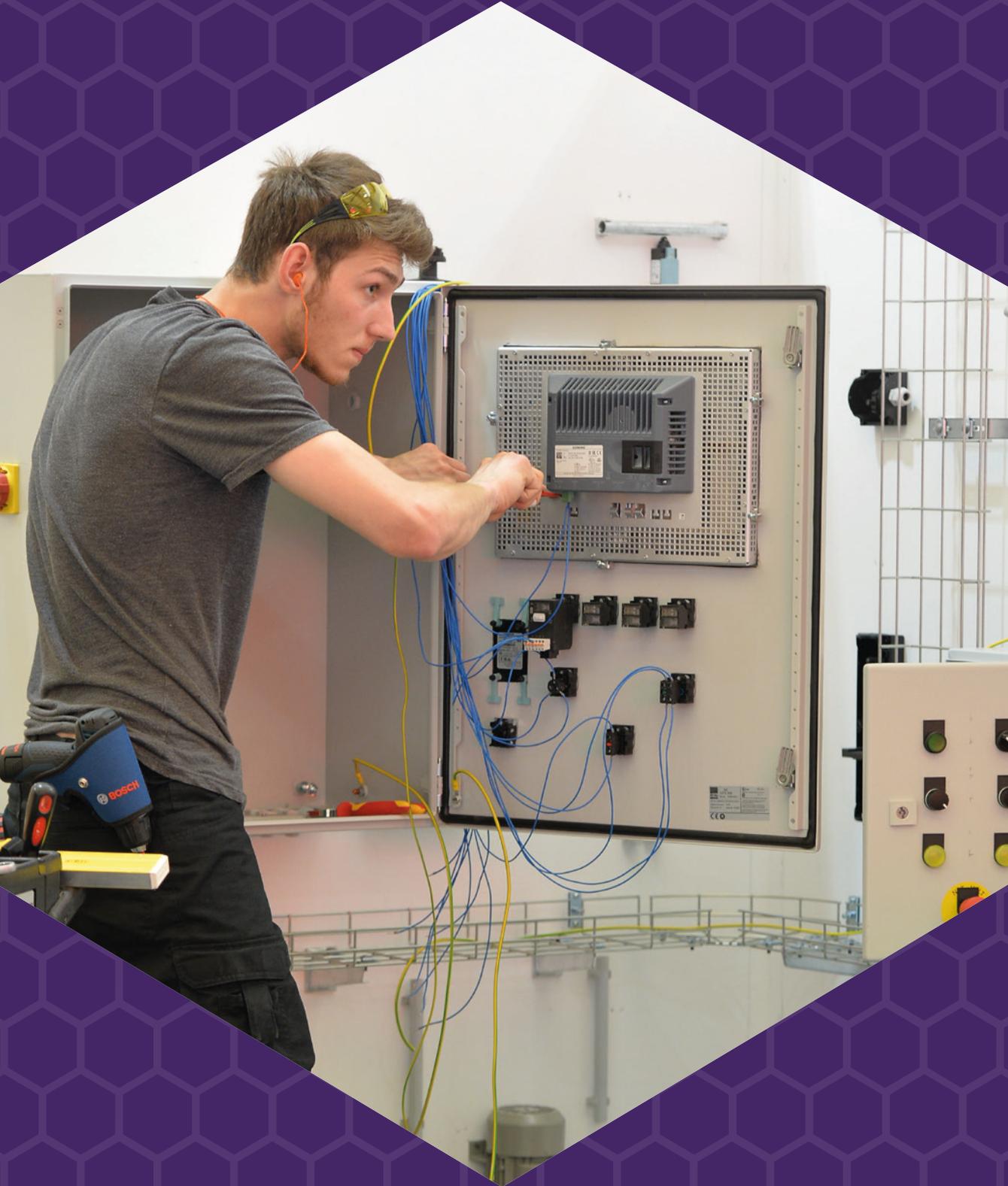


MANUFACTURING AND ENGINEERING TECHNOLOGY

Industrial Control



WorldSkills Occupational Standards

WorldSkills Occupational Standards (WSOS)

Occupation description and WSOS

The name of the occupation is

Industrial Control

Description of the associated work role(s) or occupation(s)

Industrial Control contains elements of both electrical installations and automation installations, with greater emphasis on automation installation. The industrial control practitioner requires a wide range of technical skills, such as installing conduits, cables, instruments, I/O devices and Programmable Logic Controllers. The industrial control practitioner also designs electrical circuits, programs Programmable Logic Controllers, parametrizes bus systems and configures Human Machine Interfaces.

The working environment is likely to be one that is potentially very dangerous and hazardous. The industrial control practitioner proactively promotes best practices in health and safety and rigorously adheres to health and safety legislation.

Trouble-shooting is an important skill of the industrial control practitioner and includes identifying problems during equipment installations in a new plant or remedying problems within an existing plant.

The industrial control practitioner has a wide range of industrial settings in which to work. They may be employed in one particular plant and install and maintain production equipment; or they may be employed by a sub-contractor and work in a number of industrial settings.

Delays in production as a result of reliability issues on the production line can have business implications not only financially but also for the company's reputation. Therefore, the industrial control practitioner needs to work efficiently and effectively to meet time constraints, while also providing expert advice and guidance to management on both technical production issues and on innovative and cost-effective solutions to production problems and requirements. A key skill of the practitioner is troubleshooting, identifying problems during installation, or remedying problems with an established plant.

General notes on the WSOS

The WSOS 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/WSOS).

The skill competition is intended to reflect international best practice as described by the WSOS, and to the extent that it is able to. The Standard 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 only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standard 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. This is often referred to as the “weighting”. The sum of all the percentage marks is 100. The weightings determine the distribution of marks within the Marking Scheme.

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

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

WorldSkills Occupational Standards

Section	Relative importance (%)
1 Work organization and management	10

The individual needs to know and understand:

- Health and safety regulations and best practice, especially in relation to hazardous working environments and the variety of locations and industrial settings where the work may be conducted
- Safety requirements relating to plant and equipment
- SIL levels of safety and the application to relevant industries
- The importance of site safety inductions
- The range of safety equipment used to protect self and others and the application relating to various industries
- The types of hazards that may be encountered in industrial settings
- The importance of effective communications and interpersonal skills

The individual shall be able to:

- Consistently promote and comply with health and safety regulations and industry best practices in all working environments
- Correctly use all safety equipment and personal protection equipment (PPE), lock off systems, and warning indicators
- Recognize hazards and potentially hazardous situations and take appropriate actions to minimize risk to self and others
- Work effectively as part of a team
- Communicate effectively with other professionals including work-shop supervisors and other staff where installations are being carried out
- Explain complex mechanical and engineering projects to colleagues who may not have specialist knowledge
- Provide expert advice and guidance regarding on-going use, care, and maintenance of equipment
- Think logically and work systematically

2 Circuit design and modification	10
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The individual needs to know and understand:

- Principles of technical specification diagrams
- Special technical terms and symbols
- Principles and functions of relay/contactors circuits

The individual shall be able to:

- Read and interpret and make additions to technical diagrams in a simulation software according to a function description
- Advise on modifications to circuit design
- Interpret drawing standard sections (DIN ISO 1219) that are to be used
- Design electrical circuits

Section	Relative importance (%)
3 Making of the automation control panel/centre	15

The individual needs to know and understand:

- Terminology and symbols used in technical specifications and diagrams
- Principles of technical drawing, circuit diagrams, layouts, function descriptions, and terminal drawings
- Uses and layout of operation manuals
- Electrical and mechanical tools used in panel building activities, such as drilling and cutting
- Lean manufacturing processes (wastes etc.)
- Responsibility/liability to the customer (extra holes, dirt, damages)

The individual shall be able to:

- Read, understand, and interpret complex technical drawing, circuit diagrams, layouts, function descriptions, and terminal drawings
- Apply information from technical specifications to effective work planning and solutions to engineering and operational problems
- Install ducts, terminals, components, and wiring of the control panel according to the drawings and given tolerances
- Complete appropriate panel building operations according to specifications
- Interpret operations manuals and follow guidelines and instructions

4 Field Installation (electrical and automation)	25
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The individual needs to know and understand:

- Issues and challenges of the installation of field components
- Principles of technical drawings, layouts of installations and control panels, circuit diagrams, and flow charts
- Principles and functions of all components used in field installation
- Importance of accurate measuring and calculations during field installations

The individual shall be able to:

- Measure and calculate the correct positions for the components to be installed
- Prepare and install wire trays within given tolerances
- Install conduits, cables, devices, instruments, and control centre fittings
- Install complex cabling systems that combine power and communications
- Plan work effectively to meet time schedule requirements
- Use all tools effectively and safely without risk to self or others in the workplace
- Test and commission installed equipment
- Complete all necessary documentation following installation

Section	Relative importance (%)
5 Programming	30
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> Principles of technical specifications and diagrams Processes of controlling motors, valves, and other devices used in industrial control HMI and PC-based HMI/Visualization to communicate with the PLC code Setting of input limits Uses of industry accepted equipment such as PLC, HMI, VFD/VSD, and distributed IO Distributed IO based and industrial Bus Technologies Industry 4.0 technology IEC sequence-programming methods (IEC 61131-3) 	
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Create programmes according to written specifications and diagrams Configure the HMI-screens according to written specifications and diagrams Configure the VSD as required in the function description Test functions thoroughly and safely Demonstrate functions to users and provide expert advice and guidance Conform to IEC sequence programming specifications 	
6 Fault-finding	10
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> Safety risks during the fault-finding process Principles of written specifications, technical drawings, and circuit diagrams Components and symbols of the relay-based circuit diagrams Principles of the Relay Control Fault Finding using a multi-meter Principles and functions of the common Industrial relay/contactors control circuits Principles and functions of PLC diagnostics Field Bus Diagnostic principles 	
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Apply all safety precautions Read, understand, and interpret complex written specifications and diagrams, understanding all technical symbols Analyse the correct principles of fault finding Recognize incorrect principles of fault finding Utilize the correct fault-finding principles Utilize a range of tools and software to isolate faults 	
Total	100

References for industry consultation

WorldSkills is committed to ensuring that the WorldSkills Occupational Standards fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Occupational Standards on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (<http://www.ilo.org/public/english/bureau/stat/isco/isco08/>) ILO 7411
- ESCO: (<https://ec.europa.eu/esco/portal/home>)
- O*NET OnLine (www.onetonline.org/)

This WSOS appears to relate most closely to *Industrial Engineering Technicians*:
<https://www.onetonline.org/link/summary/17-3026.00>

and/or to *Industrial Engineering Technician*:
<http://data.europa.eu/esco/occupation/bcc21c63-7eee-4520-8fa7-43eefd389668>.

and/or or *Industrial Electrician*:
<http://data.europa.eu/esco/occupation/5df63943-f1bc-4438-90f1-92768a7a23c8>

The following table indicates which organizations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Occupational Standards in place for WorldSkills Shanghai 2022.

There were no responses to the requests for feedback this cycle.