Novakon Systems Ltd

NM-200

Pro Series

OPERATOR'S MANUAL

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Chapter 1

INTRODUCTION

1.1 THANK YOU FOR YOUR ORDER

Congratulations on your purchase of Novakon's CNC Pro Series NM-200 Bed Mill. With proper set up and maintenance, your machine should provide many years of quality work and enjoyment.

This manual covers general instruction regarding machine set-up, operation, maintenance and trouble shooting for the NM-200 Bed Mill.

1.2 IMPORTANT

Before operating any of Novakon's CNC Bed Mills, this instruction manual and any accompanying instruction manuals must be read carefully. Instruction manuals should be kept in a safe place where they are always easily accessible for reference during the operation of the machine.

Remember safety comes above all else. Carefully read, follow and understand the safety information outline of this manual and always let common sense be your guide.

1.3 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 any comments about this operator's manual or if you have any project you would like to share with us, our contact information is:

NOVAKON SYSTEMS LTD.
160 Gibson Drive, Unit 11
Markham, ON
L3R 3K1

If you have any questions regarding our products, we are available from Monday to Friday from 10:00 a.m. to 6:00 p.m. Eastern Time; you can also e-mail your questions 24 hours a day to sales@Novakon.net. If you are calling outside of Canada, please dial 1-905-258-0366 or 1-905-258-0566. You can also fax your questions to 1-905-258-0633.

1.4 CUSTOMER INFORMATION

Please record the information below about your CNC Bed Mill. Having this information readily available will save time if you need to contact Novakon Systems Ltd for questions, service, accessories or replacement parts.

Model Number: _____

Serial Number: _____

Purchase Number: _____

Delivery Date: _____

We look forward to a long working relationship with you, and thank you again for placing your trust in Novakon Systems Ltd.

Chapter 2

WARRANTY INFORMATION

Novakon Systems Ltd warrants its machines for a period of one (1) year to the original purchaser from the date of purchase. If within one (1) year from the date of purchase a Novakon CNC machine fails due to a defect in material or workmanship, then Novakon will, at its discretion, repair and/or replace the components with a new manufactured part(s) free of charge. This warranty does not cover labor repairing or replacing parts.

This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence, accidents, repairs or lack of routine maintenance. This warranty is also void if the serial number of the machine has been removed, altered or modified.

An investigation will be made by Novakon Systems Ltd to determine whether the warranty applies or not. To qualify, listed below are some of the causes of machine failure that this warranty does not cover.

- Normal Wear – All mechanical devices need periodic parts service and replacement. This warranty will not cover repair when normal use has exhausted the life of a part(s) or component(s).

- Improper Maintenance – The life of the machine and control system depends upon the conditions under which it operates and the care it receives. Applications of this machine may be in dusty and dirty environments, which can cause what appears to be premature wear. Such wear when caused by dirt, dust, cleaning grit or any abrasive material is not covered under warranty.

- Problems caused by part(s) that are not original Novakon CNC machine parts.

- Machine installations – Improper installation of the machine or control system can prevent starting, causes unsatisfactory machine performance and can shorten machine life.

- Part(s) which are broken due to operation with insufficient or contaminated lubricating oil, or incorrect grade of lubricating oil.

- Repair or adjustment of associated part or assemblies, which are not manufactured by Novakon including control systems, installed on Novakon CNC machines.

- Parts damaged by excessive speed, or overheating. Refer to the instruction manual for the recommended working environment and maintenance schedules.
- Parts broken by excessive vibration caused by improper mounting of the machine or tools, installation, unbalanced set-up, improper attachment of work pieces or other abuse in operation.

- Part(s) which are determined to have failed due to improper use of excessive wear caused by continuous use in a production environment. In cases such as this, Novakon will inspect the machine or part and will be the sole judge of the merit of the claim.

- Mishandling, improper operation or using the tool or control system for operations other than what they were intended for.

Transportation charges of part(s) submitted for repair and/or replacement under this warranty are the responsibility of the purchaser. Before returning the machine or component, a Return Merchandise Authorization (RMA) number must be assigned in order for us to accept the return shipments.

No warranty registration is required. Please provide your invoice as proof of purchase. In the event that it is not provided, the date at the time of warranty will be determined by the purchase date and will be used to determine the warranty period.

Chapter 3

GENERAL SAFETY

This machine is provided with various safety devices to protect the operator and the machine. However, these cannot cover all aspects of safety. Therefore, the operator must thoroughly read and understand the content of this manual before the machine is turned on and operated. The operator should also take into consideration these and other aspects of safety related to his particular environment conditions.

2.1 WARNING

- Memorize the position of the EMERGENCY STOP BUTTON on the machine so that you can press it immediately from any position in case of emergencies.
- Do not touch any of the switches accidentally while the machine is in operations.
- Do not touch the tool holder while the machine is running.
- Under no circumstances should you touch a rotating tool holder or work piece while the machine is in operation mode.
- To prevent incorrect operation of the machine, carefully check the position of the switches before operation.
- Always unplug the main plug when the machine is not in use.
- If more than one person is operating the machine, do not proceed to the next step without informing the other operator that you are about to do so.
- Close all covers and junction boxes before running the machine.
- Check all electrical cables for damage to prevent electrical shock.
- Do not handle coolant with bare hands to avoid irritation.
- Always use wire rope or slings as per standards, suitable for the load to be supported.

- Do not remove or adjust switches to increase axis travel beyond the machine specifications.

- Do not wipe the work piece or clear away chips with your hand or with a tag while the spindle is in operation.

- Always use proper cutting tools and work holding clamps suitable for the work and within the specifications of the machine.

- Do not stall the machine during cutting due to improper feed and depth of cut suitable for the work piece material.

- Do not operate spindle above the rated speed of the accessories mounted in it such as tool holders.

- Maintenance of electrical and mechanical component should only be carried out by individuals with working knowledge of the machine tool.

- Clean the machine areas after the maintenance is completed.

- Always provide sufficient work space around the machine and peripheral equipment.

- Protect all cables from being damaged by cutting chips.

- Parts broken by excessive vibration caused by improper mounting of the machine or tools, installation, unbalanced set-up, improper attachment of work pieces or other abuse in operation.

- Part(s) which are determined to have failed due to improper use of excessive wear caused by continuous use in a production environment. In cases such as this, Novakon Systems Ltd., will inspect the machine or part and will be the sole judge of the merit of the claim.

- Mishandling, improper operation or using the tool or control system for operations other than what they were intended for.

Transportation charges of part(s)/component(s) submitted for repair and/or replacement under this warranty are the responsibility of the purchaser. Before returning the machine or

component, a Return Merchandise Authorization (RMA) number must be assigned in order for us to accept the return shipments.

No warranty registration is required. Please provide your invoice as proof of purchase. In the event that it is not provided, the date at the time of warranty will be determined by the purchase date and will be used to determine the warranty period.

2.2 CAUTION

- Do not attempt to operate or turn on the machine until you have read and understood the manuals supplied with the machine.
- Do not allow chips to accumulate in the work envelope.
- Warm up the spindle and axis motion before running the machine in automatic mode.
- Do not operate the keyboard or operation panel switches when wearing gloves.
- Do not disconnect the main power cable without switching off the CNC and PC connections.
- Do not remove any safety covers while the machine is in automatic operation mode.
- Stop all machine operations before cleaning the machine or any peripheral equipment. After a job has been completed, set up each part of the machine so that it is ready to be used for the next series of operations.
- Make sure that the tool length to diameter ratio is proper to minimize vibration due to excessive overhang conditions.
- Make sure the drawbar and the tool holders are tightened to the proper cutting conditions before actual cutting operations.
- Do not use compressed air to clean the machine.

2.3 DANGER

- There are high voltage terminals on the electric control panel, motors, junction boxes and other equipment. Do not touch any of these components under any circumstances, when the power supply is on.
- Make sure that all safety covers are fitted and electrical boxes are closed and secured before the power is switched to ON.
- If any components or safety covers are to be removed, first switch off or disconnect the main plug.
- Always disconnect the power to the machine before carrying out any maintenance work.
- After the power has been switched off for a minimum of 60 minutes, check voltage with a multi meter or equivalent to make sure that there is no residual voltage.
- Tie back long hair to prevent entangling with rotary tools.
- Wear safety equipment whenever possible.
- Always wear a protective mask when machining Magnesium alloys.
- Never wear loose or baggy clothes.
- Do not operate the machine while under the influence of drugs or alcohol.
- Do not operate the machine if you suffer from dizziness.
- Always wear gloves when loading or unloading work pieces or tools and when removing chips from the work area to protect your hands from sharp chips and burns caused by heat generated during machining.

Chapter 4

INSTALLATION & SET-UP

4.1 SET-UP CLEARANCES & CONDITIONS

When considering the permanent location for your CNC machine the following should be taken into consideration:

- The machine should be installed on a flat surface so that the machine does not rock or slide during operation.
- This location should be considered the machine's permanent location. If you need to move it, remove it from the stand first.
- Make sure your stand is level prior to placing the machine on stand. Improper installation and an unleveled machine can cause both numerical error and loss of precision in your machining operation.
- Set up the bed mill stand so you have plenty of working space. Leave at least 3 to 4 feet of clearance on the operating side of the machine.

	A Dimension	B Dimension	C Dimension	D Dimension
NM-200 Bed Mill	83 in/2110 mm	20 in/500 mm	67 in/1700 mm	81 in/1700 mm

Table 4.1 Clearance Dimension

4.2 POWER REQUIREMENTS

	Voltage	Amps	Amps
NM-200 Bed Mill	220	15	Single

Table 4.2 Power Requirements

4.3 STAND REQUIREMENTS

You will need a stand that is capable of supporting the weight of your machine plus the maximum allowable work piece depending on your bed mill. You will also need to add in this figure additional weight for work holding devices, cutters and coolant. A good rule is to build a

stand that can support 5 to 6 times the weight of the machine without any appreciable, permanent information. The bench top should be rigid, level and well supported.

Your work bench should be located in a vibration-free area with a floor that is designed to support the full weight of the bench, machine, accessories and materials.

4.4 LEVELING

Before any machining of the work piece is done, it is crucial to level your machine for best results.

Step 1: Find a relatively flat surface for the installation of the machine and place the machine stand in this spot taking note of the suggested clearances in table 4.1

Step 2: Position the X & Y Axes slides as close to the mid-stroke position as possible. The X & Y axes can be repositioned manually with the knurled wheels at the end of the axes screws. (For leveling purposes, position of the Z axis is not as critical as the X & Y axes slides).

Step 3: Make sure your stand's feet or leveling pads are touching the ground at the same time. If not, adjust the feet to make sure the machine stand does not physically rock.

Step 4: Once all the feet or leveling pads are touching the ground and the machine is not rocking, adjust the middle two feet (on both sides of the machine) off the ground by about ¼ inch while the front and rear feet are on the ground.

Step 5: Place a machinist level on the mill table, parallel to the Y axis. If the level bubble is not in the center of the scale, adjust the left and right side of the feet up or down to bring the bubble in the center (i.e. you are tilting the machine sideways in relation to the Y axis of the machine).

Step 6: Now place the level parallel with the X axis. If it is not in the center of the scale, adjust the feet at the front and rear of the machine to bring the bubble to the center (i.e. you are tilting the machine front to back in relation to the X axis of the machine).

Step 7: Keep the levels in place, drive the middle feet to the ground and make sure the bubble position does not change.

Step 8: Once both adjustments are completed, reposition the slides several times and reposition the slides in the middle stokes (NOTE: this is done after you have hooked the control system to your bed mill).

Step 9: Check to confirm that the machine is still level by repeating steps 5 and 6. If the machine appears to be unlevel, repeat steps 2-7.

NOTE: this leveling procedure should be rechecked every 6 months to ensure machine leveling has not changed due to machine operation.

4.5 INSTALLING THE CONTROLLER

Once your machine has been set up, you are ready to install your control system. If you purchased a Novakon CD 100 Controller, please refer to the documentation sent with your controller. If you have purchased the base machine, we have supplied you with set plugs that match the sockets on the junction box of the CNC bed mill that you purchased. You will be able to use these to wire your control system of choice to your bed mill.

Chapter 5

MECHANICAL COMPONENT IDENTIFICATION AND FUNCTIONS

OVERVIEW

This chapter will help you familiarize yourself with the major mechanical components and functions of your machine.

1. **Drawbar** – The drawbar supports and draws tooling into the R-8 spindle of the NM-200 Bed Mill. The function of the drawbar is to locate the tool holder accurately in relationship to the main spindle taper. The clamping and unclamping of the tools is achieved by the manual actuation of the drawbar system (this is not visible from the picture).

2. **Work Light** – The work light is controlled by the machine system. Please note this is an on/off function only.

3. **Emergency Stop Button** – Located at the bottom left side of the mill head. Press this button to stop movement of the slides and the mill spindle.

4. **Gib Adjustment Screws** – The NM-200 has a series of gib adjustment screws along the operator side of the saddle. These screws press a metal plate (the gib) to the ways of the saddle, increasing the tension when moving the cross-slide assembly. Before adjusting the gibs, make sure they are well lubricated to achieve the desire result.

5. **X Axis Stepper Motor** – The NM-200 mill is equipped with X, Y and Z axes stepper motors. This X axis stepper motor provides power for table movement along the X axis. See the machine specifications for motor sizes.

6. **Lifting Eye Hooks** – There are two lifting eye hooks located on the operator's side of the machine. Use these eye hooks in conjunction with a chain or tow ropes to help move your machine from the shipping pallet to a stand.

7. **Saddle** – the mill table is supported by the saddle along the Y axis.

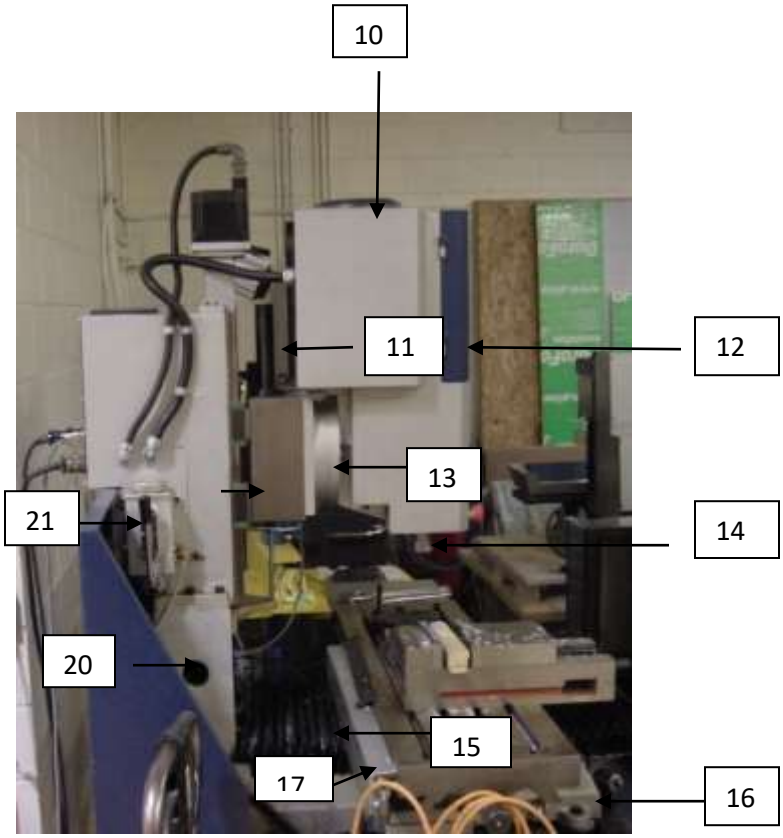
8. **Mill Table** – the mill table supports your work piece and work holding devices. It travels along the X & Y axes via ball screws. Both the NM-200 Mill has 5/8" T-slots.

9. **Motor Cover** – The motor is protected by a sheet metal cover. The motor is easily accessible by turning the knurled knob on the right side of the cover. This cover should remain closed while the machine is in operation.

10. **Spindle Drive Motor** – The fan cooled spindle drive motor is located behind the motor cover.

11. **Compressed Nitrogen Gas Cylinder** – The NM-200 mill uses a counter balance cylinder to counter the weight of the Z axis assembly.

12. **Drive Belt** – The drive belt for the motor is located behind the motor cover. The motor cover must be removed to replace or tension the belt. (Not visible in diagram)



13. **Head Rotation Lock Bolts** – There are two bolts, one on either side of the mill head that when loosened, allow the operator to rotate the mill head between 0 and 90 degrees in either direction.

14. **Spindle with R-8 nose taper –** The NM-200 utilizes a spindle with an R-8 taper nose for supporting and locating work holding tools. Any standard tool holding equivalent to the R-8 specifications can be mounted on the spindle with suitable adaptors.

15. **Bellows –** The Y axis ball screw is protected from chips and coolant by industrial bellows.

16. **Mounting Points –** There are six mounting points on the NM-200 Bed Mill. The mounting points are M10 holes located at each corner of the machine and one in the middle of each side of the machine. Make sure that your machine is properly mounted before operating it.

17. **Proximity Switches** – A switch is located on each axis of travel. These switches are the mechanical end position limits and they also are used to home the slides.

18. **Proximity Switch Covers** – The proximity switches on the NM-200 Bed Mill are protected from coolant and chips with removable sheet metal cover.

19. **Bed & Column** – The bed and the column are a box type construction made of high quality grade 25 cast iron. They are designed for high rigidity with suitable cross section and ribs for reinforcement. Proper casting treatment is give to relieve the castings of any undue stress before assembly and machining is done. The X axis, Y axis and Z axis slide components including the headstock assembly and table are mounted on the same base and column structure.

20. **Lifting Point** – This lifting point is used in conjunction with the lifting eyehooks. Run an adequately sized bar through this point and attach tow ropes or chains to the bar to assist in the mechanical lifting process.

21. **One Shot Lubrication System** – The one shot or single stroke lubrication system is located on the left side of the machine. The dovetail ways, ball nuts and liner bearings are provided, a minimum of two pumps is recommended and it is also advisable to visually check the lubrication delivery on the lubed surfaces. Lubrication is very important for machine tools since it greatly affects machine life. Use only recommended lubrication oils which are clean and free from foreign matter. Follow the maintenance scheduled in this manual.

22. **Bearing Guide Way System** – The mill head travels along the Z axis which is equipped with the linear bearing guide way system.

23. **Lubrication Distribution Block** – The shield metal lines of the lubrication system intersect at this block to deliver lubrication to the various parts of your NM-200 Bed Mill.

24. **Z axis Stepper Motor** – This motor drives the Z axis of the machine and provides motion of the head along the Z axis linear guide way.

25. **Variable Frequency Drive** – this is the drive for the main spindle motor.

26. **Junction Box** – The control system is connected to the machine via this junction box.

27. **Y axis Stepper Motor** – This motor drives the table along the dovetail ways of the Y axis.

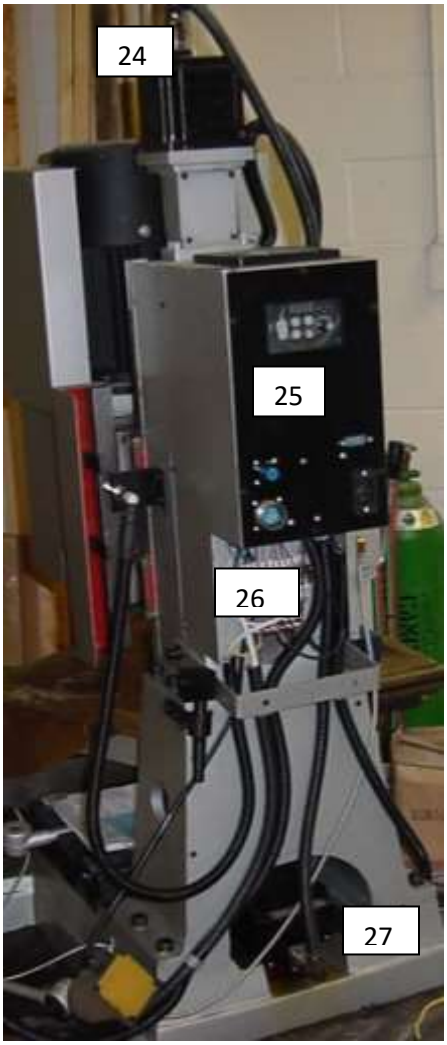


Figure 5.3: NM-200 Back View

Chapter 6

MECHANICAL MAINTENANCE

6.1 MAINTENANCE SCHEDULE

Maintaining your machine as per schedule documented in this manual will help prolong the life of the machine and aid in the production of precision work pieces. It should be noted that the maintenance schedules listed herein, are intended to be used as a guide. The environment and working conditions of your shop should be taken into consideration.

Daily Maintenance

Perform these maintenance tasks at the beginning and at the end of work.

AREA OF MAINTENANCE	MAINTENANCE TASK	HOW OFTEN
Lubrication System	• Check for oil level • Pressure build up during hand pumping • Check for distribution film of oil on all sliding surfaces • Check for leaks	At the start of work
Cutting Tools & Tool Holders	• Tighten the drawbar • Tighten work holding devices	At the start of work
Coolant Level (optional)	• Check for level	At the start of work
Machine Work Area	• Check for leakage and cleanliness	At the start & end of work
Cleaning	• Clean the work holding devices • Clean guards • Clean machine • Clean trays	At the start & end of work

External Wiring & Cables	• Check fit of cable connections • Check for damaged cable	At the start of work
Machine General Condition	• Check machine for loose or missing fasteners	At the start of work
Spindle	• Clean the spindle taper	At the start of work

Periodic Maintenance

Perform these maintenance tasks as per the schedule below.

Area of Maintenance	Maintenance Task	How Often
Mechanical		
Axes Backlash	• Check and compensate if necessary	6 months
Ball Screw Guards	• Check condition	6 months or replace if necessary
Drive Belt	• Check condition • Check tension	6 months or replace if necessary
Gib Adjustments	• Check table motion for fish tailing movement and adjust. Follow instructions	6 months
Machine Base/Table	• Check for level and mounting bolt loosening	6 months
Tool Holder/Drawbar	• Check for breakage and thread damage	1 month

Electrical		
Electrical Cabinets	• Check for cleanliness • Check and secure any loose connections	3 months
Electrical Elements	• Check for proper working of push button switches	3 months
Proximity Switches	• Check for proper operations	3 months
Motors	• Check for condition and testing	1 month

6.2 Lubrication System

This section covers the lubrication of your machine. There are two primary areas of lubrication: areas lubricated by the single stroke lube system and the life greased bearings.

Remember proper lubrication is very important. It greatly affects the performance and longevity of your machine. If the machine is operated without supplying the lubricating oil, it will cause seizure of the sliding surfaces. Before operating, visually inspect the oil on the actual machine surfaces.

Use only recommended lubrication oils which are clean and free from foreign matter. Periodically clean the tank and strainers/ filters, if provided, inspect the equipment's functioning or lube supply pipes for damages to ensure optimum machine operation.

LUBRICATING POINTS	LUBRICATING SYSTEM AND RECOMMENDED OIL GRADE	QUANTITY
Headstock Bearings	Grease Kluber Isoflex BU – 15	Life Grease
Ball Screw & Guide Ways	Manual One Shot Lubrication Mobil – 1	1 Liter
Quill & Ball Screw Bearings	Grease Kluber Isoflex NBU – 15	Life Grease

Table 6.3 Lubrication Grade Table

6.3 Ball Screws and Guide Ways

The ball screws, linear guide ways and dovetail slides are lubricated by the single stoke lubrication system. Follow the lubrication schedule in table 6.1. When lubricating the linear guide way and dovetail slide, pull the lever of the one shot lube system away and down from the machine. The number of pumps required will depend on your shop environment. Enough pumps should be administered until a thin layer of lubrication is present on the slides.

6.4 Headstock & Spindle Bearings

The bearings are of a precision class of accuracy. The spindle bearings are lubricated for life with high grade grease, such as Kluber Isoflex NBU – 15. This grease maintains its lubrication properties at both low and high temperatures (-70F to 120F). There is no necessary lubrication to these bearings.

If the spindle starts making abnormal noises or gets very warm above 120F, check for damage of the spindle bearings after stopping the machine completely. The spindle should be warmed up for approximately 15 – 20 minutes when the machine has been stopped for a long period (i.e. 5 or more days).

6.5 PERIOD MAINTENANCE TASKS

Axis Bearing Adjustment/Axis Backslash

Backslash is the amount of movement the screw makes before the table engages. There are a number of signs that may indicate that there are excessive backslash with your system:

- Rough/uneven surface finishes
- Dimension inaccuracies
- Table shakes under machining force

Even if one of these signs is present, it is recommended to che4ck for backslash compensation every 3-6 months depending on your usage of the machine. This section of the manual is addressing mechanical backslash compensation. There are three main mechanical reasons for backslash.

1. Pre-loaded ball nut is damaged and is causing axial play between the nut and screw. If the ball nut is damaged, the only solution to this is to replace the ball screw and ball nut assembly.
2. The end support bearings are damaged. If you find that the end bearings are damaged, follow the procedure below for replacing the bearings.
3. The end bearing tightening nut is loose. Follow steps 6 and 7 in the following procedure to tighten the bearings whenever required.

Y Axis Ball Screw End Bearing Adjustment

For this procedure, you will need to refer to diagram 5 of chapter 8 of this manual.

Step 1: Remove axis motor.

Step 2: Detach bellows from saddle (reference diagram number 5)

Step 3: Loosen the part #28 and #29 to remove the bearing housing #20. Loosen the end bearing nuts first. Remove the damaged bearing from the housing and ball screw.

Step 4: Check the opposed pair of angular contact bearings for damage. Make sure the bearings are not damaged or the housing of the bearing ID seating are not heavily scoured or damaged. If the bearings are damaged, acquire the new set of bearings for replacement. Also ensure the new set of bearings is

packed with proper amount and type of grease before tightening (see chapter 6 for lubrication specifications).

Step 5: Install the inner bearing #30 first on the ball screws, making sure the bearing orientation is the same as the original mounting direction.

Step 6: Install bearing housing #20 square with the ball screw axis, making sure the bearing housing #20 is securely positioned with part numbers 28 and 29.

Step 7: Install bearing #21 from the outside of the housing, making sure the bearing orientation is the same as the original mounting direction. The bearing contact angle's center lines for these two bearings should be opposed (in X fashion) to each other when mounted.

Step 8: Tighten the first nut #25 (closer to the housing/bearing) to tighten the bearings against the housing. Loosen the nut and re-tighten again to position the bearing properly. Install the second jam nut #25 to secure the first nut also.

Step 9: Rotate the screw manually to ensure the motion of the screw is smooth and uniform and the bearings are not creating any stop and go motion or are completely jammed.

Z Axis Ball Screw End Bearing Adjustment

For this procedure, you will need to refer to diagram 4 on chapter 8 of this manual.

Step 1: Remove axis motor.

Step 2: To replace the damaged bearings, loosen the part #9 to remove the bearing housing #8. Loosen the end bearing nuts first. Remove the damaged bearing from the housing #8 and ball screw #25.

Step 3: Check the opposed pair of angular contact bearings for damage. Make sure the bearings are not damaged or the housing of the bearing ID seating are not heavily scoured or damaged. If the bearings are damaged, acquire a new set of bearings for replacement. Also ensure the new set of bearings is packed with proper amount and type of grease before tightening. (See chapter 6 for lubrication process).

Step 4: Install the set of bearing #24 first on the ball screw. Make sure the bearing orientation is the same as the original mounting direction. The bearing contact angle's center lines for these two bearings should be opposed (in X fashion) to each other when mounted.

Step 5: Install the bearing housing #8 square with the ball screw axis. Please make sure bearing housing #8 is securely positioned with using part #9.

Step 6: Now tighten the first nut, part #23 to put the bearings against the housing. Loosen the nut and retighten again to position the bearing properly. Install the second jam nut, part #23, to secure the first nut also.

Step 7: Rotate the screw manually to ensure there is no jerky motion of the screw or the bearings are not creating any stop and go motion or are completely jammed.

Adjustment of Gibs on the X & Y Axis Slides

The X & Y axis slides have straight gibs. If the slide motion proves out to be sloppy or uneven, adjust the gibs evenly using the set screw provided on the front and side of the casting.

Step 1: Make sure that the slide is properly lubricated before you start adjusting the screws.

Step 2: Loosen the gib hex head bolts.

Step 3: Tighten the gib set screws all the way so there is no table movement.

Step 4: Loosen all set screws one at a time a quarter of a turn and check the motion for “fish tailing” and uneven motions to and from.

Step 5: Adjust all the set screws until the “fish tailing” movement is eliminated.

Step 6: Tighten the gib hex head bolts. Do NOT exceed 100 in-lb torque.

The tighter the gib the more accurate it will be in motion but the required to move the slide may also go up due to the increased sliding friction. Removing and cleaning the gibs before installation is also helpful.

With the gibs properly adjusted and the slides lubricated, the torque required to move the slide slowly, should not exceed 15 – 20% of the maximum motor torque available.

Headstock to Table Realignment

If you have positioned your head at an angle between +/-0-90 °, you will need to realign it to the table by following the steps below.

Step 1: Remove the tool holders and jobs from the table.

Step 2: Mount a dial indicator in the spindle of your machine.

Step 3: Loosen the head rotation lock bolts and rotate the head as necessary to realign the spindle so that it is perpendicular to the surface of the table.

Step 4: Sweep the dial indicator 360° to check the results. Make minor adjustment as necessary.

Step 5: Once the desired results are achieved, lock the mounting bolts and recheck the alignment by sweeping the dial indicator 360°.

In case of a severe accident, contact Novakon Systems for further advice.

6.6 Linear Motion Guide & Bearing Maintenance

Unlike sliding guide systems for the X & Y axes slides, linear motion guides are free from wear. It requires neither adjustment of the running ways due to uneven wear nor maintenance to restore the original accuracy. Sideway systems use a quality of oil for the forced lubrication of the sideways to form and maintain oil films. On the other hand, linear motion (LM) guide systems require only periodical lubrication in a very small quantity. It contributes to easy, reduced maintenance and to the creation of a clean working environment. There are no adjustments required for such bearings and guides. The case of failure of such bearings, replacements is the only cure.

Make sure the linear bearings are not splashed with coolant directly since the lubricant may be contaminated with coolant which may wash off or emulsify the lubricant; thereby, significantly degrading lubrication's performance. One sign of such cases is the increased noise when the Z axis slide moves up and down at high speed. Make sure lubrication supply is present by checking the ends of the lubrication supply piping for the proper oil flow.

Chapter 7
TOOL HOLDING

OVERVIEW

In milling operations cutters are mounted in a tool holder which is drawn into the spindle by a drawbar system. The NM-200 utilizes the readily available Bridgeport R-8 standard tooling. The standard drawbar for R-8 tapered tooling is 7/16 diameter with 20 threads per inch.

TOOL HOLDING OPTIONS

There are several tool holders that can be used in the spindle of the NM-200 Bed Mill.

Arbors come in different sizes and lengths with one end tapered to suit the inside spindle taper, in the case of the NM-200, an R-8 taper is required. The term arbor is used for a general work holding device. Arbors can mount drill chucks, slitting saws, gear cutters and shell end mills. An arbor is secured in place with the drawbar system.

Collets (Spring Collets) are the most commonly used work holding device. They come in a variety of styles and sizes. They are bored to hold a specific diameter. As the collet is drawn into the spindle of the machine, the spring collet “closes” or “clamps” down on the tool securing it in place.

End Mill Adapters are made specifically to hold end mills. Like arbors they come in different sizes with one end tapered to fit the inside spindle taper. End mill adapters are bored to a specific size to hold end mills with a corresponding shank size. End mills are secured in the adapter by friction and a set screw clamps down on the flat end mill for extra security.

INSTALLING THE TOOLING

Once you have determined the appropriate tooling for your operation, you will need to secure it in the mill spindle via the drawbar system. The drawbar is located inside the protective sheet metal housing of the NM-200 bed mill.

Step 1: Turn the knurled knob on the right side of the mill head door to access the drawbar.

Step 2: The drawbar is secured in place by the drawbar nut, but has a slight movement up and down in the spindle which allows you to easily install your tooling.

Step 3: Insert your tooling into the spindle. NOTE: R-8 tooling has a milled slot on the shank. The slot should be aligned with the pin in the spindle of the machine. The pin prevents your tooling from rotating against the external forces during a cut.
Step 4: Once the tooling is in place, rotate the drawbar clockwise to install your tooling. Tighten drawbar as noted below.
NOTE: Recommended Tightening Torque for R-8 Collet/Drawbar.

Proper torque settings depend on the application, the condition of the threads, grade of the thread, vibration during machining, types of cut etc. The following table provides a general idea about this tightening torque to resist any collet movements. The best practice is to check the joint and make sure, from time to time that the drawbars/collet is still tight to avoid any unsafe operation.

THREAD SIZE	**TORQUE FOR SAE GRADE 2 PLAIN**	**TORQUE FOR SAE GRADE 2 OIL WAXED**	**TORQUE FOR SAE GRADE 5 PLAIN**	**TORQUE FOR SAE GRADE 5 OIL WAXED**
7/16" – 20	32 – 36 ft – lbs	18 – 20 ft – lbs	52 – 56 ft – lbs	28 – 32 ft – lbs

To get the best result out of the draw bar/collet tightening process, the tightening procedure is recommended as follows:

Step 1: Make sure the threads are not damaged and are free of debris.

Step 2: For a new draw bar and collet, find the thread grade and material, if possible, and the condition of the thread surface.

Step 3: Tighten the draw bar to 2 to 2.5 times the recommended values provided in the above table.

Step 4: Loosen the collet and retighten to the specified torque as given in the table.

Step 5: Machine a few parts and ensure the collet/draw bar is not loose. Once confirmed, note down the final torque value for future applications also.

Removing Tooling

To remove the tooling, rotate the drawbar counterclockwise. The drawbar nut works as an upward stop when removing your tooling. When you are removing something from the spindle that is held in place with the drawbar, the drawbar will hit the drawbar nut, preventing it from moving upward as the tooling is "pushed" out of the spindle.

Chapter 8

NM-200 BED MILL SPECIFICATIONS

Dimension	Inch	Metric
General Specifications		
Length	39.33”	998.98 mm
Width	39.75”	1009.65 mm
Height	52.33”	1329.18 mm
Machine Weight	1175 lbs	532.97 kg
Footprint	36” x 24”	914.40 x 609.60 mm
Shipping Dimension	41” x 37” x 48”	1041.40 x 939.80 x 1219.20 mm
Shipping Weight	1380 lbs	625.96 kg
Maximum Work Capacities - Drilling mild steel - Tapping	 Max dia. 0.781” 0.75”	 19.84 mm 19.05 mm
Specifications		
Table Size	40” x 12”	1016 x 304.80 mm
Work Cube	22” x 13” x 11.50”	558 x 330.20 x 292.10 mm
Maximum Weight on Table	594 lbs	269.43 kg
T-slot Size	5/8”	15.88 mm
Slots on Table Qty.	4	4
Table Travel X Axis	22”	558.80 mm
Saddle Travel Y Axis	13”	330.20 mm
Head Travel Z Axis	11.5”	292.10 mm
Castings	Cast Iron	Cast Iron
Table Surface	Precision ground	Precision ground
Ways (X, Y Axis)	Dovetail	Dovetail
Ways (Z Axis)	Linear Bearings	Linear Bearings
Head Swivel	+ or - 90°	+ or – 90°
Spindle		
Motor HP Rating	2 HP	1.5 KW
Maximum Torque	94 in-lb	30 NM
Drive System	Geared Belt	Geared Belt

Minimum Speed	150 RPM	150 RPM
Dimension	Inch	Metric
Maximum Speed	4000 RPM	4000 RPM
Positioning Accuracy	+ or – 0.0005”	+ or – 0.0127 mm
Repeatability	0.00025”	0.00635 mm
Quill Diameter	3.15”	80.01 mm
Spindle Bearings	Angular Contact	Angular Contact
Spindle Taper	R-8	R-8
Axes		
Stepper Motors (X, Y, Z Axis)	1700 in-oz	1700 in-oz
Ball Screws	Pre-loaded	Pre-loaded
	Hardened & Ground	Hardened & Ground
Ball Screw Size (X Axis)	0.984”	25 mm
Ball Screw Size (Y Axis)	0.984”	25 mm
Ball Screw Size (Z Axis)	0.787”	20 mm
Ball Screw Pitch	0.196”	5 mm
Ball Screw Position	P5	P5
Electrical		
Power requirement	220 VAC @ 15 A	220 VAC @ 15 A
Stand Specifications		
Stand Footprint	25.20” x 36.50”	640.08 x 927.10 mm
Stand Dimensions	25.20” x 36.50” x 37”	640.08 x 927.10 x 939.80 mm
Stand Weight	335 lbs	151.95 kg
Stand Shipping Weight	462 lbs	209.56 kg
Floor Space Required	36” x 60” x 84”	914.40 x 1524 x 2133.60 mm

Chapter 9
MACHINE PARTS DIAGRAMS

OVERVIEW

This section shows all the necessary parts of the machine. All the diagrams are properly labeled and numbered. The reference codes and numbers are found on the reference chart after each diagram.

Please have this section ready whenever you have questions or need technical help regarding the machine's operation.

If replacement parts are required, please call 1-905-258-0366/1-905-258-0566 to talk to a Novakon technician.

Diagram 1: Protective Sheet Metal Covers, Mill Head & Junction Box

Diagram 1: Protective Sheet Metal Covers, Mill Head & Junction Box Reference Chart

Diagram Number	Part Number	Reference Number	Description
1	NM-200-01001	M5 x 8 GB818-85	Screw
2	NM-200-01002	XQK9630S-00-857	Wiring Board
3	NM-200-01003	XQK9630S-00-85	Wiring Box
4	NM-200-01004	M6X12 GB818-85	Screw
5	NM-200-01005	M5 X8 GB818-85	Screw
6	NM-200-01006	XQK9630-00-676	Transmission cover
7	NM-200-01007	XQK9630S-00-671	Drilling-milling head box shield
8	NM-200-01008	M5 X8 GB819-85	Screw
9	NM-200-01009	XQK9630-00-672	Shield door
10	NM-200-01010	M6 GB6182-86	Hexagon nuts
11	NM-200-1011	XQK9630S-00-673	Handle
12	NM-200-1012	M6 X16 GB70-85	Hexagon socket cap head screw
13	NM-200-1013	M6 X10 GB818-85	Screw

Diagram 2: Proximity Switches

Diagram Number	Part Number	Reference Number	Description

1	NM-200-02001	XQK9630S-00-201	Prox switch box
2	NM-200-02002		Prox switch
3	NM-200-02003	M5 X10 GB70-85	Hexagon socket cap head screws
4	NM-200-02004	XQK9630-00-03	Travel limit switch iron slide
5	NM-200-02005	M4 X10 GB70-85	Hexagon socket cap head screws
6	NM-200-02006	XQK9630-00-004	Limit switch block
7	NM-200-02007	M5 X16 GB70-85	Hexagon socket cap screws
8	NM-200-02008	XQK9630-00-005	Square nut
9	NM-200-02009	XQK9630S-00-299	Shield
10	NM-200-02010	M5 X16 GB70-85	Screws
11	NM-200-02011	XQK9630S-00-298	Shield
12	NM-200-02012	M5 X16GB70-85	Screws
13	NM-200-02013	XQK9630S-00-207	Prox switch box
14	NM-200-02014	M5 X10 GB70-85	Hexagon socket cap head screws
15	NM-200-02015		Prox switch
16	NM-200-02016	XQK9630-00-005	Square nut
17	NM-200-02017	XQK9630-00-003	Travel limit switch iron slide
18	NM-200-02018	M5 X16 GB70-85	Hexagon socket cap head screws
19	NM-200-02019	XQK9630-00-008	Cross limit switch block
20	NM-200-02020	M4 X10 GB70-85	Hexagon socket cap head screws
21	NM-200-02021	M5 X10 GB70-85	Hexagon socket cap head screws
22	NM-200-02022	XQK9630S-00-209	Prox switch box
23	NM-200-02023		Prox switch
24	NM-200-02024	XQK9630-00-005	Square nut
25	NM-200-02025	XQK9630-00-010	Longitudinal limit switch block
26	NM-200-02026	M5 X16 GB70-85	Hexagon socket head screws
27	NM-200-02027	M4 X10 GB70-85	Hexagon socket cap head screws
28	NM-200-02028	XQK9630-00-003	Shield
29	NM-200-02029	XQK9630S-00-297	Shield
30	NM-200-02030	M5 X16 GB70-85	Screws

Diagram 3: Mill-Drill Head

Diagram	Part Number	Reference Number	Description

Number			
1	NM-200-03001	6208-ZN GB277-64	Radial ball bearing
2	NM-200-03002	80 JB GQ0251-89	Bearing loop
3	NM-200-03003	40GB894-1-86	Circlips for shaft
4	NM-200-03004	Z7820-01-143	Sleeve
5	NM-200-03005	Z7820-01-144A	Staff
6	NM-200-03006	Z7820-01-141	Nut Sleeve
7	NM-200-03007	Z7820-01-306S	Output sleeve
8	NM-200-03008	XQK9630S-01-303S	Synch rob pulley
9	NM-200-03009	Z7820-01-305S	Sleeve
10	NM-200-03010	6208-z GB276-64	Radial ball bearing
11	NM-200-03011	40 GB894-1-86	Circlips for shaft
12	NM-200-03012	10 x 45 GB1097-79	Plain parallel key
13	NM-200-03013	D36107 GB292-64	Ball bearing
14	NM-200-03014	Z7820-01-123	Inner ring spacer
15	NM-200-03015	Z7820-01-124	Outer ring spacer
16	NM-200-03016	Z7820-01-120A	Drilling-milling spindle
17	NM-200-03017	M6 GB6170-86	Hexagon nuts
18	NM-200-03018	M6 x 16GB75-86	Screws
19	NM-200-03019	JB GQ03024-89	Felt collar
20	NM-200-03020	Z7820-01-122S	Main shaft bearing oil seal
21	NM-200-03021	M5 x 16 GB70-76	Hexagon socket cap head screws
22	NM-200-03022	M4 x 16 GB70-76	Hexagon socket cap head screws
23	NM-200-03023	Z7820-01-1109	Sleeve spacer
24	NM-200-03024	M35 x 1.5 GB812-76	Round nuts
25	NM-200-03025	Z7820-01-125S	Spindle sleeve
26	NM-200-03026	Z7820-01-108	Sleeve
27	NM-200-03027	D36206 GB292-64	Ball bearing
28	NM-200-03028	Z7820-01-107	Adjust nut
29	NM-200-03029		
30	NM-200-03030	M10 x 14 GB75-86	Screws
31	NM-200-03031	Z7820-01-128S	Drilling-milling head screws
32	NM-200-03032	Z7820-01-121	Transmission cover
33	NM-200-03033	M5 x 16 GB65-76	Slotted cheese head box
34	NM-200-03034	M10 x 25 GB70-76	Hexagon socket cap head screws
35	NM-200-03035	Z7829-01-1301S	Transmission cover
36	NM-200-03036	10 GB93-87	Plain washer
37	NM-200-03037	M10 x 30 GB5782-86	Hexagon head bolts
38	NM-200-03038	M10 x 25 GB70-76	Hexagon socket cap head screws

39	NM-200-03039	VYF2-90L-4	Motor
40	NM-200-03040	8 x 32 GB1096-79	Plain parallel key
41	NM-200-03041	M8 x 12 GB9-85	Screws
42	NM-200-03042	XQK9630S-01-302S	Synch rob pulley
43	NM-200-03043	187L-150	Synch rob belt
44	NM-200-03044	Z7820-00-104	T-shaped slide block
45	NM-200-03045	Z7820-02-101	Slide
46	NM-200-03046	10 GB93-87	Spring washers
47	NM-200-03047	M10 x 35 GB5782-86	Hexagon head bolts
48	NM-200-03048	16 GB97.2-85	Plain washer
49	NM-200-03049	M16 x 45 GB5782-86	Hexagon head bolts

Diagram 4: Column

Diagram 4: Column Reference Chart

Diagram Number	Part Number	Reference Number	Description
1	NM-200-04001	M12 x 60 GB70-85	Hexagon socket cap head screws
2	NM-200-04002	ZX7020-02-104	Intermediate pedestal
3	NM-200-04003	M12 x 40 GB5782-86	Hexagon head bolts
4	NM-200-04004	M5 x 8 GB67-85	Screw
5	NM-200-04005	XQK9630-0210SM	Back cover
6	NM-200-04006	M12 x 45 GB70-85	Hexagon socket cap head screw
7	NM-200-04007	Z7020C-02-103	Upright column
8	NM-200-04008	Z7020-02-105SM	Elevator motor base
9	NM-200-04009	M8 x 30 GB70-85	Hexagon socket cap head screws
10	NM-200-04010	M5 x 8 GB 67-85	Screw
11	NM-200-04011	Z7020-020105-2	Apron
12	NM-200-04012	M5 x 16 GB70-85	Hexagon socket cap head screw
13	NM-200-04013	XQK9630S-02-305	Backing board
14	NM-200-04014	M5 x 8 GB67-85	Screw
15	NM-200-04015	XQK9630S-02-105-2	Apron
16	NM-200-04016	XQK9630S-00-999	Mandrill seat
17	NM-200-04017	8 GB97.2 – 85	Plain washers
18	NM-200-04018	M8 x 30 GB70-85	Hexagon socket cap head screws
19	NM-200-04019	Z7020C-02-105	Z axle linear guide way
20	NM-200-04020	M6 x 25 GB70-85	Hexagon socket cap head screws
21	NM-200-04021	M5 x 12 GB70-85	Hexagon socket cap head screws
22	NM-200-04022	XQK9630-02-901S	Coupling sleeve
23	NM-200-04023	M14 x 1.5 GB812-88	Round nut
24	NM-200-04024	46102 GB292-83	Bearing
25	NM-200-04025	Z7020C-02-108SM	Elevator screw coupling
26	NM-200-04026	M5 x 16 GB70-85	Hexagon socket cap head screw
27	NM-200-04027	Z7020C-02-109	Elevator nut seat
28	NM-200-04028	M6 x 25 GB70-85	Hexagon socket cap head screw
29	NM-200-04029	XQK9630S-00-998	Mandrill sleeve
30	NM-200-04030	M6 x 16 GB70-85	Hexagon socket cap head screw
31	NM-200-04031	XQK9630S-00-997	Sleeve
32	NM-200-04032	Z7020C-02-102S	Elevator carriage
33	NM-200-04033	M6 x 25 GB70-85	Hexagon socket cap head screw

Diagram 5: Table & Bed Assembly

Diagram 5: Table & Bed Assembly Reference Chart

Diagram Number	Part Number	Reference Number	Description
1	NM-200-05001	M5 x 12 GB70-85	Hexagon socket cap head screw
2	NM-200-05002	XK9630-03-111	Main shaft bearing oil seal
3	NM-200-05003	XK9630-03-110	Sleeve spacer
4	NM-200-05004	46104 GB292-83	Bearing
5	NM-200-05005	M8 x 45 GB70-85	Hexagon socket cap head screw
6	NM-200-05006	860 GB117-86	Taper pin
7	NM-200-05007	XK9630-03-108	Cross feed screw seat
8	NM-200-05008	46104 GB292-83	Bearing
9	NM-200-05009	XK9630-03-109	Sleeve spacer
10	NM-200-05010	XK9630-03-111	Main shaft bearing oil seal
11	NM-200-05011	M5 x 12 GB70-85	Hexagon socket cap head screw
12	NM-200-05012	XK9630S-03-112SM	Worktable
13	NM-200-05013	Z7020C-03-120SM	X axle motor seat
14	NM-200-05014	M8 x 16 GB70-85	Hexagon socket cap head screw
15	NM-200-05015	XQK9630S-03-129	Backing board
16	NM-200-05016	XQK9630S-03-128	Backing board
17	NM-200-05017	M5 x 16 GB70-85	Hexagon socket cap head screw
18	NM-200-05018	XK9630S-03-121	Motor guard
19	NM-200-05019	M5 x 8 GB67-85	Screw
20	NM-200-05020	XK9630-03-108	Cross feed screw seat
21	NM-200-05021	46104 GB292-83	Bearing
22	NM-200-05022	XK9630-03-110	Sleeve spacer
23	NM-200-05023	XK9630-03-111	Main shaft bearing oil seal
24	NM-200-05024	M5 x 12 GB70-85	Hexagon socket cap head screws
25	NM-200-05025	M18 x 1.5 GB812-88	Round nut
26	NM-200-05026	M5 x 12 GB70-85	Hexagon socket cap head screws
27	NM-200-05027	XQK9630-02-901S	Coupling sleeve
28	NM-200-05028	M8 x 45 GB70-85	Hexagon socket cap head screws
29	NM-200-05029	8 x 60GB117-86	Taper pin
30	NM-200-05030	46104 GB292-83	Bearing
31	NM-200-05031	XK9630-03-109	Sleeve spacer
32	NM-200-05032	XK9630-03-111	Main shaft bearing oil seal
33	NM-200-05033	M5 x 12 GB70-85	Hexagon socket cap head screws

34	NM-200-05034	XK9630-03-114	Portrait nut seat
35	NM-200-05035	8 x 55 GB117-86	Taper pin
36	NM-200-05036	M8 x 25 GB70-85	Hexagon socket cap head screws
37	NM-200-05037	8 GB1155-79	Oil cup
38	NM-200-05038	XK9630-03-102	Slide
39	NM-200-05039	8 GB1155-79	Oil cup
40	NM-200-05040	8 GB1155-79	Oil cup
41	NM-200-05041	XK9630-03-119	Gib
42	NM-200-05042	ZX7020-03-115	Gib
43	NM-200-05043	8 GB1155-79	Oil cup
44	NM-200-05044	XK9630-03-115	Cross lead nut
45	NM-200-05045	M8 x 45 GB70-85	Hexagon socket cap head screw
46	NM-200-05046	8 x 55 GB117-86	Taper pin
47	NM-200-05047	Z7020C-03-201SM	Cross lead screw
48	NM-200-05048	M5 x 12 GB70-85	Hexagon socket cap head screw
49	NM-200-05049	4 x 14 GB1096-79	Plain paralleled key
50	NM-200-05050	6 GB1155-79	Oil cup
51	NM-200-05051	8 x 60GB117-86	Taper pin
52	NM-200-05052	M8 x 45 GB70-85	Hexagon socket cap head screw
53	NM-200-05053	XK9630-03-108-2	Cross feed screw seat
54	NM-200-05054	XK9630-03-107	Sprue
55	NM-200-05055	AT300-03-139	Spring lamination
56	NM-200-05056	AT300-03-138	Dial sleeve
57	NM-200-05057	XK9630-03-122	Dial
58	NM-200-05058	XK9630-03-116	Checkering handle bar
59	NM-200-05059	20 GB81-86	Retaining ring
60	NM-200-05060	M5/8 GB68-85	Screw
61	NM-200-05061	M8 GB79-85	Hexagon socket screw w/dog point
62	NM-200-05062	M8 GB6172-86	Hexagon nuts
63	NM-200-05063	M8/32 GB5782-86	Hexagon heed bolts
64	NM-200-05064	M8 GB1155-79	Oil cup
65	NM-200-05065	M8 GB1155-79	Oil cup
66	NM-200-05066	M8 GB6172-86	Hexagon nuts
67	NM-200-05067	M8/32 GB5782-86	Hexagon heed bolts
68	NM-200-05068	M8/35 GB79-85	Hexagon socket set screw w/dog point
69	NM-200-05069	XK9630S-03-113A	Base
70	NM-200-05070	M5/12 GB70-85	Hexagon socket cap head screw
71	NM-200-05071	Z7020C-03-202SM	Longitudinal feed screw
72	NM-200-05072	4/14 GB1096-79	Plain paralleled key

73	NM-200-05073	6 GB1155-79	Oil cup
74	NM-200-05074	M8/45 GB70-85	Hexagon socket cap head screw
75	NM-200-05075	M8/60 GB117-86	Taper pin
76	NM-200-05076	XK9630-03-108-01	Cross feed screw seat
77	NM-200-05077	XK9630-03-107	Sprue
78	NM-200-05078	AT300-03-139	Spring Lamination
79	NM-200-05079	AT300-03-138	Dial Sleeve
80	NM-200-05080	XK9630-03-122	Dial
81	NM-200-05081	XK9630-03-116	Checkering handle bar
82	NM-200-05082	20 GB891-86	Retaining ring
83	NM-200-05083	M5.8 GB68-85	Screw
84	NM-200-05084	M18/1.5 GB812-88	Round nut
85	NM-200-05085	XQK9630-02-901S	Coupling sleeve
86	NM-200-05086	M5 x 12 GB70-85	Hexagon socket cap head screw
87	NM-200-05087	M8 x 25 GB70-85	Hexagon socket cap head screw
88	NM-200-05088	XK9630-03-106SM	Y axis motor seat
89	NM-200-05089	XK9630S-03-113SM	Backing board
90	NM-200-05090	M6 x 16 GB70-85	Hexagon socket cap head screw
91	NM-200-05091	M5 x 8 GB70-85	Hexagon socket cap head screw
92	NM-200-05092	XQK9630S-00-604	Connect board
93	NM-200-05093	XQK9630S-00-605	Shield
94	NM-200-05094	M6 x 12 GB70-85	Hexagon socket cap head screw
95	NM-200-05095	XQK9630S-00-603	Right trestle
96	NM-200-05096	XQK9630S-00-606	Left trestle

Chapter 10

ELECTRICAL DIAGRAM & PIN OUTS

Overview

This section shows all the necessary electrical and pin out diagram of the machine. The diagram is properly labeled and numbered. The reference codes and numbers are found on the reference chart after each diagram.

Please have this section ready whenever you have questions, inquiries or in need of technical help regarding the machine.

Electrical Diagram & Pin Outs Reference Chart

Plug #	Application	Pin Number	Code	Function
1	Power	1	PE	PE
		2	100	220V/60 HTZ input of power
		3	101	220V/60 HTZ input of power
2	Spindle Control	1		
		2	FC	GND (simulate signal)
		3	FOR	Signal of spindle counter-clockwise
		4	SC	COM
		5	FV	O~ 10V (simulate signal)
		6	REV	Signal of spindle clockwise
		7		
3	X,Y,Z Axis, limit Switches & ESP	1	206	Emergency Stop
		2	204	Z axis limit
		3	200	DC~30V
		4	205	Emergency Stop
		5	203	Y axis limit switch
		6	201	OV
		7	202	X axis limit switch
4	Cooling motor & working light	1		
		2		
		3	600	Cooling motor of power (220V/60HTZ)
		4		
		5	603	Working light (AC24V)
		6	601	Cooling Motor of power (220V/60HTZ)
		7	602	Working light (AC24V)
5	X axis Stepper Motor working light	1		
		2	300	A+
		3	303	B-
		4	301	A-
		5	302	B+
6	Y axis Stepper Motor working light	1		
		2	400	A+
		3	403	B-
		4	401	A-
		5	402	B+
7	Z axis Stepper Motor working light	1		
		2	500	A+
		3	503	B-
		4	501	A-
		5	502	B+