SEMMME3144

Carrying out quality control of spring making activities

Overview

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This standard identifies the competences you need to carry out quality control checks of spring making activities, in accordance with approved procedures. You will be required to obtain all relevant and current documentation, and to select the appropriate inspection equipment, based on the features to be checked and the accuracy to be measured. This will involve checking that the appropriate equipment is within current test dates and, where necessary, setting up and calibrating the equipment ready for the inspection operations to be performed. In carrying out the inspection activities, you will be expected to check the springs for dimensional and geometrical accuracy, load and rate. This may be required to be undertaken at various stages of manufacture, such as random or batch sampling during production and final inspection. The types of spring will include compression, extension, torsion, wire forms, strip and flat springs.

Your responsibilities will require you to comply with organisational policy and procedures for the quality control activities being carried out, and to report any problems with the product 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 check inspect the springs are returned to the correct location on completion of the activities. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the 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 inspection techniques and procedures to springs and wire forms including, where appropriate, to British, European and International standards. You will understand how to use the tools and equipment used to inspect the springs, in adequate depth to provide a sound basis for carrying out the inspection activities and for identifying where features of the springs do not meet the required specification tolerances.

You will understand the safety precautions required when carrying out the inspection

activities, and when using the 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.

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. 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

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. the hazards associated with carrying out quality control checks on springs, and how to minimise them and reduce any risks
3. the appropriate personal protective equipment (PPE) and clothing to be worn during the quality control activities
4. how and where to obtain the required drawings and related specifications, and how to check that they are current and complete
5. how to extract information from engineering drawings 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, workpiece reference points and system of tolerancing
7. the use of relevant standards in determining if components and products are fit for purpose
8. the general principles of quality assurance systems and procedures
9. preparations to be undertaken before the product is inspected
10. the effects that the environment may have on the measurements taken
11. the need to select and use set datum faces, and the effects of taking readings from different datums
12. the application and uses of the tools and equipment used to inspect spring and wire products
13. how to determine the correct equipment for the feature to be inspected, taking into account tolerances to be achieved
14. the importance of ensuring that tools and equipment are set up correctly and are in a safe and useable condition
15. the procedure and methods used to check that tools and equipment are within calibration date
16. why sampling is used, and when it is an effective means of quality assurance

17. the typical defects and variations that can be found on springs and wire products, and how to identify them
18. the need to carry out the checks and record the results on the appropriate documentation
19. the procedure to be followed when inspected products are out of specification
20. the importance of completing quality control documentation; what needs to be recorded and where records are kept
21. 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. Carry out all of the following during the spring quality control activities:
   1.1 obtain and interpret correctly the documentation for the type of spring being checked
   1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations
   1.3 obtain the tools, measuring instruments and equipment to be used, and check the condition and calibration dates
   1.4 carry out the quality control activities, following good practice/approved inspection procedures
   1.5 identify, and record in the appropriate format, any out-of-specification features
   1.6 investigate and, where appropriate, obtain a concession for out-of-specification springs
   1.7 place the springs in the correct location on completion of the inspection activities (in and out of specification)
   1.8 return all tools and equipment to the correct location on completion of the quality control activities
   1.9 leave the work area in a safe and tidy condition on completion of the quality control activities
2. Carry out quality control activities on four of the following types of spring:
   2.1 open ended right-hand helix
   2.2 barrel
   2.3 single torsion
   2.4 open ended left-hand helix
   2.5 garter springs
   2.6 double torsion
   2.7 variable pitch
   2.8 closed end right-hand helix
   2.9 volute
   2.10 conical
   2.11 closed end left-hand helix
   2.12 flat/strip springs
   2.13 hourglass
   2.14 watch/power
   2.15 extension spring
   2.16 tension spring
   2.17 other specific wire forms
3. Carry out quality control activities on materials prior to making the springs, to

include all of the following:

3.1 checking that materials comply to works order/route card
3.2 checking that materials comply with spring specification requirements
3.3 checking the dimensional accuracy of materials
3.4 checking the surface condition of materials (such as free from contaminants and surface scale)
3.5 checking the condition of material and its suitability to coiling/forming (such as state of hardness/tempering)

4. Carry out two of the following quality control procedures:

4.1 first/one-off
4.2 one-hundred-percent final inspection of components or products
4.3 in-process sample/patrol inspection
4.4 random/selective sampling of finished components or product
4.5 statistical process control (SPC) or product

5. Inspect springs, using six of the following:

5.1 rule or tape
5.2 straight edge
5.3 dial test indicator
5.4 external micrometer
5.5 engineers' square
5.6 radius/profile gauges
5.7 length vernier
5.8 slip gauge
5.9 height vernier
5.10 protractors
5.11 other specific test equipment

Plus one more from the following:

12. jigs/fixtures (such as mechanical, pneumatic)
13. electronic gauging methods
14. optical equipment (such as shadowgraphs, microscopes)
15. hardness testing equipment (such as diamond pyramid indenter, ball impression testing)
16. spring load and rate testing equipment

1. Use the relevant equipment to measure and check six of the following spring features:

1.1 number of coils
1.2 coil pitch
1.3 material/wire gauge
1.4 length of leg extension
1.5 external diameters
1.6 size and shape of hook/eye
1.7 internal diameters
1.8 physical properties (such as hardness)

1.9 free length/linear dimensions
1.10 holes (such as size and position)
1.11 leg angles/tapers
1.12 slots (such as width, length, position,
1.13 form/profile
1.14 bends (such as position, length, angle)
1.15 spring load and rate

2. Use appropriate equipment to check four of the following geometric features:
2.1 flatness
2.2 parallelism
2.3 geometry
2.4 alignment
2.5 position/location
2.6 distortion
2.7 squareness
2.8 orientation
2.9 surface finish
2.10 straightness

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Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2023
Indicative Review Date	31 Mar 2028
Validity	Current
Status	Original
Originating Organisation	Enginuity
Original URN	SEMMME3144
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Mechanical Manufacturing Engineering Suite 3
Keywords	mechanical engineering; spring making; quality control; first off; one-off; in-process sample; batch; patrol inspection; random sampling; selective sampling; 100% final inspection; statistical process control; SPC