Title	**Explain the principles, components, and functions of robots in the manufacturing industry**		
Level	**5**	**Credits**	**5**

Purpose	This unit standard is intended for people who are currently working, or intend to work, with robots in the manufacturing industry. People credited with this unit standard are able to: explain the operating principles of robots; explain the functions of the basic components of robots; explain the basic operating principles of common input and output devices of robots; explain the basic operating principles of robots and programmable controllers; and explain the application of the basic components of robots and an automated control system in the individual's workplace.

Classification	Mechanical Engineering > Engineering - Robotics

Available grade	Achieved

Guidance Information

Definitions
Automated control system refers to the components required to make a system or device operate or change according to a specific set of criteria.
Robot refers to a reprogrammable multifunction manipulator designed to move material, parts, tools or specialised devices through variable programmed motions for the performance of a variety of tasks.
Programmable controller (also known as programmable logic controller or PLC) refers to a control device which uses computer logic and programmable memory to control industrial applications.

Outcomes and performance criteria

Outcome 1

Explain the operating principles of robots.

Performance criteria

1.1 The explanation differentiates between open-loop and closed-loop control systems.

1.2 The explanation describes regulation and sequential control functions.

1.3 The explanation differentiates between remote-manual and automated-control systems.

1.4 The explanation differentiates between digital and analogue closed-loop control systems.

Outcome 2

Explain the functions of the basic components of robots.

Performance criteria

2.1 The functions of the basic components of robots are explained in terms of closed-loop control.

Range axis movement, controller input/output signals.

2.2 The functions of input and output signals are explained in terms of their common application in robots.

Range signals - input, output;
type - digital, analogue;
evidence for a minimum of one digital and one analogue type for each signal is required.

2.3 The function of control logic is explained in terms of basic instruction and result sets converted into logic (or code).

Range logic (or code) to include - AND, OR, NOT, SET, RESET.

Outcome 3

Explain the basic operating principles for common input and output devices of robots.

Performance criteria

3.1 Common digital input devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range examples of common digital input devices include but are not limited to - switches - micro, reed, flow, level;
sensors - proximity, pressure, photoelectric;
evidence is required for a minimum of four digital input devices.

3.2 Common digital output devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range examples of common digital output devices include but are not limited to - solenoids, relays, indicator lamps;
evidence is required for a minimum of two digital output devices.

3.3 Common analogue input devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range examples of common analogue input devices include but are not limited to - sensors - temperature, pressure, flow, conductivity; evidence is required for a minimum of one analogue input device.

3.4 Common analogue output devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range examples of common analogue output devices include but are not limited to - control valves, variable speed controls, displays; evidence is required for a minimum of one analogue output device.

Outcome 4

Explain the basic operating principles of robots and programmable controllers.

Performance criteria

4.1 The explanation differentiates between stand-alone and network control.

4.2 The explanation describes the functions of common system components.

Range central processor unit, local input/output device, remote input/output device, memory device, operator interface, control interface, graphical operator display, application software, operating system software.

Outcome 5

Explain the application of the basic components of robots and an automated control system in the individual's workplace.

Performance criteria

5.1 The explanation describes the application in the individual's workplace.

Range central processor unit, input and output devices, memory device, operating system software, machine integration.

5.2 An operating sequence is outlined in terms of its functional description.

5.3 An automated system is compared to manual control in terms if its advantages.

Range safety, product consistency, plant reliability, process optimisation.

5.4 Documentation of a control system is identified and its use explained in relation to the individual's workplace.

Range functional description, process flow diagram, operation description, fault diagnosis.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	26 August 2002	31 December 2026
Review	2	26 September 2024	31 December 2026

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.