SEMET317

Loading and proving CNC machine tool programs

Overview

This standard identifies the competencies you need to load and prove machine tool programs on computer numerically controlled (CNC) machine tools, in accordance with approved procedures, to produce components used in moulds, press tools, dies, jigs and fixtures, test rigs and other experimental or developmental activities. You will be required to obtain the correct component program, which may be in the machine controller or on storage media or downloaded from a remote computer. You will need to check the program for currency and load it correctly into the machine controller, checking for fault/error messages and dealing with these, as appropriate to your level of responsibility. You will also be required to adjust the machine tool equipment and program, following proving/editing procedures, to achieve component specification. You must ensure that any edited programs are saved safely and correctly.

Your responsibilities will require you to comply with organisational policy and procedures for obtaining, loading and proving the 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 demonstrate a good understanding of your work, and will provide an informed approach to applying the machine tool programming procedures used. You will understand the CNC machine tools 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 machine controller is set up to produce the components to the required specification.

You will understand the safety precautions required when working on the machine, and with its associated tools and 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.

Setting workholding devices and tooling is the subject of other standards.

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. use the correct control program and ensure it is correctly loaded into the machine controller
3. follow the correct procedures for calling up the program and dealing with any error messages or faults
4. confirm that the machine and program operates safely and correctly
5. adjust the equipment and program operating parameters to optimise the outcomes to be achieved
6. load and correctly set up all associated equipment
7. check that all safety mechanisms are in place and that the equipment is set correctly for the required operations
8. deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken when loading and proving CNC machine tool operating programs
2. how to start and stop the machine in normal and emergency situations
3. the importance of wearing the appropriate protective clothing and equipment (PPE) and of keeping the work area clean and tidy
4. how to handle and store program media safely and correctly, away from contaminants and possible corruption sources
5. the computer coding language used in CNC programs
6. the function keys and operating system of the machine computer control system being operated
7. how to load, execute, edit and exit programs correctly
8. how to set machine datums for each machine axis being used
9. how to deal with error messages and faults on the program or computer controlled equipment
10. 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)
11. the use of tool posts, magazines and carousels, and how to identify the tools in relationship to the operating program
12. how to conduct trial runs, using single block run, dry run and feed and speed override controls
13. the items that you need to check before allowing the machine to operate in full program run mode
14. the application/output of the program being proved
15. the numbering system and codes used for identification of control input and outputs
16. how to search the user program within the controller for specific elements
17. 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
18. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
19. factors which will affect the feeds and speeds that can be used, and why they

may need to be adjusted from the program setting (condition of material, workholding method, tooling used, tolerance and finish to be achieved)
20. the application of cutting fluids with regard to a range of different materials, and why some materials do not require the use of cutting fluids
21. typical problems that can occur with the loading and editing of the operating program, and what to do if they occur
22.

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 during the program loading and proving activities:

1.1 obtain the correct operating program and check it for currency and validity
1.2 ensure that the machine controller is prepared, ready to accept the operating program
1.3 load the program into the controller, safely and correctly
1.4 ensure that program media is stored safely and correctly, away from contaminants or electromagnetic sources

2.

Load and prove programs for **one** of the following types of CNC machine tool:

2.1 turning
2.2 laser profiling
2.3 milling
2.4 electro discharge (such as wire or spark erosion)
2.5 grinding
2.6 machining centres
2.7 other specific type of machine tool

3.

Obtain and load programs stored on **one** of the following mediums:

3.1 machine controller
3.2 disk
3.3 tape (such as punched or magnetic)
3.4 remote or networked computer system
3.5 personal computer
3.6 handheld programmers
3.7 other specific media

4.

Operate a CNC machine controller, using **six** of the following, as applicable to the machine type:

4.1 single step/single block run mode of operation
4.2 full dry run
4.3 graphic displays
4.4 search facilities
4.5 data input facilities
4.6 data output peripherals (such as printers)
4.7 edit facilities
4.8 speed and acceleration parameters
4.9 program override controls (speed, feed, tool data)
4.10 program save/store facilities

5.

Confirm that the machine and program operates safely and correctly, by checking **all** of the following, as applicable to the machine type:

5.1 check that datums for each machine axis are set in relation to all equipment and tooling used
5.2 ensure that start up positions are safe and correctly set
5.3 ensure that tooling information is correctly entered into the machine controller (such as type, number, position)
5.4 check that tooling change positions are safe and clear of the workpiece and other devices (such as clamps, jigs and fixtures)
5.5 ensure that correct tooling is selected at the appropriate points in the program
5.6 check that tooling/operational paths are executed safely and correctly
5.7 ensure that all operations are carried out to the program co-ordinates
5.8 save edited programs
5.9 produce back-up copies of completed programs
5.10 ensure that any alterations to programs are communicated fully to the appropriate personnel

6.

Maintain appropriate records of program proving activities, using **one** of the following methods:

6.1 written or typed report
6.2 verbal report
6.3 electronic mail
6.4 specific company form
6.5 computer record

SEMET317

Loading and proving CNC machine tool programs

Developed by	Enginuity
Version Number	2
Date Approved	28 Feb 2015
Indicative Review Date	30 Mar 2018
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMET17
Relevant Occupations	Metal Machining, Fitting and Instrument Making Trades
Suite	Engineering Toolmaking Suite 3 2005
Keywords	Engineering; toolmaking; loading; proving; CNC; machine tools; programming; tape; disk; controller