
Overview

This standard identifies the competences you need to inspect components using co-ordinate measuring machines (CMM), in accordance with approved procedures.

You will be required to prepare the equipment in readiness for the inspection operations. This will involve obtaining and using the correct issue of drawings, job instructions and quality control/inspection documentation including, where appropriate, obtaining the correct measuring program. You will be expected to set up the co-ordinate measuring machine, to position and secure the component/product in a suitable location, and to select and mount the correct inspection probes.

In carrying out the inspection activities, you will be expected to check the components/product for both dimensional and geometrical accuracy, and this may be required to be undertaken at various stages of the engineering/manufacturing process, such as first off inspection, during production and final inspection. Components to be inspected could include machined components, pressings, mouldings, extrusions, castings, forgings, patterns, models, assemblies and sub- assemblies.

Your responsibilities will require you to comply with organisational policy and procedures for using the co-ordinate measuring machines and for checking the components. You will need to report any problems with the inspection process that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to ensure that all tools and equipment used to inspect the components are returned to the correct location on completion of the activities. You will be also expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will provide an informed approach to applying appropriate co-ordinate measuring machine inspection techniques and procedures. You will understand how to use the co-ordinate measuring machines and associated equipment, in adequate depth to provide a sound basis for carrying out the inspection activities and for identifying where features of the products do not meet the required specification tolerances.

You will understand the safety precautions required when carrying out the inspection activities. 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:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 follow the specification for the product or equipment being inspected
- P3 use the correct equipment to carry out the inspection
- P4 identify and confirm the inspection checks to be made and acceptance criteria to be used
- P5 carry out all required inspections as specified
- P6 identify any defects or variations from the specification
- P7 complete and store all relevant documentation in accordance with organisational requirements
- P8 deal with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

- K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- K2 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy
- K3 how and where to obtain the required drawings and/or machine measuring program and related specifications
- K4 how to extract information from engineering drawings and or co-ordinate measuring machine programs and related specifications in relation to the inspection work being undertaken
- K5 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K6 the preparations to be undertaken before the component/product is inspected
- K7 the basic principle of operation of the co-ordinate measuring machine being used
- K8 the functions of the various controls on the co-ordinate measuring machine being used
- K9 the application of the different types of inspection probe that are available
- K10 the importance of ensuring that the equipment is set up correctly, and is in a safe and useable condition
- K11 the systems of measurement that are used on the co-ordinate measuring machine
- K12 how to ensure that inspection probes are correctly calibrated before undertaking inspection activities
- K13 how to deal with equipment and/or program error messages
- K14 the need to select and use set datum points, and the effects of taking readings

from different datums

K15 the procedure to be followed when inspected products are out of specification

K16 the importance of completing inspection documentation

K17 what needs to be recorded, and where records are kept

K18 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

1. Carry out all of the following during the inspecting activities:
 - 1.1 obtain and use the correct issue of drawings, job instructions and quality control/inspection documentation
 - 1.2 follow specified and appropriate inspection procedures
 - 1.3 identify and record any out-of-tolerance dimensions/features, in the appropriate format
 - 1.4 place products (in and out of specification) in the correct location on completion of the inspection activities
 - 1.5 shut down the equipment, using the correct procedure
 - 1.6 resolve any issues as they occur, within your level of responsibility
 - 1.7 leave the work area in a safe and tidy condition on completion of the inspection activities
2. Use one of the following types of manual and/or CNC co-ordinate measuring machines:
 - 2.1 vertical
 - 2.2 gantry/bridge
 - 2.3 horizontal
 - 2.4 other specific type
3. Inspect one of the following types of engineering component/equipment:
 - 3.1 machined components
 - 3.2 castings
 - 3.3 patterns
 - 3.4 forgings
 - 3.5 models
 - 3.6 mechanical assemblies/sub-assemblies
 - 3.7 pressings
 - 3.8 extrusions
 - 3.9 mouldings
 - 3.10 other specific components/products
4. Mount the workpiece in a suitable position, using one of the following:
 - 4.1 direct to the machine table
 - 4.2 on parallels
 - 4.3 on angle plates
 - 4.4 on vee blocks
 - 4.5 in special jigs
 - 4.6 other mounting methods
5. Carry out one of the following inspection procedures:
 - 5.1 first/one-off
 - 5.2 in-process sample inspection
 - 5.3 one-hundred-percent final inspection of components or products
 - 5.4 statistical quality control
6. Check all of the following, as applicable to the machine type:
 - 6.1 check that datums for each machine axis are set in relation to equipment,

components and probes selected

6.2 where applicable, download the measuring program into the controller, safely and correctly

6.3 select and mount suitable inspection probes for the different features to be checked

6.4 calibrate the inspection probe (where applicable)

6.5 enter the probe information correctly into the machine controller/measuring system

6.6 ensure that probe changes are carried out safely and clear from obstructions

6.7 check that all inspection operations and probe movements are executed safely and correctly

6.8 ensure that any alterations to measuring programs are communicated fully to the appropriate personnel (where applicable)

7. Inspect components/products that have a range of features, including six of the following:

7.1 diameters

7.2 threads

7.3 recesses

7.4 internal diameters/bores

7.5 eccentric features

7.6 slots

7.7 tapered diameters

7.8 angular faces

7.9 holes or slots on linear/angular pitch

7.10 tapered bores

7.11 internal profiles/forms/surfaces

7.12 holes or slots on pitch circles

7.13 shoulders and steps

7.14 external profiles/forms/surfaces

7.15 counterbored/countersunk holes

7.16 linear dimensions (lengths)

7.17 grooves/undercuts

7.18 special forms (such as gear, spline, serrations)

7.19 depths

8. Check four of the following geometric features:

8.1 flatness

8.2 position/location

8.3 parallelism

8.4 alignment

8.5 orientation

8.6 geometry

8.7 squareness

8.8 concentricity

8.9 surface finish

8.10 ovality/lobbing

9. Complete the inspection documentation, to include one from the following, and

pass to the appropriate people:

- 9.1 inspection report
- 9.2 job card
- 9.3 customer specific documentation

SEMTS209

Checking components using co-ordinate measuring machines (CMM)



Developed by	Enginuity
Version Number	3
Date Approved	31 Mar 2026
Indicative Review Date	01 Apr 2029
Validity	Current
Status	Original
Originating Organisation	Enginuity
Original URN	SEMTS2-09
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies
Suite	Engineering Technical Support Suite 2
Keywords	Engineering; technical support; checking components; co-ordinate measuring machines (CMM); quality control; inspection; measuring programme; inspection probes; first off inspection; final inspection
