

WORLDSKILLS STANDARD SPECIFICATION

Skill o6
CNC Turning





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.



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| SECTION | | RELATIVE IMPORTANCE (%) |
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| 1 | Work organization and management | 5 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The scope and limits of the workshop and the workspace • Standards for the environment, safety, hygiene, and prevention of accidents • Safety equipment (how to use, when to use, etc.) • Different types of energy supplies for the CNC Lathe (electric, hydraulic, pneumatic) • Machine Accessories such clamping devices, tailstock, part-catching devices, etc. • Simple maintenance of CNC machines to ensure reliability • The use and care of the available computer operating systems • Programming, setting operating of CNC lathe with live tooling • CNC-programming Systems (Din-ISO (G-Code writing), CAM software) • Principles of technical design and process planning • Mathematics, especially calculations in trigonometry • Principles of cutting- and chip-removal technology • The importance of effective communications and team-work • The importance of machinery-handbooks, datasheets, and tables • The calibration, accuracy and use of measurement- and gauging tools | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Organize the workspace for optimal performance • Check the condition and functionality of the workspace, equipment, tools and materials • Interpret and apply quality standards and regulations • Promote and apply health and safety regulations and best practice • Set up and operate CNC lathe safely • Use computer related professional software effectively • Consistently apply mathematical and geometrical principles for the programming processes of CNC Turning • Select and apply appropriate cutting technology for the provided material, equipment and cutting tools • Interpret and apply manufacturer's instructions • How to find appropriate Data in a handbook, tables, or charts | |
| 2 | Interpret engineering drawings | 10 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • ISO E and/or ISO A (European and American) drawing representation • Technical terms and symbols used in drawings and plans • Standards, symbols, and tables • Technical data sheets • Drawing legends | |



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| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Interpret engineering drawings and follow the specification • Locate and identify dimensions of features • Locate and identify surface finish requirements • Locate and identify geometric specifications • Make 3D mental representations of the parts • Identify the materials that parts are made of • Identify critical sequences (high possibility damage or unsafe practice) | |
| 3 | Process planning | 10 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The importance of good planning for reliable machining operation • Successful timing of the selected sequences • Identification of critical sections • How material, tools and machine accessories will react in different cutting processes • How material and clamping-devices will react in the clamping process • Methods of work holding techniques • Methods to avoid crash or collision for the selected sequences • Identification of work piece-features and the appropriate machining- and measuring processes | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Imagine solutions using capacities of the workshop-environment and according to the required work (size of batch, complexity) • Identify the features of the work piece and the appropriate machining and measuring processes • Identify and prepare the best work holding method • Identify, prepare, and calibrate the correct measuring tools • Identify and prepare the correct cutting tools • Identify critical sections (high possibility damage or unsafe practice) and think of alternatives • Imagine innovative ways of using the environment to solve technical issues • Check if the solution will be reliable until the end of the process • Weigh each solution and choose the best (consider speed, safety, and price) • Make a final choice and lock the strategy • Plan the operations and sequences (machining strategy) based on specified data • Create awareness actions for critical operations where no alternative is available | |



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| 4 | Programming | 10 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none">• CNC-Programming as the creation of a logical process plan• Different methods and techniques to generate a program (manual, CAM etc.)• CAM system programming and the techniques of tool-modelling and profile drawing• Cutting-effect (temperature, bending, force etc.) on:• Geometric complex constructions in the work piece design• Work holding devices• Tool holding devices• Machine-accessories• Selection the cutting tools for machining the required material and operation• Mathematics (especially trigonometry)• Speeds and feeds for different materials and tools and work holding devices• Choosing a postprocessor• Generating G-Code• Dialoguing with the CNC Lathe• How to use Canned cycles to program work piece features like diameters, steps, threads, bores and grooves (outside and inside) | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none">• 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• Create a CNC Program using the provided drawing and the provided software | |
| 5 | Metrology | 5 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none">• Chip removal behaviour of provided materials and tools• Temperature behaviour of provided materials and tools and accessories• Effect of cutting force on material, tools, and accessories• Range of tools and gauging instruments and their applications• Understand how temperature may influence the measurements | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none">• Select appropriate measuring- or gauging instruments• Calibrate measuring tools• Use selected tools to make measurements on all components on the drawing• The properties, uses, and handling of material | |



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| 6 | Setting and operating CNC lathe | 55 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none">• The different steps that lead to the setup of the machine• The different modes of machine operation• Power up sequence• Initializing CNC Lathe• Manipulating CNC Lathe• Mounting tools, setting tool parameters• How to modify clamping device, such as jaws, etc.• How to transfer a CNC program to the CNC lathe, using provided software, cable, memory devices, or wireless technology• How to test a program, simulation, dry run etc.• How to clamp the part, correctly, and safely• How to set the work shift and offset system• How to run the programme safely• Stopping and restarting a cycle• Emergency stopping | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none">• Follow his/her selected process-strategy• Upload generated CNC program to the CNC lathe and test run• Identify and designate the different machining processes on the CNC lathe• Mount and align selected tools• Mount and align selected work holding devices• Mount and align selected accessories (Tailstock, Partscatcher etc.)• Avoid vibration in the machining sequences• Apply burr-removal techniques on the work piece• Optimize the machining strategy• Quickly react if anything goes wrong• Get dimensions, geometries, surface roughness by interacting with the CNC Lathe• Get the final part to conform to the blueprint• Report any health, safety and environment issue to the appropriate personnel• Report equipment failure to the appropriate personnel | |
| 7 | Finalize and deliver work piece | 5 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none">• The procedures and calculations required for scheduling time with software and machinery• The importance of completing the work piece to the required standard within their capabilities• The circumstances in which referral should be made to other appropriate personnel | |



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| | <p>The individual shall be able to:</p> <ul style="list-style-type: none">• Make a final check by re-using measurement instruments• Clean the part• Deliver the part, drawing and digital memory devices back to the appropriate location and/or personnel as required by the organization• Dismount tools, clamping, accessories• Clean the machine• Set the environment to its initial state, ready for next job | |
| | Total | 100 |