# PROMT22
# Restoring mechanical components to usable condition by repair

## Overview

This standard identifies the competences you need to restore mechanical components to usable condition by repair, in accordance with approved procedures. You will be required to restore a range of mechanical components and equipment to operational condition, by repairing assemblies/sub-assemblies and components, by reforming, reworking the surface, replacing threads or the replacement of worn parts. You will also be required to select the appropriate equipment to use, based on the nature of the repair, the operations that will need to be carried out and the accuracy to be achieved.

In producing the components, you will be expected to use a range of hand tools, machine tools, portable power tools, and shaping and fitting techniques, that are appropriate to the type of material and repair being performed. These activities will include such things as sawing (hand, band), drilling, reaming, grinding (hand or machine), filing, scrapping or lapping, threading (internal or external), turning, milling, and thermal processes. Materials to be used will include ferrous, non-ferrous, non-metallic and composites, which may be in sheet form, bar sections (such as square/rectangular, round, angle), and part-machined components.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment. You will also understand your responsibilities for safety and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

Your responsibilities will require you to comply with organisational policy and procedures for the repairing activities undertaken, and to report any problems with these activities or with the tools, equipment or materials used, that you cannot personally resolve or that are outside your permitted authority, to the relevant people. You will be expected to work with minimal 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 applying component repair procedures. You will understand the function and operating conditions of the components being repaired, in sufficient depth to determine a suitable repair sequence and to ensure that the repairs carried out are safe and practical in operation. You will also understand the organisational policy on repairing components, and its application.

# PROMT22

## Restoring mechanical components to usable condition by repair

### 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 | Follow the relevant specifications for the component to be repaired |
| P3 | Prepare the component for repair |
| P4 | Carry out the repairs within agreed timescale using approved materials and components and methods and procedures |
| P5 | Ensure that the repaired component meets the specified operating conditions |
| P6 | Produce accurate and complete records of all repair work carried out |

# PROMT22

## Restoring mechanical components to usable condition by repair

### Knowledge and understanding

*You need to know and understand:*

| | |
|---|---|
| K1 | The health and safety requirements of the area in which the repairing activity is to take place, and the responsibility these requirements place on you |
| K2 | The isolation procedures or permit-to-work procedure that applies |
| K3 | The specific health and safety precautions needed to be applied during the repairing procedure, and their effects on others |
| K4 | The importance of wearing protective clothing and other appropriate safety equipment during maintenance activities |
| K5 | The hazards associated with the repair/restoration operations being carried out (such as sawing (hand, band), drilling, reaming, grinding (hand or machine), filing, scrapping or lapping, threading *(*internal or external*)*, turning, milling and thermal processes), and how to minimise these and reduce any risks |
| K6 | Where to obtain, and how to interpret drawings, specifications, manufacturers' manuals, maintenance schedules and other relevant documents |
| K7 | The methods, techniques and company procedures to be followed for repairing mechanical equipment |
| K8 | The types of repairs that can be made to components in order to prolong their useful life (such as bushing worn holes, fitting thread inserts, building up surfaces by thermal process or metal spraying, making stepped keys, cutting new keyways, making stepped/oversize dowels or studs) |
| K9 | The factors to be taken into account when deciding if a repair is practical and possible (such as is a replacement component available, cost of replacing, safety of repair, age and condition of equipment) |
| K10 | The need to liaise with other departments in order to have specialised operations carried out on the components (such as thermal processes, metal spraying) |
| K11 | How to use filing, scraping and lapping to achieve the required surface finish (such as various types of files/scrapers, checking that file/scraper handles are in good condition, the range of lapping mediums) |
| K12 | How to cut internal and external threads (such as using hand dies and taps, machine cutting) |
| K13 | How to produce a sliding or mating fit, and the techniques to be adopted |
| K14 | How to select saw blades for different materials and different operations |
| K15 | The types and application of portable power tools that can be used for the fitting operations |
| K16 | How to check that portable power tools and extension cables are in a safe usable condition |
| K17 | How to use hand power tools and specialist equipment correctly (such |

## Knowledge and Understanding

| | |
|---|---|
| | as electrical, pneumatic, lifting equipment) |
| K18 | The operating requirements of the machine tools and accessories being used (such as guards, workholding devices, taper turning attachments, steadies, dividing heads, specific statutory regulations such as Abrasive Wheels Regulations) |
| K19 | The various shapes and types of tooling that can be used (such as solid high-speed tooling, brazed tip tooling, interchangeable tipped tooling) |
| K20 | How to handle and store tools and equipment safely and correctly |
| K21 | Factors which affect the selection of cutting feeds and speeds, 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) |
| K22 | The application of cutting fluids with regard to a range of different materials and processes |
| K23 | The techniques and implications of clamping of a workpiece in a chuck/work holding device (such as safely secured for the process, causing distortion in the finished components) |
| K24 | How to recognise machining faults, and how to identify when tools need re-sharpening/dressing |
| K25 | The operating requirements of the thermal processes and accessories being used (such as any statutory regulations and quality standards to be observed, guards, workholding devices, fume extraction, gas storage) |
| K26 | The methods that can be used to position the workpiece in relation to the cutting tools |
| K27 | The effects of backlash in the machine slides and how this can be overcome |
| K28 | The company recording procedures to be used following repair, and how to apply them |
| K29 | The problems associated with repair, and how to resolve them |
| K30 | The extent of your own authority and to whom you should report if you have problems that you cannot resolve |

# PROMT22

## Restoring mechanical components to usable condition by repair

### Scope related to performance criteria

**1 Carry out all of the following activities during the maintenance activity**

1.1 plan the repair activities to cause minimal disruption to normal working
1.2 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.3 ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids)
1.4 provide and maintain safe access and working arrangements for the maintenance area
1.5 carry out the repair activities using appropriate techniques and procedures
1.6 record the repair using appropriate methods or documentation
1.7 dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition

**2 Use appropriate techniques to carry out six of the following types of repair**

2.1 reforming component surface by adding metal
2.2 recondition unit by replacement of worn components
2.3 rework surface finish (using techniques such as filing, scraping, grinding)
2.4 sleeving worn components
2.5 making stepped dowels or studs
2.6 cutting new keyways
2.7 make temporary fix
2.8 bushing worn holes
2.9 replacement of internal thread (inserts)
2.10 rework fit (shimming)
2.11 making new or stepped keys
2.12 replacing damaged or missing gear teeth
2.13 plugging holes
2.14 stopping cracks running and filling them
2.15 other specific repair procedures

**3 Use a range of methods and techniques to repair components, to include six of the following**

3.1 sawing (hand, band)
3.2 drilling
3.3 reaming
3.4 grinding (hand or machine)
3.5 filing
3.6 scrapping or lapping

## Scope related to performance criteria

| | |
|---|---|
| 3.7 | threading external |
| 3.8 | threading internal |
| 3.9 | turning |
| 3.10 | milling |
| 3.11 | thermal processes (such as brazing, welding, metal spraying) |
| **4** | **Repair components made from different types of material, to include two from the following** |
| 4.1 | low carbon steel |
| 4.2 | high carbon steel |
| 4.3 | cast iron |
| 4.4 | aluminium |
| 4.5 | brass/bronze |
| 4.6 | stainless steel plastic/synthetic |
| 4.7 | composite |
| **5** | **Carry out repairs to mechanical equipment which complies with one of the following** |
| 5.1 | organisational guidelines and codes of practice |
| 5.2 | equipment manufacturer's operation range |
| 5.3 | BS, ISO and/or BSEN standards |

# PROMT22

## Restoring mechanical components to usable condition by repair

| | |
|---|---|
| **Developed by** | Proskills |
| **Version number** | 1 |
| **Date approved** | June 2009 |
| **Indicative review date** | June 2013 |
| **Validity** | Current |
| **Status** | Imported |
| **Originating organisation** | SEMTA |
| **Original URN** | EM7 |
| **Relevant occupations** | Coal Mining Operatives; Managers in Mining; Quarry workers and related operatives |
| **Suite** | Mines Technical Operations |
| **Key words** | mines; technicians; technical; operations; mining; electrical; engineering; equipment; mechanical; maintenance |