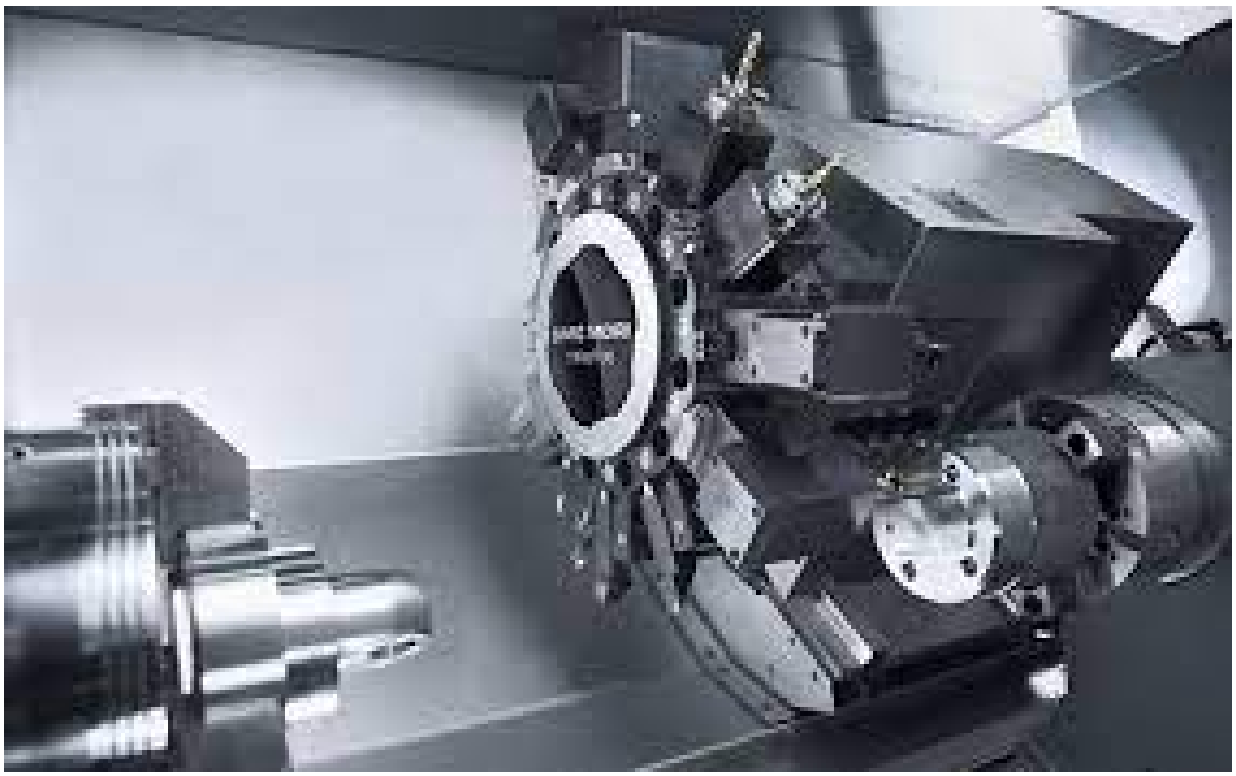

CNC Turning

Technical Description 2022

—

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We thank all the amazing sponsors that make this competition possible:

Mitutoyo

DMG MORI

AUTODESK

Mastercam

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Introduction

WorldSkills UK is an annual skills competition designed to promote standards and skills across a wide range of industries, developing competence into excellence.

The CNC Turning competition sees talented engineers test their expertise on a series of challenging practical tests in a bid to be named WorldSkills UK National Champion.

WorldSkills UK can bring invaluable benefits to students, colleges, and employers.

Competitors can gain recognition for exceptional skills, injecting dynamism, and excitement into training.

Employers can enhance their business reputation and improve the skills of their workforce.

The aim of this technical manual is to help competitors prepare for the CNC Turning competition from registration, through passive to qualifying and culmination at the national level.

The guide contains general advice, technical tips and an in-depth overview of the competition structure and its content.

CNC Turning is a significant sector within the engineering industry, encompassing a wide range of skills, standards, and ideas. This guide will provide you with a clear path to follow, from initial registration to the National finals and beyond.

Role Overview

The CNC machinist / Technician role can cover a wide range of skills such as machine setting and operating, CNC programming and editing and the use of CAD/CAM software to generate efficient machining strategies that can be output as CNC programs.

They are expected to safely prove out CNC programs while ensuring that the production process is also optimised. Completed components must be checked and inspected against tight tolerances and quality standards

Key attributes required by all CNC technicians wherever they work are efficient work organisation, self-management, communication, interpersonal skills and problem-solving.

They must have the ability to work safely and rigorously adhere to regulations, manufacturer's instructions, and organisational requirements. These universal traits are the benchmark of an outstanding CNC technician.

Resources

For information and resources, including how to register, competition rules, and the steps to competing, visit:

Mastercam home learning edition

Autodesk Fusion 360 Download

Competition Page

Core competencies

Projects will be designed to test competitors technical ability to;

- Follow relevant safety practices
- Read engineering drawings
- Understand tolerances
- Create wireframe geometry
- Manipulate Solid CAD models
- Program CNC toolpaths from solid models and wireframe
- Produce CNC programs using CAD/CAM software
- Set tool information on machine
- Set and adjust work datums
- Calculate speeds and feeds
- Run CNC programs safely
- Use a wide range of measuring equipment
- Accurately measure and adjust tool information
- Compete under time pressure

Competition Structure

Registration

Once you have completed your registration (and accepted all terms and conditions) you will receive email confirmation and will be sent a link to join a Google Classroom here you will find further details about the competition and be asked to complete the Passive test online

Prospective students should try to familiarise themselves with working under competition-style activities, for example, have a fellow student judge a completed work task during a timed practical session at college/training provider.

Passive Stage

The passive test consists of multiple choice type questions.

It covers a range of relevant topics and is aimed at challenging and assessing your knowledge of general and specific topics of CNC machining and Engineering

When all registered entrants have completed the passive test, you will be notified if you have scored high enough to progress to the National Qualifying round.

National Qualifiers

Ensure you are ready to compete in your National Qualifier by reading and understanding the project brief, core competencies. This outlines the tasks you will be expected to carry out.

Ask your lecturer/employer for help in any areas where you feel you may have any knowledge gaps and work to improve/gain the necessary skills.

The Qualifying task will be to program and produce a component to the correct quality standards on a CNC Lathe within a specified time limit. A 2D engineering drawing will be provided and a 3D CAD model.

Any CAD/CAM system may be used to create the program. The finished test project component must be sent for judging with a copy of the CAD/CAM file and output CNC code.

The test project should be sent to:

Adam Youens
Coleg Cambria
Engineering Technology Centre
Bersham Road
Wrexham, LL13 7UH

WorldSkills UK Pre-National training

As part of the invitation to compete at the National Finals, WorldSkills CNC Turning invites all competitors to a training event beforehand. This is an excellent opportunity for all competitors to boost their confidence using/familiarising the equipment in a safe environment while replicating the competition project and expectations.

Training dates are yet to be released but expected in September/October 2022

WorldSkills UK National Final

The highest scoring competitors across the National Qualifier will be invited to compete at the finals.

The competition task will be to program and produce a component to the correct quality standards on a CNC Lathe within a specified time limit. A 2D engineering drawing will be provided and in some instances, a 3D CAD model

Ensure you are ready to compete in your WorldSkills UK Live final by reading and understanding the project brief, core competencies. This outlines the type of tasks you will be expected to carry out.

Ask your lecturer/employer for help in any areas where you feel you may have any knowledge gaps and work to improve/gain the necessary skills.

Self-directed training

All competitors will need to practice to make it to the National finals. Dedication is key to confident performance in a competition.

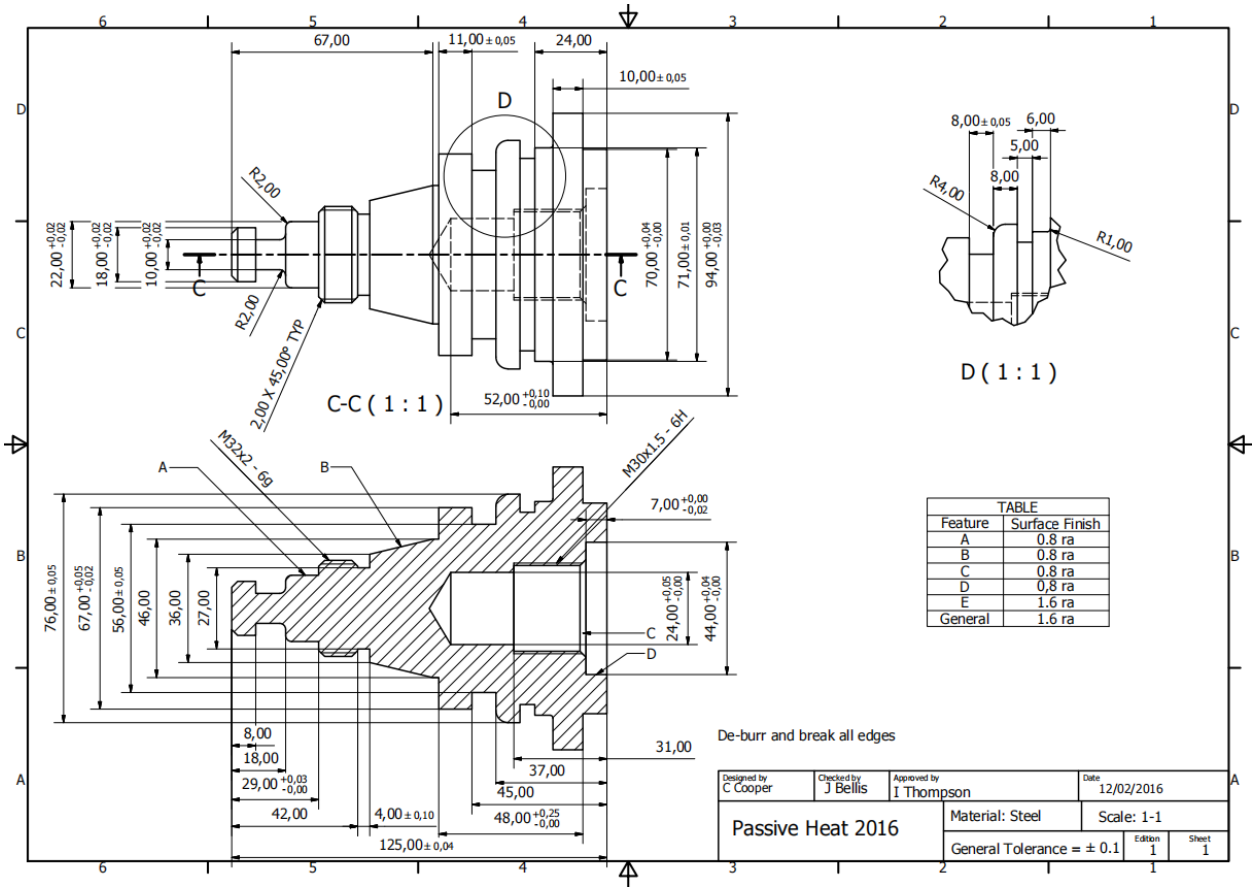
Project overview

While the project drawings and models can vary greatly within CNC turning, we have reduced the number of features to test core skills while keeping costs manageable for organisers and entrants. So only the following features will be included

Included features	Optional features
-Internal and External Turned diameters -Profile contours -External Grooves -External Threads -Chamfers -Radii	-Engraving -Simple Milled features -Bored soft Jaws

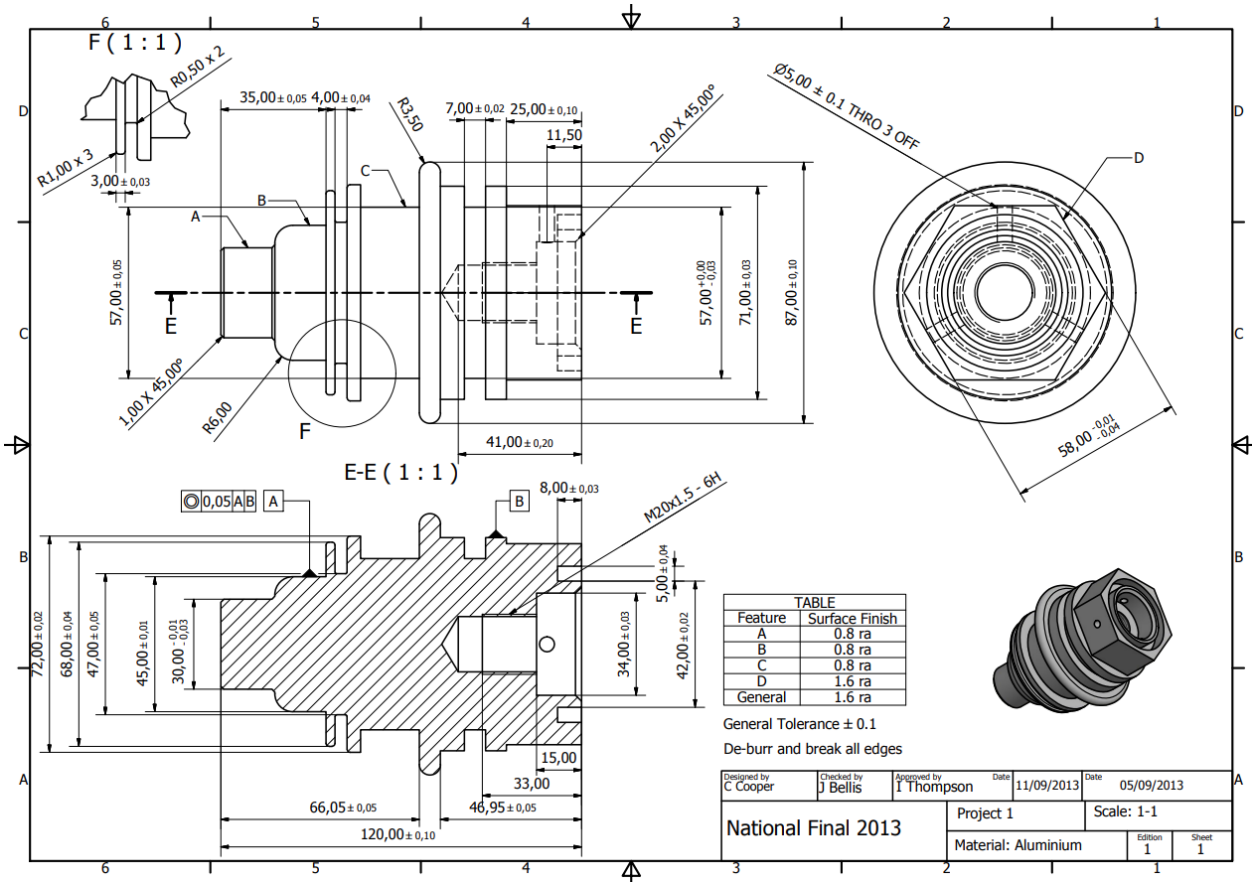
Project example: National qualifiers

Design specification	
Material	Steel Ø4" x 130mm
Time	7h
Additional data	• 2D drawing with 3D shaded view; all dimensions included • STEP file of component supplied • Work on 2 sides • Will be possible with minimal tooling: • OD turning Tools. • Groove tool • 1.5mm Radius profile grooving too • Threading Tool • Drills • Boring Bar



Project example: National finals

Design specification	
Material	Aluminium Ø4" X 125 Brass 80x80x20mm
Time	7h
Additional data	• 2D drawing with 3D shaded view; critical dimensions only • Work on 2 Sides



Marking scheme

The marking scheme is designed to fairly compare every competitor's work. Marking is split between measurement and judgement aspects.

Measurement

Any dimension on the drawing can be a measurement mark. The value of a given dimension is decided by its tolerance, which are split into:

- Main dimensions (±0.005mm to ±0.02mm)
- Secondary dimensions (±0.04mm)
- General tolerance (±0.1mm)
- Surface finish (0.8Ra to 1.6Ra)

All projects will be supplied with a mark summary form. The mark summary form will show only the number of marks assigned to each aspect, not the breakdown of marks (e.g., main dimensions: 40 marks maximum).

All marks for measurement criteria are "all or nothing", e.g., if a dimension is specified at 40±0.04, full marks will be awarded from 39.960mm to 40.040mm. Anything outside of this will be awarded zero marks.

Judgement

marks are more subjective, for aspects such as;

- False cuts (collisions)
- Vibration
- Scratches
- Machine de-burring
- Hand de-burring

Judges will work to a judgement handbook with examples of each criterion. Each judge will reveal a value from zero to three, and an average will be taken. For example, if all judges assess the machine de-burring as a two overall, the competitor will receive 66% of the possible marks. Judgement marking accounts for only 10% of the overall score.

Equipment

During training and delivery of the National finals, l tooling and equipment will be provided by WorldSkills UK and various competition sponsors.

Typical Machine used at national finals:

DMG Mori	**CLX with Siemens 840Dsl control**

Software

CAD/CAM Mastercam Mastercam home learning edition	AUTODESK Autodesk Fusion 360 Download

Training

Self-directed training

All competitors will need to practice to make it to the National finals. Dedication is key to confident performance in a competition.

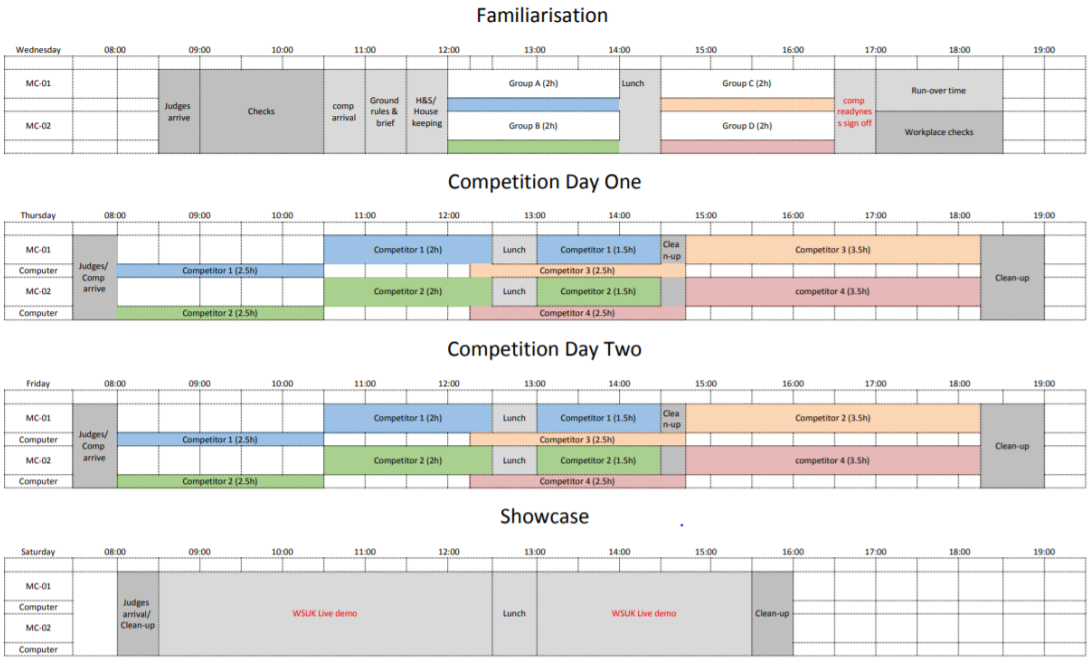
National finals

What to expect

Employers can enter the competition floor with the permission of the competition manager; they can take sponsorship photos or gain a better understanding of the competition itself. Competitors are expected to wear the appropriate H&S equipment (e.g., safety boots, glasses) as well as a company work top and trousers while competing.

The competition stand will be prepared with all the equipment necessary to compete. Each competitor will have a computer they can password-protect, as well as a USB to back up files. There will be one set of measuring equipment and cutting tools per machine, which will be checked and cleaned between each competitor's shift.

An example timetable:



Beyond the National finals

Looking beyond the National finals, there are a host of opportunities for competitors. Age-eligible competitors who show the highest skills, passion, and drive to compete will be invited to train for the EuroSkills and WorldSkills international competitions.

Those who are not eligible for international competitions may join the Champions programme, which allows continued involvement, including the opportunity to work with WorldSkills UK and visit schools, colleges, and events to inspire the next generations.

Alternatively, if training is of interest to you, you could consider supporting WorldSkills UK with organising and training, and even helping to run the National finals.

Get inspired and become a part of Team UK today!