

Kushed Procedures

Drill Mill HM-46

M10

Hafco Drill/Mill HM-46





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.



Hafco HM-46 Mill/Drill

HAFCO METALMASTER MILLING / DRILLING MACHINE - Type HM-45

Milling is the process of machining flat, curved, or irregular surfaces by feeding the workpiece against a rotating cutter containing a number of cutting edges. The mill consists of a motor driven spindle, which revolves a milling cutter, and a reciprocating adjustable worktable, which mounts and feeds the workpiece.

Description

The HM-46 milling machine has a 95-1600rpm, 6-speed gear driven head which can be tilted up to 90° either side of the vertical. This feature allows the head to be positioned in a variety of positions, allowing a whole range of milling, slotting, grooving, drilling and boring operations to be carried out.

A handle-driven down feed is available for precision drilling and there is a fine manual down-feed control for precise vertical milling.

The motor is controlled by a standard forward and reverse on/off switch.



Features

- Gear driven head 6 speeds
- Dovetailed vertical Z-axis
- Tilting head to $\pm 90^\circ$ from vertical with display
- Large 730 x 210mm ground work table with T-slots
- Adjustable leadscrew nuts eliminating backlash on both X and Y axis, but not on the Z axis
- Fine feed hand wheel operating quill feed
- Forward and reverse on/off switch
- Tilting head gauge
- 3MT spindle with 75mm diameter quill
- Adjustable table and drill length stops
- Rack and pinion wind-up head
- Rear slide-way cover and slide clamps on all axis
- Spindle lock for quill
- Table lock on both axis
- Metric dial graduations @ 0.05mm for X & Y axis



Safety First

- Avoid accidental starting. Make sure machine power switch is “OFF” before turning on at ceiling socket. (This is not practical – too high)
- Check machine for damaged parts before turning on. Damaged guards or other parts should be properly repaired or replaced.
- Never leave machine running unattended. Turn power “OFF”.

SAFETY RULES

- You must be accredited to use this machine
- Remove adjusting keys and spanners before turning “ON”.
- Keep the work area clean.
- Don’t force the tool. Use the right tool and run at the correct speed and feed
- Wear proper apparel. No loose clothing, gloves, neckties, rings, bracelets or other jewellery which may get caught in moving parts. Non-slip foot wear is recommended. Wear protective hair coverings to contain long hair.
- Always wear eye protection.
- Secure work always. Use clamps or vice to hold work.
- Don’t overreach. Keep proper footing and balance at all times.
- Maintain tools in top condition. Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.
- Turn power “OFF” before servicing or changing cutters.
- Use recommended accessories, Consult the owner’s manual for recommended accessories.



Lubricant Pump

ADDITIONAL SAFETY RULES FOR MILL/DRILL

- Check that chuck, drill bit or cutting tool is securely locked in position.
- Remove chuck key before turning on power.
- Adjust the table or depth stop to avoid drilling into the table.
- Shut off the power, remove the drill bit or cutting tool and clean the table before leaving the machine.
- Use clamps or a vice to secure workpiece to keep the workpiece from rotating with the drill bit or cutting tool.
- Do not wear gloves when operating machine.
- Collet must be in the quill holder and pressed home before inserting and tightening the cutter
- While setting up work, install the cutter last to avoid being cut.
- Never adjust the workpiece or work mounting devices when the machine is operating.
- Chips should be removed from the workpiece with an appropriate rake and a brush.

Figure 1: Backlash

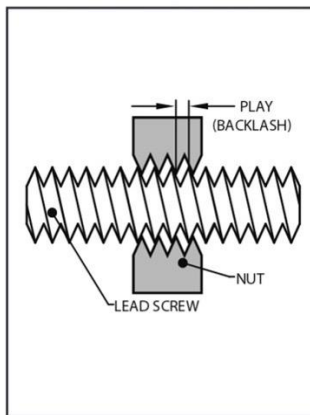
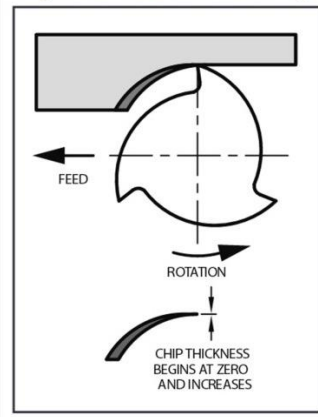


Figure 2: Conventional Milling



TECHNICAL RESOURCES

There are two distinct ways to cut materials when milling, conventional (up) milling and climb (down) milling.

The difference between these two techniques is the relationship of the rotation of the cutter to the direction of feed.

Conventional Milling

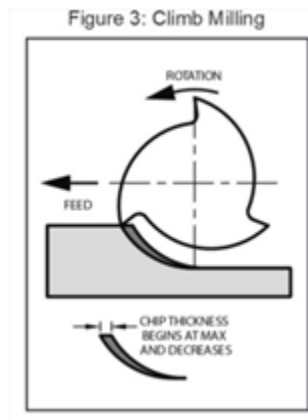
In conventional milling, the cutter rotates against the direction of the feed while during climb milling, the cutter rotates with the feed.

Conventional milling is the traditional approach when cutting because the backlash (Figure 1), the play between the lead screw and the nut in the machine table, is eliminated.

Chip width starts from zero and increases which causes more heat to diffuse into the workpiece and produces work hardening. Tool rubs more at the beginning of the cut causing faster tool wear and decreases tool life.

Chips are carried upward by the tooth and fall in front of cutter creating a marred finish and re-cutting of chips.

Upwards forces created in horizontal milling tend to lift the workpiece, more intricate and expansive work holdings are needed to lessen the lift created.



Climb Milling

Conventional milling is the recommended choice for manual machines which are not fitted with anti-backlash features. Conventional milling is also suggested for use on casting or forgings or when the part is case hardened since the cut begins under the surface of the material.

Climb Milling

Chip width starts from maximum and decreases so heat generated will more likely transfer to the chip

Creates cleaner shear plane which causes the tool to rub less and increases tool life Chips are removed behind the cutter which reduces the chance of re-cutting

Downwards forces in horizontal milling is created that helps hold the workpiece down, less complex work holdings are need when coupled with these forces.

Climb milling should only be used for light finishing cuts when the gibs are tightened to eliminate unwanted table movement which can damage work and break cutters.



SPEED CHANGING

6 Spindle speeds from 95 RPM to 1600 RPM can be obtained by selecting the appropriate gears with the 2 levers on the front of the mill.

Note: TURN OFF POWER BEFORE CHANGING THE SPEED.

SPINDLE FEEDING MECHANISM.

Quick spindle down feed is performed by the drilling handles on the side of the mill.

Micro spindle feeding is performed by locking the knob in the centre of the drilling handles and turning the wheel at the front of the mill head.



Morse taper shank sleeve adapter

SET-UP MACHINE FOR DRILLING

- Clean the Morse taper shank on the chuck and in the mill spindle.
- Insert the chuck into the spindle and firmly tighten the drawbar bolt. Do not overtighten or it will be difficult to remove.
- To remove the chuck from the spindle, loosen the drawbar by approximately 2 turns and lightly tap the top of the drawbar with a soft headed hammer. (heavy blows may damage the spindle bearings)
- Insert the selected drill in the chuck and tighten with chuck key.
- Remove the chuck key. (Do not leave it in the side of the chuck).
- Taper shank drills can be inserted directly into the mill spindle. They normally do not have a threaded hole for a drawbar but are held in place by a friction grip with the tapered hole.
- Rotate the drill to align the tang with a slot in the spindle and firmly push into place by hand.
- (Hold the drill so it is not damaged when it falls out)



SET-UP MACHINE FOR DRILLING

- To remove a taper shank drill, extend the spindle to its lowest point and lock in position. Insert a tapered wedge into the slot in the side of the spindle and tap the end of the wedge with a hammer.
- Rotate the drill to align the tang with a slot in the spindle and firmly push into place by hand.
- To remove a taper shank drill, extend the spindle to its lowest point and lock in position. Insert a tapered wedge into the slot in the side of the spindle and tap the end of the wedge with a hammer.
- (Hold the drill so it is not damaged when it falls out)
- Ensure the power is switched “OFF” and select the required spindle speed. Manually turn the spindle by hand to assist the meshing of the gears.
- Loosen the locking knob on the drilling handle shaft. Ensure mill spindle is in the retracted position.
- For blind holes, position depth stop for correct position, or free state for through holes.



SET-UP THE MACHINE FOR MILLING

- Ensure the mill spindle is in the retracted position. (the cutter has a more support when the spindle is retracted).
- Raise or lower the milling head to the working height with the crank handle on the RH side of the column and lock the gib clamp screws on the LH side of the mill head. (do we have a diagram?)
- Tighten the locking knob to engage the hand feeding wheel.
- Turn the hand feeding wheel to lower the cutter to the correct height.
- Lock spindle height with fixing bolt.
- Check coolant level and monitor level while milling. Top up if necessary.



After machine use

Switch the motor and coolant tap completely off and remove workpiece.

Thoroughly clean shavings from the machine table and slots.

Replace all tooling and clean surrounding work area, including the floor.

Safety & Procedural Issues

Before the Milling or Drilling Operation -

- If in doubt about the operation you are about to do, seek a Coordinator's assistance.
- Check to see that all switches are in "OFF" position and that feeds are disengaged before making any adjustments to the machine.
- If the cutter or arbour is attached to the machine, ensure that it is suitably tightened.
- Tools with replaceable inserts/tips should be checked for loose or missing parts.
- Check coolant reservoir and fill if necessary.

During the Milling or Drilling Operation -

- Monitor coolant usage and stop machine to refill if necessary.
- Ensure feed and power to machine is completely turned off if your attention is required elsewhere.
- Listen to the cutting action and if something sounds wrong, stop the machine to check for loose cutters and grip on work. Slow the speed setting, feed and cut depth if excessive vibration is evident.