WORLDSKILLS STANDARD SPECIFICATION

Skill 07
CNC Milling

THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

GENERAL NOTES ON THE WSSS

The WSSS specifies the knowledge, understanding and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSSS).

The skill competition is intended to reflect international best practice as described by the WSSS, and to the extent that it is able to. The Standards Specification is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will not be separate tests of knowledge and understanding.

The Standards Specification is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards Specification. The sum of all the percentage marks is 100.

The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

WORLDSKILLS STANDARDS SPECIFICATION

SECTION		RELATIVE IMPORTANCE (%)
1	Work organization and management	10
	The individual needs to know and understand: • The extent and impact of CNC-milling on modern life and industry • Quality standards for materials and quality of metals • Standards for the environment, safety, hygiene, and prevention of accidents at work • Computer operating systems • Mathematics, especially accurate and detailed calculations, and trigonometry • Properties and behaviours of materials, especially steel and aluminium • Principles of technical design and process planning • CNC equipment technology (Vertical and Horizontal Machining Centre) – programming and operating • Programming by hand or CAM system software • Cutting technology according to the cutting parameters, the material, and the equipment and cutting tools • Health and safety regulations, legislation, and best practice • The importance of adhering to manufacturer's operating instructions • Ensure the maintenance of sophisticated milling machines to promote efficient and reliable working • The importance of effective communications and team-work • The importance of effective working methods with other professionals related to the CNC-milling process	
	The individual shall be able to: • Use computer related professional software effectively • Interpret and apply quality standards and regulations • Promote and apply health and safety regulations and best practice • Effectively use IT and related professional software • Consistently apply mathematical and geometrical principles accurately for the preparation and programming processes for CNC-milling • Develop creative solutions to complex design or technology challenges	
2	Interpret engineering drawings and follow the specification	10
	The individual needs to know and understand: • ISO 1 and/or ISO 3 (European and American) drawing representation • Technical terms and symbols used in drawings and plans • Standards, standards symbol and tables • Drawing legend	

	The individual shall be able to:	
	• Interpret and apply engineering drawings and follow the specification • Locate and identify main dimensions and secondary dimensions • Locate and identify ISO standards for surface finish • Locate and identify ISO standards for geometrical form and positional tolerances	
3	**Process planning**	15
	The individual needs to know and understand: • The importance of good planning for the successful execution of Programming and operation/machining • How to plan, based on the type of operation and the sequence (machining strategy) of the data that must be specified • Types of machining tools used in CNC technology including lathes, multi-axis spindles, wire electrical discharge machines, and milling machines • Methods of work holding according to the shape of the base material	
	The individual shall be able to: • Identify and set the different machining features • Correctly identify the most efficient work holding solution to clamp the base material into the machine that best suits the operational requirements • Correctly select the cutting tools for machining the required material and operation • Define the cutting parameters as a function of the operation sequence, material type, and type of operation	
4	**Programming**	20
	The individual needs to know and understand: • Programming as the creation of a logical process plan • Different methods and techniques to generate a programme (CAM/CAD or manual) • CAM system programming • Skill related software	
	The individual shall be able to: • Select the best methods according to the production type and part specification • Effectively use skill specific software and related hardware • Generate a programme using a CAD/CAM system taking into account the format of the initial data • Start with a drawing in paper format – creation of the geometry in wireframe and/or surface and/or solid	
5	**Metrology**	10
	The individual needs to know and understand: • Range of tools and gauging instruments and their applications • The main measuring techniques	

	The individual shall be able to: • Select appropriate measuring tools or gauging instruments and use them correctly • Make measurements on threaded elements		
6	Operating	15	
	The individual needs to know and understand: • The different steps that lead to the setup of the machine • The different modes of machine operation		
	The individual shall be able to: • Prepare, make measurements and record cutting tools • Identify and designate the functional parameters for operation on the CNC-milling machine		
7	Machining	20	
	The individual needs to know and understand: • The different types of machine features • The machining sequence		

| | The individual shall be able to:
• Identify and designate the different machining processes on a CNC-milling machine
• Optimize the machining strategy
• Define and adjust the cutting parameters as a function of the operation sequence, material type, type of operation, and CNC machine tool
• Start the cutting process form
• Solid block
• Perform the following machining operations:
   • Facing
   • Roughing and finishing

      • External contours
      • Island milling
      • Milling channels
      • Pocket (figurative)
      • Pocket (circular and rectangular)
      • Taper ribs

   • Thread milling
      • Internal
      • External

   • Canned cycles
      • Through hole boring
      • Blind hole boring
      • Reaming
      • Tapping
      • Drilling

   • 3D machining operations
      • Roughing
      • Finishing

• Tapping
• Drilling
• 3D machining operations
• Roughing
• Finishing | |
| | **Total** | 100 |