
Overview

This standard identifies the competencies you need to inspect finished castings using Co-ordinate Measuring Machines (CMM), in accordance with approved procedures. You will be required to prepare and set up the equipment in readiness for the inspection operations and this will involve obtaining the correct component program, which may be on a range of storage media, down loaded from a remote computer or entered into the controller manually. You will be expected to mount the workpiece in a suitable position on the surface plate/table and to select and mount appropriate inspection probes to the machine spindle.

You will need to ensure that all the inspection probes have been allocated a relevant tool number and that the relevant data on their co-ordinates and datum positions are entered into the operating program and machine. This will involve loading and proving component programmes, checking for errors/faults, editing and saving program changes. You will also be required to adjust the equipment and program, following proving/editing procedures to achieve correct component inspection.

Your responsibilities will require you to comply with organisational policy and procedures for the setting up and operating of the co-ordinate measuring equipment and to report any problems with the equipment, tooling, programs or setting-up 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 the setting-up procedures used. You will understand the co-ordinate measuring equipment used and its application and will know about the machine operating programmes, inspection probes, setting-up and operating procedures, in adequate depth to provide a sound basis for setting up the equipment, correcting faults and ensuring the casting inspection activities are carried out to the required specification.

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

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. use the correct control program and ensure it is correctly loaded into the machine controller
3. follow the correct procedures to call up the program, deal with any error messages or faults and confirm program integrity
4. load and set-up all associated equipment
5. adjust the equipment and program operating parameters to optimise the test outcomes
6. carry out the inspection activities in accordance with approved procedures
7. deal promptly and effectively with problems within your control and report those that cannot be solved
8. ensure that work records are completed, stored securely and available to others, as per organisational requirements
9. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. the methods and procedures used to minimise the chances of infecting a computer with a virus
6. the potential impact of the computer you are using does become infected with a virus and who to contact if it does occur
7. how to use and extract information from casting drawings and related specifications (to include symbols and conventions to current industry standards and codes of practice)
8. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
9. how to interpret CNC drawings/data and the use of workpiece zero/reference points
10. the systems of measurement used on CNC drawing/data (including absolute and incremental)
11. the computing language used in co-ordinate measuring machine programs (with regard to machine axes, positional information, machine management and auxiliary functions)
12. how to use of repetitive programs and program loops to reduce program size and inputting time
13. how to prepare part programs, using operational sequences and inspection techniques that avoid unnecessary probe movements or tool changes
14. the function keys and operating system of the machine computer control system in use
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 place the machine into the correct operating mode and how to access the program edit facility, in order to enter inspection probe data (probe datums, positions, lengths, offsets and radius compensation)

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- how to load, execute, edit and exit programs correctly
17. how to set machine datums for each of the machine axis being used, the importance of correct datum setting and potential impact of incorrect setting
 18. how to deal with error messages and faults on the program or co-ordinate measuring machine equipment
 19. how to conduct trial runs (using single block run, dry run and override controls)
 20. the items to check before allowing the machine to operate in full program run mode
 21. how environmental conditions in the inspection area could interfere with the inspection measurements (temperature, humidity, airborne particles) and if you need to avoid this
 22. how to conduct the casting inspection activities, and how to compare results achieved against the component specification
 23. the typical problems that occur with the inspection activities and what to do if they occur
 24. what you need to do with castings that fail the inspection criteria and how to inform others of the problems identified
 25. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
 26. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1. Conduct inspections, carrying out all of the following checks
 1. all equipment is correctly connected and is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed)
 2. the correct operating program is obtained and checked for currency and validity
 3. ensure that you have the necessary inspection data and information
 4. the machine controller is prepared ready to accept the operating program
 5. the program is loaded safely and correctly into the controller
 6. program media is stored safely and correctly
 7. all inspection documentation is completed accurately and passed on to the appropriate personnel
2. Locate the workpiece in a suitable position, using two of the following:
 1. direct mounting to machine table
 2. mounting on parallels
 3. mounting on angle plates
 4. mounting on vee blocks
 5. mounting in special jigs
 6. other mounting methods
3. select and mount suitable inspection probes, to include carrying out all of the following:
 1. external mounting
 2. internal mounting
 3. calibrating the probe
 4. updating inspection programs after calibration
4. Confirm the machine and inspection programme operates safely and correctly, by checking all of the following:
 1. datums for each machine axis are set in relation to all equipment and probes used
 2. probe information is correctly entered into the machine controller
 3. where appropriate, probe change positions are safe and clear

of the workpiece

4. the correct probes are selected at the appropriate points in the program
 5. probe inspection paths are executed safely and correctly
 6. all inspection operations are carried out to the programme co-ordinates
 7. any alterations to programs are communicated fully to the appropriate personnel
5. Inspect castings that have a range of different features and cover six of the following:
1. diameters
 2. threads
 3. recesses
 4. internal diameters/bores
 5. eccentric features
 6. holes or slots on linear/angular pitch
 7. tapered bores
 8. internal profiles/forms/surfaces
 9. holes or slots on pitched circles
 10. shoulders and steps
 11. external profiles/forms/surfaces
 12. counterbored/countersunk holes
 13. linear dimensions (lengths)
 14. grooves, undercuts
 15. special forms (such as gear, spline, serrations)
 16. depths
6. Inspect castings with three of the following geometric features:
1. flatness
 2. position/location
 3. parallelism
 4. alignment
 5. orientation
 6. geometry
 7. squareness
 8. concentricity
 9. ovality/lobbing
7. Carry out the inspection activities, to include all of the following:
1. running the inspection programme safely and correctly
 2. producing a metrological printout for the component
 3. determining and highlighting any out-of-tolerance dimensions

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4. isolating any castings that have failed to meet the inspection criteria and who you should inform
 8. Complete the inspection activity, carrying out all of the following:
 1. shut down inspection equipment
 2. return all tools and equipment to their correct locations
 3. hand over inspected castings to the next process
 4. complete the required inspection documentation/records accurately and store safely
 5. leave the work area in a safe and appropriate condition on completion of the inspection activities

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