### **B.2.10 Adjusting to changing conditions**

**EstQF Level 3**

##### Performance indicators

1. Can adjust to changing work conditions.

2. Analyses their activities and can find appropriate information to perform their duties and solve work-related problems.	
<b>B.2.11 Participation in additional training</b>	<b>EstQF Level 3</b>
Performance indicators 1. Acquires new duties, methods and techniques quickly. 2. Uses opportunities for self-improvement and to upgrade their skills and takes part in in-service training.	
<b>B.2.12 Using and storing work equipment</b>	<b>EstQF Level 4</b>
Performance indicators 1. Uses all work equipment and tools prudently, regularly organises and cleans the tools, equipment and protective equipment used during work, following their operation and maintenance instructions.	

## Part C

### GENERAL INFORMATION AND ANNEXES

<b>C.1 Information concerning compilation and certification of occupational qualification standard and reference to classification of occupations</b>	
1. ID of occupational qualification standard in register of occupational qualifications	24-08052019-2.3.2/7k
2. Occupational qualification standard compiled by:	Tatjana Karaganova, Tallinna Tööstushariduskeskus Tarvo Krapp, Contractor OÜ Toomas Reha, Inspecta Eesti OÜ Enn Orav, Inspecta Eesti OÜ Vladimir Belõi, Tallinna Lasnamäe Mehaanikakool Andres Laansoo, Tallinna Tehnikaülikool Anu Tuuksam, SA Innove
3. Occupational qualification standard approved by:	Engineering, Manufacturing and Processing
4. No. of decision of Sectoral Council	12
5. Date of decision of Sectoral Council	08.05.2019
6. Occupational qualification standard valid until	26.04.2021
7. Occupational qualification standard version no.	7
8. Reference to International Standard Classification of Occupations (ISCO 08)	7212 Welders and Flame Cutters
9. Reference to European Qualifications Framework (EQF)	4
<b>C.2 Occupational title in foreign language</b>	
English:	Welder, EstQF Level 4
<b>C.3 Annexes</b>	
Lisa 1 <a href="#">Terms used in occupational qualification standard</a>	