Technical Handbook
Industrial Robotics – 2026 Cycle

About WorldSkills UK

WorldSkills UK is a set of dynamic skills competitions for young people and adults, designed and delivered by industry experts annually in over 50 skills.

Many WorldSkills UK competitions lead into WorldSkills International competitions which are biennial global events.

For further details, please visit:
www.worldskillsuk.org/worldskills-uk-competitions

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ENGINEERING SKILLS FOR THE FUTURE

Industrial Robotics

Introduction

The aim of this manual is to help competitor teams prepare for the Industrial Robotics competition at regional and national level. We hope this will help competitors to perform to the best of their ability during the competition cycle. The guide contains general advice, technical tips and a more in-depth overview of the competition structure and its content. The teams are made up of **two competitors**.

Using the tips and advice throughout the guide will help you focus on the competition areas with a higher level of accuracy to read, look at and review tasks thoroughly before beginning each task and teach you to step back occasionally to see if you are achieving your goal.

Remember it's not a race, you are competing against a standard, a very high standard, but one that is achievable.

Competition Overview

Industrial Robotics involves the application of industrial robots to perform automated manufacturing operations. These robots can be configured and programmed for use across a wide range of industries, including assembly, foundry operations, material handling, palletizing, finishing processes, and welding, among others.

Robot integrators require a broad mix of practical and digital skills to effectively carry out responsibilities such as:
- robot system design and implementation
- integration of peripheral and auxiliary equipment
- robot programming
- project planning and technical documentation
- system maintenance and troubleshooting

Automation is a rapidly expanding and innovative engineering discipline that spans multiple industry sectors. It demands strong problem-solving abilities, critical thinking, and process optimization skills, alongside a commitment to high standards and a strong work ethic.

Industrial Robotics is a practical competition that will test your logic, design and fault-finding skills in a challenging environment.

To complete the tasks competitors are expected to apply their theoretical knowledge of fundamental principles alongside practical skills in robot system design and implementation, the integration of peripheral and auxiliary equipment, and robot programming. They must also demonstrate competence in project planning and technical documentation, as well as the ability to carry out effective system maintenance and troubleshooting to ensure reliable and efficient robotic operation.

Stage 1 Registration and preparation

To compete in the competition, you must register using the WorldSkills UK website. You will then receive a confirmation of whether you have successfully registered. Industrial Robotics competition involves a team of two competitors. Whilst you wait to get to the next stage of the competition, you should do your best to prepare for the competition by taking a look at the **pre-competition activity task** made freely available to you on **our website**. While you will register your details individually, it is also very important at this stage to specify the same team name when registering so that you are allocated to the same team to avoid unnecessary delays.

Stage 2 Entry stage

Shortly after registering, the competition journey will begin with what is called an entry stage. This will be an online task in the form of a multiple-choice activity, exploring the competitor's basic knowledge and familiarity with robot system design and implementation, the integration of peripheral and auxiliary equipment and robot programming. This activity is time limited to 1 hour and will take place soon after the registrations closes. Each competitor will take part in the activity, but the individual marks will be combined to get a team mark. This is an important part of the competition journey as it gives the competitor an early taste of what knowledge is needed to be successful on the journey. Once everyone's scores have been totalled, competitor teams will be informed if they have progressed on to the next round, called the national qualifiers.

Stage 3 National Qualifiers

For competitors who have managed to progress from the entry stage, the next step is the national qualifiers. There will be a range of venues and dates that will be available to register. You will be allocated to your nearest host centre, subject to availability, however, we will do our best to ensure you can participate. National qualifiers are one-day activity, typically involving two main tasks. The top six scoring teams meeting the minimum threshold from the national qualifiers will then be invited to the next round, the National Finals.

Stage 4 WorldSkills UK National Finals

The top six (6) ranking teams will be invited to compete in the UK National Final which is the pinnacle of the UK national competition cycle.

The finals are usually a large-scale event, and a chance to show off your skills, meet a number of industry professionals and other competitors taking part, as well as bring your own family along to see you compete. The UK National Final is currently planned to take place, typically in mid-November, involving practical activities. This is typically a three-day event involving a day of setup and familiarisation followed by two days of competition activity.

Stage 5 WorldSkills UK International Competitions

Beyond the national finals, there are a host of opportunities for competitors. Eligible competitors who show the highest skills, passion, and drive from the national finals will be given the opportunity to compete to train for the EuroSkills and WorldSkills International competitions. The winners from national final competitions who are not eligible for international competitions may join the Skills 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.

Core Competencies

Please note the following are core competencies for the full set of Industrial Robotics competitions, that competitors will be assessed on. Not all competencies are covered at all stages and levels.

	Core competencies and standards for WorldSkills UK Skills Competitions activities	Qualifier Stage	National Final	WSI Team UK

Standards	**Layout and Design**
	Knowledge and understanding:
	• Principles and applications of industrial robots, robotic tools and equipment mounted on robots and in robotic cells
	• Principles of CAD and offline simulation tools used for layout and design of robot systems
	• Principles and relevant practical applications of:
	  - engineering science and technology
	  - electrical engineering and pneumatics
	• Principles and applications for incorporating and integrating robots within industrial systems such as:
	  - payload settings
	  - reach studies
		Y	Y	Y

Competency	Competitors shall be able to:
	• Carry out system design for a given industrial application
	• Incorporate the dimensioning of electrical and pneumatic systems
	• Carry out system analyses for risk assessment
	• Itemize the requirements and implications of installation and integration in relation to:
	  - robots, ancillary equipment and tools
	  - human resources and time
	  - estimated impacts on production during installation
	  - estimated impacts on production following installation
	  - operating parameters and risk management			

Standards	**Installation and connectivity**
	Knowledge and understanding:
	• Principles and methods for:
	  - assembling and fixing tools and equipment to the robots
	  - safe management of equipment, tools, and materials
	• Principles underlying the:
	  - installation of robotics into production systems
	  - the positioning, connection and use of electrical and pneumatical power
	  - correct foundations required for installation of industrial robots and peripheral equipment
		Y	Y	Y

Competency	Competitors shall be able to: • Assemble, position and instal robotic tools and equipment according to instructions and documentation • Align, fit or assemble components, using hand tools, power tools, fixtures or templates, according to specification • Connect Input/Output (I/O) control signals between robot and peripheral equipment • Perform tests during the installation process to ensure functionality			

Standards	**Automation and Programming**
	Knowledge and understanding:
	• Principles and functions of computer hardware and software
	• Principles that provide the basis for breaking down information or data into separate parts
	• Principles and options for:
	  - manipulating robot coordinate frames, for robot, cell and tooling
	  - controlling robot motion
	  - controlling robot input/output (I/O) functions
	• Sensor integration: simple digital/electrical sensors and/or advanced sensors
		Y	Y	Y

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Competency	Competitors shall be able to: • Develop diagrams or flow charts of systems operations • Write, analyse, review and rewrite programs, using flow charts and diagrams • Create application software programs that are easy to document, understand and maintain • Conduct trial runs of programs and software applications to ensure they will produce the desired robot and cell performance • Optimize robot motion performance and I/O handling to minimize cycle time/maximize throughput while retaining reliable operation • Integrate simple and/or advanced sensors			
Standards	**Documentation and reporting** Knowledge and understanding: • Importance of maintaining records of each stage of activity • Required format of records and reports to ensure compliance with contracts, regulations and legislation, verification and audit	**Y**	**Y**	**Y**
Competency	Competitors shall be able to: • Document design and development procedures according to requirements • Write documentation of program development, inserting comments in the coded instructions so that others can understand the computer programs			
Standards	**Commissioning and troubleshooting** Knowledge and understanding: • Strategies for fault finding, problem solving and optimization • Principles and techniques for generating innovative solutions	**N**	**Y**	**Y**
Competency	Competitors shall be able to: • Investigate whether the robot and its peripheral equipment are responding to the programs' instructions • Revise, repair or expand existing programmes to increase operational efficiency or adapt to new requirements			

Schedule

Registration: 02 – 27 March 2026
Entry Stage: 28 – 30 April 2026
Results of Entry Stage: 07 May 2026
National Qualifiers**:**   TBC

National Finalists Announced: 09 July 2026
National Finals: 17 - 20 November 2026, Swansea, South Wales.

- These are provisional qualifier dates and other venues and dates may be added following the Entry Stage.

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General Instructions

1. Entry stage will involve 1-hour multiple choice test, aimed at testing the competitor's basic knowledge and familiarity with robot system design and implementation, the integration of peripheral and auxiliary equipment and robot programming.
   Competitor teams will be e-mailed a link to take the Entry Stage test during the above dates. Once you start the test, you must complete within an hour. Time taken will be recorded by the online system.
2. Maximum working time at National Qualifiers is 2 x 3-hours tasks. At the start of the competitions an allotted time will be allocated for work planning. This time is not part of the working time.
3. The National Final will typically consist of a full Test Project on robot system design and implementation, the integration of peripheral and auxiliary equipment and robot programming exploring different competencies tested over two or three days, requiring approx. 12 – 16 hours of total competition time.
4. All supplied equipment and materials must be accurately checked by the competitor teams prior to commencing the competition.
5. All materials and equipment must be marked out/used in the most economical method.
6. Competitor teams will lose marks for any misplaced, lost or spoiled materials and/or equipment, where this is the result of competitor error. Competitor teams will lose marks for each minor breach of the Health & Safety rules. Where a competitor puts themselves or any other person at risk as a result of a Health & Safety breach, the task will be stopped. Where a task is stopped due to a Health & Safety risk, the judge will decide if the task can be continued safely.

Competition equipment needed at National Qualifiers and Finals

1. Competition equipment is typically based on the Fanuc Educational Cell ER-4iA Robot with R-30iB Mate Pluss Controller and Fanuc's Roboguide simulation software V9.40 – R-30iB Plus. This equipment is provided by the competition organisers.
2. All competitor teams will need to bring their own laptop and associated programming software, that will be provided to you after successful progression from Entry Stage.
3. While it is not necessary, competitors may bring their own tools, writing pads or boards.
4. Competitor laptop will need to have minimum of:
   Operating System
   - Windows 10 (32-bit and 64-bit)
   - Windows 8.1 (32-bit and 64-bit)
   - Windows 7 (32-bit and 64-bit)
   - (Windows 64-bit version recommended)

   Processor
   - Type: AMD Athlon 64 3200+, Pentium IV 2.4 GHz (Core (TM) 2 Quad or higher recommended)
   - Speed: 2.4 GHz

   System Memory
   - 1 GB (4GB recommended)

   Video Card
   - RAM: 512 MB
   - Resolution: 1280x1024
   - Colour Depth: 24-bit colour
   - Hardware Features: OpenGL Hardware Support

   Free Hard disk space
   - 4 GB

   Additional Hardware
   - Ethernet, DVD 32x, Mouse

Practice

There are a number of resources made available to download from the [WorldSkills UK website](#) and on the [WorldSkills UK Learning Lab](#).

Please ensure you make full use of these resources in preparing to attend the qualifiers and national finals.

> " A wise man can learn more from a foolish question than a fool can learn from a wise answer.
> **Bruce Lee**

Judges Top Tips

The following eight aspects are neither exhaustive nor prescriptive and not a 'magic' formula to success. However, these are tips based on being involved with competitions for many years and we hope these will help you in future competition participation.

1. **Pressure.** You will be nervous, but you will need to keep nerves under control and not let the pressure overtake you. But managed pressure can be good, increasing energy and performance potential.

    How to handle nerves:

    a. Listen to the Judge's brief and ask questions – what sort of questions depends on you, i.e. repeating an aspect of their brief; gives you a chance to understand more.

    b. Importantly, understand at what point your allotted time actually starts, i.e. normally after the Judge's brief.

    c. Read your competitors' brief; everything you need to know for the task is in that brief. Allow yourself 2 to 3 minutes to read it. Read it at least twice as your first reading will be too fast.

    d. Take a deep breath and start the task. You are against the clock and so you will need to work with focus.

    e. Task going wrong? Take a moment, think. If necessary, quickly re-read that part of the instructions and then refocus. You may need to move on from that particular aspect of the task.

2. **Time Management.** The tasks are all against the clock. So, once you have had your task brief and know how long you have, then quickly plan your workload. Section the aspects of the task into time blocks.

3. **Remember,** it is a competition and so practically everything you do within the task is marked and worth points; so, focus on gathering points. Leave some time to put tools away at the end (that is worth points), clean up the working area (again, worth points). If you are stuck on a particular aspect then accept you may or may not get points for that particular part and in order to move onto the next part of the task, ask the Judge for assistance. Remember, there are other points to be earned.

4. **Think outside of the task.** Where is the documentation for the peripheral equipment or specific CAD files? If in doubt, then ask the Judge where these items are. Remember, you have a limited time to display your technical skill to the Judge and so you must be smart with your actions and work levels.

5. **Practice before the competition** at working under pressure and with someone watching you; perhaps your works' supervisor or college lecturer. Get them to be super critical on your work quality, methods of work and approach.

6. **Understand the advantage of selecting the right tool for the job.**

7. **Sleep.** Get plenty of sleep the night before. If offered, take advantage of accommodation for the night before the competition. Resist the temptation to consume alcohol the night before and have a good breakfast on the day of the competition; these actions will assist in preparing your mind and body.

8. **Enjoy.** To get to the WorldSkills UK National Qualifiers or the WorldSkills UK National Finals is in itself a massive achievement that you should be extremely proud of - make the most of the whole WorldSkills UK/IR Skills Competitions process and enjoy it!

Technical Guidance

Technical guidance for each specific task and / or tooling will be given at the competition.

Additional Resources

Referring to the following resources will be helpful:

If you don't have access to CAD software, such as Solidworks or ProEngineer, a good alternative would be to visit the AutoDesk website and take a look at their Fusion360 software, most of their software is free to download and use for students and educators.

https://worldskills.org/partners/autodesk/

Most of them have in-built tutorials that you can use to practice your modelling skills before the release of the competition tasks. FANUC Modeler is a function that can be installed within Roboguide. The software gives you the ability to create parts and models that can then be used in your simulations. To use this function when you first install the Roboguide software you would need to check the 'Modeler' option plug-in.

Task Breakdown

The following is an example of the marking criteria for the National Qualifier.

Criteria	Task	Mark
A	TASK 1: Installation and Programming	60
B	TASK 2: Layout and Design	25
C	TASK 3: Documentation and Reporting	15
	Total Marks	**100%**

Competition Rules

Conduct for competitors during live competitions:

- It is the competitor's responsibility to arrive on time at the event each day, late arrivals may be excluded from the competition.
- Competitors will start and finish tasks as instructed by the judges or Competition team.
- Equipment, tools, and specific safety equipment will be supplied; however, competitors are required to wear any competitor work wear supplied. Please bring your own safety shoes. (Without your safety shoes you may not be able to take part in the competition due to health and safety regulations).
- Any competitor who wishes to leave the area during the competition must seek the permission of the competition organisers or lead judge.
- If there is a power stoppage, breakdown of machinery or accident, the competitors must act according to the instructions of the competition organisers.
- Competitors are expected to comply with the host venue rules and regulations.
- No competitors will be allowed to bring their own mobile phones, laptops, or other devices with them into the competition, any competitor found in breach of this will automatically disqualify themselves and their team from the competition.
- At the end of each day of competition, all documentation and equipment for each team will be secured within the workcell or competition area to prevent tampering or loss.
- Any special equipment requirements must be agreed with by the competition organisers prior to attending the competition. If you do not follow this stipulation, the organisers reserve the right to refuse its use during the competition.
- The competition area is a working environment and competitors are expected to conduct themselves accordingly.
- Please report any problems or damage to equipment as soon as possible to the competition organisers so that they can carry out any repairs or replacements required – it will only harm your ability to produce a final entry submission for the competition.

Health & Safety

During the competition as in any work or educational facility you have a duty to protect yourself and those around you.

As an Organising Partner, our delivery partners have a responsibility to protect you and keep you informed about health & safety procedures and practices including:
- making the competition area safe and without risks to health
- ensure robotic cell and equipment are safe and that safe systems of work are set and followed
- ensure hazardous articles and substances are moved, stored and used safely
- provide adequate welfare facilities
- give instruction, information, supervision and where applicable training necessary to maintain health and safety.

As a competitor you have a legal duty to:
- take reasonable care for your own health & safety and that of others who may be affected by what you do or do not do
- cooperate with the Organising Partner and/or their appointed delivery team on health and safety matters
- correctly use work/competition items provided, including personal protective equipment, in accordance with instructions and/or training given
- not interfere with or misuse anything provided for your health, safety or welfare

In particular:
- all health and safety regulations, including protection standards, specified by the competition hosts and delivery team, must be followed exactly. Any defect in machines or equipment must be reported immediately.
- safety goggles must be used in all material-removing operations.
- shoes and clothing must comply with health and safety regulations.

Conclusion

Remember, the competition will be designed to take you out of your comfort zone, but the tasks will be achievable. There will be a lot of 'self-pressure'. You need to learn how to control this and focus on the task in hand.

Once a task is complete, you cannot change the outcome good or bad, start the next task afresh and with positivity.

Drink plenty of water throughout the competition, staying hydrated will help with your concentration, focus and will reduce stress and headaches.

Beyond the UK Finals

The Industrial Robotics Skills Competition National Finals also form part of the selection process for WorldSkills International competitions. This year will be the fourth time that the UK has looked to enter the Robot Systems Integration skill internationally. Training managers will be onsite during the Finals competition, monitoring the performance of those who are age eligible and who show the highest skills, passion, and drive to compete and could be invited to form part of the UK Squad.

Further details of the international competitions, including eligibility criteria and other opportunities you can get involved with, can be found on the [WorldSkills UK International website](#). You will be notified if you are age eligible following the UK Finals.

Those who are not eligible for WorldSkills competitions may join the [Skills 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!

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We wish you the best of luck in your competition journey,
and would like to leave you with the following quote:

> Life is a series of experiences, each one of which makes us bigger, even though sometimes it is hard to realise this. For the world was built to develop character, and we must learn that the setbacks and grieves which we endure help us in our marching onward.
>
> **Henry Ford**

Competition Organising Partner

Competition Investment Partner