

Checking mechanical components and assemblies

Overview

This standard identifies the competences you need to carry out dimensional and visual checks of mechanical components and assemblies, in accordance with approved procedures. You will be required to obtain all relevant and current documentation, and to obtain the necessary tools and equipment. This will involve selecting the appropriate inspection equipment, based on the features to be checked and the accuracy to be measured.

You must ensure that the inspection equipment to be used is within current test/calibration dates. In carrying out the inspection activities, you will be expected to check the components for visual defects, and dimensional and geometrical accuracy. This may be required to be undertaken at various stages of manufacture, such as random sampling during production, pre-assembly, intermediate and final assembly. Components to be inspected will include machined components, pressings, mouldings, castings, forgings, assemblies and sub-assemblies, treated and coated components.

Your responsibilities will require you to comply with organisational policy and procedures for the checking activities undertaken, and to report any problems with the product, or activities 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 mechanical product are returned to the correct location on completion of the activities. You will be 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 inspection techniques and procedures to mechanical components and products. You will understand how to use the tools and equipment required for inspecting the products, 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.

Checking mechanical components and assemblies

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. follow the correct specification for the product or equipment being inspected
3. use the correct equipment to carry out the inspection
4. identify and confirm the inspection checks to be made and acceptance criteria to be used
5. carry out all required inspections as specified
6. identify any defects or variations from the specification
7. record the results of the inspection in the appropriate format
8. deal promptly and effectively with problems within your control and report those that cannot be solved

Checking mechanical components and assemblies

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken when inspecting mechanical components (such as specific legislation or regulations governing the activities or work area, safe working practices and procedures to be adopted, general workshop safety practice)
2. the health and safety requirements of the work area in which you are carrying out the inspection activities, and the responsibility these requirements place on you
3. COSHH regulations with regard to the substances used in the inspection process
4. the hazards associated with inspecting mechanical products, and how they can be minimised
5. the appropriate personal protective equipment (PPE) and clothing to be worn during the inspection activities
6. how and where to obtain the required job instructions, drawings and quality control/inspection documentation
7. how to extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
8. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
9. the general principles of quality assurance systems and procedures
10. preparations to be undertaken before the product is inspected
11. the visual and dimensional inspection methods and techniques that are used for mechanical components and assemblies
12. the need to select and use set datum faces, and the effects of taking readings from different datums (such as accumulation of limits leading to errors)
13. the equipment that is used to carry out the various inspection checks (such as rules and tapes, micrometers, Verniers, gauges, special measuring equipment)
14. the need to check that the equipment is approved for the inspection activities undertaken (including calibration checks and current certification dates)
15. how to determine the correct equipment for the feature to be inspected, taking into account tolerances to be achieved
16. the importance of ensuring that tools and equipment are set up correctly and are in a safe and useable condition
17. the typical defects and variations that can be found on mechanical products, and how to identify them
18. the procedure to be followed when inspected products are out of specification

Checking mechanical components and assemblies

19. the importance of completing inspection documentation; what needs to be recorded, and where records are kept

20.

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 inspection process:

1. obtain and use the correct issue of drawings, job instructions and specifications
2. obtain and check the condition and calibration dates of tools, measuring instruments and equipment to be used
3. follow specified or appropriate inspection procedures
4. use the correct and appropriate tools and equipment at all times
5. identify and record out-of-specification features, in the appropriate format
6. place products (both in and out of specification) in the correct location on completion of the inspection activities
7. resolve any problems as they occur, within your level of responsibility
8. leave the work area in a safe and tidy condition on completion of the activities

2. Inspect **one** of the following types of mechanical product:

1. machined components
2. castings
3. extrusions
4. mechanical assemblies/sub-assemblies
5. forgings
6. patterns
7. pressings
8. overhauled products
9. models
10. mouldings
11. treated/coated components
12. other specific mechanical product

3. Carry out **one** of the following inspection procedures:

1. first/one-off
2. one-hundred-percent final inspection of components or products
3. in-process sample/patrol inspection
4. random/selective sampling of finished components or product
5. statistical quality control

Checking mechanical components and assemblies

4. Inspect mechanical products, using **six** of the following:
 1. micrometers
 2. gauges for external diameters
 3. profile gauges
 4. Verniers
 5. gauges for lengths or depths
 6. surface texture comparison plates or measuring equipment
 7. rules or tapes
 8. hole/bore gauges
 9. dial test indicators
 10. taper/angle gauges
 11. torque wrench
 12. engineer's square
 13. thread gauges
 14. hardness testing equipment
 15. straight edge
 16. gap gauges
 17. protractors
 18. other specific equipment
5. Use the relevant equipment to measure and check **six** of the following features:
 1. external diameters
 2. thread fit
 3. fit/working clearance
 4. internal diameters
 5. thread form/profile
 6. bonding strength
 7. length/linear dimensions
 8. profiles/forms
 9. coating thickness
 10. depth
 11. angles
 12. torque
 13. internal tapers
 14. chamfers and radii
 15. security of fasteners/connections
 16. external tapers
6. Use appropriate equipment to check **four** of the following geometric features:
 1. flatness
 2. position/location
 3. verticality
 4. alignment

Checking mechanical components and assemblies

5. orientation
6. parallelism
7. squareness
8. concentricity
9. geometry
10. ovality/lobing
11. eccentricity
12. distortion
13. straightness
14. level
15. surface finish

7. Complete inspection documentation, to include **one** from the following, and pass it to the appropriate people:

1. inspection report
2. job card
- 3.

customer specific documentation

Checking mechanical components and assemblies

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	SEMTS2-08
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies
Suite	Engineering Technical Support Suite 2
Keywords	Engineering; technical support; checking mechanical components; checking assemblies; dimensional checks; visual checks; approved procedures; documentation; inspection equipment; inspection activities