MEM18002B
Use power tools/hand held operations

Learner guide
Version 1

Training and Education Support
Industry Skills Unit
Meadowbank

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MEM18002B Use power tools/hand held operations

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Topic 1: Portable power tools and accessories

Portable power tools

Introduction
Portable hand-held power tools are extensively used by workers in engineering and manufacturing industries. Due to their availability, design, cost and efficiency, many tasks can be completed quickly using modern hand-held power tools.

The most common power tools found in engineering workshops and construction sites include:
- Angle grinders
- Pistol drills
- Hammer drills
- Power hand shears
- Nibblers
- Saws and jig saws.

Personal protective equipment (PPE)
When using portable power tools you will need to wear a combination of the following:
- Safety glasses
- Boots or shoes, with steel cap and rubber soles
- Ear protection (plugs, muffs)
- Hair net if required
- Close fitting heavy drill cotton overalls, shirt or trousers.

Portable power tools can be operated using three types of power sources, they can be:
- Electrically operated
- Battery operated
- Pneumatically operated.

Electric powered tools are the most commonly used; however; battery operated power tools are gaining popularity, especially for pistol drills. An alternative is to use pneumatically powered tools; these can be lightweight for the user but require an air compressor to operate them.

Types of portable grinders
Three types of portable grinders used are:
- Angle grinders
- Die grinders
- Straight grinders.
Angle grinders

Hand held powered angle grinders are used to grind work where it is easier to take the grinder to the job rather than the job to the grinder. These tools are commonly used by operators to remove defects, rough edges, remove unwanted metal etc, due to their portability and ease of operation.

Unlike the larger fixed bench and pedestal grinding machines, hand held angle grinders have an adjustable guard to assist in streaming sparks and particles away from the operator and the work.

These units have a side-handle which can be located on either the left or right hand side of the machine to suit the operator’s needs. There is an extensive range of purpose designed cutting and grinding discs to suit the work and material and should only be used in accordance with the manufacturer’s specifications.

Die grinders

When selecting a die grinder it is important to consider its intended use, the attachments to be used and the amount of time that will be spent grinding down materials i.e. thickness of area. Therefore, an incorrectly used die grinder will, more than likely, wear out quickly from unnecessary overuse.

Typically this tool is used to remove metal spurs and other irregular surface conditions where a cut has been made in metal pipe or tubing. This tool can also be used to deburr, polish and/or buff the inside of cylindrical sections.

A cylindrical grinding/polishing attachment known as a grinding nose is selected by the operator for the task and fitted to the die grinder in a similar fashion to that of a drill bit.
Rotary burrs

Rotary burring (cutting) tools are used on a wide range of pneumatic and electric hand-held grinding tools. Some typical applications include:

- Fast frehand stock removal
- Weld preparation and surface removal
- Dressing metal surfaces
- Gaining access into tubes, pipes and other hollow sections
- Contouring metal profiles.

To achieve optimum performance of the tool it may be necessary to adjust the speed of rotation. For instance if the speed of rotation is below the cutting tool’s optimum speed it may cause chipping. Harder metals and extra long burrs will require slower speeds. Running the tool at excessive speed will cause tooth wear and caution should be used to avoid tools from becoming too hot.

Should the braze weld holding the head of the shank become too heated it could loosen, causing the head to detach. An operator should apply a constant light force and movement during use of the tool and replace worn collets as they can cause chipping of the workpiece.

Burring tools can be used to grind and finish many different types of metals, such as:

- Aluminium
- Brass/bronze
- Copper
- Titanium alloys
- Cast Iron
- Carbon and alloy steels
- Bronze
- Nickel and nickel alloys
- Stainless steel
- Zinc alloys.
**Straight grinder**

Straight or barrel grinders are ideal for grinding steel pipe and tube and also buffing and polishing applications. Buffing and polishing of stainless steel and aluminium is done using a combination of rag and sisal mops.

![Electric straight grinder](image)

**Abrasives consumables**

A range of abrasives consumables, such as grinding discs, cut-off wheels, sand papers and sanding discs, are commonly available as well as the products listed below:

- Resinoid-bonded cut-off wheels
- Industrial wire brushes
- Flap discs and Flap wheels
- Vitrified grinding products
- Rotary burrs
- Abrasive belts
- Polishing tools
- Sticky back discs.

![Selection of abrasives](image)

Angle grinders fitted with abrasive cut-off wheels can be used to cut bar, tube and plate. Thin cut-off wheels are designed to suit either a depressed or flush centre mounting and are generally made from carborundum, which is a compound of silicon and carbon. Typical applications for these cut-off wheels include cutting:

- Thin-walled tube
- Sheet metal items made of steel and stainless steel
- Nonferrous metals
- Composite materials.
**Resinoid-bonded cut-off wheels**

These wheels are designed for use with hand held grinding machines and are generally suitable for use with a variety of metals and cutting applications, such as steel pipe, bar and plate. They should not be used on non-ferrous metals such as aluminium and brass as soft materials will clog the disc and may cause it to overheat and shatter.

The wheels are fibreglass reinforced for strength and are required to run at cutting speeds of up to 80 m/s (metres per second). Manufacturers recommend a wheel thickness in the range of 2 - 3.2 mm for cutting and depressed centre wheels with a thickness of 4 - 10 mm for grinding.

**Abrasives cut-off wheels**

Reinforced cutting and grinding discs are generally made of corundum (aluminium oxide), have a medium to hard bond and are less brittle than vitrified wheels. They are also typically flat and are coloured black but are available in a raised hub variety. These discs can also include the following materials:

- Aluminium oxide
- Single crystal aluminium
- Green silicon carbide
- White aluminium oxide
- Zirconia aluminium
- Black silicon carbide.

**Industrial wire wheel brushes**

Specially designed wire brushes can be fitted to angle grinders. These brushes are used to clean metal surfaces prior to priming or painting.