THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Member Accreditation

Metal Turning Lathe	M2

Centre Lathe

Hafco Metalmaster AL336

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

The Shed provides items such as welding masks and gloves.

Members are required to provide their own footwear, eyewear, hearing protection and masks.

Safety

This is a very high priority for our Shed members. There are some aspects that are mandatory under our insurance policies and some which the The Shed requires members to adhere to for everyone's benefit.

The Shed Safety Induction

It is a requirement of attendance at The Shed that members have reviewed the Safety Induction Presentation

Personal Protective Equipment

This is required in various forms depending upon the equipment being used or the activity being undertaken.

Protective eyewear is always mandatory when using machinery.

The Shed schedules a Coordinator and a First Aid Safety Officer for each day of attendance and their safety directions are final and must be adhered to.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Machinery

Hafco Metalmaster AL336 Centre Lathe

Key Features of Metal Turning Lathe (also known as a Centre or Engineering Lathe)

The Metal Turning Lathe can be used to shape cylindrical, tapered, hollow, drilled, bored, reamed, flat, threaded, stepped and knurled work. With the aid of the milling attachment, it can also be used for milling operations.

Work-pieces are usually metal, however, other materials such as plastics and timber can be turned. Polishing and sanding can also be achieved, however, dust and abrasive particles must be carefully and thoroughly cleaned from the machine when finished. Never wrap abrasive paper or fabric around the work.

A pumped, coolant wash can be used during cutting to keep keen cutting edges, maintain a cool work-piece and tools, and to flush away cuttings or swarf. Some materials are better cut without a coolant but steels, especially stainless, require cutting coolant.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Installation and setup

It is important that the lathe not be moved as it has been set up accurately to within less than half a degree of incline both laterally and longitudinally. It is mounted on specially constructed adjustable feet which help prevent warping of the bed. The lathe weighs in excess of 590 kgs.

Metal Turning Lathe

The lathe has a myriad of uses and can also be used in a stationary mode to help line up other procedures such as starting a taper tap in a drilled hole or pressing bearings onto shafts.

The Metal Turning Lathe has the potential to cause serious accidents and injury due to impact with moving parts, especially the chuck jaws and the rotating work-piece. There is also a strong possibility of entanglement, eye injury and crushing if unsafe operating procedures are adopted. Injury can also be caused by flung objects such as a chuck key or swarf. Major damage can also be done to the machine if correct operational procedures are not followed. It is particularly dangerous to be distracted or leave an operating machine.

Demonstration of the thorough understanding of switching controls, especially the electrics, is essential to avoid accidents and damage to the machine. A preparedness to get hands dirty with oily, metallic, ingrained grit is necessary of operators. Persons with sensitive skin are advised to apply barrier cream and then to wipe any greasy residue off their hands before lathe operation. Gloves must not be worn.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Safety & Procedural Issues

Starting/Stopping: There are eight electrical controls to be familiar with. Check that the machine is electrically isolated before replacing chucks, making any adjustments or fitting work-pieces.

- Power to the machine is indicated by a light on the front control panel. The wall power outlet should be turned off and unplugged before making major changes to the machine.
- The clear plastic chuck safety- cover, when in the open position, isolates the motor via a micro-switch. The chuck key must be removed and the plastic cover needs to be closed to start the machine.
- The large red button on the front panel can be depressed to stop the machine and isolate the motor until the button is withdrawn. Simply pull the button out to release it. Do not forcibly rotate it as this will simply turn it in the panel and twist the wiring behind it.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Safety & Procedural Issues

- The black button on the front panel is a test button and puts the spindle into motion when depressed. The lathe stops when this button is released. This button is not the ‘’start’’ button. It could be used when checking that the work-piece is “on centre’’.
- The operative on/off switch during turning is the switching lever to the right of the carriage and it has three positions, ie forward drive, stopped and reverse. Pushing it down forwards gives forward drive ie front face of work rotating downwards. Special care must be taken to ensure the lever is not pushed too far back from the down position when stopping the machine as this can engage reverse.
- Emergency stopping can be achieved by depressing the foot stop bar (pedal). This is quicker than other means and can be done even when the operator’s hands are otherwise engaged.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Pic of cooling pump switch

Safety & Procedural Issues

The black rotating switch for turning the coolant pump on and off is on the main control panel. The pump turns off automatically if the red on/off button is turned off. Releasing the red button will turn the coolant back on if its switch has been left on. The operational lever does not turn the coolant off.

There is a micro switch under the headstock gear-train cover. This prevents operation of the machine when the cover is removed.

Never have the cutting tool in contact with the work when switching the machine on. Engaging tungsten carbide tipped cutting tools with reverse rotating work can seriously chip the cutting tip. They are designed for forward cutting. It should be noted that there is no auto stop for the saddle moving dangerously towards the chuck. This is unlike some lathes which have an adjustable micro cut-out switch. Always check gear settings and that auto feed is off before starting lathe.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Pic of chuck

Holding The Work-piece:

The work must be very securely held during turning operations. This is usually achieved by three jaw self-centring or four jaw independent chucks, or faceplates. These are all attached to the spindle via three cam lock mechanisms which in turn are locked by allen keyed cap screws. The chuck backing plate can be removed by undoing the four allen keyed cap screws holding the chuck onto to it. This is done after removal of the chuck from the spindle but is not usually necessary as both chucks have their own backing plates.

The chucks, mounted on their backing plates are removed from the spindle by first undoing the cam lock allen locking-screws and then using the cam lock key (slightly different square drive size from chuck jaw key) to turn the cam lock to its centre position. Turning the cam lock too far will tighten it again. Ensure the wooden protection board is in place over the lathe bed below the chuck before attempting to remove the chuck

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

NOTE:

- Some work may require being screwed or bolted to the face of the face plate to enable it to be turned.
- A lathe dog, in conjunction with live and tailstock centres, can be used to turn work between centres.
- Some long work may require the added support of a lathe steady which is clamped in position to support the work as it is being turned. This is for more advanced operators.

- Be prepared to support a heavy load when removing the chuck and ensure fingers do not get caught between it and the board underneath. Replacement or swapping of the chuck is achieved in reverse order and it must be tight both by cam lock and locking screws. Before fitting the chuck, mating surfaces, especially the short taper onto which the chuck tightens, must be clean and be coated with a very thin film of oil. The chuck which is not in use and the wooden protection board are kept in the left hand compartment of the lathe pedestal stand.
- Round and hexagonal, etc work can be held in the three jaw chuck, and the four jaw chuck can be used for square, octagonal, rectangular or other shaped work. Centring by adjustment of individual chuck jaws is required for the four jaw and all four jaws should be tightened.
- A tighter grip is obtained on the three jaw chuck by tightening all jaws.
- The spindle bore taper is approximately 38mm thus allowing for large diameter rod and bar to be held through the headstock.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Pic of mounted cutting tool

Cutting and shaping operations

These include use of cutting tools held in a tool-post which is mounted on top of the top-slide which in turn is mounted on the cross-slide. Roughing cuts, finishing cuts, parting (cutting- off), and knurling (impressing a ‘’grip’’ pattern on the surface) are the most common lathe cutting operations. These are used when turning parallel, tapered, faced, and bored surfaces.

- Tungsten tipped cutting tools must be clear of work and cutting tips be set up ‘’on-centre’’ before starting the machine and engaging the work with the tool. A quick change set of tool holders and tool post can be used to hold the cutting tools.
- Packing strips may be needed to align the tool tip with the centre height when using standard tool holders. A boring bar is used to hold boring tools and a special knurling tool is used to impress a grip pattern when knurling.
- Small interchangeable tungsten carbide cutting tips are held in tool holders with allen keyed screws. All fastening screws must be tight before engaging the cutting tool with the work.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Lathe Adjustment - Taper Turning

The top slide of the lathe can be adjusted to various angles for taper turning.

Always ensure the two locking nuts to hold it firm and any other holding screws or bolts, including tool holders and tool post, are tight before turning the lathe on

Cutting and shaping operations

- Cutting tools can be set up to cut towards the left (LH tools) or right (RH tools). A smooth continuous cut which provides automatic swarf curl and clearance from the work is desirable. Steady continuous hand feed assists creation of a better surface finish.
- The cutting tool angles for the tungsten tipped tools are pre-determined however operators using HSS tools should be acquainted with correct sharpening angles for the tool and make sure the tools are correctly ground. Texts showing tool angles and lathe operations are on the high bookshelf in the engineering section of the Shed.
- Drilling is most commonly done using a drill held in a Jacobs type chuck which has a taper friction grip which is achieved when it is slid firmly into the tailstock barrel.
- Mating tapered surfaces must be clean to avoid damage and locking of tapers. The drill must be tight in the chuck and is fed into the work using the tailstock hand-wheel after ensuring that the tailstock is locked to the bed with its locking lever.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Cleaning

Remove the tank top by undoing the two retaining screws. The magnet in the base of the tank is in a plastic bag to help facilitate its cleaning.

Sludge in the bottom of the tank will need cleaning out after a period of use. Replacement fluid is mixed as per the plastic bottle instructions which can be found together with a funnel in the pedestal tank compartment.

Coolant

Coolant should be used for most cutting operations on steel and stainless in particular. Brass and aluminium can be cut dry or with a small flow of coolant. The coolant is turned on with a switch on the main control panel. The flow rate is adjusted by rotating the nozzle of the supply hose. Excessive flow will cause splash onto the floor and surrounds. Any coolant in the eyes must be thoroughly washed out with running water and medical assistance sought as per msds for horto grind 60.

- Ensure the coolant hose is free to move with the carriage when it moves along the lathe bed. The coolant tramp oils should be skimmed off the coolant surface periodically. The coolant tank requires cleaning less frequently. Unhook the coolant hose from its hook behind the bed to allow removal of the coolant tank from its right hand lathe-pedestal housing.
- The front cover can be removed by loosening the four securing screws and lifting the cover on its slots to clear the screw heads. Access the magnet and fluid in the tank by sliding the tank out of the compartment whilst at the same time feeding the fluid return hose out of its hole in the tank top plate.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

Pic of charts

Mechanical controls

- Lathe operators should be familiar with the three main headstock control systems and be sure not to use automatic systems unless they are advanced operators.
- The charts on the control panel show relevant information such as spindle speed, lead screw engagement and feed, and thread cutting settings.
- The lead screw and feed shaft should be left disengaged at the headstock for hand feed operators then automatic movement of the carriage into the headstock cannot accidently occur.
- The carriage feed and lead screw engagement lever (on the apron of the saddle) should also be left disengaged as a further back up to ensure that automatic carriage and cross slide movements do not occur.
- Operators should select suitable spindle speeds to suit the work diameter and cutting operation. A chart is available in the Shed's lathe information folder next to the machine.
- Calculations are sometimes necessary to ensure suitable cutting speeds are obtained. Rotating the spindle slightly by hand may be needed to assist gear change.

THE SHED
KU-RING-GAI COMMUNITY WORKSHOP

After Use

Operators must ensure the lathe is thoroughly cleaned, dried and oiled if necessary after they have used it. An oil can is available on the shelf attached to the lathe splash shield behind the tailstock.

The tray under the lathe slides out to facilitate thorough cleaning. All tools and equipment must be correctly stored away after lathe use.

Before starting the machine, turn the work over by hand to ensure clearance.

- The light to help illuminate work on the lathe is a 24 volt lamp. The switch for it is on the body of the light.
- Keep the work area and any electrical cords and switches dry.
- Keep loose tools and equipment clear of the lathe working area.
- Never allow access or reaching over the lathe to the wall board behind the lathe without it being completely stopped.
- Never attempt to slow a machine by hand after turning it off.
- Never allow cuttings or swarf to build up as they can become entangled with moving parts and flung out from the lathe.
- Always use a banister brush to remove the bulk of shavings away - never use your hands as the swarf can have very sharp edges which can cause cuts and metal splinters.