Unit 330 Loading and proving computer control programs

UAN: A/600/5694
Level: 3
Credit value: 24
GLH: 91

Relationship to NOS: This unit has been derived from National Occupational Standard engineering technical support Unit No 30: loading and proving computer control programs (Suite 3).

Endorsement by a sector or other appropriate body: This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.

Aim: This unit covers the skills and knowledge needed to prove the competences required to load and prove computer control programs, such as Numerically Controlled (NC) or Computer Numerically Controlled (CNC) machine tools, Co-ordinate Measuring Machines (CMM), Programmable Logic Control (PLC), and robotic applications, in accordance with approved procedures. The learner will be required to obtain the correct component program, which may be on tape, disk or downloaded from a remote computer. The learner will need to check the program for currency, and load it correctly into the machine controller, checking for faults or error messages and dealing with these, as appropriate to their level of responsibility. The learner will also be required to adjust the equipment and program, following proving/editing procedures, to achieve the specification. The learner must ensure that any edited programs are saved and backed up, safely and correctly.

The learner’s responsibilities will require them to comply with organisational policy and procedures for obtaining, loading and proving the programs, and to report any problems with these activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision,
taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner’s knowledge will provide a good understanding of their work, and will provide an informed approach to applying computer control program loading and proving techniques and procedures. The learner will understand the computer control equipment used in the process, and its 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 machine controller is set up to carry out its activities to the required specification.

The learner will understand the safety precautions required when working on the computer equipment and its associated accessories/equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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<th>Learning outcome</th>
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<td>The learner will:</td>
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<td>1. load and prove computer control programs</td>
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<th>Assessment criteria</th>
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<td>The learner can:</td>
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<td>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</td>
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<td>1.2 use the correct control program and ensure it is correctly loaded into the machine controller</td>
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<td>1.3 ensure that they apply all of the following checks and practices during the programming activities:</td>
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<td>• the correct operating program is obtained and checked for currency and validity</td>
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<td>• the machine controller is prepared, ready to accept the operating program</td>
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<td>• the program is loaded into the controller, safely and correctly</td>
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<td>• program media is stored safely and correctly, away from contaminants or electromagnetic sources</td>
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<td>1.4 follow the correct procedures for calling up the program and dealing with any error messages or faults</td>
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<td>1.5 confirm program integrity</td>
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<td>1.6 adjust the equipment and program operating parameters to optimise the outcomes to be achieved</td>
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<td>1.7 load and correctly set-up all associated equipment</td>
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<td>1.8 load and prove programs for one of the following types of computer</td>
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control equipment:
- NC/CNC machine tools
- co-ordinate measuring machines
- industrial robots
- PLC equipment

1.9 obtain and load programs stored on one of the following mediums:
- remote computer terminal
- personal computers
- handheld programmers
- machine controller
- tape (such as punched or magnetic)
- disk

1.10 operate the controller using six of the following, as applicable to the equipment type:
- use single step/single block run mode of operation
- graphic displays
- full dry run
- search facilities
- program save/store facilities
- edit facilities
- program override controls (speed, feed, tool data)
- data input facilities
- data output peripherals (such as printers)
- speed and acceleration parameters

1.11 check that all safety mechanisms are in place and that the equipment is set correctly for the required operations

1.12 confirm that the equipment and program operates safely and correctly by carrying out the following, as applicable to the type of equipment used:
- either carry out all of the following:
  - check that datums for each axis are set in relation to the equipment/component and tooling used
  - ensure that start-up positions are safe and correctly set
  - ensure that tooling information is correctly entered into the machine controller (such as type, number, position)
  - check that tooling change positions are safe and clear of the workpiece and other devices (such as clamps, jigs and fixtures)
  - ensure that the correct tooling is selected at the appropriate points in the program
  - check that tooling/operational paths are executed safely and correctly
  - ensure that all operations are carried out to the program co-ordinates
  - save edited programs
  - produce back-up copies of completed programs
  - ensure that any alterations to programs are communicated fully to the appropriate personnel
- Or carry out all of the following:
force contacts ‘on’ and ‘off’ and check for correct operation of peripherals
edit, enter and remove contacts from lines of logic, where appropriate
check counter and timer settings
save edited programs
produce back-ups of completed programs
ensure that any alterations to programs are communicated fully to the appropriate personnel

- Or carry out all of the following:
  confirm that the robot operates within the defined operating environment/envelope/cell layout
  ensure that start-up positions are safe and correctly set
  check that intrusion monitoring systems are operating correctly (where appropriate)
  check that robot operations are executed safely and correctly
  monitor and review cycle times
  ensure that all operations are carried out to program co-ordinates
  save edited programs
  produce back-ups of completed programs
  ensure that any alterations to programs are communicated fully to the appropriate personnel

1.13 deal promptly and effectively with problems within their control and report those that cannot be solved
1.14 maintain appropriate records of program proving activities, using two of the following methods:
- written or typed report
- electronic mail
- computer record
- verbal report
- specific company form.

### Learning outcome

The learner will:

2. know how to load and prove computer control programs

### Assessment criteria

The learner can:

2.1 describe the specific safety precautions to be taken when loading and proving computer control operating programs
2.2 explain how to start and stop the equipment in normal and emergency situations
2.3 describe the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy
2.4 explain how to handle and store program tapes and disks, safely and correctly, away from contaminants and electromagnetic sources
2.5 describe the computer coding language used in operating programs
2.6 describe the function keys and operating system of the computer
control system being operated

2.7 explain how to load, execute, edit and exit programs correctly

2.8 explain how to set machine datums for each machine axis being used

2.9 explain how to deal with error messages and faults on the program or computer controlled equipment

2.10 explain how to place the controller into the correct operating mode, and access the program edit facility, in order to enter data (such as tool datums, positions, lengths, offsets and radius compensation)

2.11 describe the use of tooling magazines and carousels, and how to identify the tooling in relationship to the operating program

2.12 explain how to conduct trial runs (using single block run, dry run and override controls)

2.13 describe the things that they need to check before allowing the equipment to operate in full program run mode

2.14 describe the application/output of the program being proved

2.15 describe the numbering system and codes used for identification of control input and outputs

2.16 explain how to search the program within the controller for specific elements

2.17 describe the programming techniques and codes used (interlocking, timers, counters, sub-routines, etc)

2.18 explain how to force contacts ‘on’ and ‘off’ to check if peripherals are operating correctly

2.19 describe the techniques involved in editing, entering and removing contacts from lines of logic and, where applicable, the procedure to be followed for ‘on-’ and ‘off-line’ programming

2.20 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken

2.21 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing

2.22 describe the factors which affect the feeds and speeds that can be used, and why they may need to be adjusted from the program setting (such as condition of material, workholding method, tooling used, tolerance and finish to be achieved)

2.23 describe the typical problems that can occur with the loading and editing of the operating program, and what to do if they occur

2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.