

Smithy

MI-409MZ Operator's Manual



Detroit Machine Tools

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While every precaution has been taken in the preparation of this manual, Smithy Ind. shall not have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the instructions contained in this manual. Please see section on warranty and safety precautions before operating the machine.

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Chapter 1

Introduction

Welcome

The Smithy MI-409MZ Mill manual will teach you about the parts of the machine and how to take care of your investment. This manual is complete and current at the time of printing. In our continuing effort to bring you the best in machine tools, changes may be made - please visit us at **www.detroitmt.com** for the latest updates.

This manual—and any other manuals associated with this Smithy machine—should remain with the machine. If ownership changes, please include the Operating Manual with the machine.

Please read the operating manual carefully and closely. Follow the procedures described. If you don't understand how your machine works, you risk injury to yourself or others. Misuse can cause damage to the machine or to your project. To learn more about general machining practices you can turn to a number of sources. The Smithy website has a series of Machinist Training Videos under the Machining Helps section of website heading. Smithy also offers books that meet the needs of Congratulations on the purchase of your Smithy Milling Machine. We welcome you to the Smithy family of quality machine owners. Smithy strives to provide you with the best in machines and service. Please read through this manual carefully to ensure that you achieve maximum performance from your Mi-409MZ Mill machine.

We also suggest your local library as a resource. Enrolling in a machining class will give you the best opportunity to learn about machining from professionals in a supportive environment.

Suggestions or Comments

We are interested in any suggestions you might have to improve our products and services. Feel free to contact us with your suggestions by phone or in writing. If you have comments about this operator's manual, or if you have a project you'd like to share with other Smithy owners, contact Detroit Machine Tools, 170 Aprill Drive, Ann Arbor, MI 48103. You can also send an e-mail to: service@detroitmt.com

Questions?

If you have questions not covered in the manuals, please call our toll-free number:

1-800-476-4849

Our friendly service technicians are available Monday through Friday from 8:00 am. to 5:00 pm. Eastern Standard Time. You can also e-mail your questions 24 hours a day to **info@smithy.com**.

Customer Information

Please record the information below about your Smithy machine. Having this information readily available will save time if you need to contact Smithy for questions, service, accessories, or replacement parts.

Model Number: _____

Serial Number: _____

Purchase Date: _____

Delivery Date: _____

Customer Number: _____

We look forward to a long working relationship with you, and thank you again for putting your trust in Smithy.

Chapter 2

Safety

Overview

Smithy machines are proven to be safe and reliable; however, if abused or operated improperly, any machine can cause injury. Please read this manual carefully before you start machining. Proper use will create a safe working environment and prolong the life of your machine.

Symbols Used In This Manual

In this manual, the symbols below draw attention to specific operating issues:



CAUTION

Potential hazard, unsafe situation, or potential equipment damage that may result in injury to yourself or damage to your machine.



DANGER

Hazardous situation which if not avoided could result in serious injury or death.

WARNING

Potential hazard, unsafe situation, or equipment damage could result in death or serious injury.

! NOTICE !

Alerts user to helpful and proper operating instructions.

Shop Safety Rules

Your workshop is only as safe as you make it. Take responsibility for the safety of those who use or visit it. This list of rules is by no means complete, so remember that common sense is a must.



Smithy strongly discourages the use of casters or wheels on metal-working machine benches. The weight of the machine could result in the bench tipping while being moved. Once the machine is mounted, consider your workbench to be permanent. If you must move the machine, first remove it from the bench.

WARNING - Preparing to Operate Machine

- 1. Read this manual thoroughly before operating your machine.** Don't try to do more than you or your machine can handle. Understand the hazards of operating a machine tool. In particular, remember never to change speeds or setups until the machine is completely stopped and never operate it without first rolling up your sleeves.
- 2. Wear proper clothing.** Avoid loose-fitting clothes, gloves, neckties, or jewelry that could get caught in moving parts. If you have long hair, tie it up or otherwise keep it from getting into the machine. Always wear non-slip footwear.
- 3. Protect yourself.** Use ANSI approved safety glasses, goggles, or a face shield at all times. Use safety glasses designed for machinery operation; regular glasses will not do. Have extras available for visitors. Know when to wear a face mask or earplugs as well.
- 4. Keep your work area clean and organized.** Cluttered work areas and benches invite accidents. Have a place for everything and put everything in its place.

5. Childproof your work area and keep children away from the machine while it is in use. Childproof your shop with padlocks, master switches, and starter keys or store the machine where children do not have access to it.

6. Never operate your machine under the influence of drugs and alcohol.

7. Keep track of tools. Remove adjusting keys and wrenches from the machine before operating. A chuck key or misplaced Allen wrench can be a safety hazard.

8. Avoid accidental starts. Turn the switch to the OFF position before plugging in the machine. Turn the speed dial to zero, if you have a variable speed drive, before starting your machine.

9. Ground your machine. The machine has a three-conductor cord and three-prong, grounding-type plug. Never connect the power supply without proper grounding

10. Keep your mind on your work. By paying attention to what you are doing and avoiding distractions you will spend many safe, enjoyable hours in your workshop.

11. Never leave your machine running unattended!

Attention! - Machine Operation Safety Rules

1. Stop the machine before servicing. Stop the machine before making changes, removing debris, or measuring your work.

2. Don't over reach. Don't reach over the machine when it's operating. Keep your hands out of the way.

3. Turn the switch OFF. Turn the switch to off before plugging in the machine. If your machine is equipped with variable speed control, turn the speed dial to zero before starting your machine.

4. Use proper tooling. Use only recommended accessories and understand how they should be used before trying them out. Don't try to make a tool into something it isn't or attempt to use a tool in inappropriate ways. Remember to always use the proper tooling for the material you are cutting. Reference a general machining guide such as [Machinist Ready Reference](#) for recommended tooling for your material.

5. Secure your work. Before starting your machine, be certain that your work piece is properly and securely mounted. Flying metal is dangerous!

6. Do not run you machine beyond its limits of travel. Before starting your project, ensure that your work area does not go beyond the limits of travel on your machine. Going beyond the limits of travel will cause serious damage to your machine which will not be covered by your warranty.

7. Run your machine at recommended spindle speeds and feed rates. Always cut at the recommended speed and feed rates for the type of metal that you are cutting for optimum performance. Do not begin your cut until the machine has reached the full and proper speed.

8. Do not change the direction of the spindle rotation or lead screw rotation while your machine is running. Changing the rotation direction of the spindle or lead screw while your machine is running could cause serious damage to your machine.

9. Do not stop the spindle by hand. Always use your on/off switch to stop the spindle from rotating.

10. Do not clear chips by hand. Metal chips are very sharp and can easily cut your hand. Use a brush to clear chips.

11. Protect bed ways. When removing or installing tooling from your lathe spindle, place a piece of wood or other material across the bed to protect the ways from being damaged if the tooling is dropped.

12. Keep your machine maintained. Always replace worn or damaged parts before using your machine to prevent damage to your machine or the operator. Follow the maintenance schedule outline in this manual for peak performance.

Chapter 3

MIDAS MI-409MZ MILL SPECIFICATIONS

ELECTRICAL SPECIFICATIONS	
Power Requirements	220v Single Phase, 60 Hz
Prewired Voltage	220V A/C (adaptable to 110 volts)
Phase	Single
Plug	6-15P (Included) (220 volt)
Outlet	6-15R (Not Included) (220 volt)
Connection Type	Plug & Cord
SPINDLE MOTOR SPECIFICATIONS	
Horse Power	2 HP, 1500 Watts
Motor Voltage	220 v (adaptable to 110 volts)
Motor Current	A/C
Motor Amperage	20 Amps/9.7 Amps
Motor Type	A/C Constant Speed Induction
PRODUCT DIMENSIONS	
Weight	966 lbs.
Depth	34"
Width	53"
Height	56"
Footprint	25" x 16"
SHIPPING DIMENSIONS	
Shipping Weight	1077 lbs.
Depth	39"
Width	40"
Height	50"
Content	Machine
Type	Wood Crate
Must Ship Upright	Yes

MAIN SPECIFICATIONS	
Work Area Requirements	73" x 50-1/2"
T-Slot Size	5/8"
Table Size	40" x 9-3"
Column	Dovetail Ways
Draw Bar Size	7/16-20
Drill Chuck Size (Included)	5/8"
Drill Chuck Arbor (Included)	R8/JT3
Rotating Mill Head	45 Degrees (Left and Right)
Head Travel	15"
Quill Travel	5"
Quill Diameter	3"
X-Axis Travel	30"
Y-Axis Travel	7.25"
Spindle Taper	R8
Spindle Speeds	95, 175, 310, 450, 850, 1500 95, 175, 310, 450, 850, 1500
Spindle to Table (Distance)	2.5" to 16.5"
Spindle Center to Column	10"
Dial Calibration Drill - Coarse Feed	.045"
Dial Calibration Mill - Fine Feed	.001"
Dial Calibration X-Axis	.001"
Dial Calibration Y-Axis	.001"
Powerfeed (X Axis)	Yes
Powerfeed (Z Axis)	Yes (Spindle)
Oiled Gear Boxes	Yes
Oil Type	SAE 30
MAXIMUM TOOL SIZE	
Drill	1"
Face Mill	3"
End Mill	1"
Tapping	1/2"

Chapter 4

Setting Up the MI-409MZ Mill

Overview

Moving a machine tool can be dangerous. Improper techniques and methods may injure you and/or damage the machine. To find a professional to move and site your Smithy machine to look in your local Yellow Pages under "Machine Tools, Moving and/or Rigging." If there is no such listing or your community does not have a rigging specialist, a local machine shop or machinist may be able to provide a referral.

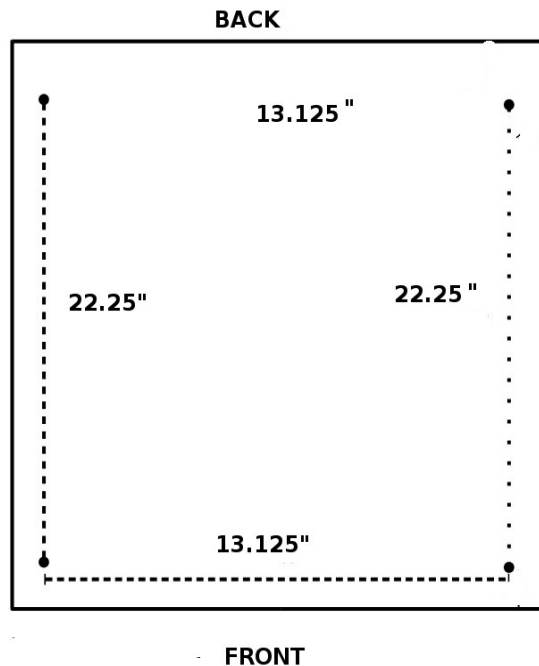
Remember to use caution when moving your new Smithy.

Mounting the Machine

1. Before mounting the machine, install the headstock positioning motor with the provided screws.
2. Ensure the headstock is as low as possible, and locked before moving machine.
3. Don't mount the machine in direct sunshine in order to avoid heat expansion, resulting in the deformity of machine and the loss of accuracy.
4. Mount machine to a sturdy table or a solid concrete foundation. Smithy's 80-055 with optional chip tray, item 80-056, has through holes drilled to accommodate the hole pattern of the MI-409MZmill.

If your plans are to make your own stand, please reference the hole pattern below and note that all holes are measured to center.

5. Before mounting your machine, make sure that the location is adequately suited for the machine. Allow enough clearance in the back to access the electrical box and enough clearance on the sides of the machine to allow for full X-Axis travel. Use the figures below as a general recommendation.



30" Clearance on each side of the stand 18-24" For accessing the rear of the unit

6. Once you have found a suitable location for your new mill, you will need a mechanical lifting device, such as a engine hoist or fork lift, to remove the machine from the pallet and to place it on the stand. There are four 5/8" holes in the base of the machine. Insert steel rods through these holes so that they extend out far enough on either side of the machine to be able to attach tow ropes or chains.

7. Remove the bolts, securing the machine to the pallet and any loose boxes or parts that may fall off the machine while moving it.

8. Attach appropriately rated chains or tow ropes to the machine and hook them to the mechanical lifting device.

9. Slowly lift the machine slightly off the pallet to see if the machine is properly balanced. If machine is not balanced, lower the machine back to the pallet and reposition the chains or tow ropes, until a good balance is achieved.

10. Once the machine is balanced, slowly lift the machine off the pallet. Do not rise the machine up until it is ready to place it on the stand.

11. When at the machine stand, raise the mill up to place it on the stand. Before completely lowering the machine onto the stand, use a couple of pieces of all-thread, steel rod or long bolts to align the holes in the machine base to the holes in the machine stand.

12. With machine in place, secure it to the base.

Chapter 5

Inventory Check List

Overview

It is a good idea to take inventory of your machine soon after it is unpacked. By doing so, you can quickly determine if any parts are missing. In addition, should you find it necessary to return the machine to Smithy the inventory will ensure that all the parts you received have been returned along with the machine.

A third reason to perform an inventory is to become familiar with the names of all of the parts of your Smithy machine.

Check your machine and all packages against the packing slip that was attached to the outside of the machine shipping crate.

Please advise us at 800-476-4849.

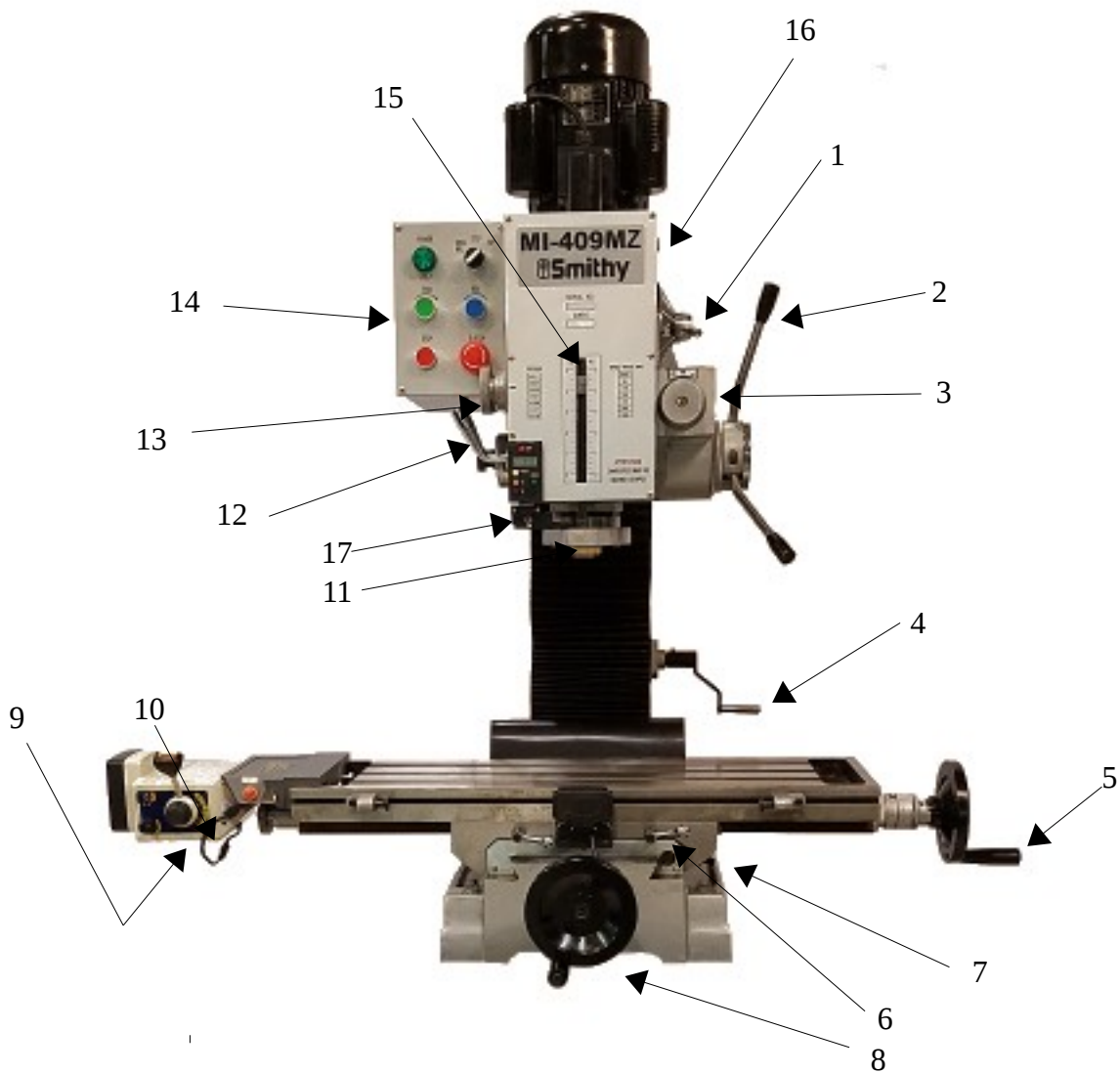
Chapter 6

Machine Overview

Overview

This chapter will help to familiarize yourself with the Smithy MI-409MZ Milling Machine. The figure below identifies the major controls for your machine.

MAJOR CONTROLS

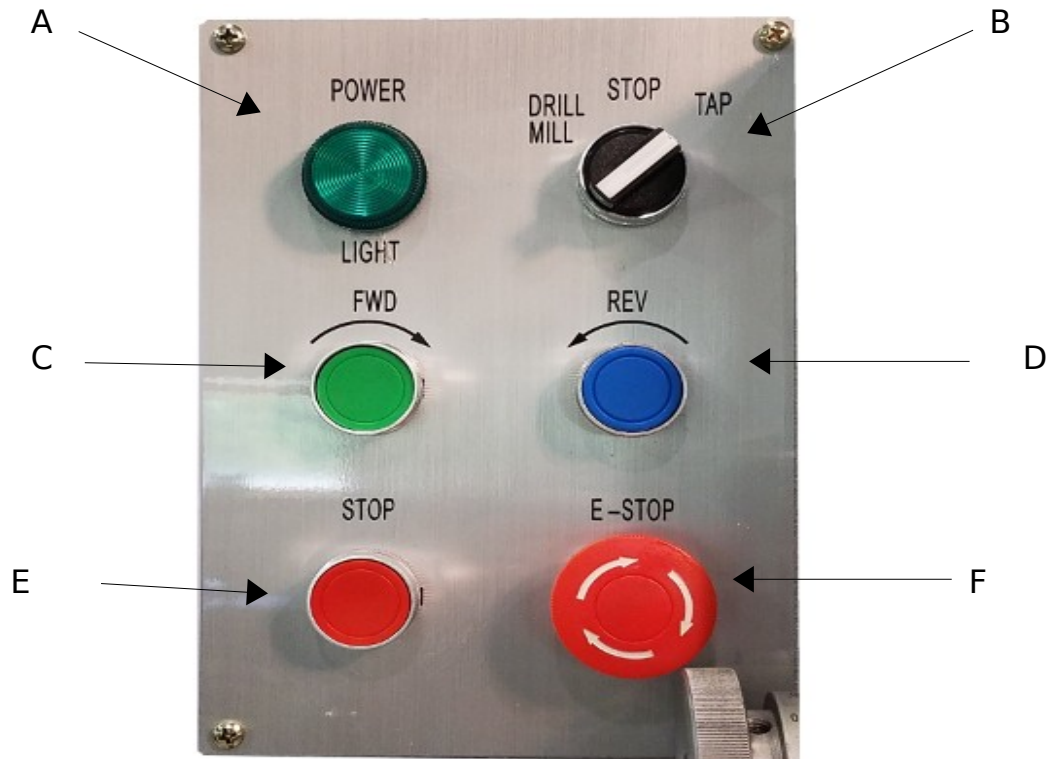


CONTROL DESCRIPTION

- 1. SPINDLE SPEED SELECTOR.**
 - With motor off, rotate to desired speed. You may need to rotate the spindle by hand to get the selector to move into position.
- 2. QUILL FEED AND Z AXIS POWERFEED HANDLES.**
 - Use to feed as drill press or pull outward to engage the powerfeed.
- 3. FINE FEED IN MANUAL MODE.**
 - Use to do a precise feed of the spindle in the manual mode.
- 4. CRANK FOR RAISING AND LOWERING MILL HEAD**
- 5. X Axis manual feed handle**
- 6. Y Axis lock**
- 7. X Axis lock**
- 8. Y Axis manual feed handle**
- 9. X Axis powerfeed selector**
- 10. X Axis rapid feed button**
- 11. Depth stop**
- 12. Quill depth lock**
- 13. Z Axis powerfeed speed selector**
- 14. Control panel**
- 15. Depth gauge**
- 16. Oil site gauge**
- 17. Digital readout for spindle travel**

NOTICE: Check all parts and safety precautions for proper condition before operation:

OPERATOR'S PANEL



A) Power Indicator - Indicates that the machine is on when the light is on.

B) Mill-Drill / Tapping Selector - When turning the switch to the left the drilling/milling operation is engaged. And when turn to the right the tapping operation is engaged. Center position shuts off both mill/drill and tapping.

C) Forward run button - Use for running the mill spindle in a clockwise or forward direction.

D) Reverse Button - Used for running the spindle in a counterclockwise or reverse direction.

E) Stop Button - Stops the spindle without killing power to machine.

F) E-Stop Button - turns the power on and off to machine. Rotate the button clockwise until it pops out to start the power. The power light will illuminate. Push the button in and it shuts off power to the machine. It will stay in until the button is rotated to turn power back on.

Chapter 7

Preparing the MI-409MZ for Operation

Overview

Before using your new machine, it is important to make sure it is top working condition and is properly lubricated. The section of the manual, will walk you through lubrication and gib adjustments.

Cleaning and lubricating the machine

Smithy machines are shipped with a protective grease coating. To remove it, spray on WD-40, let it sit for a few minutes, and wipe it off with rags. Use a brush and noncorrosive kerosene or white mineral spirits to clean hard to reach places.

Give special attention to the lead screw. Use a brush or cotton string to clean down into the threads.

Once it's cleaned, your Smithy is ready for lubricating. Do this carefully and thoroughly before starting the machine. Use pressure oil can and good quality SAE 30 weight machine oil on the bearings and headstock.

The mill head has an oil site gauges on the right side of the mill head. The oil level should be half way up the site gauge. Use a good quality 30wt or 10w 30 wt oil.

There are oil buttons located in numerous locations on the carriage, table, tool post and tail stock. These should be oiled on a daily basis.

When the machine is not in use, it is recommended that a thin coat of oil be applied to all exposed metal parts to protect the surfaces from corrosion.

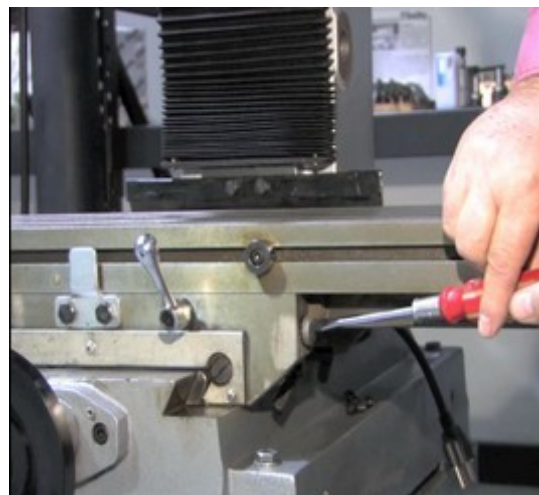
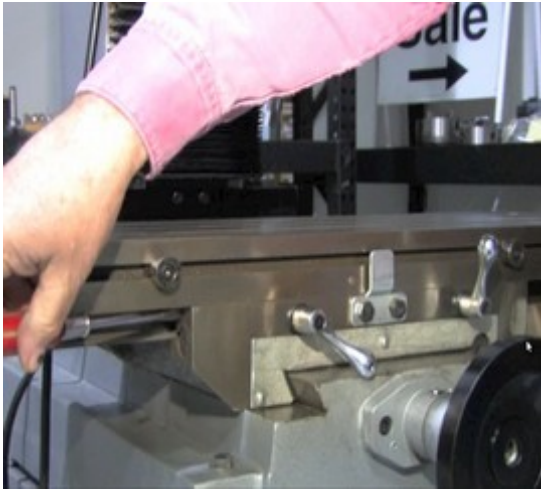
Adjusting the Mill - Tightening the Gibs

The objective of adjusting the gibs is to eliminate as much play in the X, Y, and Z axis as possible without having the tightness of the gib interfere with their movement and cause a decrease in the accuracy and performance of the machine due to excessive friction.

Before beginning, make sure the ways are clean and well-oiled.

X Axis Gib Adjustment

There are two adjustment screws for X, Y and Z axis. One on the left and the other one on the right end which shown in the images below. Turning in the right screw will adjust the gib tighter and turning in the left screw will makes everything loose. Have both of them loose, and then start turning the right screw a little bit of a time to make it tighter. When you fill drag on the hand wheel that's the time to stop and tighten the other screw on the left. You tighten both screws to hold the device.



Y Axis Gib Adjustment

There are also two adjustment screws. One in the front and the other one on the back end which also shown in the image below. To loosen the gib for Y-axis, screw out the front screw and screw in the rear screw. While screw in the front screw and screw out the rare screw will tighten the gib.



Z Axis Gib Adjustment

Images below will show the location of the adjustment screw. The process is also the same with the X and Y axis gib adjustment. Screw out the upper screw and screw in the lower screw will loosen the gib while screw in the upper screw and screw out the lower screw will tighten the gib.



Chapter 8

Running-in

The MI 409 milling machine is put through a initial run-in procedure at the factory before the machine is packaged for shipment.

1. Once you have your mill setup, Smithy recommends that the spindle motor be run for about 5 minutes at each of the spindle speeds starting with the slowest speed.
2. Operate the powerfeed motor for the X and Y power feeds for 5 minutes in each of the 6 speeds.
3. When the machine has set for some period of thin without being run or if the machine is in a cold environment, it is recommended to run the spindle for about 5 minutes at a medium speed before beginning and cutting operations.

Chapter 9

Mill Operations

The powered operations of the MI mill are done at the control panel, which is located on the movable arm to the left of the mill.

The only electrical control not located on this main panel is the master power switch. It is located on the left side of the large electrical box that is attached to the rear of the mill column. As a safety feature, the master power switch also has the ability to accept a padlock to prevent unauthorized use of the machine.

Simple instruction for Operating Machine

1. Raise and lower the headstock on its rack and pinion mechanism by using the crank. When the desired height is reached, tighten the locking bolts to avoid vibration.
2. Head may be rotated 45° in either direction. Loosen the three lock nuts. Adjust the head to the desired angle, and then tighten the heavy duty head lock nuts.
3. Move the table from side to side by using the longitudinal handwheel, and from front to back by using the cross handwheel .
4. Adjust the positive depth stop gauge according to desired working depth.

Turning Machine On

1. Rotate the "E-STOP" button clockwise to assure it is not pushed in. This button is an emergency stop and it will stay in the power off position when pushed in. It must be rotated clockwise to allow it to go into the power on mode and operate the machine.
2. When the E-Stop is out turns on the power and will illuminate the green "POWER" light.

The machine is now powered on!

Spindle Operation

1. For normal drilling and milling operations, place the "DRILLING-MILLING / TAPPING" selector into the drilling-milling position.
2. Push the "FWD" button to start the motor.
3. Stop the motor by pushing the stop button or the "REV" button.
4. Setting the depth gauge on the front of the machine will allow you to have the machine stop when a desired depth is reached.
5. The motor will not run in reverse in the drilling-milling mode due to the placement of limit switches inside the mill head.
6. To run the motor in reverse, select the tapping mode. Be sure the spindle is extended a little to be sure the upper limit switch off the stops, thus allowing power to the spindle motor. Depress the "REV" button and the spindle will run in reverse.
7. To stop the spindle when in reverse, allow the spindle to retract all the way and it will shut off automatically. You can also push the stop button to stop the machine.
8. Spindle speed is changed using the dial on the right side of the mill head. These speeds should only be changed with the motor stopped.

Table Power Feed



1. The X axis power feed motor is powered by it's own motor. To turn the power feed on, move the ON /Off switch to the on position.
2. Turn the speed control to zero before moving the direction lever. This will keep the table from moving faster than desired.
3. Move the direction lever left to move left and right to move right. The center position shuts the motor off and disengages the internal gears so the table can be moved with the hand wheel.
4. Turn the speed control slowly until you reach the desired feed speed.

Spindle Power Feed

1. The spindle power feed is located on the mill head. There is a selector on the right front of the mill head that will select the different feed speeds. Between each feed speed is a neutral position.
2. These speeds are best changed with the main spindle motor running.
3. To engage the spindle feed, the handles that are used to manually move the spindle can also be pulled outward and to the right. This will engage the spindle feed. To stop the spindle feed, push the handles inward toward the mill head and to the left.

Changing Spindle Speed

1. Turn the power off.
2. To select the proper speed, move the handle to the desired position.
3. If the gear is not engaged, remove the arbor bolt cover. Rotate the spindle slightly to engage the gears, and then replace the arbor bolt cover.
4. Recheck the handle setting, and then turn the power on.

Chapter 10

Speeds and Feeds/Powerfeeding

Determining Speeds and Feeds for Milling

Speeds

Milling cutting rates vary according to the machinability of the material being cut; whether cutting fluid is used and, if so, what kind; the type, size, and material of the cutter and the coarseness of its teeth; and the amount of metal being removed. Cutting speed for milling is the distance the cutting edge of a tooth travels in one minute. If cutting speed is too high, the cutter overheats and becomes dull. If it's too low, production is inefficient and rough.

There is no exact right cutting speed for milling a particular material. Machinist usually start with an average speed, then increase or decrease it as needed. For light cuts, use the upper end. Use the lower end for heavy cuts and when you don't use cutting fluid.

Determining rpm. To set the spindle speed, you have to know the cutter rpm (revolutions per minute).

For inch measurements, use this formula:

$$\text{rpm} = 12 \times \text{CS (fpm)} / \text{D}'' \times \pi$$

where:

CS - cutting speed

fpm -feet per minute

D'' - diameter of the cutter in inches

$\pi = 3.14$ You can use an rpm chart for selected diameters of cutting tools at different cutting speeds.

For metric measurement, use this formula:

$$\text{rpm} = \text{CS (rpm)} \times 1000 / \text{D (mm)} \times \pi$$

where:

CS - cutting speed

mpm - meters per minute

D (mm) - diameter of the cutter in millimeters

$\pi = 3.14$. You can use an rpm chart for selected diameters of cutting tools at different cutting speeds.

Change Speeds by selecting the belt location and turning the speed dial

Feeds

Set the direction of feed before you begin milling. Up milling, or conventional milling, is when the direction of feed is opposite to the direction of cutter rotation. Down milling, or climb milling, is when the direction of feed is the same as the direction of cutter rotation.

Up Milling

In up milling, forces on the work piece tend to pull it out of the vise or fixture holding it, so fasten it securely. These forces also push the work piece away from the cutter, which eliminates backlash. Up milling is advised for milling cast iron, softer steels, and other ductile materials. In general, it's how you should perform milling operations.

Down Milling

Down milling usually produces good surface finishes because chips do not sweep back into the cut. Setups are more rigid, an advantage when cutting thin work pieces held in a vise or work pieces held in a magnetic chuck. Down milling also produces straighter cuts. We recommend down milling when using carbide cutters because there is less wear on the cutting tool. In general, however, avoid it because of the backlash problems associated with it.

Feed Rates

Your feed rates should be as high as your machine, cutting tool, work holding method, and work piece can tolerate while giving a good finish. Feed rate is usually given in inches per minute (ipm). You determine feed rate by the speed of the cutter in rpm and the number of teeth in the cutter.

There are many factors to consider in selecting the feed per tooth, and there is no easy formula to follow. Here are several principles to guide you:

- Use the highest feed rate conditions allow
- Avoid using a feed rate below 0.001" per tooth
- Harder materials required lower feed rates than softer materials
- Feed wider, deeper cuts more slowly than narrow, shallow cuts
- Slower feed rate gives a better surface finish
- Never stop the feed before finishing the cut

CHAPTER 11

Tapping operation

The MI mill is equipped with two micro switches inside the mill head which allow it to perform a tapping cycle in which it will tap to a preset depth, and then automatically reverse the motor and reverse the tap out of the tapped hole.

1. Install the tap into an appropriate size of collet.
2. Feed the spindle downward to the depth at which you wish the tap to stop and lock the spindle in that position.
3. There is a depth stop on the face of the mill. Turn the thumb wheel below the depth stop to bring the stop down.
4. Keep bringing the stop downward and listen for the click as it engages the reversing switch. During the tapping operation the motor will automatically reverse when the downward movement of the spindle reaches this point.
5. Double check the depth you have just set, make sure the tap is not going to bottom out in the hole to be tapped.
6. Unlock the spindle and raise it up.
7. Position your work piece under the tap, turn the Milling-Drilling/Tapping selector to Tapping position.
8. Select the slowest spindle speed.
9. Push the forward button and hand feed the tap into the work piece. Once the tap has started cutting, it will feed itself into the work piece.
10. Once the tap has reached the preset depth, the micro switch will reverse the motor and the tap will feed out of the tapped hole. Retracting the spindle to the full up position will hit a second switch that will shut the machine off.

Chapter 12

Tooling Installation and Work Holding

Installing and Changing Tools

WARNING : Be sure the power is turned off and the machine unplugged before installing or changing tool bits

Aligning Tooling - *Use the procedure below to align your tooling in the R-8 spindle:*

Step 1: Select the appropriate tool or fixture.

Step 2: Wipe the surfaces of the tooling and spindle interior to ensure a proper fit. Grease or debris on either surface will cause misalignment.

Step 3: Align the keyway in your tooling with the key inside the mill spindle and insert the fixture in the lower mill spindle opening.

You can feel the key in the mill spindle with your finger. It is located just beyond the tapered portion of the spindle.

Securing R-8 Tooling with the Drawbar - *Use the procedure below for attaching and securing the drawbar:*

Step 1: Remove the arbor bolt cover located on the top of the mill belt cover and insert a drawbar (SAE standard 7/16-20) from the top of the spindle.

Step 2: Tighten the drawbar clockwise into the fixture or tooling that is inserted into the mill spindle opening. Use the spanner wrench to stabilize the spindle while tightening the drawbar.

Step 3: Use a wrench to apply torque to the drawbar. This will draw the fixture firmly into the spindle.

Step 4: Reinstall the arbor bolt cover when the fixture/tooling is in place.

Removing R-8 Tooling from the Drawbar

Use the procedure below to remove tooling using the drawbar method:

Step 1: Stabilize the drawbar with the spanner wrench and use a wrench to apply force counter clockwise to the drawbar nut.

Step 2: Loosen the drawbar two to three turns counter clockwise.

Step 3: Use a dead blow or brass hammer to strike a downward blow on the top of the drawbar to loosen the fixture from the spindle.

Unscrew the drawbar only two to three turns before striking. Unscrewing it further before striking the drawbar can damage the threads on the drawbar or the fixture.

Step 4: Continue turning the drawbar until it unscrews from the tooling.

Step 5: After the tool is free from the spindle, hold the fixture with your free hand or use a catch box to prevent the tooling from dropping onto your machine or work piece.

A common catch box consists of a cardboard or wooden box eight to ten inches square with four- to six-inch high sides. Rags loosely thrown in the bottom of the box provide padding for the tool to land in when the drawbar is removed from the fixture and the fixture falls from the mill spindle.

Holding Milling Cutters

There are several ways to hold milling cutters: in arbors, with collets and special holders, and in adapters.

Arbors

Arbors come in different sizes and lengths, with one end tapered to fit the bore in the end of the machine spindle. The MI-409MZ mill arbor, which has an MT4 taper, is driven by spindle. The arbor stays in place by means of a drawbar screwed into the end of the arbor from the top of the spindle.

Take good care of your arbors. Store them in a rack or bin. If you won't be using them for several days or longer, oil them to prevent rusting, especially in damp weather.

Collets and Holders

Straight-shank end mills fit into spring collets or end mill holders. Their precision-ground shanks go into the mill spindle. When you tighten a spring collet, its hole reduces and the collet grips the end of the end mill shank evenly. Tighten the end mill securely with the setscrew against the flat surface of the end mill, or it may slip out and damage the work piece, the cutter or you.

Adapters

Adapters mount various types and sizes of cutters on the spindle. Arbor adapters mount face mills on the spindle. Collet adapters mount end mills on the spindle. Taper-shank end mills mount in adapters that have holes with matching tapers. If the taper shank on the tool is smaller than the hole in the adapter, put a reducing sleeve into the adapter. Shell end mill adapters come in different sizes to accept different sized shell end mills.

To remove arbors or adapters held with a drawbar, follow these steps:

1. Loosen the locknut on the drawbar about two turns.
2. Hit the end of the drawbar with a dead-blow hammer, releasing the arbor or adapter from the spindle hole.
3. Hold the arbor or adapter so it won't fall out of the spindle when the drawbar is removed.
4. Unscrew the drawbar and remove the arbor or adapter.
5. Your machine includes a tapered drift for removing tapers. Follow these steps:

6. Remove the drawbar.
7. Extend the mill spindle to expose the outer taper drift slot.
8. Rotate the spindle to align outer and inner taper drift slots. You will be able to see the end of the adapter through both slots.
9. Insert the drift in the slot.
10. Holding the adapter with one hand, use a non marring hammer (rubber, dead-blow, or brass) to drive the drift into the slot. The taper on the tool will release and the adapter drop out.

Cutters mounted in the spindle must fit accurately. There are two ways to make sure they do. For small cutters, fit the shank of the arbor that carries the cutter directly into the taper hole at the end of the spindle. A drawbar holds the arbor in place. For large cutters, bolt the cutter directly to the end of the spindle.

Ordering Machining Accessories: To order machining accessories for your MI-409MZ mill refer to the accessories section of the website at www.detroitmt.com.

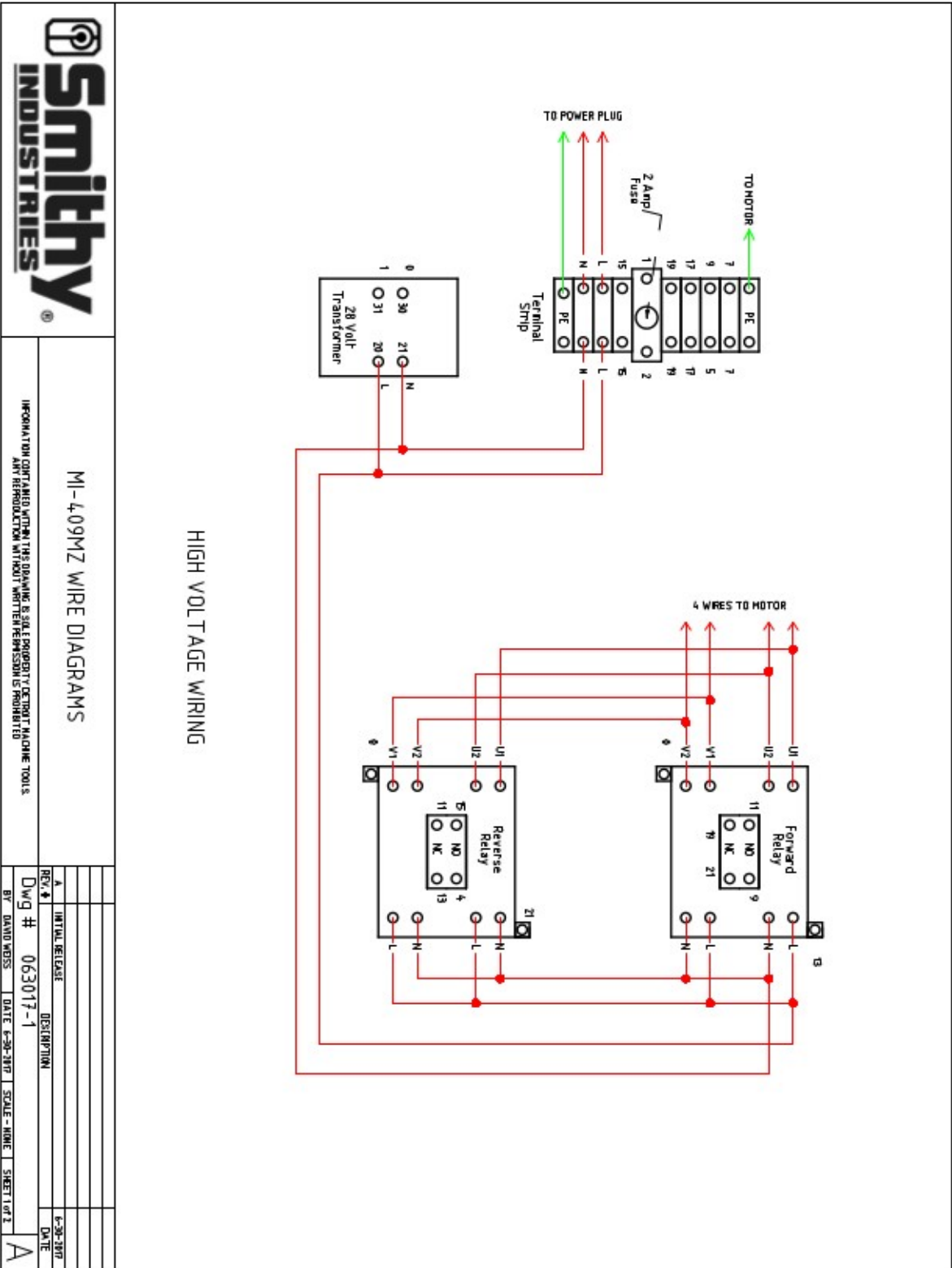
Chapter 13

Parts Diagrams

in work

Chapter 14

Electrical Diagrams



MI-409MZ WIRE DIAGRAMS

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