

Overview

This standard identifies the competences you need to produce, load and prove programs for industrial robot controllers, in accordance with approved procedures. You will be required to produce the control programs using a teach pendant, and by producing and downloading programs from a computer. You will check/prove the program using single block run and program edit facilities. You will also be required to adjust the robot program, following proving/editing procedures, to achieve the control specification. You must ensure that any edited programs are saved and backed up, safely and correctly.

Your responsibilities will require you to comply with organisational policy and procedures for producing, loading and proving robot programs, and to report any problems with these activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying the appropriate robot programming techniques and procedures. You will understand the sensors and actuators used in the process, and their application, and will know about the programming, editing and proving process, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the process, equipment and robot are set up and performing to the required specification.

You will understand the safety precautions required when working on the robot and associated process equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

You will be able to demonstrate the correct, safe working practice for any robotic cell you are working on.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. produce computer control programs that contain all the relevant and necessary data for the engineering activity to be carried out
3. produce the control programs in the appropriate formats
4. make sure that codes and other references used in the programs are applicable to the type of controller used
5. pass on the programs to the appropriate people, within agreed timescales
6. save and back up the program detail, and store securely in accordance with organisational requirements
7. undertake changes to program details, within agreed control procedures

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be followed when producing and proving industrial robots operating programs
2. the specific safety precautions to be taken when working with computer systems (to include safety guidance relating to the use of visual display unit (VDU), equipment and workstation environment (such as lighting, seating, positioning of equipment), repetitive strain injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)
3. good housekeeping arrangements (such as cleaning down work surfaces; putting media, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)
4. the basic set-up and operation of the computer systems, and any peripheral devices that are used
5. the correct start-up and shutdown procedures to be used for the computer systems
6. how to access the specific programming software, and the use of manuals and related documents to solve problems and aid the efficient programming of robots
7. how to drive the robot in each type of coordinate frame (such as tool, global, joint, user)
8. how to drive the robot at different speeds (including jog mode)
9. how to operate the robot in all available modes (including auto and teach)
10. the importance of protecting the computer system from viruses, and the implications if the correct procedure is not followed
11. how to power up, log on and activate the computer system and programming software correctly
12. how to deal with system problems (such as error messages received, peripherals which do not respond as expected)
13. the checks that need to be carried out to ensure that peripheral devices are connected correctly
14. the correct procedure to shut down the operating and programming system
15. how to create and structure directories and files correctly (such as importing, copying, transferring, exporting, deleting, backing up

- and saving files)
16. the different types of storage media that can be used to save program files on
 17. the main robot types that are available, and the importance of understanding that a different robot may use a completely different syntax for similar functions
 18. the information and data required in order to produce complete and accurate robot programs
 19. how to extract and interpret general and technical data and information from different sources (such as drawings, computer models, symbols and conventions, BS or ISO standards) in order to produce the robot control program
 20. the factors to be taken into account when producing robot programs (including the type of robot (such as SCARA, jointed-arm, parallel) and its control capabilities, safety, the product/environment being controlled)
 21. how to produce effective and efficient programs to avoid unnecessary operations (including the use of macro programs and canned cycles, to reduce program size)
 22. the methods and procedures used to check that the completed program will perform safely, accurately and efficiently
 23. how to save the completed programs in the appropriate format, and the need to store programs safely and correctly
 24. how to back up completed or edited programs, and the implications if this is not carried out effectively
 25. the problems that can occur with the downloading and running of the robot program, and how these can be overcome
 26. the correct procedure to be followed before the program is released to the end user
 27. the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve

**Scope/range related
to performance
criteria**

1. Ensure that you apply **all** of the following checks and practices during the robot programming activities:
 1. check that all the teach pendant/computer equipment is correctly connected, and is in a safe, tested and usable condition (such as cable(s) undamaged, safely routed)
 2. power up the equipment and activate the programming software
 3. set up the computer system to produce the program
 4. ensure that the correct process input/output and control data to produce the program is obtained and checked for currency and validity
 5. identify and deal with problems (such as information based and/or technical)

2. Prepare, load and prove programs for **one** of the following types of robot controller:
 1. Cartesian (gantry)
 2. SCARA
 3. jointed arm/articulated
 4. parallel
 5. other specific type

3. Produce operating programmes for **one** of the following engineering applications:
 1. welding
 2. stud welding
 3. machine loading/unloading
 4. packaging
 5. surface coating
 6. assembly
 7. gluing/sealing
 8. logistics movement/control
 9. other specific activity

4. Produce process control programs, for robots with digital and analogue inputs/outputs from **four** of the following:
 1. proximity sensors
 2. hydraulic actuators
 3. pressure switches
 4. barcode scanners

5. limit switches
 6. liquid flow switches
 7. optical sensors
 8. timer switches
 9. air flow switches
 10. control panel switches
 11. colour sensors
 12. temperature sensors
 13. liquid level sensors
 14. counters
 15. pneumatic actuators
 16. other actuator
5. Develop programs which contain **all** of the following, as applicable to the robot type:
1. safe start and stop positions
 2. all necessary positional information
 3. type of motion (such as joint interpolated, linear, circular)
 4. preparatory commands and process management/auxiliary functions
 5. repetitive programs (sub-routines, canned cycles, labels)
 6. part programs downloaded from a computer (such as patch programmes)
 7. speed/acceleration parameters
 8. use of workframes (such as tool, global, joint, user)
 9. sensor information
6. Prove the robot program using, **four** of the following:
1. single block run
 2. full dry run
 3. search facilities
 4. edit facilities
 5. program override controls
 6. data input facilities
 7. all modes (such as auto, T1, T2 and remote)
7. Carry out **all** of the following on completion of the programming activity:
1. check and review program formats and contents
 2. edit programs using the correct procedure (where

- appropriate)
- 3. check that programs are correctly titled and referenced
- 4. ensure that programs are stored safely and correctly in the correct format
- 5. ensure that programs have been checked and approved before forwarding to the end user
- 6. create a separate back-up copy of the program, in case of file corruption or accidental deletion

Producing operating programs for industrial robots

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