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**CE Safety Manual**  
**Bedmills and Machining Centers**  
October, 2000 Revision A

# **CE Safety Manual**

**for**  
**Hurco Bedmills and**  
**Machining Centers**

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# Using This Manual

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The *CE Safety Manual* meets the requirements set forth by the European Committee for Standardization, specifically those requirements found in the document, “prEN 12417 Machine Tools—Safety—Machining Centers,” item 7, and is published based on the requirements stated in the document, “EN 292-2 : 1991,” item 5.

The sections in the following “CE Machine Standards” section ascertain Hurco’s compliance to the CE requirements identified in section 7.2 of the prEN12417 document.

This manual uses several conventions to explain the safety features and emphasize key concepts. These conventions are described in this section.

Additional information is available in the following manuals, which are available at all Hurco bedmills and machining centers:

- *Operator’s Manual* (translated versions available from Hurco)
- *Maintenance Manual*
- *Parts Listings and Wiring Diagrams Manual*

## Style Guide

Indexed terms are italicized within the paragraphs that define them. Titles of books also appear in italic print to meet the English language convention for titles. References to chapter and section names are in quotation marks for the same reason.

Screen titles, field names, key names and button names begin with capital letters within the text and the index, to help the reader identify the reference exactly as it appears on the system screen or console.

## Ultimax Screens

Hurco machining centers are operated using the Ultimax CNC. References to CNC screens are made in this manual. Ultimax screens have three areas of primary interest:

- Softkeys with associated “F” keys on the right side of the touch screen. Note that the softkeys may change even when the text and data entry area does not.
- Fields to the left of the softkeys. A field is an area that displays information and may also receive information that the operator enters by pressing console keys.
- Prompt and error message area at the bottom of the screen. For instance, the message area may contain an prompt such as s, “Select softkey or press <Enter> to change part program name.”

## Standard Text Icons

This manual contains several icons to mark important sections:



### Caution

A Caution message tells the operator that the machine may be damaged or a part ruined if the described procedure is not followed.



### Hints and Tricks

The light bulb icon marks useful suggestions for the machine tool operator. These suggestions may show creative uses of the Ultimax features or just helpful hints.



### Important

The information marked with the arrow icon must be carefully studied to ensure proper operation of the machine and/or the control.



## Troubleshooting

The toolbox icon indicates steps that can be taken to solve potential problems. These sections contain information for Hurco Technical Service representatives and customers.



## Warning

A Warning message indicates that the operator may be injured and the machine tool severely damaged if the described procedure is not followed.



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# CE Machine Standards

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The information in this section ascertains Hurco's compliance with the European Community's machine safety standards.

As defined in the Foreword of the "prEN 12417 Machine Tools—Safety—Machining Centers" document, "...This European standard has been prepared under a mandate given to CEN by the Commission of the European Communities and the Secretariat of the European Free Trade Association, and supports the essential safety requirements of the Machinery Directive to determine safety for new machining centres.

"This standard has been prepared to provide one means of conforming with the essential requirements of the Machinery Directive and associated EFTA regulations.

"It was prepared by CEN/TC 143/WG4 – 'Safety of Machining Centres' under the direction of CEN Technical Committee 143 'Safety of Machine Tools.' ..."

## European Directives and Standards

Hurco machining centers installed in Europe must conform to the directives and standards accepted by the European community. Consult local authorities for additional safety directives and standards that may apply in your country.

### Directives

These directives apply to all machine tools sold in Europe:

- European Machinery Directive 98/37/EC
- Electromagnetic Compatibility Directive 89/336/EEC (amended by 91/263/EEC and 92/31/EEC)
- European Low Voltage Directive 73/23/EEC (amended by 93/68/EEC)

## Harmonized Standards

These standards apply to all machine tools sold in Europe:

### Safety

- EN 292-1
- EN 292-2
- EN 294
- EN 349
- EN 418
- EN 953
- EN 954-1
- EN 60204-1

### EMC (Electromagnetic Compatibility)

- EN 50081-2
- EN 50082-2

## Other Standards

- BS 5378 Parts 1 and 3

## Safe Installation of Guarding System and Machine

Upon arrival, inspect the machine to ensure that all parts are included and are in intact. This inspection should include all mechanical and electrical parts in addition to the self-contained guarding system.

The owner is responsible for proper site preparation before the machine is installed. A Hurco Field Service Engineer must install the machine in the prepared location. This location must not subject the machine to uncontrolled cabinet temperatures or unfavorable work environment conditions that could cause electronic component failure.

If the owner decides later to *move the machine tool* from its installed location, it is recommended that the owner call Hurco for assistance. If this is not possible, Hurco recommends that the owner use a competent rigger with the necessary equipment to move the machine to the desired location.



Improper moving of the machine may result in personal injury or damage to the machine.

### Guarding System

Each machining center has a self-contained guarding system. Inspect the machine to ensure the guarding system is intact.

- The chip doors on the front of the machine lock during Automatic Run Mode to prevent access to the moving parts of the machine.
- The guards on each side of the machine are either movable or fixed. The movable guards can be opened to access the inside of the machine. A special key is required to open a fixed guard.

## Machine

Check these items before the machine is installed:

### Floor Conditions

The foundation must be able to support the weight of the machine tool, and should be constructed of continuous concrete (reinforced is best). The thickness and consistency of the concrete must be compatible with industry standards for supporting the machine's weight. Actual requirements will depend upon the physical properties of underlying soil. A local civil engineer should be consulted if soil conditions are questionable.

Rough level the machine by positioning it on foot pads, screwing each leveling bolt down until it presses into the indentation of the footpad, and torquing all bolts evenly so the machine does not move.

### Electrical Service Requirements

Follow all requirements below to help ensure the safety of personnel and prevent damage to equipment.



Always disconnect power before working with electrical connections.

### Connecting Electrical Service

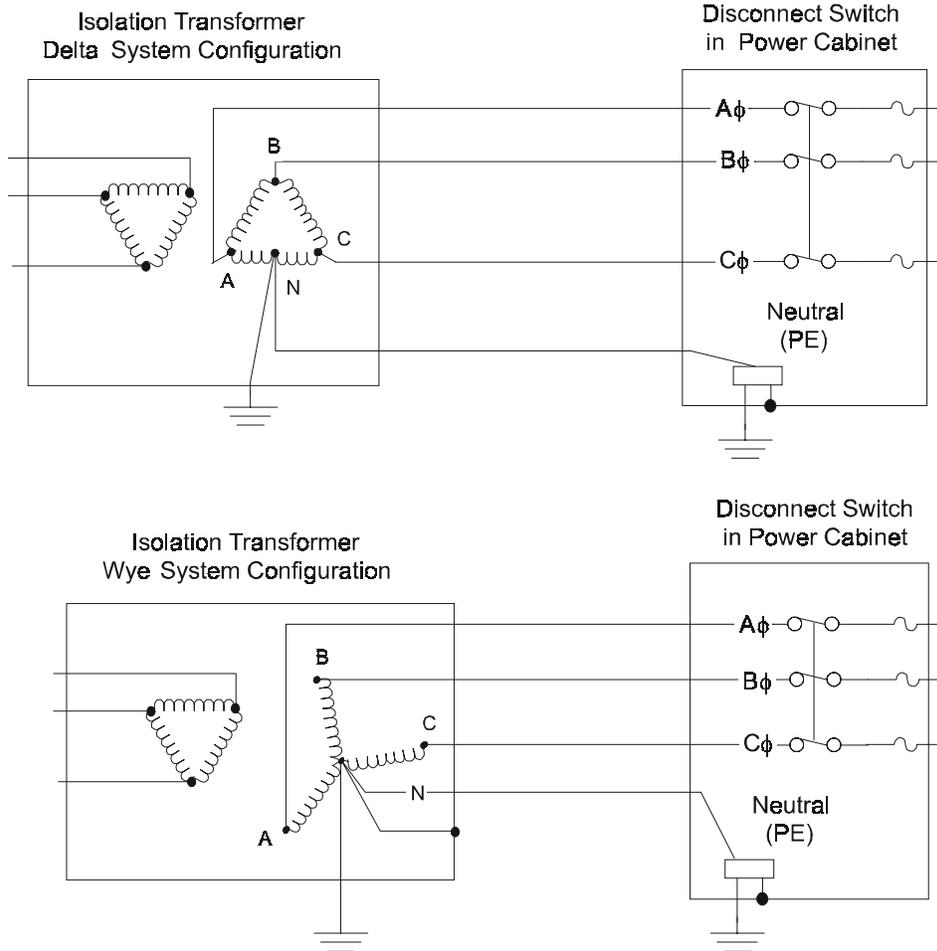
Follow these guidelines:

- On-site wiring, including grounding and protection of the machine's transformer, must comply with all established directives and standards, including local electrical codes.
- Clean power is essential for operation and reliability. Dedicated, grounded 3 phase AC power for the machine is required. This ensures that incoming AC is free from high and/or low voltages, spikes, surges, and high frequency noise caused by inductive loads.

- Make certain that the AC power source matches the voltage specifications on the machine's electrical cabinet. This information is listed on the machine's data plate.
- Wiring to the machine must be capable of supplying the continuous specified amperage.
- Failure to provide the required power parameters may affect safety, machine performance and the warranty.
- Do not make any electrical connections to the machine. Run electrical power to the machine's location, with adequate cable length to reach the connections in the power cabinet. Final connections must be supervised by a Hurco Certified Service Engineer.

Recommended Isolation Transformer Configuration

If you decide to use a transformer not provided through Hurco, select a transformer that meets Hurco’s machine operating voltage requirements. Use one of the configurations shown in the figure below. Hurco recommends the Wye system.



*Figure 1.. Delta and Wye Transformer Configurations*

### Grounding Equipment

The machine's electrical and electronic control systems are interconnected, terminating at the Protective Earth (PE) (i.e., ground) point.

- This terminal, which is located inside of the machine's power cabinet, must be properly connected to the ground circuit of the AC power source.
- This single point ground provides only one conducting path between the machine and external ground, preventing an unwanted ground loop (ground differential voltage).
- A ground loop can appear to the control as common mode electrical transient. The grounding conductor must be sized to conform to all applicable electrical codes. However, Hurco recommends that the size of the neutral conductor (when applicable) be at least the size of the phase (current carrying) conductors.

## Compressed Air Requirements

A continuous supply of clean and dry air is essential for proper machine operation, and must be connected to the machine as described here.

### Specification

Compressed air must conform to the specification: 5 CFM at 80-100 PSI or 0.14 M<sup>3</sup>/min at 6-8 bar.

### Connecting Compressed Air

Install the air supply line to the machine, meeting these requirements:

- Connect the air supply line to the machine using an NPT pipe fitting.
- Install a regulator valve to control the air pressure into the machine.
- Install a factory-set pressure switch to shut off control voltages if the air pressure falls below the pre-set level.
- Use a minimum 1.27 cm diameter (trade size) pipe, or an equivalent 1.99 cm diameter air hose supply line to the machine. This will ensure adequate air volume for proper machine operation.
- Install a drip leg in the line ahead of the filter/regulator assembly. The drip leg will help remove moisture accumulation in the supply, making the filter last longer.
- Do not use quick coupler type fittings at the connection to the air filter/regulator, or within the supply line to the machine. This is because of the restrictive nature of these fittings.

## Anti-Vibration Mountings

Anti-vibration mountings consisting of a spring-mounted ball bearing are attached to each machine. Loose springs and balls are signs of excessive vibration.

Check the mountings before uncrating the machine to ensure that the machine has been handled properly prior to its arrival. Continue to inspect the mountings on a regular basis.

## Initial Test and Examination

Follow the instructions below for performing the initial test and examination of the machine and its guarding system before first use and placing the machine into production.

Contact your Hurco Distributor to arrange for a Hurco Service Engineer to perform the final leveling procedures. Complete these procedures prior to the Service Engineer's arrival:

- Provide utilities such as electrical service and compressed air.
- Check all lubrication levels.
- Place the flood coolant tank, tubing, and coolant pump motor near the machine base.

The Hurco Service Engineer performs these tasks:

1. Inspects the machine level and makes required adjustments.
2. Checks and connects electrical service to the machine.
3. Installs the control console.
4. Measures voltages in the electrical cabinet and control enclosure and makes adjustments if needed.
5. Installs the flood coolant tank, tubing, and coolant pump motor.



### Caution

The motor encoder and cable assemblies are designed to resist coolant and liquid contamination. However, Hurco will not be responsible for failures due to abuse and direct spray of coolant during cleaning, etc.

6. Installs covers and enclosures as applicable.
7. Checks fans and pumps for proper operation.
8. Checks all axes for calibration and correct limit switch operation.
9. Tests the disk drive.

## Periodic Maintenance

Follow this periodic maintenance schedule for machine, guards, and protective devices, Refer to the *Maintenance Manual* for detailed maintenance procedures.

### Cleaning the Machine

The machine should be cleaned on a regular basis:

- Machined and unpainted surfaces should be wiped clean with a lint-free cloth dipped in a clean light machine oil.
- The machine's exterior painted surfaces may be cleaned with a soft cloth dampened with water and a mild detergent.
- The control console's exterior surface may be cleaned with a soft cloth moistened (not wet) with water and a mild detergent.
- The console screens may be wiped with a damp, soft, lint-free cloth.

### Equipment Maintenance

Before any maintenance or repair operations are performed within the *electrical cabinet*, the machinist or maintenance representative must verify that the power switch has been turned to the Off position before the electrical cabinet door is opened.

## Recommended Routine Maintenance

A regular schedule of lubrication and maintenance checks is required to ensure continued dependable operation of the machine. It should be noted that machine maintenance is dependent upon the amount of use, severity of operation, and machine environment. Therefore, maintenance frequency should also be determined on an individual basis and varied accordingly. For more details about these procedures, refer to the *Maintenance Manual*.

### Daily

Perform these maintenance checks on a daily basis:

Inspect and clean Coolant Tank or Chip Tray Filter Screens.

- Check all lubrication levels particularly in the Autolube system and the air line lubricator.
- Check air pressure at the Filter, Regulator, and Lubricator (FRL) assembly in the pneumatic system.
- Check coolant level(s).
- Check the ways for proper lubrication and any scratches or excessive wear. Be certain that the way wipers are not damaged.
- Check for and remove dirt, dust, fingerprints and other materials from the touch screen that could degrade its optical properties. The touch screen is abrasion-resistant. However, contact with abrasive materials, such as metal chips clinging to an oily glove, can scratch the front surface. For best results, use a clean (damp) non-abrasive cloth towel and any commercially available window cleaner to regularly clean the surface. Apply the cleaning solution to the towel rather than to the surface of the touch screen.

### **Weekly**

Perform these maintenance checks on a weekly basis:

- Check the moisture drains from the FRL Unit and check lube level.
- Refill Autolube tank with proper lubricant.
- Perform necessary cleaning of machine.
- Check filter screen on the spindle oil cooler (if installed).
- Inspect tools and tool holders and replace worn inserts, shims, and clamp screws as needed. It is important to keep the tools sharp since dull and damaged tools break easily and impair part quality.

### **Monthly**

Perform these maintenance checks on a monthly basis:

- Check condition of tool holders.
- Check the fasteners securing limit switches and the dogs to be certain they are tight.

### **Quarterly**

Perform these maintenance checks each quarter:

- Clean and inspect flood coolant system.
- Check ground impedance level on a quarterly basis during the first year of installation.

### **Semi-Annually**

Perform this maintenance check on a semi-annual basis:

- Replace Autolube tank suction filter.
- Replace Lube Metering filter.

### **Annually**

Perform this maintenance check annually:

- Check ground impedance level (resistance to true earth).

## Safety Circuits

If the owner or operator modifies the hardware or software by removing, altering, disabling, or tampering with any safety circuit, safety switch, or any safety operation and then continues to operate the machine with those modifications, such operation is extremely hazardous, is also a *foreseeable misuse* of the machine, and voids the Hurco warranty. If the owner or an operator finds that such modifications have been made, that person must immediately switch off the machine and prevent use of the machine until it has been repaired. The owner must then contact a Hurco service representative for assistance in restoring the machine to safe operation.



### Important

In many locales, machine hardware or software modification to override safety protections and continued operation of such a modified machine is illegal and punishable with a fine and/or imprisonment.

## Guidelines

The machining center safety circuit is designed to provide safe and reliable operation on Hurco products. The basic rules governing operation are as follows:

- The spindle cannot operate unless all enclosure doors are closed, not including doors that are fastened shut with bolts or screws.
- Enclosure doors must be closed, and locked, when initiating or performing automatic motion. This includes part program execution, warm-up cycle, calibration cycle, automatic tool changes, probing cycles, etc., or when running the spindle (excepting orient).
- In the event that the enclosure door is opened during automatic operation, or any time the doors are locked, an immediate command to stop all motion will be executed and control power will be removed.

- Redundancy is included in electrical design to detect single point failures (switch contact, relay coil, etc.)
- Upon removal of control power, and a set time delay (approximately 7 to 10 seconds to allow for deceleration), the spindle drive will be removed from its source power rendering it totally disabled.
- ATC electrical circuits will be isolated from source power when any door is open.

Tamper-resistant fasteners are used to hold combination door lock/switches in place and to prevent access to internal wiring.

## CE Safety Circuits Commissioning Checklist

Check the safety circuits after changing component parts and periodically. Checklists are provided below for Manual Setup, Automatic Preparation, and Automatic Production Modes:

### Mode: Manual Setup

Door(s) Status: Open

Access code: Enabled (Limited operation)--- VMX/VSX only

A four-digit code is required for enabling limited safe operation such as jogging axes with the chip doors open. The code is entered in the CE Status & Diagnostics screen.

Safety Requirement	Verification	Pass	Fail
1. Control shall not allow "Spindle On" to be selected.	<Error message> displayed when Spindle On key depressed.		
2. Calibration cycle shall not be initiated.	<Error message> displayed when softkey is depressed.		
3. Control shall not allow tool change to be initiated.	<Error message> displayed when tool change cycle initiated.		
4. Axes may be jogged at maximum feedrates of 2 M/min.	Initiate jog cycle at maximum allowable feedrate.		
5. Chip auger shall not run.	<Error message> displayed when auger softkey depressed.		
6. Part program execution shall not be initiated.	<Error message> displayed when automatic mode enabled.		

**Mode: Automatic Preparation**

Door(s) Status: Closed

Mode: Manual

Safety Requirement	Verification	Pass	Fail
1. The axes may be jogged at maximum allowable without restriction	<Error message> displayed when doors opened with jog key depressed; all motion ceases upon opening.		
2. All tool change cycles shall be permitted.	Verify all doors lock when tool change key selected. <ul style="list-style-type: none"> <li>● Front enclosure</li> <li>● Side enclosure</li> <li>● ATC loading (CAT50)</li> </ul>		
3. Chip auger functions shall be permitted when function is selected.	Verify all doors lock when softkey function is selected. <ul style="list-style-type: none"> <li>● Front enclosure</li> <li>● Side enclosure</li> <li>● ATC loading (CAT50)</li> </ul>		

**Mode: Automatic Production**

Door(s) Status: Closed.

<b>Safety Requirement</b>	<b>Verification</b>	<b>Pass</b>	<b>Fail</b>
1. Doors shall remain locked throughout part program execution.	Verify all doors lock in auto mode when "START CYCLE" pushbutton is engaged. <ul style="list-style-type: none"> <li>● Front enclosure</li> <li>● Side enclosure</li> <li>● ATC loading</li> </ul>		
2. Doors shall unlock in auto mode only after all motion ceases.	Verify doors unlock after axis and spindle stop with program abort engaged (Stop Cycle pushbutton or Interrupt Key)		
3. Doors shall remain locked during an ESTOP condition.	Verify all doors remain locked when ESTOP is engaged during part program execution. <ul style="list-style-type: none"> <li>● Front enclosure</li> <li>● Side enclosure</li> <li>● ATC loading</li> </ul>		
4. Doors shall unlock only after the fault condition has been reset.	Verify all doors unlock only after control power is restored (reset and Control On).		

## Safe Operation, Setting, and Maintenance

This section addresses the safety hazards encountered with the intended use and the *foreseeable misuse* of the bedmill and BMC machine tools. However, this information is not an exhaustive description of all of the possible misuses of the machine nor is it a substitute for operator training, skill, and good judgment. Hurco does not accept any liability for *operator error*.

### Training for Operators

All operators must be trained machinists. The machinists who run the machine tool must be trained by Hurco or a Hurco authorized distributor. Before attempting to operate the machine tool, study this manual and become familiar with the machine functions and safety features.

While studying the manuals that accompany the product, make special note of the caution and warning messages and all warning and instruction plates or decals on the machine tool.

## Setup

Follow these precautions during machine and production setup:

- Perform all setup work with the ESTOP engaged. This includes adjustments to the workpiece, fixture, and coolant nozzles. Never put your hands near a part being machined.
- Clamp the workpiece and fixtures securely before starting the machine. Remember, loose objects such as wrenches and chuck keys can become flying projectiles if not removed before the machine is started.
- Wear gloves or use a shop cloth when handling tooling.
- Inspect tools and tool holders frequently. Use tools that are properly sharpened and in good condition. Replace worn inserts, shims, clamp screws (etc.) as needed. (Dull and damaged tools break easily.)
- Never start the machine when the cutter is in contact with the workpiece. Make sure the direction of spindle rotation is correct to prevent cutter breakage. (Rotate the spindle clockwise for right-hand tools, and counterclockwise for left-hand tools.)
- Keep the work area well-lighted, using additional lights if necessary. Adjust lamps so that light does not shine directly into your eyes.

## Operation and Maintenance

- Know where the Emergency Stop pushbuttons are located.
- Do not leave the machine unattended, but stand away while it is running. Never lean on the machine.
- Be aware of all pinch points caused by the motion of the table, head and Automatic Tool Changer. Be aware of protruding machine parts (such as hoses, piping, etc.).
- Keep the electrical cabinet doors closed while power is on. Before opening the electrical cabinet doors, verify that the main disconnect switch has been turned Off.



### **Warning**

High voltages present in the machine's electrical system can cause serious injury or even death.

- Do not remove or bypass safety limit switches, interlocks and other safeguards. Doing so (to obtain more travel, etc.) can seriously damage the machine. If a job requires greater range than the limit switches allow, for example, do the work on a machine that has the necessary travel.
- Do not start the machine unless all systems contain the proper amount and type of lubricant.
- Make certain that all necessary guards and protective devices are in place before operating the machine.
- Be aware of any unusual sounds, smoke, heat or damaged parts. Turn off the machine immediately and report the problem to a supervisor.

## Safe Working Practices

This product was intended to be used by trained machinists who create part programs either on the machine tool console or an off-line system. These machinists then run the part programs to shape materials into parts or molds. While running the machines, the machinists must use their experience and training to make any necessary adjustments and improve the efficiency of their programs.

In order to ensure the safe operation of machinery, follow the correct service and repair procedures. This reduces the likelihood of serious injury. All service personnel must be careful that their actions will not jeopardize the safety of others or damage the machine.

Safety precautions appear below. Observe these basic precautions when working near a machine:

### Responsible Conduct

- Follow the instructions provided when performing a maintenance task.
- Keep all parts of your body away from moving parts.
- Be alert and keep safety in mind. Realize that the work you are performing can be dangerous.
- Never attempt to operate or repair a machine if you have taken strong medication, used a prescription drug, or consumed an alcoholic beverage.
- Do not attempt to operate or repair a machine until you have read and understood all information that pertains to the machine. This includes all warning and instruction plates or decals mounted on the machine.
- Know how the machine functions, and understand its safety features. Ask your supervisor for help if needed.

## Personal Care

Follow established working practices and personal hygiene standards. As part of this effort, avoid frequent or prolonged skin contact with fresh or used cutting fluids and oils. Some operators wear gloves or use a special hand cream to protect their hands from these chemicals. If you get machining chemicals on your hands, wash your hands immediately upon leaving the machine and before taking a break. Change clothing that has become contaminated with machining fluids and oils.

For complete information about handling industrial chemicals used in machining, refer to the international Control of Substances Hazardous to Health (COSHH) materials from the chemical suppliers.

## Wearing Apparel

- Any time you are in the work area, wear eye protection and safety shoes. Safety glasses with side shields are recommended. Safety shoes should be in good condition (no holes), with steel toes and oil-resistant soles.
- Remove items that could get caught in moving parts. This includes watches, rings and other jewelry, and neckties. Do not wear loose-fitting clothing or long shirt sleeves. Roll long sleeves above the elbow.
- Keep long hair tied-back so that vision is not obstructed and hair cannot become caught in moving parts.
- Remove your gloves before starting the machine.

## Heavy Lifting

- Do not attempt to lift more than you can safely handle. Keep your back straight and use your legs.
- Use a hoist for heavy lifting, making sure that the load is evenly balanced and is raised slowly.
- Do not raise the load over aisles and make certain that the landing area is clear and level.

## Housekeeping

- Maintain a clean and orderly work space around the machine. The floor must be free of coolant and oil spills. Do not allow stacked cartons, supplies, etc. to obstruct the area.
- Use only sturdy work platforms with anti-slip surfaces around the machine.
- Do not store tools, shop cloths, and miscellaneous parts on the machine. Keep these items on workbenches, shelves, etc.
- Dispose of chips properly. Do not use compressed air to blow them from the spindle, table, controls, cabinet or floor. Use a brush or chip scraper to remove chips. Do not remove chips by hand, or while the spindle is turning. The cutter must be completely stopped. Dispose of chips frequently.

## Control Systems

Instructions on control systems including circuit diagrams for electrical, hydraulic, and pneumatic systems are available in the accompanying *Parts Listings and Wiring Diagram Manual*.

## Noise Levels

The following noise level readings were taken in the vicinity of the Ultimex CNC, 1.6 meters from the floor, 1 meter from the machine's enclosure. The maximum ambient noise level reading taken for each machine at the time was 60 dB.

Measurements were made with background noise present using a dB meter set on A-rated scale. The sensor head was placed vertical to the floor.

<b>Readings Measured From CNC</b>	
<b>Machine Type</b>	<b>dB Reading</b>
VMX64	max 82 dB
VMX30	max 77 dB
VMX40	max 82 dB
VMX24	max 79 dB
HAWK30/40	max 75 dB

### Note

The figures quoted above are emission levels and are not necessarily safe working levels. While there is a correlation between the emission and exposure levels, this cannot be used to determine whether further precautions are required. Factors that influence the actual level of exposure of the workforce include characteristics of the workroom, other sources of noise, etc. i.e. the number of machines and other adjacent processes. Also the permissible exposure level can vary from country to country. This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk.

## Descriptions of Failure Modes

Failure conditions can be evident during power up and operation. Descriptions follow for detection and prevention.

### Power-Up Troubleshooting



#### Troubleshooting

If a problem occurs during power up, look for one of the following symptoms:

- No messages appear on the console screen. The system may beep, but it does not start up.
- Error messages appear during the initialization process before the Input screen appears.
- Error messages appear on the Input screen.



#### Warning

Before testing live circuits or attempting any repairs to electrical connections, be certain that the power switch on the electrical cabinet is in the Off position. Follow all established safety practices. Remember that the power line from the source to the machine may be live even though the machine tool is not receiving power.

### **No Response on the Console**

If no messages appear on the text screen after switching on power, make sure of the following:

- Power supply cord on the Card Rack inside the Electrical Cabinet is properly connected to the power source.
- Power switch on the Card Rack inside the Electrical Cabinet is in the On position.
- No floppy disk is in the floppy drive.

If these conditions are met, but the control still does not respond, contact the machine shop's maintenance department or the machine manufacturer's technical services department.

## Initialization Error Messages

After power has been switched on, initialization messages appear on the text screen. If an error message appears, there are many possible causes. The error messages indicated below can be easily corrected by an operator.

**“Non-system disk detected.  
Press any key.”**

This message means there is a diskette in the floppy drive. Remove the diskette and turn the power off and then back on.

**“Security device is invalid or  
has failed.”**

The software security key has been removed, is broken, or is not properly connected. Switch off the control and remove the security key. If the key is damaged, replace it. Reconnect the key and switch on power.

Other possible messages during initialization usually indicate missing or corrupted files. The usual solution for such problems is to restore or delete files. For help solving these problems, contact Hurco’s service department or the distributor’s service department.

However, before asking for help, see the following important notice.



### **Important**

Before calling a service representative for assistance, always switch off the control at the power button, wait a few minutes, and then power on again. If the problem continues, call the machine manufacturer’s technical services department.

## Error Messages on Input Screen

Occasionally, the system will go through all of the initialization steps, display the Input screen, and then refuse to respond when console keys are pressed.

If this occurs, you should take careful note of any error messages on the Input screen. If there are no error messages, the cable to the front panel may be loose or defective. If the shop has a maintenance department that repairs computers, a machine maintenance staff member may be able to check the custom cable inside a conduit. If it needs to be replaced, call technical services to perform the operation.

### Corrective Measures

One or more of the following corrective measures may be necessary:

#### Swap Out a Printed Circuit Board

If a PC board is suspect and you can get a replacement, try swapping out the board.

If swapping out a board corrects the error, one of the following problems was the cause:

- The original board is bad or has an intermittent problem.
- The connector was not making good contact.

Install the original PC board to see whether the error returns. If not, the connector probably was not seated properly or the contacts need cleaning.

#### Check Wiring

Perform these checks:

- Trace the wiring as far as possible.
- Wiggle connectors and ensure they are properly seated.
- Check the connections with an ohmmeter.
- Unplug and reseat circuit boards; sometimes connectors become tarnished and do not conduct well. If the contact points on a PCB are dull looking, polish them with a common rubber pencil eraser.

### Perform a Reset

Technical assistance personnel may ask you to reset a circuit board or the machine.

- To reset a PC board, press the board's reset button.
- To reset the machine, switch the main power off and then back on.

### **Emergency Stop Condition**

While troubleshooting, you may encounter the Emergency Stop condition or instructions to go to the Machine Diagnostics screen. An error condition occurs if the Emergency Stop button is depressed, or a machine system needs service. These conditions are easily corrected.

Pressing the Emergency Stop button removes all servo power and power to the way lubrication pumps. The current program resets to the beginning. A message on the screen indicates the Emergency Stop condition. To remove the Emergency Stop condition, execute these steps:

1. If the Emergency Stop button is depressed, twist and lift it.
2. Press these console buttons in this order:
  - a. Manual
  - b. Power On
  - c. Start Cycle

### **Manual Safety Override Mode (BMC only)**

A Safety switch is installed on the chip doors and is operated with a key. This switch has a Safety Override position that permits opening the enclosure doors when the system is in the manual mode. With the doors open, manual functions such as adjusting the fixture can be performed. However, the jog feed and spindle are restricted. The Safety Override is cancelled when the chip doors are closed and one of the following console keys is pressed: Input, Single, Auxiliary, Test, Auto and Review.

When the key is turned to the Protected Operation position, all movement is prohibited when the chip doors are opened. Removing the key from the switch locks the machine into protected operation (see Conversational Part Programming in the Condensed Operator's Manual).

## Machine Diagnostics

Several error messages direct you to the Machine Diagnostics screen. The control detects the status of various machine components, and presents this information on the diagnostics screen. For example, the status of the Autolube level will be either OK or Low Level.

The ATC and Machine Diagnostics screen shows the current status of the machine tool limit switches. To reach the Machine Diagnostics screen, follow these steps:

1. Press the console Manual key.
2. Select Machine Diagnostics (F2)
3. Select ATC and Machine Diagnostics (F7)

If an error condition is displayed, follow these steps:

1. Correct the problem and view the diagnostics screen again.
2. Once the error status is corrected, exit the screen.
3. Restart and calibrate the machine.

Bedmills sold in Europe have a *Chip Enclosure* and a limit switch to indicate whether or not the enclosure doors are open or closed. If the doors are not completely closed, the Door Open field will be highlighted. Press the enclosure doors together to clear the error and begin machining.

## Common Problems

Possible problems are listed below, with causes and solutions. These problems are usually noticeable without the help of error messages, although error messages may occur. More than one problem can result from a single cause.

### Power-on Self Test

When you turn on the machine, the control performs a self test. If an error in the control circuitry is detected, a pattern of beeps may sound instead of the normal start-up beep. A screen error message may appear. Do not ignore these indications. Write down all messages.

### Machine Voltages

Missing or faulty connections can cause a combination of problems. High impedance conductors to Ground (PE) or to Neutral can also interrupt voltages to machine systems.

Connections	Description
Missing	Open grounds Open neutrals Open phase connections Missing neutral-to-ground strap at main source
Improper	Phase and neutral reversed Phase and ground reversed Ground and neutral reversed Ground and neutral shorted at panel
Loose	At main panels At equipment At other equipment in system At service entrance

*Table 1. Missing or Faulty Connections*

Fluctuating voltages to the machine can create problems. Power transients can come from inside or outside of your facility. They often occur when power usage in your region is high (typically on a very hot or cold day).

<b>Problems</b>	<b>Causes</b>	<b>Solutions</b>
Fuse blows	Power sag	Repair faulty in-plant wiring. Move any other machines on the circuit to separate circuits.
Power is lost.		
Motor(s) overheat		
Control PC boards and/or microprocessor fail	Power spike	Move any nearby high current switching devices (arc welders, inductive motors) away from the machine.  Properly ground equipment and install surge protection to insulate against lightning strikes.
Machine stops		
Data is lost.		

**Table 2. Problems Due to Power Transients**

If a machine malfunction occurs, consider the following issues:

- Is another machine that uses high current connected to the AC distribution power supply line?
- Is the ground impedance of the AC distribution power supply line sufficient?
- Are there fluctuations in the input voltage to the machine?
- Is there a source of “noise” nearby (crane, welder, etc.)?
- If other CNC or NC machines are connected to the same group of circuits, do any of those machines demonstrate similar problems?
- Was another machine being operated at the same time the problem occurred?
- Does the problem occur mainly at a certain time of day (such as, start of work shift, noon, etc.)?

**Note**

Power surges can occur when large loads are suddenly placed on, or removed from, an electrical system.

## Coolant System

If a problem occurs with the coolant system, check these possibilities:

<b>Problems</b>	<b>Causes</b>	<b>Solutions</b>
Coolant flows slowly or stops.	Clogging due to dirty coolant	Flush lines, clean filters, drain and refill the system with fresh coolant.
	Pump is not working properly	Check and service the pump. For mist system, check shop air pressure.
No liquid (only air) comes from mist nozzle	Coolant tank is empty	Fill coolant tank with fresh coolant
	There is too much air in the system.	Close off valve, then slowly open again to get desired flow
Coolant fails to start when head lowers to Z up level or below	Coolant valve is not turned On	Turn on the valve (via the control).
	Coolant is not programmed to be On.	Check the operating mode (auto or manual) or programming.
Coolant fails to stop when head is up to Z retract level	Incorrect program parameters	Check parameters and correct the setting.

*Table 3. Coolant System Problems*

Machine operation failures, such as a coolant valve not opening, can be a programming or hardware problem. Hardware includes electronic components, wiring, and electro-mechanical devices.

## Motion and Spindle Rotation

If the spindle or an axis does not move the way it was programmed to, moves without being instructed to, or spindle rotation is incorrect, refer to the following table.

<b>Problems</b>	<b>Causes</b>	<b>Solutions</b>
Spindle does not turn.	Program might not have proper RPM setting	Check the RPM setting in the program. If this setting is wrong, check and correct the entire program.
	Spindle drive breaker is tripped	Power down the machine, reset the breaker on the spindle amp and turn on power.
The machine's control power is Off and the screen shows a Motion Error message.	Actual collision or binding occurs between machine parts and product fixtures.	Examine the path, parts and fixtures for evidence of collision or rubbing.
	Chip buildup causes a Motion Error	Look under chip covers for excessive chip buildup. Clean and maintain to avoid reoccurrence.
	The X, Y and Z axes ballscrews are not well lubricated.	Check the lube oil level, lubrication to the way ballscrews, and lube pump operation. Correct as needed.
	Servo cable connections are not making good contact.	Check each connector (by hand, visual check is not enough). Clean, press together and wiggle. Replace the connection if it is intermittent during wiggling.
	Error LED is On servo(s)	Note the location of lighted LED(s). Phone for technical assistance.
	Servo encoder or decoder not working properly	Jog the machine while watching position numbers on the screen.

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<b>Problems</b>	<b>Causes</b>	<b>Solutions</b>
The machine chatters while machining or cutting	Machine feeds too fast	Check the program settings for Feed and Speed – reprogram if they are wrong Make sure that the actual speed matches the programmed speed.
	Wrong tool, tool is damaged, or tool is not sharp	Make sure the right tool is being used for the application. Make sure the tool shaft is clean and not bent. Verify that the tool is sharp.
	Fixture is not rigid enough	Check the fixture. Tighten or reinforce it if needed.
	Tool is not held perfectly straight	Check the spindle taper for foreign material. Clean the taper if necessary. Check the tool holder to see that the tool is inserted straight. Reinsert the tool if needed. Check tool retention force on the draw bar.
Small errors in dimensions show up occasionally	Temperature fluctuates as the part is machined.	Stabilize the temperature of the blank by providing enough coolant while machining.

*Table 4. Motion and Spindle Rotation Problems*

## Environmental Conditions

When the *electrical cabinet overheats*, this causes the machine to shut down until the cabinet's temperature sensor registers that the temperature has dropped to an acceptable level. If this error occurs, check the temperature around the electrical cabinet to be certain the cabinet is not subjected to an additional heat source such as a space heater or bright sunlight from a nearby window.

Temperature and other environmental variables can cause problems which might otherwise be attributed to the machine.

<b>Problems</b>	<b>Causes</b>	<b>Solutions</b>
Relatively small dimensional problems occur in the product.	Metal blanks stored in temperatures much higher or lower than the temperature of the machining area can expand or contract during and after machining.	Before machining, move the blanks to the machine area and allow the blanks time to reach ambient temperature.
Dust, debris, rust or discoloration accumulates on work surfaces.	Extreme temperatures are typical, and/or the environment is too humid or dusty.	Improve the machine's environment. (For example, close the machining area to outside dust, etc., and install air conditioning to lower room temperatures and humidity.)

*Table 5. Environmental Factors*

## Fluid Specifications

Although lubrication procedures have been performed at the factory and during final installation, check all lubrication levels. This not only familiarizes you with the lubrication points, but further guarantees safe operation of the machine. In order to keep the machine in good operating condition, the operator must periodically check and maintain all lubricant levels.

### Lubrication

Lubrication points and recommended lubricants appear in the table below. This is not a complete list of lubricants. Lubricants that meet the same specifications as those listed below may be substituted. It is the customer's responsibility to ensure that the lubricant used is an equivalent of the recommended type. Local suppliers should be able to cross reference recommended lubricants.

Lube Point	Fill Level or Condition	Lubricant Type	Lubricant and Manufacturer
ATC Oil Unit 40-Taper 24-station Swing Arm ATC	Maintain reservoir at 1/3 full.	I.S.O. V.G. 32	Teresso 32 (Esso), DTE Oil Light (Mobil), Tellus Oil 32 (Shell), Turbo 32 (Shell), Magnus Oil 32 (Phillips), Hyken Golden (Kendall)
Hydraulic Power Unit 40-Taper 40-station and 50-Taper Swing Arm ATC	Top of the tank's sight gauge		
FRL Unit (Filter, Regulator, Lubricator)	Between the high and low marks on the plastic bowl		
Optional High Speed Machining Spindle Oil Cooler	Midway on the sight gauge		

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<b>Lube Point</b>	<b>Fill Level or Condition</b>	<b>Lubricant Type</b>	<b>Lubricant and Manufacturer</b>
Tool Release Cylinder	Maintain at 1/3 full, not to exceed 1/2 full. Otherwise, oil will flow out during pumping of cylinder.	I.S.O. V.G. 32	Teresso 32 (Esso), DTE Oil Light (Mobil), Tellus Oil 32 (Shell), Turbo 32 (Shell), Magnus Oil 32 (Phillips), Hyken Golden (Kendall)
Autolube Linear Way Ballscrew	Between the high and low marks on the reservoir. If machine will be idle for 30 days or more, use rust protection additive.	I.S.O. V.G. 68	Febis K68 (Esso), Vactra No. 2 (Mobil), Tonna Oil T68 (Shell)
Spindle Taper	If machine will be idle for 30 days or more, clean the taper and wrap it in a cloth soaked with this lubricant and rust protection additive		

*Table 6. Lubrication for BMC Machines*

## Autolube System

The Autolube system automatically lubricates the slideways and ballscrews. If the axes are idle for 30 days or more and a rust preventative is added, initiate a manual lube cycle and move all axes for full travel several times. Pump flow is delivered to main oil manifolds, where it is sent through fixed metering fittings and tubing for delivery throughout the system. The discharge rate of the meter fittings is not adjustable.

To prevent contamination from entering the lines and fixed metering fittings, the system lines contain lube metering filters. These filters must be checked periodically, and replaced if they become plugged.

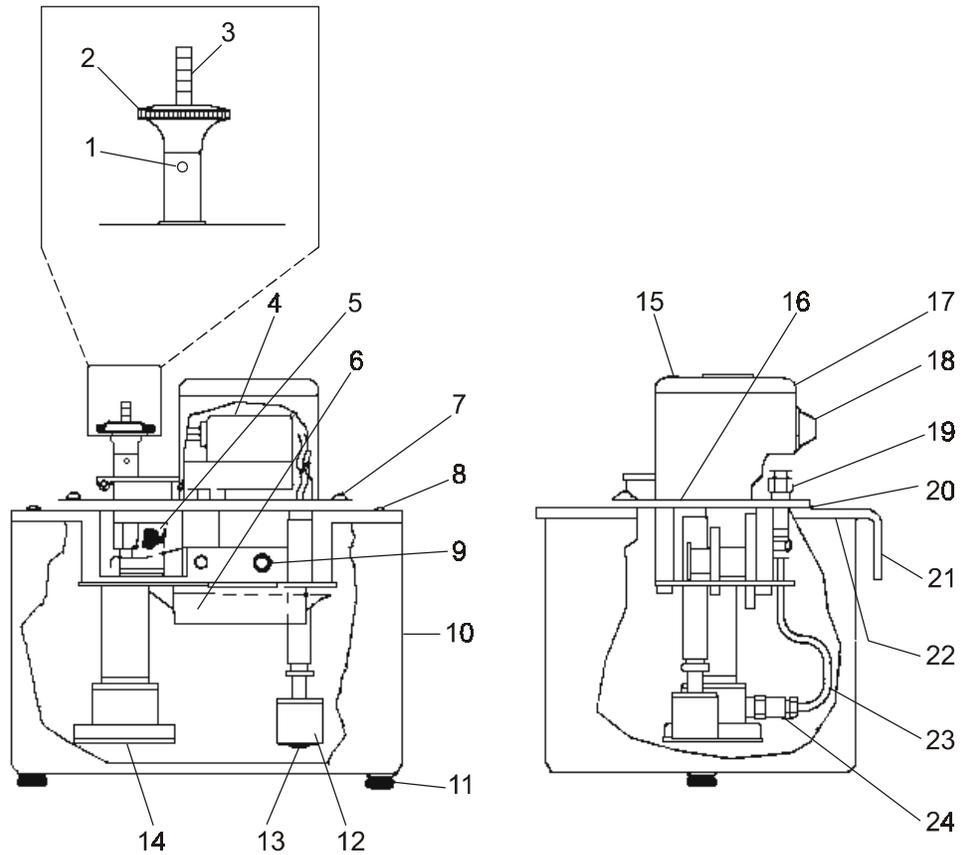
Perform maintenance according to the schedule in the “Periodic Maintenance—Equipment Maintenance” section earlier in this manual.

System lubrication is a timed *cycle*. The pump will cycle once every 15 minutes to send the preset discharge rate of lube oil through the system when servos are On. The preset discharge rate, which is 3.0 cc per pump cycle, is adjustable. The cycle time and discharge rate are the same for bedmills.

### **Note**

Excess servo On time without table or head movement may cause oil to accumulate on the table and the slideways. This is normal since automatic lubrication operates at predetermined time intervals while the axis servo motors are energized. Control has a Power Off Timer that automatically shuts off Control Power after the machine is idle for a specified time. This prevents the Lube Pump from cycling and causing excess lubrication and spills.

Here is a diagram of an Autolube system.



1	Set screw	9	Retaining ring	17	Motor cover
2	Discharge plunger	10	Reservoir	18	Grommet
3	Indicator rod	11	Screw	19	“Thru” coupling
4	Electric motor	12	Float switch assembly	20	Reservoir gasket
5	Strainer, oil filter	13	O-ring	21	Mounting bracket, reservoir
6	Reservoir worm and gear lube	14	Suction filter group	22	Reservoir gasket
7	Screw, cover mounting	15	Screw, cover mounting	23	Outlet tube assembly
8	Screw, reservoir mounting	16	Gasket, motor cover	24	Outlet check valve assembly

*Figure 2. Autolube Pump and Tank Assembly*

## Check Filler Screen and Fluid Level

Maintain the fluid level and check the filler screen:

1. Lift the oil filler cap and check that the screen is clean.
  - If it is dirty, remove and clean it using a suitable solvent.
  - Dry the screen before reinstalling it.
2. If needed, add oil to the tank. The level should be between the high and low marks (about ½" or 1.27 cm from top cover of tank). Return the fill cap into place.

## Activate System Manually

If the machine has been idle for a long time before powering up, or if the oil has just been replaced, follow these steps to activate the system manually:

1. Pull upward on the discharge plunger, then release it.
2. Stroke the plunger in this manner three to six times.

## Adjust Autolube Discharge Rate

The scale graduations on the flat surface of the indicator rod indicate the discharge rate in cubic centimeters (cc) per pump cycle. This rod is located in the discharge plunger. To adjust the discharge rate of the Autolube system, follow these steps:

1. Loosen (but do not remove) the set screw in the center of the discharge plunger body.
2. Turn the plunger body clockwise to increase, or counterclockwise to decrease the pump discharge rate.
3. Once the required discharge rate is obtained, align the set screw with the flat surface on the rod. Tighten the set screw to secure the rod position.

## Replace Oil and Suction Filter

To drain the tank and replace the oil and suction filter, follow these steps:

1. Shut off power to the machine.
2. Loosen and remove the two thumb screws that secure the tank to its mounting bracket.
3. Lower the tank downward from the threaded spacers.
4. Remove the suction filter group by first carefully prying out the retaining ring.
5. Remove the filter discs and screws. Note their order of assembly.
6. Insert the new coarse screen (filter disc support), fine screen (screen disc, filter disc), filter clamp ring and retaining ring.
7. Clean any contaminates from inside of the tank. Dry the inside with a clean, lint-free cloth.
8. Check that the strainer in the filler opening is clean and not damaged (i.e., there are no holes, etc.).
9. Make certain that the gasket is installed and is in good condition.
10. Place the tank on its mounting bracket, guiding it over the threaded spacers.
11. Carefully tighten the two thumb screws that secure the tank to its mounting bracket.



### Caution

Over-tightening these thumb screws can damage the tank.

12. Check that the screen is installed in the filler opening.
13. Fill the tank with the recommended oil.
14. Manually activate the system.

## Automatic Tool Changer

The lubrication required depends upon the type of ATC.

### ATC Oil Unit

This procedure is for the 40-Taper tool changer that has a 24-station magazine. If the tool magazine has more than 24 tool pockets, see the “Hydraulic Unit” section that follows.

This 40-Taper tool changer with 24-station magazine has an enclosed oil lubrication system. The tool changer housing holds the oil, some of which is displaced into a small oil reservoir during the tool change cycle.

#### Maintain the Oil Level

Follow these steps to maintain the oil level:

1. Check the level – the reservoir cup should be 1/3 full. The reservoir is located on the front of the tool changer (viewed from front of machine).
2. If the oil is low, add the recommended type. (See the table at the start of this chapter.)

#### Replace the ATC Oil

To replace the ATC oil, follow these steps:

1. Open the drain plug located near the bottom of the swing arm transmission casting. Drain the oil.
2. Flush the system. Use a non-volatile flushing agent that is suitable for a mineral-type lubricating system.
3. Replace the drain plug.
4. Add the suggested oil until the reservoir cup is 1/3 full.

## ATC Hydraulic Unit

This free-standing hydraulic unit runs the rotation of the tool magazine, the magazine locking cylinder and the tool pot up and down cylinder. The hydraulic unit also runs the unclamp cylinder for the tool in the spindle.

The following Automatic Tool Changers operate using a hydraulic unit:

- 50-Taper Swing Arm
- 40-Taper Swing Arm with a 40-station tool magazine

The hydraulic oil tank is located at the rear of the machine. The system holds 80 liters (21 gal.) of oil (50-Taper and 40-Taper machines).

Perform the following service according to the recommended maintenance schedule in the “Periodic Maintenance—Equipment Maintenance” section earlier in this manual.

### Maintain Fluid Level

Maintain the fluid level in the tank:

1. Check the tank sight gauge.
2. If the level is low, add the recommended oil type. For the correct lubricant type, see the table at the beginning of this section.

### Replace Hydraulic Oil

To replace the hydraulic oil, follow these steps:

1. Drain the oil using the plug at the bottom of the tank.
2. Flush the system. Use a non-volatile flushing agent that is suitable for use in a mineral-type hydraulic system.
3. Check the filter. If necessary, replace it.
4. Replace the drain plug.
5. Add the recommended oil type to the tank, checking the sight gauge on the tank. For the correct oil type, see the table at the beginning of this section.

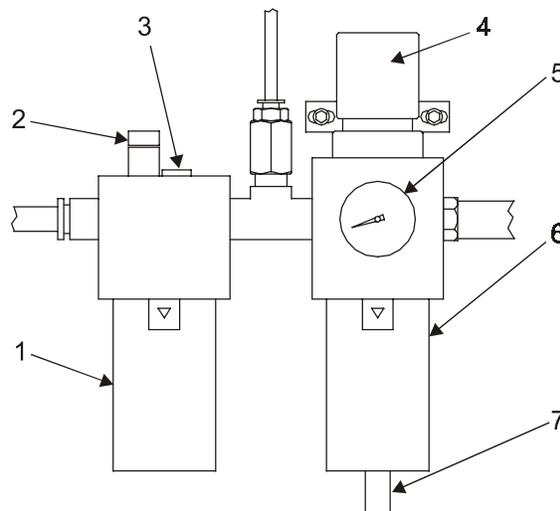
## Pneumatic System FRL Unit

The pneumatic system includes a Filter, Regulator and Lubricator (FRL) Unit. The filter cleans incoming compressed air and expels accumulated moisture through a drain. The lubricator meters oil into the air stream to lubricate cylinders and valves. The rate at which lubricant is released into the pneumatic system (i.e., drip rate) is adjustable.



### Important

The air supply requirement for the machine is a continuous 5 CFM of clean, dry compressed air at 80-100 PSI (0.14 M<sup>3</sup>/min at 6-8 bar).



1	Lubricator unit	5	Air pressure gauge
2	Fill/Oil drip viewer	6	Filter unit
3	Drip rate adjust	7	Auto moisture drain
4	Air pressure adjust		

*Figure 3.. Filter, Regulator and Lubricator*

Maintain the FRL according to the schedule in the “Periodic Maintenance—Equipment Maintenance” section earlier in this manual.

### **Set Air Pressure**

If the air pressure reading on the gauge does not meet the required specification, adjust the knob on top of the filter unit to set the correct system pressure.

### **Maintain Oil Level**

Maintain the oil level between the low and high marks on the lubricator unit. If oil must be added, do not overfill.



### **Important**

Shut off the compressed air supply before adding lubricant or removing one of the housings. Use only a recommended oil or an equivalent. Refer to the table in the “Lubrication” section for recommended lubricant types. Other lubricants can damage components in the pneumatic system, including the polycarbonate housings. If the lubricant becomes contaminated, it can clog the lubricator element and prevent the necessary oil drip.

### **Adjust Drip Rate Screw**

The oil drip rate was factory-set and should not require adjustment. However, if the oil drip is not visible at the top of the lubricator unit, turn the drip rate adjustment screw to obtain one drop of lubricant for every second tool change.

## Check and Replace Air Filter Element

Check the air filter element in the filter unit regularly and replace it when necessary. If the filter becomes clogged, the air pressure may still measure as acceptable, but air flow to the pneumatic system will be restricted.



### Caution

When you remove the bowl to access the filter element, clean the bowl using a soft, lint-free cloth dabbed with the recommended FRL Unit lubricant. Do not use any type of cleaning fluid.

Before connecting the air supply, install the metal bowl guard.

## Check Auto Moisture Drain

Make sure the auto moisture drain is not stuck open and leaking air. If the drain is stuck open, follow these steps:

1. Shut off the compressed air supply to the machine.
2. Using a crescent wrench, turn the auto drain nut at the filter unit bottom counter-clockwise one turn.
3. Press upward on the nut to release any foreign material that may be lodged, and to reseal the drain valve.
4. Tighten the nut clockwise.

## Tool Release Cylinder Air/Oil Unit

An air/oil unit lubricates the tool release cylinder. This applies to machines equipped with a Swing-in position ATC, and not to machines equipped with a Swing Arm Random Pocket tool changer.

Maintain the oil level, checking it more often if the ATC is used frequently:

1. Remove the set screw.
2. The oil level should be 1/3 full ideally, up to 1/2 full. If needed, add oil. Do not fill above 1/2 full, which will cause oil to flow out of the cylinder when it cycles.
3. When finished, insert the set screw. Tighten the screw and then back it out slightly so air can vent.

## Spindle Taper

When the spindle is unclamped, air blows from the spindle taper hole. Any moisture in the air system will be detrimental to the taper, especially when the machine is stopped for an extended time. If the machine will be idle, wrap the spindle taper in a cloth soaked with clean Autolube oil.

## Optional Spindle Oil Cooler

The optional spindle oil cooler is used to maintain the temperature of cooling oil that is force-circulated around the spindle cartridge. This action cools the head and helps stabilize its operating temperature. This cooling effect reduces thermal growth, which improves machining accuracy.

If the oil level in the tank is not maintained at or above the low mark, foaming could result and damage the system's pump. Additionally, spindle cooling would be impaired.

Service the spindle oil cooler according to the schedule in the "Periodic Maintenance—Equipment Maintenance" section earlier in this manual.

### **Maintain Oil Level in Spindle Oil Cooler Tank**

To maintain the oil level in the spindle oil cooler tank, follow these steps:

1. Check the level. Units typically have a sight gauge.
2. If the level is low, shut off the oil cooler.
3. Add the recommended oil to the tank. Leave space at the top to allow for hot oil expansion. Do not overfill.

### **Inspect the Air Filter Screen**

To inspect the air filter screen, follow these steps:

1. Shut off the spindle oil cooler.
2. Clean the air filter screen if it is dirty.

### **Maintain Oil in Cooling Tank**

To drain, flush and refill the cooling tank yearly, and any time the oil shows signs of contamination or overheating, follow these steps:

1. Shut off the spindle oil cooler.
2. Drain and flush the tank. Use a non-volatile flushing agent suitable for use in a mineral-type hydraulic system. This agent must be compatible with the oil.
3. Add the recommended oil to the tank. Leave space at the top for hot oil expansion. Be careful not to overfill.

## Persons Trapped in Machine

Provided that all safety circuits are intact, it is not possible to run a bedmill or machining center while making direct contact with any axis, the tool changer, chip conveyor, or chip auger.

Pressing the Emergency Stop push button releases all energy and stops movement. Once this occurs, mechanically disassemble the machine to remove tooling.

## Specifications for Table and ATC Tools

The tables below contain table and ATC tool specifications for each machine.

### Table Specifications

Table Specifications	Machine Type			
	VMX 24	VMX 30	VMX 40	HSMC
Working Surface (No Skirt)	76.2 cm x 50.8 cm	101.6 cm x 50.8 cm	121.92 cm x 50.8 cm	150 cm x 65.0 cm
Number of T-Slots	5	5	5	9
T-slots Width and Spacing	18mm/100mm	18mm/100mm	18mm/100mm/	14mm/63mm
Load Capacity	1335kg	1335kg	1350kg	1350kg
Stainless Steel Cap in Front	NA	NA	NA	NA
Floor to Table Surface	87.38 cm	88.90 cm	88.90 cm	84.5 cm

Table continued on next page.

Table continued from previous page.

	<b>Machine Type</b>				
	<b>VMX 50</b>		<b>VMX64</b>		
<b>Table Specifications</b>	<b>40T</b>	<b>50T</b>	<b>40T 24 Station</b>	<b>40T 40 Station</b>	<b>50T</b>
Working Surface (No Skirt)	149.86 cm x 66.04 cm	149.86 cm x 66.04 cm	167.64 cm x 88.9 cm	167.64 cm x 88.9 cm	167.64 cm x 88.9 cm
Number of T-Slots	6	6	7	7	7
T-Slots Width and Spacing	18mm/ 100mm	18mm/ 100mm	18mm/ 125mm/	18mm/ 125mm/	18mm/ 125mm/
Load Capacity	1335kg	1500kg	2670kg	2670kg	2670kg
Stainless Steel Cap in Front	Yes	Yes	NA	NA	NA
Floor to Table Surface	91.44 cm	91.44 cm	101.60 cm	101.60 cm	101.60 cm

<b>Table Specifications</b>	<b>Machine Type</b>	
	<b>HAWK 30</b>	<b>HAWK 40</b>
Working Surface (No Skirt)	132.08 cm x 27.94 cm	147.32 cm x 33.02 cm
Number of T-Slots	3	4
T-slots Width and Spacing	16mm/ 80mm	18mm/ 82mm
Load Capacity	350kg	450kg
Stainless Steel Cap in Front	NA	NA
Floor to Table Surface	93.5 cm	95.5 cm

*Table 7. Table Specifications*

Type	Swing Arm/ Drum	Swing Arm/ Drum	Swing Arm/ Drum	Swing Arm/ Drum	Double Gripper Robotic Arm
Number of Tools	24	24	24	20	30
Maximum Tool Diameter with Adjacent Tools	81 mm	81 mm	81 mm	125 mm	80 mm
Maximum Tool Diameter without Adjacent Tools	120 mm	120 mm	120 mm	150 mm	130 mm
Maximum Tool Length	300 mm	300 mm	300 mm	300 mm	250 mm
Maximum Tool Weight	7 kg	7 kg	7 kg	15 kg	8 kg
Maximum Tool Carousel Weight	82 kg	82 kg	82 kg	82 kg	200 kg
Magazine Driving	Electric motor	Electric motor	Electric Motor	Electric Motor	NA
Robot Gripper Tool Position	NA	NA	NA	NA	Electric Motor
Robot Arm Rotation	NA	NA	NA	NA	Pneumatic Motor
Robot Arm Position	NA	NA	NA	NA	Pneumatic Cylinder
Chip Guard	Standard	Standard	Standard	Standard	NA

*Table 8. ATC Tool Specifications*

## Part Replacement

### Replacing Tool Pots on the Swing Arm Tool Changer



#### Warning

Only Hurco authorized service personnel are authorized to make the repairs described below.

#### 40-Taper /24-Station Swing Arm ATC

Follow these steps to replace a tool pot for this type of ATC. Only one tool pot can be changed at a time.

#### Note

To replace a tool pot on the 40-station magazine, see the next procedure.

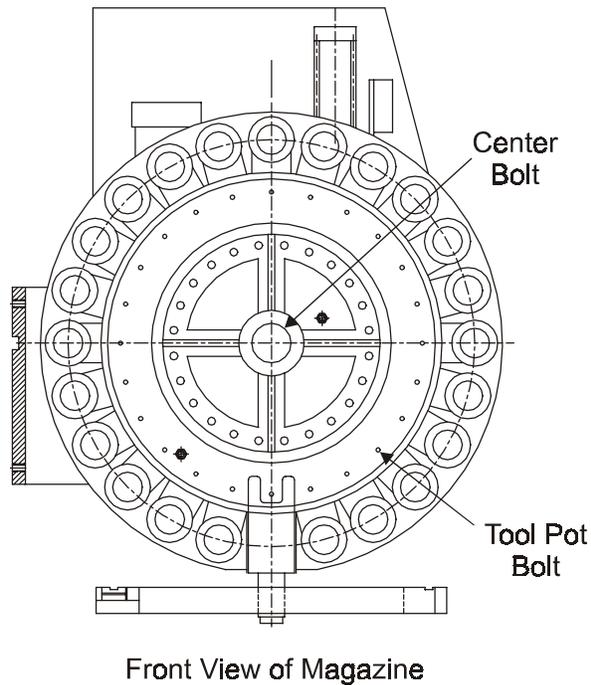
1. Tag and remove all tooling.
2. Rotate the tool magazine so that the defective tool pot is in the 6 o'clock position.
3. Press the ESTOP push button.



#### Warning

You must engage the ESTOP push button before going to the next step. Failure to do so could result in injury.

4. Remove the fiberglass magazine cover.
5. Loosen the M6 SHCS bolt in the tool pot to be removed.



*Figure 4. Center Bolt and Tool Pot Bolt*

6. Loosen the tool magazine's 16mm M6 center bolt. This bolt must stay threaded into the center hub 2 to 3 turns.



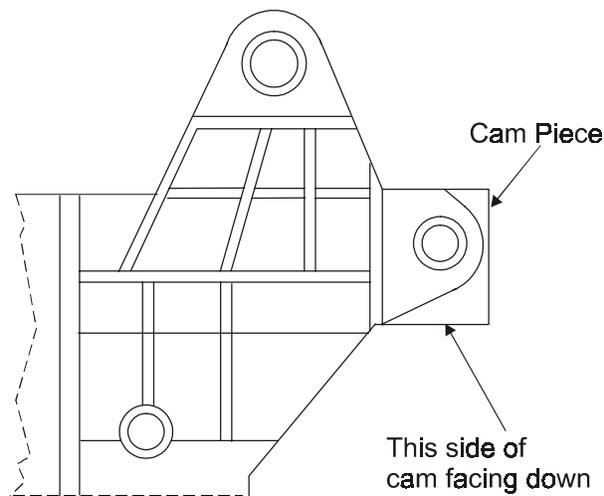
### **Warning**

Do not completely remove the bolt in the center of the magazine.

Do not pull the magazine too far from the main casting. If the magazine is pulled too far, the tool pots and magazine will fall off the center hub, damaging the equipment and possibly causing injury.

If tool pots disengage from the magazine, the magazine will have to be removed and all tool pots unbolted from the magazine. The empty magazine must then be installed onto the hub, and the tool pots installed one at a time onto the magazine.

7. Pull the magazine out and away from the casting until it hits the center bolt.
8. Remove the M6 SHCS from the tool pot and push the tool pot straight back.
  - a. Grab the tool pot by the tool opening in the pot and pull down and back towards the casting.
  - b. The tool pot should pop out. If not, loosen the center bolt just a little more and try again. Do not pull the magazine out too far.
9. Put a small amount of grease on the top and bottom of the new tool pot's cam piece to prevent wear. The cam piece of the new tool pot should have the larger side facing down. See the figure below.



Tool Pot (Rear View)

*Figure 5. Correct Tool Pot Alignment*

10. Install the new tool pot.
  - a. Grab the pot by the tool opening in the pot.
  - b. Push up and forward away from the casting.
11. Use 242 Blue loctite on the tool pot's M6 bolt and torque to 12 ft-lbf (1.659 kgf-m). It may be necessary to use a small allen wrench, coming in from the backside of the tool pot, to index the threaded bar into location so the bolt can be installed.



### Caution

The tool pot is not installed correctly if one of these conditions exist:

- After being tightened, the tool pot is not in alignment with the adjacent tools
  - The tool pot has a small amount of up and down travel. A properly installed tool pot will not have up and down movement. Re-install, making sure that the cam on the tool pot is oriented properly, as shown in the previous figure.
12. If you have more than one tool pot to replace, push the magazine back against the casting, snug the center M6 bolt, and rotate the magazine to the next defective tool pot. Repeat the steps above.
  13. When you are finished replacing tool pots, push the magazine back against the casting.
  14. Remove the M6 bolt and apply 242 Blue loctite.
  15. Re-install the M6 bolt and torque to 12 to 14 ft-lbf (1.659 to 1.936 kgf-m).
  16. Rotate the magazine one full revolution clockwise, and then one revolution counter-clockwise. Rotation should be smooth in both directions.
  17. Calibrate the magazine and install the magazine cover. Tool pot 1 must be in the 6 o'clock position.

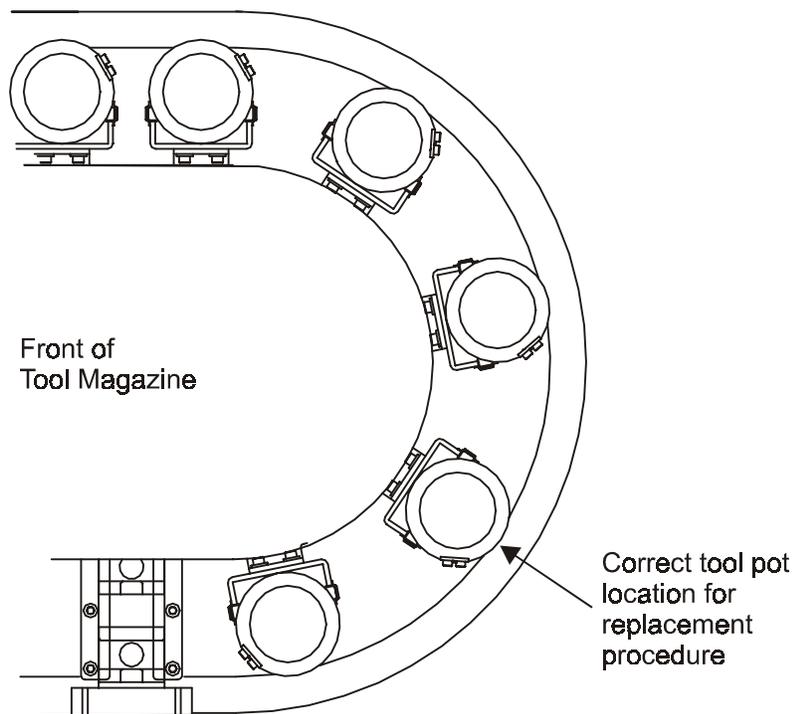
## 50-Taper /32-Station and 40-Taper /40-Station Swing Arm ATC

Follow these steps to replace a tool pot for this type of ATC:

### Note

To replace a tool pocket on the 24-station magazine, see the previous procedure.

1. Rotate the magazine so that the tool pocket is at one end of the magazine (see the figure below). The front of the tool magazine is the best place to perform this procedure.



*Figure 6.. Tool Pot Position for Replacement Procedure*

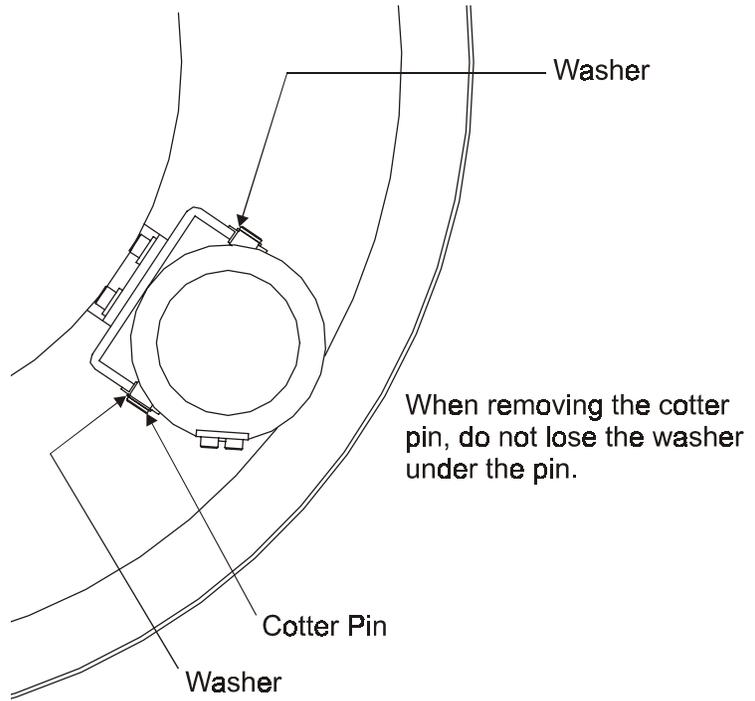
2. Press the ESTOP push button.



### Warning

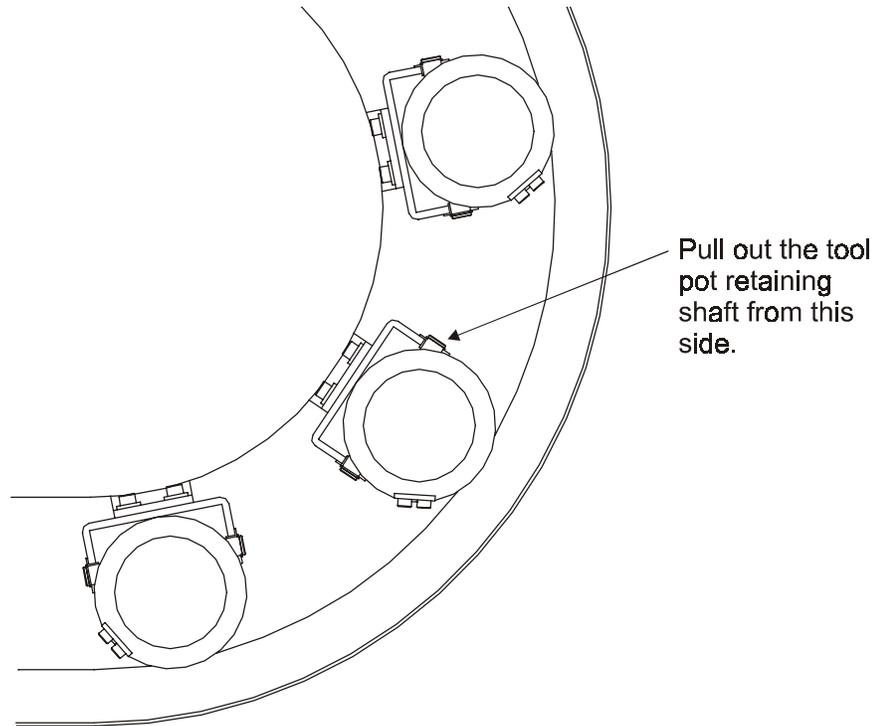
You must engage the ESTOP push button before going to the next step. Failure to do so could result in injury.

3. Locate the cotter pin that holds the retaining shaft in place (see the figure below).



*Figure 7. Cotter Pin Location*

4. Straighten the cotter pin and remove it from the end of the retaining shaft.
5. Pull out the tool pot retaining shaft, from the side indicated in the figure. Do not lose the two washers located on each end of the shaft.



**Figure 8. Tool Pot Retaining Shaft Removal**

6. Take the broken tool pot out of its bracket. The tool pot will pull straight out.
7. Put the new tool pot into the empty tool pot bracket.
8. Make sure that one washer is still affixed to the retaining shaft before installing the shaft in the next step.
9. Insert the retaining shaft through the tool pot bracket and tool pot.
10. Once the shaft end with the cotter pin hole is through, put a washer over the end.
11. Insert the cotter pin through the hole in the shaft end. Bend the two ends of the cotter pin to secure it.
12. Check that the tool pot is secured in place.



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