

SEMET11

Producing mould, press tool or die components by manual machining



Overview

This unit identifies the competences you need to produce mould, press tool or die components by manual machining, in accordance with approved procedures. The machining activities carried out will include milling, turning, grinding, shaping/slotting, drilling, boring and spark or wire erosion, as applicable to the components being produced. You will be expected to produce new components or to modify existing ones, requiring you to use a wide range of different machines, and this will involve setting up the workholding arrangements, workpiece and machine tooling. The components produced will have a combination of features such as diameters, lengths, threads, flat faces, square faces, slots, profiles/special forms.

Your responsibilities will require you to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the activities, materials or equipment used 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 demonstrate a good understanding of your work, and will provide an informed approach to applying appropriate machining techniques and procedures for the production of mould, press tool or die components. You will understand the machining processes used, and their application, and will know about the tooling and ancillary equipment, materials and consumables, in adequate depth to provide a sound basis for carrying out the machining activities, correcting faults and ensuring that completed components are to the required specification.

You will understand the safety precautions required when working with the machines and their associated tools and equipment, especially those for isolating the machine during tool mounting and setting, and when handling cutting tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

SEMET11

Producing mould, press tool or die components by manual machining

Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
 - P2 confirm that the machine is set up and ready for the machining activities to be carried out
 - P3 manipulate the machine tool controls safely and correctly in line with operational procedures
 - P4 produce components to the required quality and within the specified dimensional accuracy
 - P5 carry out quality sampling checks at suitable intervals
 - P6 deal promptly and effectively with problems within your control and report those that cannot be solved
 - P7 shut down the equipment to a safe condition on conclusion of the machining activities

SEMET11

Producing mould, press tool or die components by manual machining

Knowledge and understanding

You need to know and understand:

- K1 the health and safety requirements of the area in which you are carrying out the machining activities
- K2 the safe working practices and procedures to be followed whilst operating machinery and carrying out the machining activities
- K3 the hazards associated with carrying out machining activities, and how they can be minimised
- K4 the importance of wearing protective clothing and equipment, and of keeping the work area safe and tidy
- K5 how to operate all the machine controls in both hand and power modes, and how to stop the machine in the case of an emergency
- K6 the safety mechanisms on the machine, and the procedure for checking that they are operating correctly
- K7 the procedure for obtaining the required drawings, sketch, development sheets job instructions and other related specifications
- K8 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate bs or iso standards) in relation to work undertaken
- K9 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing.
- K10 the basic concepts of material removal using machines (such as lathes, milling, grinding, drilling, shaping, slotting and electro-discharge machining)
- K11 the various machining techniques that can be used to produce the required shapes, and the types of tooling and cutters required (such as high speed steel tools, solid carbide tools and interchangeable tipped tooling)
- K12 types and applications of grinding wheels, methods of mounting, and why some wheels require balancing
- K13 types and application of electrodes, wires and tapes used in spark and wire erosion activities
- K14 the methods that can be used to position the workpiece in relation to the cutting tools
- K15 the effects of backlash in the machine slides, and how this can be overcome
- K16 how to handle and store cutters, grinding wheels and tools, safely and correctly
- K17 factors which effect the selection of cutting feeds and speeds, the application of roughing and finishing cuts and the depth of cut that can be taken (such as workpiece rigidity, machine condition, type of tooling being used, material type, finish and tolerance required)

SEMET11

Producing mould, press tool or die components by manual machining

- K18 how the various types of materials will affect the feeds and speeds that can be used
- K19 the application of cutting fluids and dielectrics for a range of different materials
- K20 the effects of clamping the workpiece, and how material removal can cause warping/distortion in the finished workpiece
- K21 the quality control procedures used, inspection checks to be carried out, and the equipment to be used for these
- K22 how to check that the inspection equipment is within current calibration requirements
- K23 how to use and read measuring instruments used in tool and die component manufacture
- K24 the problems that can occur with the machining activities, and how these can be overcome
- K25 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

SEMET11

Producing mould, press tool or die components by manual machining

Additional Information

Scope/range related to performance criteria

You must be able to:

1. Carry out **all** of the following during the machining activities:
 - 1.1. use the correct issue of drawings, specifications and quality documentation
 - 1.2. check that machines used are in a safe and usable condition
 - 1.3. check that cutting tools and equipment are in a serviceable condition
 - 1.4. ensure that workpieces are held securely without distortion
 - 1.5. apply safe and appropriate machining techniques at all times
 - 1.6. use correctly adjusted machine guards and safety devices
 - 1.7. ensure that components produced meet the required specification

2. Machine the mould, press tool and die components, to include **both** of the following:
 - 2.1. modifying/repairing existing components
 - 2.2. producing new components

3. Produce machined components using **three** of the following machining processes:
 - 3.1. turning
 - 3.2. drilling
 - 3.3. band sawing
 - 3.4. milling
 - 3.5. spark erosion
 - 3.6. wire erosion
 - 3.7. grinding
 - 3.8. shaping or slotting

4. Use a range of workholding devices, to include **five** of the following:
 - 4.1. 3-jaw chucks
 - 4.2. 4-jaw chucks
 - 4.3. plain vice
 - 4.4. swivel/universal vice
 - 4.5. vee blocks
 - 4.6. clamping arrangements
 - 4.7. angle plates

SEMET11

Producing mould, press tool or die components by manual machining

- 4.8. magnetic plates
 - 4.9. indexing devices
 - 4.10. face plates
 - 4.11. special fixtures
 - 4.12. collet chucks
 - 4.13. catch plate and centres
5. Produce mould, press tool or die components which cover **eight** of the following features:
- 5.1. external diameters
 - 5.2. internal diameters
 - 5.3. lengths/depths
 - 5.4. flat faces
 - 5.5. parallel faces
 - 5.6. steps/shoulders
 - 5.7. internal threads
 - 5.8. external threads
 - 5.9. circular/curved/radial profiles
 - 5.10. faces that are square to each other
 - 5.11. angular/tapered surfaces
 - 5.12. slots/recesses
 - 5.13. through holes
 - 5.14. blind holes
 - 5.15. bored or reamed holes
 - 5.16. concave or convex forms
 - 5.17. special forms
6. Produce components within **all** of the following standards, as applicable to the machining operations chosen:
- 6.1. components to be free from false tool cuts, burrs and sharp edges
 - 6.2. dimensional tolerance equivalent to BS 4500 or BS 1916 Grade 9
 - 6.3. flatness and squareness 0.001" per inch or 0.025mm per 25mm
 - 6.4. surface finish 63 μin or 1.6 μm
 - 6.5. reamed and bored holes within H8
 - 6.6. screw threads BS medium fit
 - 6.7. tapers/angles within +/- 0.5 degree
7. Machine **three** different types of material from:
- 7.1. low carbon steel
 - 7.2. high carbon steel
 - 7.3. stainless steel
 - 7.4. cast iron
 - 7.5. silver steel
 - 7.6. aluminium alloys

SEMET11

Producing mould, press tool or die components by manual machining

- 7.7. brass
 - 7.8. bronze
 - 7.9. tool or die steel
 - 7.10. hardened steels
 - 7.11. special steels or alloys
 - 7.12. composite
 - 7.13. plastic/synthetic
8. Carry out the necessary checks, during manufacture, for accuracy of **eight** of the following:
- 8.1. external diameters
 - 8.2. internal diameters
 - 8.3. linear dimensions
 - 8.4. depths
 - 8.5. taper or angles
 - 8.6. flatness
 - 8.7. squareness
 - 8.8. concentricity
 - 8.9. thread size and fit
 - 8.10. hole size/fit
 - 8.11. profile
 - 8.12. quality of surface finish
9. Use **four** of the following instruments to check that components meet the specification:
- 9.1. external micrometers
 - 9.2. internal micrometers
 - 9.3. vernier callipers/gauges
 - 9.4. optical equipment
 - 9.5. slip gauges
 - 9.6. bore/hole gauges
 - 9.7. profile checking devices
 - 9.8. dial test indicators (DTI)
 - 9.9. surface texture comparison/measuring equipment
 - 9.10. co-ordinate measuring machines

SEMET11

Producing mould, press tool or die components by manual machining

Developed by SEMTA

Version number 1

Date approved January 2005

Indicative review date December 2012

Validity Current

Status Original

Originating organisation SEMTA

Original URN 045NET11

Relevant occupations Metal Machining, Fitting and instrument making trades

Suite Engineering Toolmaking Level 3

Key words Engineering, toolmaking, manual, machining, moulds, press tools, dies, milling, turning, grinding