SEMMME3132

Programming CNC spring making machines

Overview

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This standard identifies the competences you need to produce, load and prove machine operating programs on computer numerically controlled (CNC) spring making machines, in accordance with approved procedures. The CNC machines covered by this standard include single head, multi-head and coiling and bending centres. You will be required to produce the spring program, using manual data input or by use of a remote computer, saving the prepared program on a range of media devices, or downloading it directly into the machine controller from a computer. You will need to check the program using single block run and program edit facilities. You will also be required to adjust the spring making machine equipment and program, following the proving/editing activities, to achieve the 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 producing, loading and proving the spring programs, and to report any problems with these activities that you cannot personally resolve, or that 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 CNC spring making machine programming procedures. You will understand the CNC spring making machine 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 produce springs to the required specification.

You will understand the safety precautions required when working on the CNC spring making machine, and with its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility

for taking the necessary safeguards to protect yourself and others in the workplace.

Note Setting material feed mechanisms and tooling is the subject of other standards.

Performance criteria

You must be able to:

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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 that 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 the program integrity
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. complete the required production documentation
9. 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:

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1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. how to start and stop the machine, in normal and emergency situations
3. the importance of wearing the appropriate protective clothing (PPE) and equipment, and of keeping the work area clean and tidy
4. the computing/coding language used in CNC spring making machine programs, with regard to machine axes, positional information, machine management and auxiliary functions
5. how to extract and use information from engineering drawings or data and related specifications (to include symbols and conventions to appropriate standards) in relation to work undertaken
6. how to interpret first and third angle drawings, imperial and metric systems of measurement, and system of tolerancing
7. how to interpret CNC drawings and the use of workpiece zero/reference points
8. how to carry out currency/issue checks on the specifications you are working with
9. the systems of measurement used on CNC drawing (including absolute and incremental)
10. the use of repetitive programs and canned cycles to reduce program size and inputting time
11. how to prepare spring programs, using operational sequences and bending and forming techniques which avoid unnecessary tool movements or tool changes
12. the function keys and operating system for the CNC spring making machine being operated
13. the operation of the various hand and automatic modes of machine control (such as program operating and control buttons)
14. how to set machine datums for each machine axis being used
15. how to set the machine controller in the program and editing mode, and how to enter or download the prepared program

16. how to deal with error messages and faults on the program or equipment
17. how to access the program edit facility, in order to enter tooling data
18. the use of tool posts, magazines and carousels, and how to identify the tools in relationship to the operating program
19. how to conduct trial runs using single-block run, dry run, and feed and speed override controls
20. factors that will affect the operating speeds that can be used, and why they may need to be adjusted from the program setting
21. the items that to check before allowing the machine to operate in full program run mode
22. how to save the completed programs in the appropriate format
23. how to handle and store program tapes and disks, safely and correctly, away from contaminants and electromagnetic sources
24. the methods and procedures used to minimise the chances of infecting a computer with a virus
25. typical problems that can occur with the programming, loading and editing activities, and what to do if they occur
26. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

Scope/range related to performance criteria

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1. Apply all of the following checks and practices during the CNC spring making machine programming activities:
    1.1 obtain and interpret correctly the documentation for the type of spring being made
    1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations
    1.3 check that the machine and spring forming equipment to be used is in a safe and usable condition
    1.4 carry out the setting-up activities, following good practice/approved procedures
    1.5 ensure that correctly adjusted machine guards are in place
    1.6 leave the machine and work area in a safe and clean condition on completion of the setting-up activities
2. Prepare CNC spring programs for four of the following:
    2.1 open ended right-hand helix
    2.2 double torsion
    2.3 variable pitch
    2.4 power
    2.5 open ended left-hand helix
    2.6 conical
    2.7 barrel
    2.8 scroll/spiral
    2.9 closed end right-hand helix
    2.10 hourglass
    2.11 garter spring
    2.12 volute
    2.13 closed end left-hand helix
    2.14 constant pitch
    2.15 clock
    2.16 single torsion
    2.17 other wire forms
3. Prepare programs to finish extension spring ends, to include producing three of the following:
    3.1 full round hook/full round eye
    3.2 straight offset

3.3 long round end hook on centre
3.4 enlarged loop
3.5 coned end to hold long swivel eye
3.6 side loop
3.7 eye and hook at right angles
3.8 plain ends
3.9 extended eye on centre or side
3.10 machine loop
3.11 small eye on centre
3.12 crossover
3.13 square end
3.14 double loop
3.15 short hook end
3.16 45 degree loop
3.17 hinge end
3.18 extended leg
3.19 English loop
3.20 continental (German) loop
3.21 other specific end configuration

4. Produce CNC spring programs, using one of the following methods:
   4.1 written
   4.2 entered directly into the machine controller
   4.3 using computer software
5. Develop spring programs, which contain all of the following:
   5.1 all necessary dimensional information
   5.2 all necessary positional information
   5.3 all necessary geometry (such as helix, bend angle, loop)
   5.4 appropriate letter address codes
   5.5 preparatory commands and machine management/auxiliary functions
   5.6 repetitive programs (such as sub-routines, canned cycles, labels)
   5.7 absolute or incremental systems of measurement
   5.8 forming tool/shearing tool change/stop positions
   5.9 forming tool information (such as lengths, offsets, radius compensation)
6. Input the spring program to the controller, to include carrying out all of the following:
   6.1 using the appropriate reference manuals and programming codes to suit the type of machine controller
   6.2 preparing the machine controller to accept the operating program
   6.3 inputting/loading the prepared program into the controller, safely and correctly
   6.4 saving programs safely and correctly, in the appropriate format
   6.5 storing completed program media safely away from contaminants or possible corruption sources
7. Prove the spring program, using six of the following:
   7.1 data input facilities single block run
   7.2 full dry run

7.3 search facilities
7.4 program save/store facilities
7.5 graphic displays
7.6 edit facilities
7.7 program override controls (such as speed, feed, tool data)

8. Confirm that the spring making machine and program operates safely and correctly, by checking all of the following:

8.1 all operations are carried out to the program co-ordinates
8.2 the correct tools are selected at the appropriate points in the program (where applicable)
8.3 tool change/park positions are safe and clear of the workpiece and machine equipment (where applicable)
8.4 tool data is checked and, where applicable, updated in the machine controller
8.5 material feed mechanisms operate safely and correctly
8.6 auxiliary functions operate at the correct point in the program (such as bending, looping, shearing)
8.7 finished springs are ejected into the correct storage bins
8.8 programs have been saved in the appropriate format

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