

OCCUPATIONAL STANDARD

Welder, 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 welder, 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>Welder, level 4</i>	<i>4</i>

Specialisations and titles on the occupational qualification certificate

Title of partial occupational qualification	Level of the Estonian Qualification Framework (EQF)
<i>Welder of MMA welding</i>	<i>4</i>
<i>Welder of semiautomatic welding</i>	<i>4</i>
<i>Welder of TIG welding</i>	<i>4</i>

Part A JOB DESCRIPTION

A.1 Job description

A welder mainly works in a company manufacturing metal products and structures and performs construction, installation, maintenance and repair work.

The main tasks of a welder include preparing welding operations, assembling structures according to drawings, performing welded joints, as well as after treatment and checking the result. The work requires the skill of reading drawings, knowledge of processing technology and material properties.

The occupational qualifications of the profession of a welder are on two levels:

Welder, level 3

Welder, level 4

This occupational standard describes **the professional competencies of a welder of level 4.**

A welder of this level assembles and welds various welded products, components and building structures. In case of work involving more responsibility (products that require inspection), he/she consults and cooperates with a direct manager, coordinator or master.

A welder of level 4 uses the following welding methods in his/her work: manual metal arc welding (MMA 111), semiautomatic welding (MIG 131, MAG 135, 136, 138) and TIG welding (141, 142).

Within the framework of the occupational qualification of a welder, level 4 it is possible to acquire also the following partial occupational qualifications with limited competence:

Welder of MMA welding, level 4

Welder of semiautomatic welding, level 4

Welder of TIG welding, level 4

A.2 Units

A.2.1 Organising one's workplace, selecting and preparing production and auxiliary equipment

2.1.1 Examining working drawings, work instructions and welding procedure specification (WPS)

2.1.2 Selecting tools

2.1.3 Selecting welding equipment

2.1.4 Adjusting the welding equipment and selecting the mode

2.1.5 Organising a proper workplace

2.1.6 Selecting personal protective equipment

A.2.2 Preparing and assembling work pieces and assemblies

2.2.1 Preparing and checking work pieces

2.2.2 Setting up assemblies for welding and checking the assemblies

A.2.3 Quality control and repairing defects

2.3.1 Checking welds

2.3.2 Checking the assembly

2.3.3 Repairing defects

2.3.4 Final inspection

OPTIONAL UNITS

A.2.4 Performing MMA welding operations and after treatment of work pieces

2.4.1 Performing MMA welding operations

2.4.2 Intermediate inspections

2.4.3 After treatment of finished products

A.2.5 Performing semiautomatic welding operations and after treatment of work pieces

2.5.1 Performing semiautomatic welding operations

2.5.2 Intermediate inspections

2.5.3 After treatment of finished products

A.2.6 TIG welding and after treatment of work pieces

2.6.1 Welding metals by using TIG technology

2.6.2 Intermediate inspections

2.6.3 After treatment of finished products

The occupational qualification of a welder of level 4 includes the following partial occupational qualifications:

WELDER OF MMA WELDING

A.2.1 Organising one's workplace, selecting and preparing production and auxiliary equipment

2.1.1 Examining working drawings, work instructions and welding procedure specification (WPS)

2.1.2 Selecting tools

2.1.3 Selecting welding equipment

2.1.4 Adjusting the welding equipment and selecting the mode

2.1.5 Organising a proper workplace

2.1.6 Selecting personal protective equipment

A.2.2 Preparing and assembling work pieces and assemblies

2.2.1 Preparing and checking work pieces

2.2.2 Setting up assemblies for welding and checking the assemblies

A.2.3 Quality control and repairing defects

2.3.1 Checking welds

2.3.2 Checking the assembly

2.3.3 Repairing defects

2.3.4 Final inspection

A.2.4 Performing MMA welding operations and after treatment of work pieces

2.4.1 Performing MMA welding operations

2.4.2 Intermediate inspections

2.4.3 After treatment of finished products

WELDER OF SEMIAUTOMATIC WELDING

A.2.1 Organising one's workplace, selecting and preparing production and auxiliary equipment

2.1.1 Examining working drawings, work instructions and welding procedure specification (WPS)

2.1.2 Selecting tools

2.1.3 Selecting welding equipment

2.1.4 Adjusting the welding equipment and selecting the mode

2.1.5 Organising a proper workplace

2.1.6 Selecting personal protective equipment

A.2.2 Preparing and assembling work pieces and assemblies

2.2.1 Preparing and checking work pieces

2.2.2 Setting up assemblies for welding and checking the assemblies

A.2.3 Quality control and repairing defects

2.3.1 Checking welds

2.3.2 Checking the assembly

2.3.3 Repairing defects

2.3.4 Final inspection

A.2.5 Performing semiautomatic welding operations and after treatment of work pieces

2.5.1 Performing semiautomatic welding operations

2.5.2 Intermediate inspections

2.5.3 After treatment of finished products

Welder of TIG welding

A.2.1 Organising one's workplace, selecting and preparing production and auxiliary equipment

2.1.1 Examining working drawings, work instructions and welding procedure specification (WPS)

2.1.2 Selecting tools

2.1.3 Selecting welding equipment

2.1.4 Adjusting and the welding equipment and selecting the mode

2.1.5 Organising a proper workplace

2.1.6 Selecting personal protective equipment

A.2.2 Preparing and assembling work pieces and assemblies

2.2.1 Preparing and checking work pieces

2.2.2 Setting up assemblies for welding and checking the assemblies

A.2.3 Quality control and repairing defects

2.3.1 Checking welds

2.3.2 Checking the assembly

2.3.3 Repairing defects

2.3.4 Final inspection

A.2.6 TIG welding and after treatment of work pieces

2.6.1 Welding metals by using the TIG technology

2.6.2 Intermediate inspections

2.6.3 After treatment of finished products

A comparative table of units and tasks of welder's occupational qualifications is presented in Annex 1 of the occupational standard.

A.3 Working environment and specific aspects of work

A welder works in both indoor and outdoor environment, the working time is generally fixed but according to the specific nature of the company, shift work may be organised. The pace of work is moderate and the tasks are varied. A welder must be ready to work in uncomfortable or forced positions, withstand temperature fluctuations, heights, vibration, noise and dust. The work may be performed in dangerous environments, e.g. tanks, in heights at construction or industrial sites. He/she must be acquainted with professional safety equipment, as well as safety equipment related to using the electrical equipment, use relevant protective equipment and know the dangerous effects on a human body (danger of burning, vision impairment, etc.) accompanying welding. Gases emitted during welding, as well as the stone and metal dust spreading in the working environment may cause allergic reactions.

A.4 Tools

In his/her work, a welder uses welding, oxyfuel gas cutting, metal cutting and lifting equipment; electrical, mechanical and pneumatic hand tools (mill, chisel, hammer, wheel sander, etc.); auxiliary equipment (jig, rotating table, mechanised welding equipment, carbon electrode, etc.) and measuring instruments (template, square, tape measure, calliper, etc.).

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

A welder must be able to plan his/her work independently and be ready for teamwork. The work requires a developed sense of responsibility, diligence and accuracy since a welder works with

ESF programm „Kutsete süsteemi arendamine“

valuable materials.

Spatial thinking, good coordination and accuracy of movements, normal physical fitness and eyesight, ability to focus and persistence are essential.

A.6 Occupational training

Welders of level 4 usually have vocational education. Professional competence may be gained also through professional in-service training and/or practical work experience.

A.7 Possible job titles

Welder, welder-fitter, welder-assembler

A.8 Regulations

§ 12 and § 14 of the Fire Safety Act.

Part B

COMPETENCE REQUIREMENTS

B.1. The structure of the occupational qualification

In order to obtain the **occupational qualification of a welder of level 4**, the applicant must verify the mandatory (B.2.1–B.2.3), transversal (B.2.7–B.2.12) and at least two optional competencies (among competencies B.2.4–B.2.6).

In order to obtain **the partial occupational qualification of a welder of MMA welding, level 4**, the applicant must verify the following competencies:

- all mandatory competencies (B.2.1–B.2.3);
- all transversal competencies (B.2.7–B.2.12);
- competence B.2.4 Performing MMA welding operations and after treatment of work pieces.

In order to obtain **the partial occupational qualification of a welder of semiautomatic welding, level 4**, the applicant must verify the following competencies:

- all mandatory competencies (B.2.1–B.2.3);
- all transversal competencies (B.2.7–B.2.12);
- competence B.2.5 Performing semiautomatic welding operations and after treatment of work pieces.

In order to obtain **the partial occupational qualification of a welder of TIG welding, level 4**, the applicant must verify the following competencies:

- all mandatory competencies (B.2.1–B.2.3);
- all transversal competencies (B.2.7–B.2.12);
- competence B.2.6 TIG welding and after treatment of work pieces.

B.2 Competences

MANDATORY COMPETENCIES

B.2.1 Organising one's workplace, selecting and preparing production and auxiliary equipment	EQF level 4
<p><u>Performance indicators:</u></p> <ol style="list-style-type: none">1. Examines the working drawing, work instructions and welding procedure specification (WPS)2. Selects the equipment, materials (assemblies, work pieces, elements, etc.), tools and accessories based on the character of work and production conditions. Under guidance, selects the method of welding and type of weld based of the working drawing and WPS.3. Selects the required welding equipment (welding wire, electrode, shielding gas, backing, etc.) based on WPS.4. Adjusts the welding machine to a mode determined in WPS and assesses the conformance of the weld on a sample work piece.5. Before work, organises a proper workplace within his/her own work section, following the fire safety requirements. Removes all disturbing, excessive or highly flammable items from the vicinity of the workplace. Covers surrounding inflammable surfaces with a suitable covering material.6. Before work, verifies the existence and good condition of personal protective equipment.	

Supporting knowledge:

- a) equipment and auxiliary equipment used for welding;
- b) structure and operating principles of welding power supply;
- c) knowledge of materials;
- d) properties of metals and their alloys;
- e) labelling of welding and basic materials;
- f) properties, labelling, handling of welding gases;
- g) oxyfuel gas cutting equipment, their use;
- h) welding modes;
- i) welding terminology;
- j) weld seam designation on working drawings;
- k) safety requirements (correct practices, principles of providing first aid, basic requirements for the working environment, etc.);
- l) WPS (Welding Procedure Specification);
- m) principles of the welding quality standard EN 3834;
- n) welder's qualification standards.

B.2.2 Preparing and assembling work pieces and assemblies

EQF level 4

Performance indicators:

1. Prepares the work pieces for welding – cleans and, if required, bevels the welding edges, using suitable methods (e.g. manually, mechanically). Preheats the work pieces according to the WPS and specified work instructions. Measures the work pieces to ensure that the dimensions conform to the working drawings.
2. Fits assemblies (by spot or tack weld) based on working drawings, instructions and WPS, checks the conformance of the assembly to the working drawing. If required, fixes the assemblies by means of jigs.

Supporting knowledge:

- a) oxyfuel gas cutting equipment, their use;
- b) general knowledge on gas welding, gas welding equipment;
- c) joint types, edge shapes;
- d) meaning of symbols marked in working drawings;
- e) deformations of work pieces and changing the dimensions during welding;
- f) methods and means for checking the dimensions;
- g) defects of blanks;
- h) edge bevelling equipment, their operating principles;
- i) safety requirements (correct practices, principles of providing first aid, basic requirements for the working environment);
- j) general knowledge on preheating work pieces;
- k) quality levels according to welding defects (EVS-EN-ISO 5817).

B.2.3 Quality control and repairing defects

EQF level 4

Performance indicators:

1. By using the visual inspection method, checks his/her own welds and ensures that they conform to the requirements indicated in the working drawings.
2. Checks and measures the assembly and ensures that it conforms to the requirements indicated in the working drawings.
3. Repairs the welding defects and shape deviations of the assembly discovered during inspection.
4. After repairing the detected defects, performs the final inspection of the welds and assembly and ensures that they conform to the specified standards and quality requirements.

Supporting knowledge:

- a) main sources of welding defects, methods for their prevention;
- b) main sources of shape deviations of the assembly, methods for preventing and repairing them;
- c) methods for quality control of welds: destructive testing methods (fracture, tensile, bending and other tests);
- d) methods for quality control of welds: non-destructive testing method (visual, penetrant, magnetic powder, X-ray method, ultrasound, etc.).
- e) control and measuring instruments, their use (different templates, ruler, calliper, welding meter);
- f) defects characteristic to different welding processes, methods for preventing and repairing them;
- g) quality levels according to welding defects (EVS-EN-ISO 5817).

OPTIONAL COMPETENCIES

B.2.4 Performing MMA welding operations and after treatment of work pieces

EQF level 4

Performance indicators:

1. Welds fillet welds of steel sheets in positions PA, PB, PC and PF, and butt welds in positions PA, PC and PF. Performs this according to the working drawing and/or WPS and at level B. If required, cleans the weld edges of the filling runs manually or mechanically.
2. Through visual inspection and using the appropriate measuring instruments, ensures that the welds are flawless (no pores, cracks, etc.). In case of defects, repairs them.
3. Performs after treatment of the finished assemblies by removing splashes, slag, etc. from the surfaces. Cleans welds.

Supporting knowledge:

- a) properties of metals and their alloys;
- b) methods for reducing deformations;
- c) weldability, heat input, preheating, postheating of metals;
- d) preparation for welding of work pieces and structures;
- e) equipment and auxiliary equipment used for MMA welding;
- f) structure and operating principles of welding power supply;
- g) labelling of welding and basic materials;
- h) properties, labelling, handling of welding gases;
- i) oxyfuel gas cutting equipment, their use;
- j) wire welding modes;
- k) weld seam designation on working drawings;
- l) safety requirements (correct practices, principles of providing first aid, basic requirements for the working environment, fire safety requirements, electrical safety requirements, etc.);
- m) particular nature of welding thick work pieces;
- n) methods of preheating of metals and measuring the temperature, effect of cooling speed;

o) basics of heat treatment of metals.

B.2.5 Performing semiautomatic welding operations and after treatment of work pieces	EQF level 4
<p><u>Performance indicators:</u></p> <ol style="list-style-type: none"> 1. Welds fillet welds of steel sheets either by using MIG or MAG method in positions PA, PB, PC, PF, or butt welds in positions PA, PC and PF. Performs this according to the working drawing and/or WPS and at level B. If required, cleans the weld edges of the filling runs manually or mechanically. 2. Checks the temperature between the runs in the course of work. Through visual inspection and using the appropriate measuring instruments, ensures that the welds are flawless (no pores, cracks, etc.). In case of defects, repairs them. 3. Performs after treatment of the finished assemblies by removing splashes, slag, etc. from the surfaces. Cleans welds. 	
<p><u>Supporting knowledge:</u></p> <ol style="list-style-type: none"> a) properties of metals and their alloys; b) methods for reducing deformations; c) weldability, heat input, preheating, postheating of metals; d) preparation for welding work pieces and structures; e) equipment and auxiliary equipment used for MAG welding; f) equipment and auxiliary equipment used for MIG welding; g) structure and operating principles of welding power supply; h) labelling of welding and basic materials; i) properties, labelling, handling of welding gases used for MIG welding; j) properties, labelling, handling of welding gases used for MAG welding; k) oxyfuel gas and plasma cutting equipment, their use; l) wire welding modes; m) weld seam designation on working drawings; n) safety requirements (correct practices, principles of providing first aid, basic requirements for the working environment, fire safety requirements, electrical safety requirements, etc.); o) cleaning and passivation of stainless steel welds. 	

B.2.6 TIG welding and after treatment of work pieces	EQF level 4
<p><u>Performance indicators:</u></p> <ol style="list-style-type: none"> 1. Welds fillet welds of steel sheets in positions PA, PB, PC and PF, and butt welds in positions PA, PC and PF and pipe welds in position PA (rotatable pipe). Performs this according to the working drawing and/or WPS and at level B. If required, cleans the weld edges of the filling runs manually or mechanically. 2. Checks the temperature between the runs in the course of work. Through visual inspection and using the appropriate measuring instruments, ensures that the welds are flawless (no pores, cracks, etc.). In case of defects, repairs them. 3. Performs after treatment of the finished assemblies and cleans the welds. 	
<p><u>Supporting knowledge:</u></p> <ol style="list-style-type: none"> a) properties of metals and their alloys; b) methods for reducing deformations; c) weldability, heat input, preheating, postheating of metals; d) preparation for welding work pieces and structures; e) equipment and auxiliary equipment used for TIG welding; 	

ESF programm „Kutsete süsteemi arendamine“

f) structure and operating principles of welding power supply; g) labelling of welding and basic materials; h) properties, labelling, handling of welding gases; i) oxyfuel gas and plasma cutting equipment, their use; j) wire welding modes; k) weld seam designation on working drawings; l) safety requirements (correct practices, principles of providing first aid, basic requirements for the working environment, fire safety requirements, electrical safety requirements, etc.); m) welding with backing, including shielding gas; n) use of tungsten electrodes.

TRANSVERSAL COMPETENCIES

B.2.7 Compliance with work instructions, technologies and quality requirements	EQF level 4
<u>Performance indicators:</u>	
1. Uses all the acquired knowledge and skills specific to his/her field to achieve the work goals. 2. Manufactures products according to the quality requirements. 3. Understands and is capable to assess the possible consequences caused by defective work. Meets the deadlines and adheres to the WPS.	
<u>Assessment method(s):</u>	
Assessment of transversal competences is integrated within other competences of this standard.	
B.2.8 Compliance with the occupational health and safety requirements	EQF level 4
<u>Performance indicators:</u>	
1. Upon planning the work, preparing the workplace, during work and arranging the working place, complies strictly to the occupational health and safety requirements in order to prevent accidents at work. 2. In case of an accident, provides emergency care, calls professional help and informs the direct manager or employer about the accident.	
<u>Assessment method(s):</u>	
Assessment of transversal competences is integrated within other competences of this standard.	
B.2.9 Participating in teamwork	EQF level 4
<u>Performance indicators:</u>	
1. Participates in teamwork. Is cooperative, shares all the information required and useful for work with others and acts in the name of the best joint result. 2. Is able and dares to present and protect his/her position with solid arguments, present ideas and innovation proposals for improvement of work. 3. During work, takes into account employees performing other work.	
<u>Assessment method(s):</u>	
Assessment of transversal competences is integrated within other competences of this standard.	
B.2.10 Adapting with changing conditions	EQF level 4
<u>Performance indicators:</u>	
1. Is capable of adapting with changing working conditions. 2. Analyses his/her activities, can find relevant information for performance of one's tasks and solve work related problems.	
<u>Assessment method(s):</u>	
Assessment of transversal competences is integrated within other competences of this standard.	
B.2.11 Participating in an in-service training	EQF level 4
<u>Performance indicators:</u>	
1. Acquires new tasks, methods and techniques quickly.	

ESF programm „Kutsete süsteemi arendamine“

2. Uses opportunities for self-development and improving one's skills, participates in professional in-service training.	
<u>Assessment method(s):</u> Assessment of transversal competences is integrated within other competences of this standard.	
B.2.12 Use and storage of tools	EQF level 4
<u>Performance indicators:</u> 1. Uses all tools and equipment prudently, arranges and cleans tools, equipment and protective equipment used for work according to the user and maintenance manuals.	
<u>Assessment method(s):</u> Assessment of transversal competences is integrated within other competences of this standard.	

ESF programm „Kutsete süsteemi arendamine“

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	10-16092014-1.5/6k
2. The occupational standard is compiled by	Tatjana Karaganova, <i>Tallinna Tööstushariduskeskus</i> Tarvo Krapp, <i>Contractor OÜ</i> Toomas Reha, <i>Inspecta Eesti OÜ</i> Enn Orav, <i>Inspecta Eesti OÜ</i> Vladimir Belõi, <i>Tallinna Lasnamäe Mehaanikakool</i> Andres Laansoo, <i>Tallinna Tehnikaülikool</i> Anu Tuuksam, <i>SA Innove</i>
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	6
8. Reference to the Classification of Occupations (ISCO 08)	7212 – welders and flame cutters
9. Reference to the European Qualification Framework (EQF)	4
C.2 Title of occupational qualification in foreign languages	
In English: <i>welder</i>	
C.3 Annexes	
Annex 1 Comparative table of units and tasks of welder's occupational qualifications	
Annex 2 Definitions used in the occupational standard	

Comparative table of units and tasks of welder’s occupational qualifications

UNITS AND TASKS	WELDER, LEVEL 3	WELDER, LEVEL 4
1. Organising one’s workplace, selecting and preparing production and auxiliary equipment		
Examining working drawings, work instructions and welding procedure specification (WPS)	X	X
Selecting tools	X	X
Selecting welding equipment	X	X
Adjusting the welding equipment and selecting the mode	X	X
Organising a proper workplace	X	X
Selecting personal protective equipment	X	X
2. Preparing and assembling work pieces and assemblies		
Preparing and checking work pieces	X	X
Installing assemblies for welding and checking the assemblies	X	X
3. Quality control and repairing defects		
Checking welds	X	X
Checking the assembly	X	X
Repairing defects	X	X
Final inspection	X	X
OPTIONAL UNITS		
4. MMA welding and after treatment of work pieces		
Performing MMA welding operations	X	X
Intermediate inspections	X	X
After treatment of finished work pieces	X	X
5. Performing semiautomatic welding operations and after treatment of work pieces		
Performing semiautomatic welding operations	X	X
Intermediate inspections	X	X
After treatment of finished work pieces	X	X
6. TIG welding and after treatment of work pieces		
Welding metals by using the TIG technology		X
Intermediate inspections		X
After treatment of finished work pieces		X

Definitions used in welder’s occupational standards

Manual welding	<i>manual welding</i>	Welding that is performed manually by a welder.
Semiautomatic welding	<i>semiautomatic welding, partly mechanized welding</i>	Partly mechanised welding (as a rule, manual welding where the feeding of filler metal in the form of a welding wire or tape is mechanised by means of a relevant operating mechanism and movement along the weld is made manually by the welder).
Automatic welding	<i>automatic welding</i>	Automated welding executed fully by equipment where the movement and location of the welding head is controlled by means of relevant equipment.
MMA welding or SMAW	<i>MMA welding, or SMAW</i>	Also known as shielded metal arc welding or manual metal arc welding with a stick electrode. Arc welding uses thermal energy produced by the electric arc as the source of energy.
Gas welding	<i>Gas welding</i>	In case of gas welding, the required heat for melting metal comes from the flame ignited from the mixture of combustible gas and oxygen. Combustible gas may be acetylene or propane. In most cases, gas welding uses filler metal in the form of a wire.
MIG welding or metal inert gas welding	<i>MIG welding</i>	The reference number of the welding process belonging to the group of semiautomatic welding processes according to EN ISO 4063 is 131. The most common inert gas used for welding is argon (Ar), less used is helium (He). Used mainly for welding aluminium.
MAG welding or metal active gas welding	<i>MAG welding</i>	The reference number of the welding process belonging to the group of semiautomatic welding processes according to EN ISO 4063 is 135 for welding with solid wire electrode and 136 or 138 for welding with flux-cored electrode. Flux-cored welding uses a tubular wire electrode or flux-cored wire containing a flux and gas inducing substances, deoxidizers, etc. As a rule, carbon dioxide is used as a shielding gas for flux-cored welding. The most common active gas used for welding is carbon dioxide (CO ₂). A mixture of argon and carbon dioxide is used widely, e.g. AGAMIX-20 (80% of argon and 20% of carbon dioxide).

ESF programm „Kutsete süsteemi arendamine“

TIG welding or GTAW	<i>TIG welding, or GTAW</i>	<p>An arc welding process with a non-consumable electrode where the welding arc burns between the end of the non-consumable electrode (mainly tungsten) and the work piece, and the weld area is protected by an inert gas. Previously known as argon welding.</p> <p>The following sub-groups with the following numeric codes are defined:</p> <p>141 – TIG welding with solid filler material, directed to the weld pool in the form of a wire or rod.</p> <p>142 – Autogenous TIG welding without using filler material. Edges of the work pieces are welded.</p> <p>143 – TIG welding with cored filler material. Filler material is directed to the welding pool either in the form of cored wire or rods.</p> <p>145 – TIG welding using reducing gas and solid filler material (wire or rod).</p>
----------------------------	-----------------------------	---