

40315**Program and operate industrial robotic equipment**

Kaupae Level	4
Whiwhinga Credit	10
Whāinga Purpose	<p>This skill standard is for people who want to learn how to program and safely operate industrial robotic equipment in a variety of sectors, including engineering, manufacturing and logistics.</p> <p>It is expected that learners wanting to work with industrial robotic equipment that performs specialist functions, such as welding, will already be proficient in that function prior to completing this standard.</p> <p>This skill standard can be used in any programme leading to qualifications and/or micro-credentials at level 4 and above.</p>

Hua o te ako me Paearu aromatawai | Learning outcomes and assessment criteria

Hua o te ako Learning outcomes	Paearu aromatawai Assessment criteria
1. Describe and explain the functions and controls of industrial robotic equipment.	a. Describe power on-off procedure and safety controls.
	b. Describe hard keys, soft keys and menus and explain their function.
	c. Explain the purpose and operation of a deadman switch.
	d. Describe the coordinate system modes.
	e. Explain how the robotic equipment behaves in each coordinate system mode.
	f. Describe interpolation modes and related parameters.
	g. Explain how the robotic equipment behaves in each interpolation mode.
	h. Describe offline programming and online programming.

Hua o te ako Learning outcomes	Paearu aromatawai Assessment criteria
2. Program industrial robotic equipment.	a. Determine the suitability of task for industrial robotic equipment.
	b. Create a program for a task completed by industrial robotic equipment.
	c. Debug errors and edit programs.
	d. Upload programs to robotic controller and manage files.
3. Operate industrial robotic equipment safely.	a. Determine the safe working area for the robotic equipment.
	b. Control robotic equipment safely using the different operation modes.
	c. Follow reset procedures and implement recovery protocols.

Pārongo aromatawai me te taumata paearu | Assessment information and grade criteria

Industry Standards and Workplace Procedures: Assessment evidence for this standard must reflect industry standards and follow workplace procedures and manufacturer's instructions. Working to industry standards must be confirmed by someone with current industry expertise (verifier). Must include signed attestation from verifiers.

Evidence gathered for this standard must relate to one piece of industrial robotic equipment.

Evidence must include:

At least one example of each of the following coordinate system modes:

- joint
- robot (cartesian)
- tool
- user coordinate

At least one example of each of the following interpolation modes:

- joint
- linear
- circular

Operation modes must include both:

- play (automatic, remote)
- teach Mode.

Definitions

Cell refers to a designated area in a manufacturing environment where a robot and its associated equipment are set up to perform specific tasks.

Industry standards refer to verbal and written information covering company policy, standard operating procedures, processes and job-specific instructions and regulations from both government and standard-setting bodies.

Multi-station cells refer to a series of individual setups within a production line where a robot operates.

Online programming refers to programming done directly on the robot using the teach pendant.

Offline programming refers to creating and testing robot programs on a computer using simulation software before uploading them to the robot.

Workplace procedures refer to the verbal or documented procedures for performing work activities and include health and safety, operational, environmental, and quality management requirements. They may refer to manuals, manufacturer's specifications, codes of practice, or policy statements.

Ngā momo whiwhinga | Grades available

Achieved

Ihirangi waitohu | Indicative content

General

- System description: robot type and number of axes, units, controller.
- Safety systems, such as estops, light curtains, reset buttons, gate stops, reduced speed, deadman switch, brake release procedure, safeties on different units.
- Categories of stopping modes.
- Factors to consider when determining the safe work area:
 - reach of arm.
 - the difference between a collaborative robot and an industrial robot.
 - end of arm tooling (EOT) and their function.
 - enclosure and safety guarding system (cell).
- Screen icons, softkeys and menus.
- Coordinate systems: joint, cartesian, tool, user frame.
- Hard keys:
 - how to turn motors on with the pendant.
 - speeds, menus, movement keys.
- Three interpolation modes: joint, linear, circular.
- Parameters, such as speed and accuracy.

Programming and setup

- The Euler coordinate system.
- Tool centre point (TCP) concept.
- TCP calibration procedure.
- User frame programming.
- Calling a program from within another program.
- Assigning programs in multi-station cells.

Online or Teach Pendant Programming

- Direct interaction, including moving the robot to desired positions, recording these positions, and defining the robot's actions step-by-step.
- Teach pendant, including manual control of the robot's movements:
 - jogging (moving the robot in small increments).
 - recording positions (waypoints).
 - inputting program commands.
- Programming process, including movement control, waypoint recording, command input.
- Debugging.

- Waypoint parameters, including speed, acceleration, and actions (e.g. gripper operations).
- Command input, including movement commands, looping, conditional statements, and I/O (input/output) operations.
- Benefits of online or teach pendant programming.

Applications

- Path teaching, including programming precise paths for tasks such as welding, painting, or material handling.
- Task adjustments, such as making on-the-spot changes to accommodate new products or processes.
- Maintenance and troubleshooting, such as quickly diagnosing and resolving issues with robot programs.

Advanced Operations and Maintenance

- Test program execution.
- File management, including version control and backup.

Rauemi | Resources

Legislation, regulations and/or industry standards relevant to this skill standard include but are not limited to:

- [Health and Safety at Work Act 2015](#)
- [ISO/TS 15066:2016 Robots and robotic devices — Collaborative robots](#)
- [BS EN ISO 10218-1:2011 Robots and robotic devices. Safety requirements for industrial robots. Robots.](#)

Pārongo Whakaū Kounga | Quality assurance information

Ngā rōpū whakatau-paerewa Standard Setting Body	Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council
Whakaritenga Rārangi Paetae Aromatawai DASS classification	Engineering and Technology > Mechanical Engineering > Mechanical Engineering Technology
Ko te tohutoro ki ngā Whakaritenga i te Whakamanatanga me te Whakaōritenga CMR	0013

Hātepe Process	Putanga Version	Rā whakaputa Review Date	Rā whakamutunga mō te aromatawai Last date for assessment
Rēhītatanga Registration	1	26 September 2024	N/A
Kōrero whakakapinga Replacement information	N/A		
Rā arotake Planned review date	31 December 2029		

Please contact Hanga-Aro-Rau Manufacturing, Engineering, and Logistics Workforce Development Council qualifications@hangaarorau.nz to suggest changes to the content of this skill standard.