



EQF assigned qualification sample:  
**The professional qualification "Welding"  
from Spain**

Provided by: FLM, ES

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## Spanish qualification structure sample

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This Qualification belongs to the current National Qualification Catalogue managed by the National Qualification Institute of Spain (INCUAL). The information below is partial, the complete qualification description can be found at [http://www.educacion.es/educa/incual/ice\\_incual.html](http://www.educacion.es/educa/incual/ice_incual.html).

**Qualifications/Family: Mechanical Manufacturing**

**Professional qualification: WELDING**

**Level: 2**

**Code: FME035\_2**

## General competency

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Perform welding in accordance with welding procedure specifications (WPS, based on criteria of quality, safety and environmental protection).

## Competency units

- UC0098\_2: Perform oxy-fuel welding and thermal spraying.
- UC0099\_2: Perform electric arc welding with covered electrode.
- UC0100\_2: Perform arc welding under protective gas with non-consumable electrode (TIG).
- UC0101\_2: Perform arc welding under protective gas with consumable electrode (MIG, MAG) and arc thermal spraying.

## Professional context

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### Professional field

Carries out his/her activity as an employee or self-employed worker in large, medium and small enterprises engaged in the manufacture, assembly or repair of metal constructions, installations and mechanical engineering products.

## Productive sectors

This qualification is found in the field of mechanical engineering industries and facilities in the area of manufacturing, assembly and repair.

Relevant occupations and positions.

## Welders and flame cutters

Thermal spray operators

## Related training (600 hours)

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### Training Modules

- MF0098\_2: Oxy-fuel welding and thermal spraying.
- MF0099\_2: Electric arc welding with covered electrode.
- MF0100\_2: Arc welding under protective gas with non-consumable electrode.
- MF0101\_2: Arc welding under protective gas with non-consumable electrode.

## COMPETENCY UNIT 1 Perform oxy-fuel welding and thermal spraying.

### Level 2

#### Code UC0098\_2

### Professional performance (PP) and performance criteria (PC)

PP 1: Prepare the equipment to carry out the welding and spraying operations, in compliance with the standards of Occupational Health and Safety and the Environment.

PC 1.1 The torches and hoses are clean and in good condition, they fit properly and the outlet pressure of the gas in the cylinders or of the supply systems is regulated to suit the characteristics of the materials to be welded or sprayed.

PC 1.2 The gas is supplied by connecting the hoses to the cylinders or specific supply systems for the type of welding or spraying to be performed.

PC 1.3 The equipment and installations are monitored by controlling the operating parameters.

PP 2: Prepare the elements to carry out the welding and spraying operations, following the standards of Occupational Health and Safety and the Environment.

PC 2.1 The consumables are selected according to their function and the materials to be welded.

## Information used or generated

Manufacturing drawings. Welding and thermal spraying standards. Standards for Occupational Risk Prevention and the Environment. Catalogues of material and consumables. Equipment maintenance instructions. Specifications for welding and thermal spraying procedures.

## TRAINING MODULE 1 Oxy-fuel welding and thermal spraying

Level 2

Code MF0098\_2

Associated with UC Performance of oxy-fuel welding and thermal spraying

Duration 140 hours

### Skills and assessment criteria (AC)

C1: Analyse the technical information used in the manufacturing drawings, repair and installation in order to determine the most appropriate procedure for oxy-fuel welding and thermal spraying.

AC1.1 Interpret the various symbols used in oxy-fuel welding.

AC1.1 Interpret the various symbols used in oxy-fuel thermal spraying.

AC1.3 Identify the characteristics of oxy-fuel welding operations using manufacturing drawings.

AC1.4 Explain the identifying characteristics of oxy-fuel thermal spraying operations in manufacturing drawings.

AC1.5 Using a construction and assembly drawing of the type used in the most representative sectors of the steel building industry:

- Identify the symbols associated with the welding process.
- Explain the process defined.
- Define the required edges.
- Explain the features of the "consumables" indicated.
- Describe the potential treatments besides welding.
- Predict the assembly time of the elements.
- Explain the possible welding defects, together with their cause/effect.
- Explain the local treatment for stress relaxation.

AC1.6 Using a construction and assembly drawing of the type used in the most representative sectors of the steel building industry:

- Identify the symbols associated with the spraying process.
- Explain the process defined.
- Explain the features of the "consumables" indicated.
- Describe the potential additional treatments.
- Describe the areas to be masked.

- Explain the possible spraying defects, together with their cause/effect.

C2: Define the oxy-fuel welding and spraying processes, determining steps, operations, equipment, supplies. etc., taking into account economic quality and criteria and complying with the standards of Occupational Health and Safety and Environmental Protection.

AC2.1 List the welding and spraying processes with their main application, based on the materials, economic and quality criteria and describing their capabilities and limitations.

AC2.2 Describe the characteristics of the different "consumables" used in the welding and spraying, taking into account their applications.

AC2.3 Explain the parameters of welding and spraying in terms of the process and materials to be used.

AC2.4 On a construction drawing of a metal construction that does not contain welding specifications, with certain quality specifications:

- Determine the procedure for obtaining a joint that meets the standard features of a weld (edge preparation, consumables, etc.) and takes into account economic and quality criteria.
- Establish the most appropriate welding sequence for the requirements of the construction to be made.
- Identify the necessary equipment, supplies, tools and materials.
- Define the necessary quality controls.

AC2.5 On a construction drawing of a metal construction that does not contain thermal spray specifications, with certain quality specifications:

- Establish the most appropriate spray sequence for the finish requirements, taking into account economic and quality criteria.
- Identify the necessary equipment, supplies, tools and materials.
- Define the necessary quality controls.

C3: Perform oxy-fuel welding on sheets, sections and tubes of different materials, meeting the specifications and standards of Occupational Health and Safety Prevention and Environmental Protection.

AC3.1 List the characteristics of the gases used and the filler materials.

AC3.2 Describe the oxy-fuel welding procedures with different base and filler materials.

AC3.3 List the oxy-fuel welding equipment, with the required materials and finishes, indicating their features, together with the different parameters of the procedure, with the expected results, economic, quality and safety aspects.

AC3.4 Analyse the oxy-fuel welding equipment, describing the various components, the role of each and the interaction between them in the unit overall, explaining the rules of use and maintenance of the equipment.

AC3.5 Explain the changes that take place during the welding process, together with the main parameters involved, and the basic features and defects that the welding can present.

AC3.6 In a case study of an oxy-fuel welding process of thin sheets of different materials, defined in a construction drawing of metal constructions and without specifying the applicable procedure:

- Identify the welding symbols.
- Identify the different components of the welding equipment.
- Choose the most appropriate procedure, given the possibilities and limitations of these, taking into account materials and thicknesses as well as economic and quality criteria.
- Adjust the equipment and installation, checking that it meets the safety standards.
- Determine the different types of joint in the horizontal, vertical and overhead positions, using the number of welding seams necessary for the thickness and characteristics of the material used to obtain the required quality.
- Evaluate the results and adjust the parameters if necessary.
- Perform a visual inspection of the welds obtained, identifying "defects" and their underlying causes.

C4: Perform oxy-fuel spraying of different metal and non-metal materials, meeting the specifications and standards of Occupational Health and Safety Prevention and Environmental Protection.

AC4.1 Describe the main characteristics and defects that thermal spraying may produce.

AC4.2 Explain the rules of equipment use and maintenance.

AC4.3 In a case study of an oxy-fuel spraying process, defined in a construction drawing of metal constructions and without specifying the applicable procedure:

- Identify the spray symbols.
- Identify the different components of the spray equipment.
- Choose the most appropriate procedure, given the possibilities and limitations of these, taking into account materials and thicknesses as well as economic and quality criteria.
- Adjust the equipment and installation, checking that it meets the safety standards.
- Perform spraying with the correct number of passes for the thickness and characteristics of the material used, in order to obtain the required quality.
- Evaluate the results and adjust the parameters if necessary.
- Perform a visual inspection of the thermal spraying, identifying "defects" and their underlying causes.

### Skills that must be learnt in a real working environment

C3: Oxy-fuel welding of different materials with different procedures and in different contexts.

C4: Oxy-fuel spraying of different metal and non-metal materials with different procedures and in different contexts.

### Contents

- Properties and storage of propane, acetylene and oxygen.
- Regulations for oxy-fuel thermal spraying and welding equipment.
- Occupational Risk Prevention Regulations.
- Environmental Regulations.
- Oxy-fuel welding procedures:

- Operating principles.
- Flame adjustment.
- Combustion process.
- Temperature profile.
- Oxy-fuel thermal spraying procedures:
  - Operating principles.
  - Flame adjustment.
  - Combustion process.
  - Temperature profile.
- Maintenance of oxy-fuel thermal spraying and welding equipment.
- Facilities.
- Safety equipment.
- Care and maintenance of equipment.
- Pressure regulators.
- Hoses and hose connections.
- Verification that the operation is safe.
- Specific safety for gas welding processes.
- Decomposition of acetylene, cylinder fire and gas cylinder handling.
- Fire protector.
- Extinguishing agents, fire-fighting.
- Gases.
- Gas welding consumables.
- Identification and selection of rods and gases for oxy-fuel welding.
- Classification of rods (EN 12536) and gases.
- Typical gas welding parameters:
  - Welding procedure specifications, as per EN-ISO 15609-2.
  - Typical welding parameters: choosing a nozzle based on welding thickness, position.
  - Welding techniques "to the left?" and "to the right?".
- Oxy-fuel welding and thermal spraying.
- Welding flaws and potential problems specifically related to gas welding processes.

### Visual inspection

- Defects.
- Edge preparation.
- Joint types.
- Types of weld.
- Welding symbols.
- Fastening tools.
- Pre- and post-weld treatments.
- Material transformations.

## Basic requirements of the training context

### Spaces and facilities:

160-m<sup>2</sup> steel-building workshop.

### Professional profile of trainer:

1. Mastery of the knowledge and techniques involved in oxy-fuel welding and thermal spraying, occupational risk prevention and environmental protection. This must be accredited in one of the following ways:
  - Minimum academic training as a Senior Technician in relation to this professional field.
  - Professional experience of at least 3 years in the field of competencies related to this training module.
2. Recognised teaching competence in accordance with the requirements of the competent authorities.

For further information on the project please consult:

[www.project-predict.eu](http://www.project-predict.eu)

For further information on the paper please contact:

[innovacion@fundacionlaboraldelmetal.es](mailto:innovacion@fundacionlaboraldelmetal.es)