

AUTOMATIC TOOL GRINDING MACHINE

TOGU-III

US EXP.

OPERATOR'S MANUAL



PREFACE This operator's manual applies to the automatic tool grinding machines TOGU-III US and EXP. Read this manual carefully so that you can operate the machine safely and correctly. Keep the manual at hand and refer to it whenever you are not sure of how to operate the machine.

The dimensions given in this manual are basically in millimeters. Inch equivalents are enclosed in parentheses. Except for some values, the inch dimensions are rounded off to three decimal places.

Example: 30 mm (1.181")

Operator's Manual:

Automatic Tool Grinding Machine TOGU-III US EXP.

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Safety

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SAFE OPERATION

When operating the machine, be sure to follow the safe operating procedures described in the manual.

Warning plates

The following types of warning plates are attached to the machine. Check the content of these plates to ensure safe operation with the machine. Never remove them from the machine.

Warning plate on electrical box and filter box

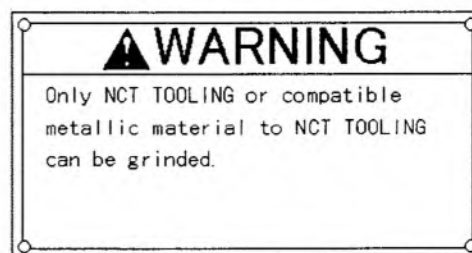


The warning plate shown above consists of an electrical shock mark and a high voltage danger plate.

 DANGER	● Never open the covers of the electrical box and the filter box when electric power is supplied to the machine. Otherwise you may get an electrical shock in a very dangerous manner.
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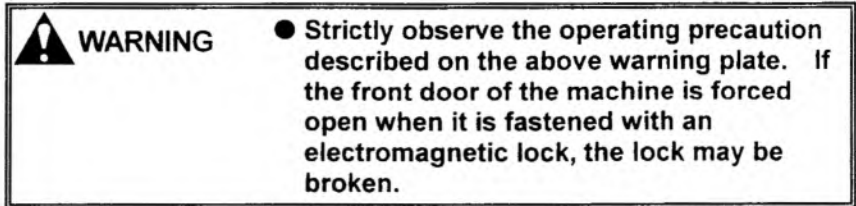
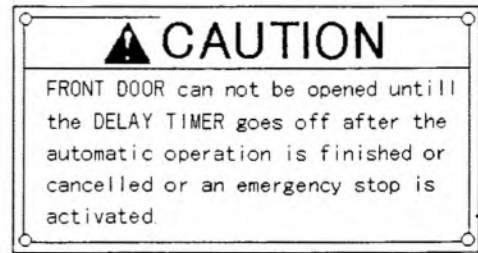
Warning plate on machine proper

The warning plate shown at right specifies the materials that can be ground on the machine. Be sure to observe this warning.



 WARNING	● Grinding any material not specified on the above warning plate causes the failure of the machine. We are unable to warrant the machine against such a failure. Never grind such materials on the machine.
--	---

The warning plate shown at right indicates an operating procedure to ensure safety.



Definitions of warning instructions

Strictly observe the procedures described in the manual when operating, lubricating, or maintaining the machine. The alert symbols used in the manual are classified into the following three types according to the degree of risk involved. Operate and maintain the machine by keeping these warning instructions in mind.



DANGER

Potential risk is likely to cause death of operator.



WARNING

Precaution against risk for operator or machine. Operator's injury or machine's damage is involved.



CAUTION

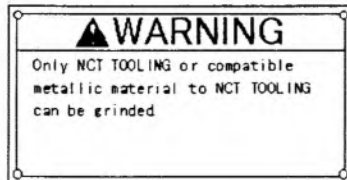
Precaution or advice with respect to operator or machine operation. No risk (hazard or accident) is involved.

For the locations of the above warning plates, refer to the following pages.

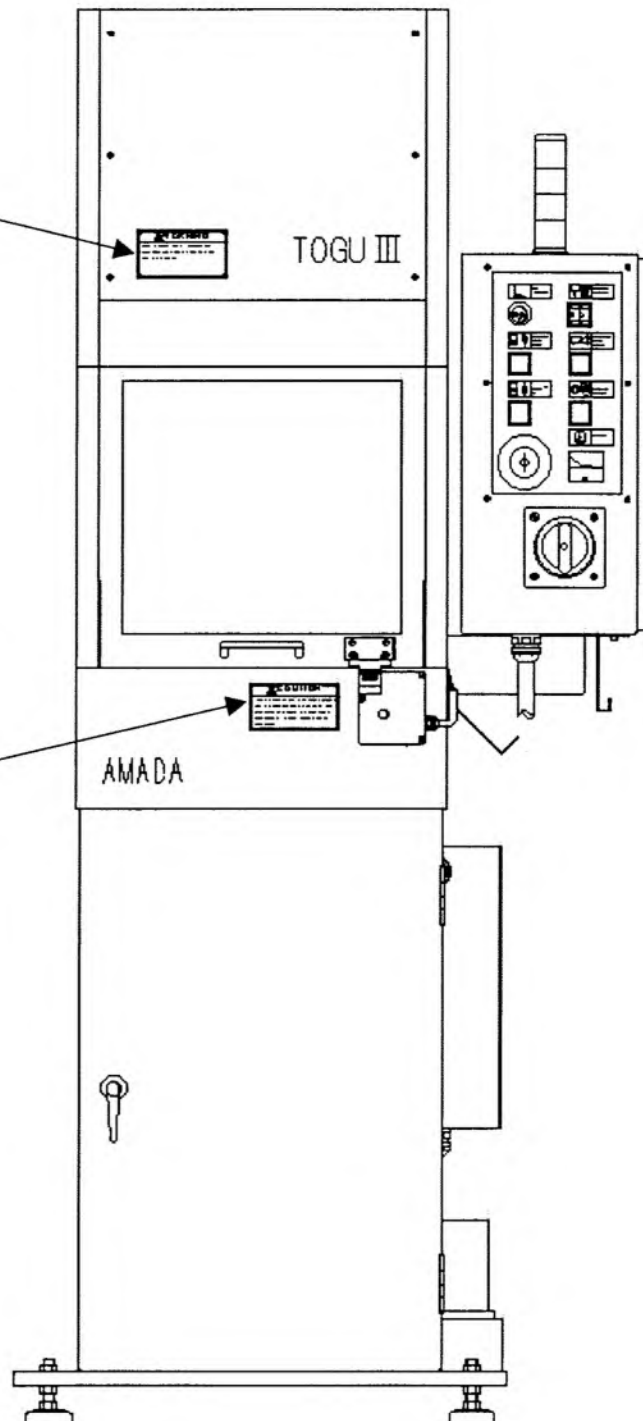
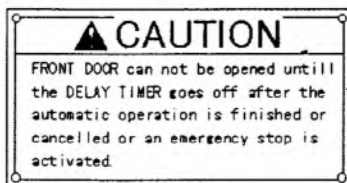
LOCATIONS OF WARNING PLATES

Front of machine

Warning plate limiting types of materials that can be ground on machine



Caution plate indicating operational precaution



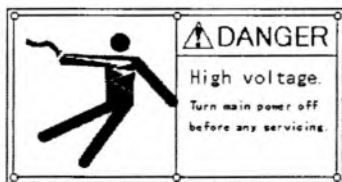
Side of machine (electrical box)

Electrical shock mark

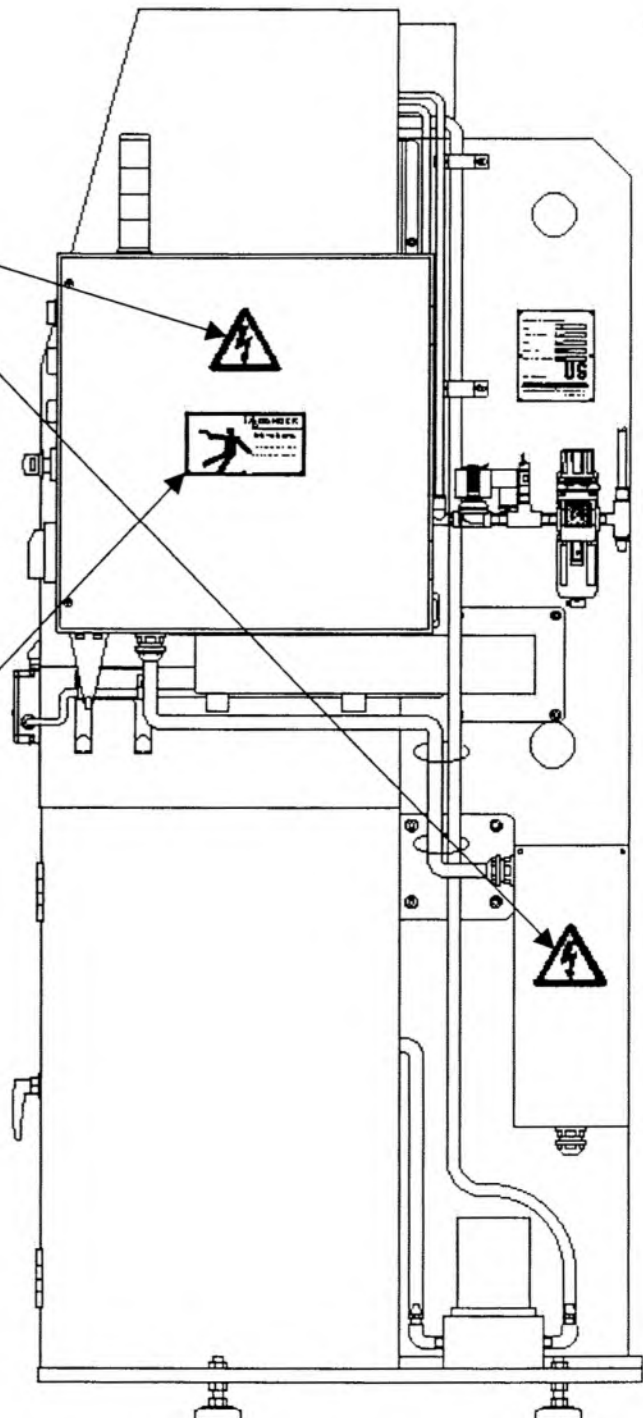


This mark is attached to electrical box and filter box.

High voltage danger plate



This plate is attached to electrical box.



SAFETY RULES

In addition to the instructions described on the warning plates, be sure to observe the following safety rules to ensure the safe operation of the machine.

When installing machine

- | | |
|--|---|
|  CAUTION | ● The machine uses electric sparks of DC 24 V for positioning. Be sure to ground its primary power supply side. |
|--|---|

When operating machine

- | | |
|--|--|
|  WARNING | ● Grinding wheels other than the CBN grinding wheel installed as standard accessory on the machine cannot be used. |
|--|--|

- | | |
|---|---|
|  CAUTION | ● When grinding many high-speed tool steel (SKH) tools — especially Type D (3-1/2") and E (4-1/2") dies, dress the grinding wheel as required to prevent its loading. Dress the grinding wheel every three grindings. |
|---|---|

- | | |
|--|--|
|  CAUTION | ● When the front door of the machine is open, the ONE CYCLE AUTO START button is disabled, but the GRINDING WHEEL UP button is enabled. Keep this point in mind. |
|--|--|

- | | |
|--|--|
|  WARNING | ● When the machine is not in use, keep its front door open as much as possible, in order to remove moisture and to protect the jig, chuck and other parts against rusting. |
|--|--|

When maintaining machine

- | | |
|---|---|
|  DANGER | ● Before changing the grinding wheel, be sure to turn off the main power circuit breaker switch of the machine. |
|---|---|

- | | |
|---|---|
|  DANGER | ● Before opening the door of the electrical box, be sure to cut off the shop power supply and to attach to the shop circuit breaker a tag indicating that the machine is under maintenance. |
|---|---|

SAFETY FUNCTIONS

The machine is equipped with the following safety functions in addition to the emergency stop function.

Safety functions for operator protection

1. Door open interlock mechanism

The machine is interlocked so that it cannot be automatically started when its front door is open.

2. Safety door lock mechanism

This mechanism consists of the front door of the machine and a safety door switch that locks the front door. It electromagnetically locks the front door so that the front door cannot be opened after the start of automatic operation. (The front door cannot be opened until the electromagnetic lock is released.)

Safety functions for machine protection

1. Motor overload protection function

When an electric current exceeding the specified limit flows to all of the spindle motor, table motor, and coolant pump motor, this function interrupts the electric power to the motors and protects them.

2. Servo system overload protection function

When an electric current exceeding the specified limit flows to the servo system or when the servo system is overheated, this function interrupts the electric power to the servo system and protects it. This condition is indicated as a servo alarm by the signal tower (rotating beacon light tower).

3. Spindle upper overtravel limit switch mechanism

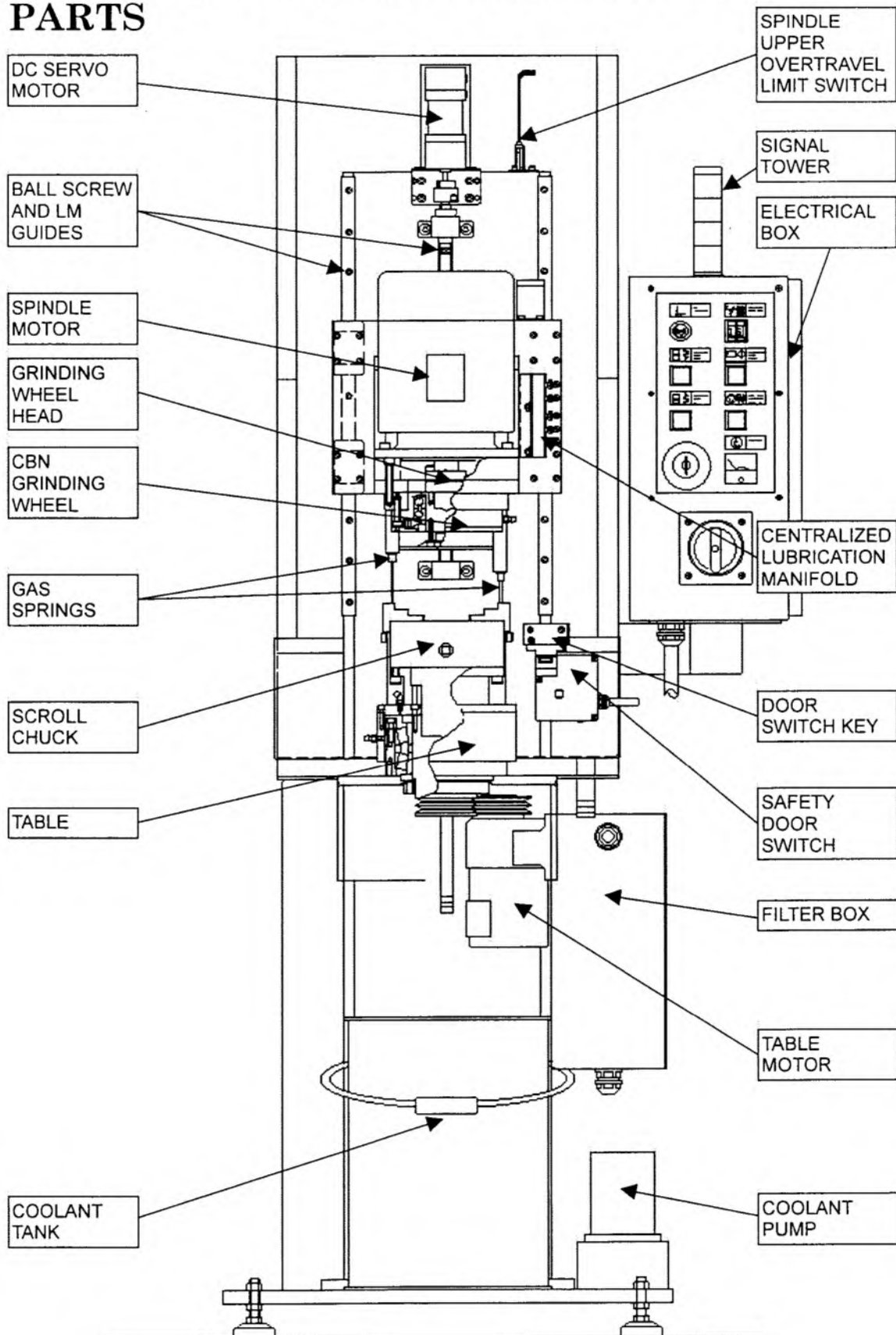
The position of the spindle is detected by a limit switch so that the spindle does not overtravel upward during manual operation. When the spindle rises to the specified position, the limit switch automatically stops the spindle. When the limit switch has failed, the spindle is stopped by a mechanical stopper.

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IDENTIFICATION OF MAIN MACHINE PARTS



EXPLANATION OF MAIN MACHINE PARTS

DC servo motor

Feeds the spindle in the vertical direction. Controlled by a controller, the DC servo motor feeds the spindle for accurate grinding.

Ball screw and LM guides

Transfer the rotation of the DC servo motor to the spindle, and guide the spindle sliding in the vertical direction.

Spindle motor and grinding wheel head

The spindle motor, spindle, and grinding wheel are installed in the grinding wheel head. Along the column, the spindle is moved up and down by the DC servo motor. The grinding wheel is rotated at high speed by the spindle motor.

CBN grinding wheel

An electrically conductive grinding wheel dedicated to the machine and used to determine the grinding start position.

Gas springs

Support the grinding wheel head and prevent the grinding wheel from falling under its own weight when the power of the machine is turned off or stopped in an emergency.

Scroll chuck and table

The scroll chuck to fix a tool is mounted on the table and driven by the geared motor secured to the frame.

Coolant tank and pump

The coolant unit consists of the coolant tank, hose, and coolant pump. It starts and supplies the coolant after the depression of the ONE CYCLE AUTO START button and the completion of positioning, and just before the start of grinding.

Spindle upper overtravel limit switch

Limits the vertical movement of the spindle. When this switch has failed, the spindle is stopped by a mechanical stopper.

Signal tower

Indicates the condition of the machine by a red, yellow, or green rotating beacon light.

Electrical box

Houses a sequencer and other parts to control the operation of the machine.

Centralized lubrication manifold

Centralized lubrication ports to lubricate the sliding and rotating parts of the machine.

Safety door switch and key

A safety mechanism provided for operator protection. After the start of automatic operation, the front door of the machine is electromagnetically locked by the key attached to the front door and the safety door switch mounted on the machine proper. This mechanism prevents the front door from being opened during the rotation of the grinding wheel.

Filter box

A box that contains the noise filter to cut noise entering from the main power line.

Air blow mechanism

Starts as soon as the ONE CYCLE AUTO START button is pressed, blows the chips and water off the grinding wheel for accurately detecting the position of the tool being ground, and stops as soon as the position of the tool is detected. When the amount of air discharged from the air blow mechanism becomes extremely small, the tool position detection is adversely affected. The air blow mechanism is interlocked so that a pressure switch detects any drop of the air pressure below the specified level and deactivates the machine accordingly.

SPECIFICATIONS

Control	Sequencer circuit
Maximum grinding amount	0.99 mm (0.099")
Maximum tool diameter	160 mm (6.299") (Type E (4-1/2") die)
Maximum tool height	150 mm (5.906") (when Type E (4-1/2") shear-angled punch body jig is used)
Minimum tool height	Chuck jaw height
Standard grinding wheel	Made of CBN and 135 mm (5.315") in diameter (conductive)
Spindle motor	1.5 kW, 2P
Spindle rotating speed	2810/3000 min ⁻¹ (rpm) at 50/60 Hz
Vertical travel distance	240 mm (9.449")
Vertical feed motor	40 W, DC servo motor with 1/10 gear head
Rapid feed speed	600 mm (23.622")/min
Positioning speed	60 mm (2.3622")/min
Grinding speed	0.06 mm (0.0023622")/min
Table motor	0.1 kW, 4P, 1/30 geared motor
Table rotating speed	60/72 min ⁻¹ (rpm) at 50/60 Hz
Coolant tank capacity	18 L (4.76 US gal)
Coolant pump motor	0.06 kW, 2P
Coolant pump capacity	20/25 L (5.28/6.61 US gal)/min at 50/60 Hz
Air consumption	1700 L (60 ft ³)/min at 0.5 MPa (5 kgf/cm ² or 72 psi)
Supply voltage	3-phase, 200/220 V at 50/60 Hz
Electric power consumption	2.5 kVA
Machine mass	480 kg (1059 lb) (excluding transformer mass)
Machine dimensions	813 × 858 × 1930 mm (32.008 × 33.780 × 75.984")

OPERATING ENVIRONMENT

Operate or store the machine under the following environmental conditions.

Ambient temperature	5 to 40°C (41 to 104°F)
Maximum relative humidity	75% (without dew condensation)
Levelness	Level to 0.05 mm (0.002")/m as specified for general machine tools
Vibration	0.59 m/s ² (0.06 G) or less
Storage temperature	5 to 40°C (41 to 104°F) (without freezing)



CAUTION

- If subjected to vibration greater than that specified above, the machine may produce unevenly ground surfaces. In such a case, mount the machine on a vibration-isolating mat.



WARNING

- This automatic tool grinding machine is designed for grinding the cutting edges of punches, the receiving surfaces of dies, and the like used on CNC turret punch presses. Never use it in any other application. Particularly when used to grind nonmetallic materials, it may break.

ACCESSORIES

Standard accessories

The machine is supplied with the following standard accessories.

Part	Type or drawing No. (manufacturer)	Quantity
Scroll chuck	5103577 (Taiwa)	1
Chuck handle	5103578 (Taiwa)	1
CBN grinding wheel	5130604 (Taiwa)	1
Air gun	AG-45 (Kurita)	1
Dresser	5103662 (Taiwa)	1
Coolant	TOGU GRINDING OIL (Amada)	1 (4 L or 1.05 US gal)
Coupler plug	20PM (Nitto)	1
Coupler socket	30SH (Nitto)	1
Warranty, inspection performance sheet, operator's manual, and service book		1 set

Optional accessories (jigs)

The following optional jigs are separately required as optional accessories, depending on the types of tools to be ground. Check the types of tools to see if these optional jigs are necessary.

Type of tool	Long	Short
Type A (1/2") and B (1-1/4") die jig	Common	
Type C (2") shear-angled punch body sleeve	Common	
Type D (3-1/2") shear-angled punch body sleeve	Common	
Type E (4-1/2") shear-angled punch body jig	Common	
Short, small-diameter punch body spacer		Dedicated to short tools

Jigs not listed in the above table must be separately ordered as special jigs.

A table filter is provided as optional accessory, although it is not a jig.

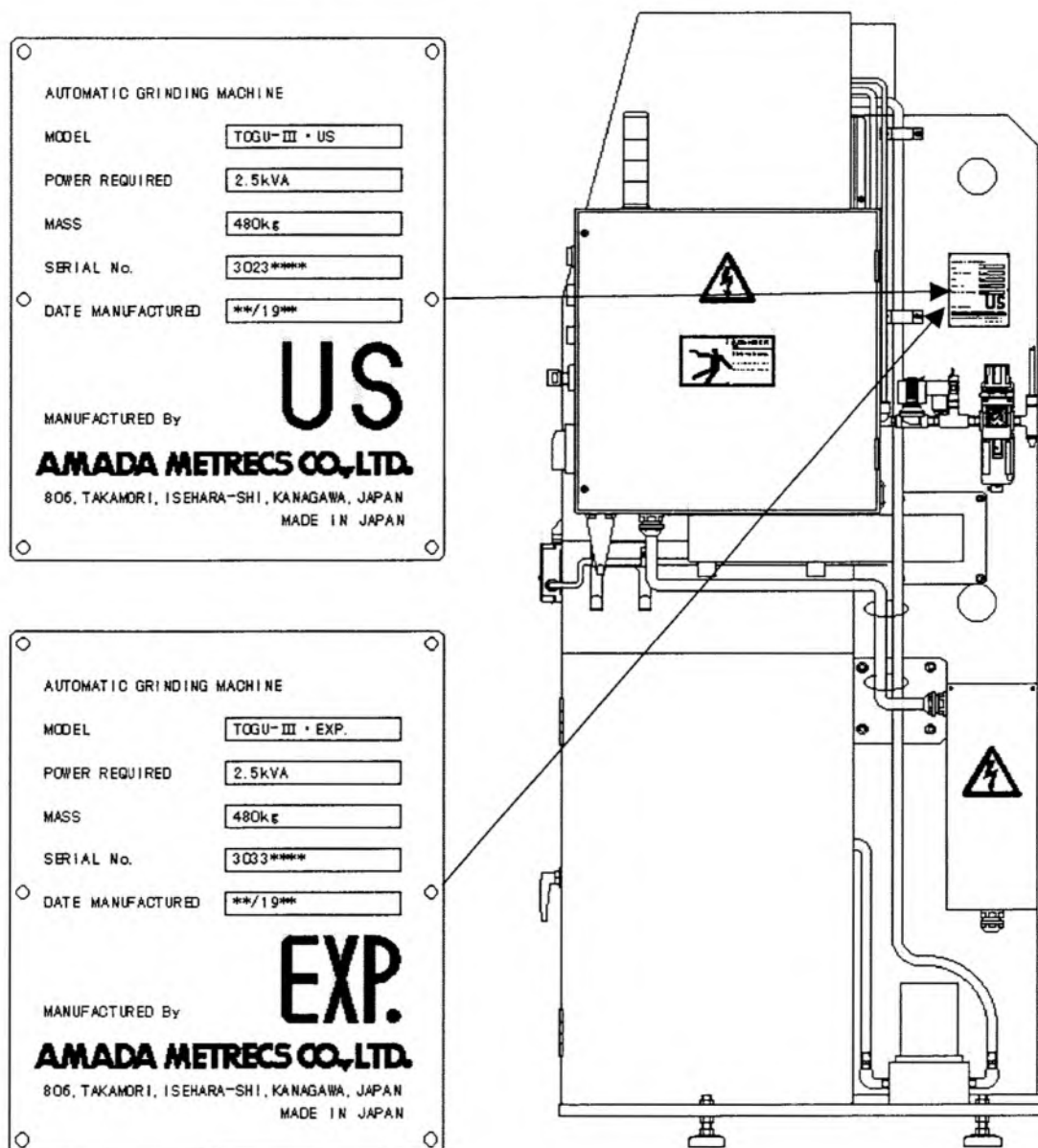
Part	Drawing No. (manufacturer)	Quantity
Table filter	5103672 (Taiwa)	1

DIFFERENCE BETWEEN US AND EXP. MACHINES

The TOGU-III US machine appears the same as the TOGU-III EXP. machine. They differ only in the following point.

The grinding amount is set in 0.001-inch increments for the US machine and in 0.01-mm increments for the EXP. machine.

Since they cannot be visually distinguished, they are made distinguishable by their serial number plates as shown below.



As shown above, the US logo is marked on the serial number plate of the US machine, while the EXP. logo is marked on the serial number plate of the EXP. machine.

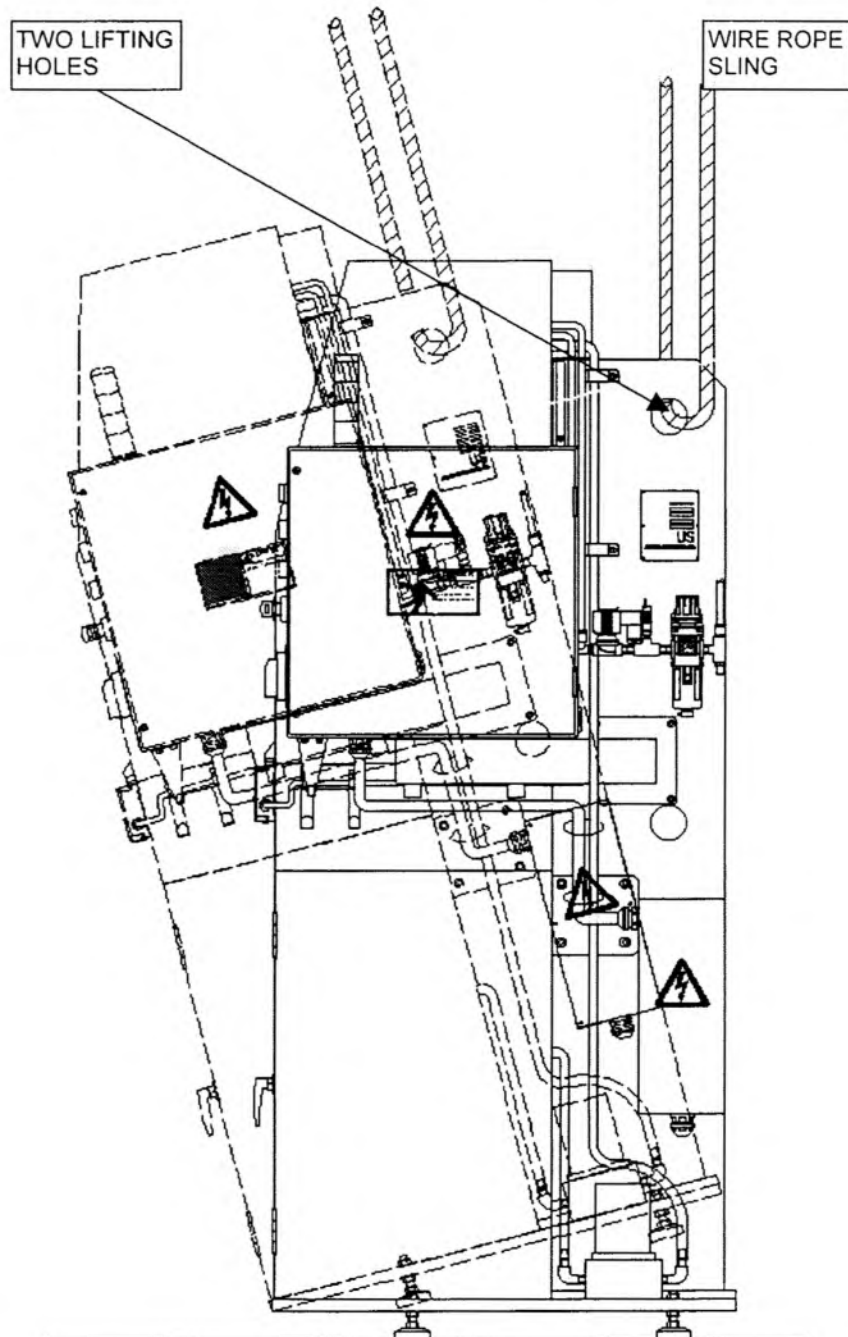
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LIFTING

When installing the machine, lift it with a wire rope sling applied to the position as shown below.



WARNING

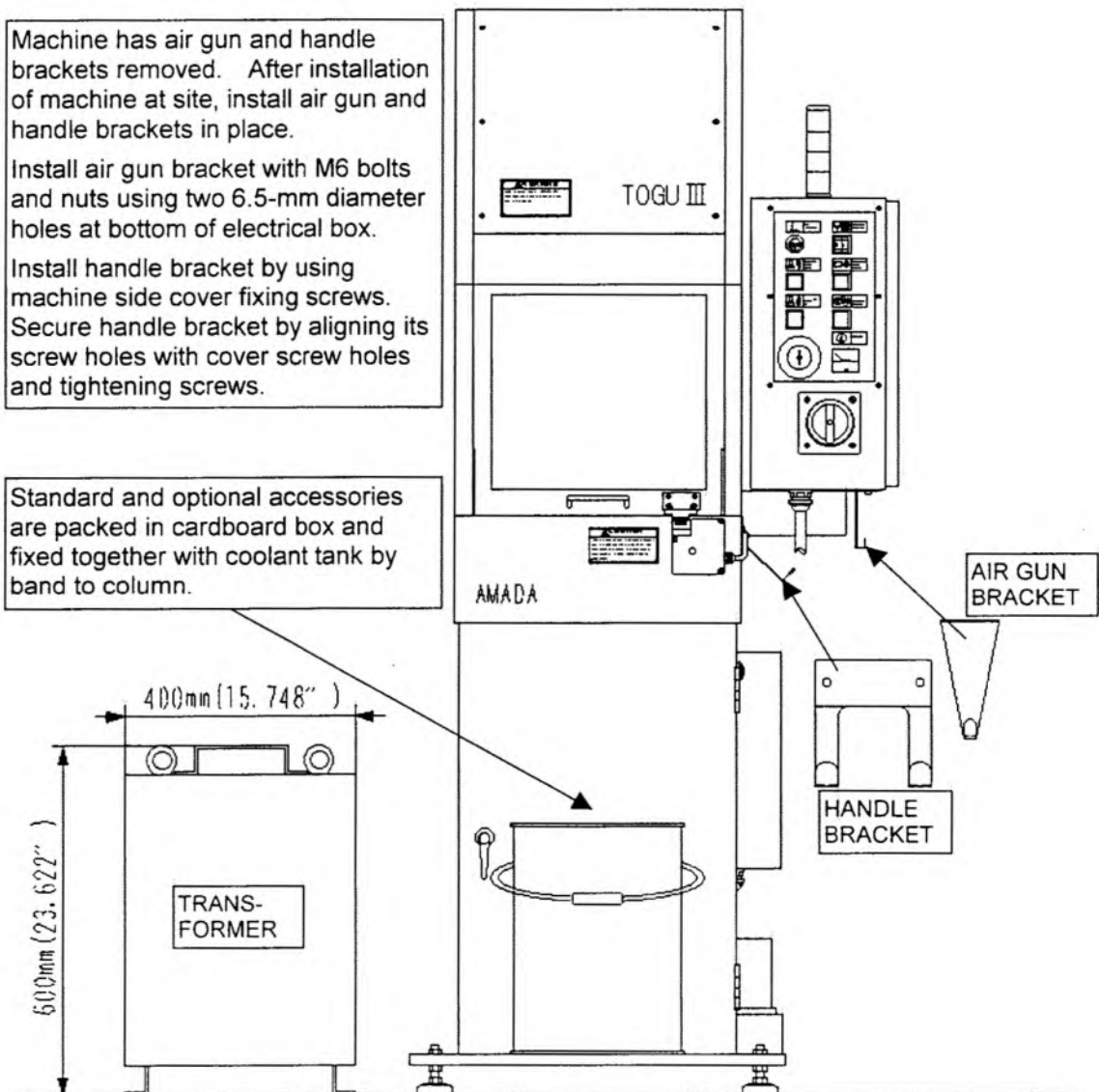
- When lifted, the machine tilts forward. It is dangerous if you stand before the machine when it is lifted. When lifting the machine, be sure to work alongside the machine.

PACKAGED CONDITION AT SHIPMENT

The machine is shipped from our factory as packaged as shown below. Refer to the drawing when assembling the machine for use at your factory. The following transformer is supplied together with the machine. The specifications of the transformer are subject to change without notice.

Transformer specifications: Made by Fukuda Denki Seisakusho
3-phase, 5.5 kVA, 50/60 Hz, 14.4 A, with
shielded case

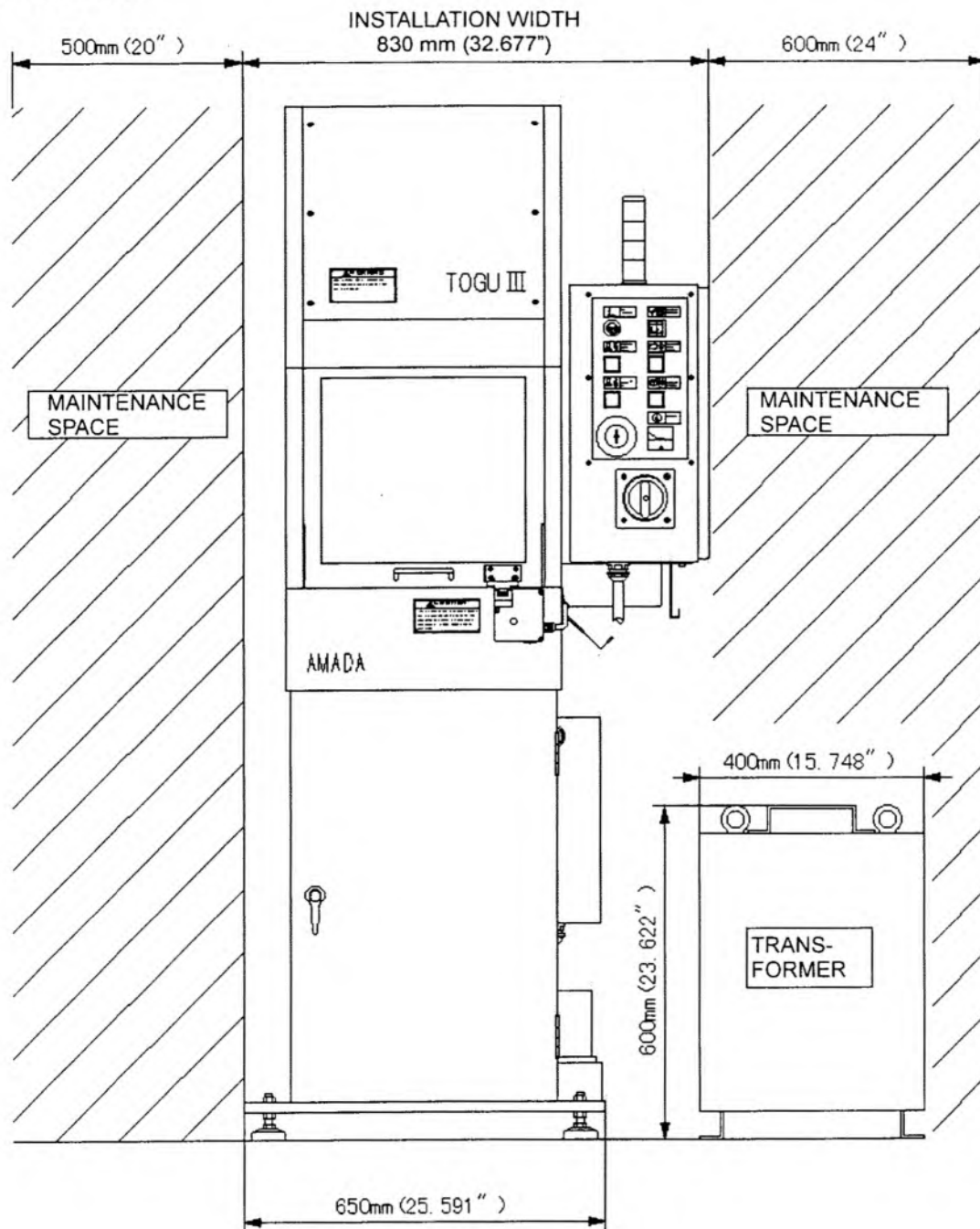
Transformer mass: 60 kg (133 lb)



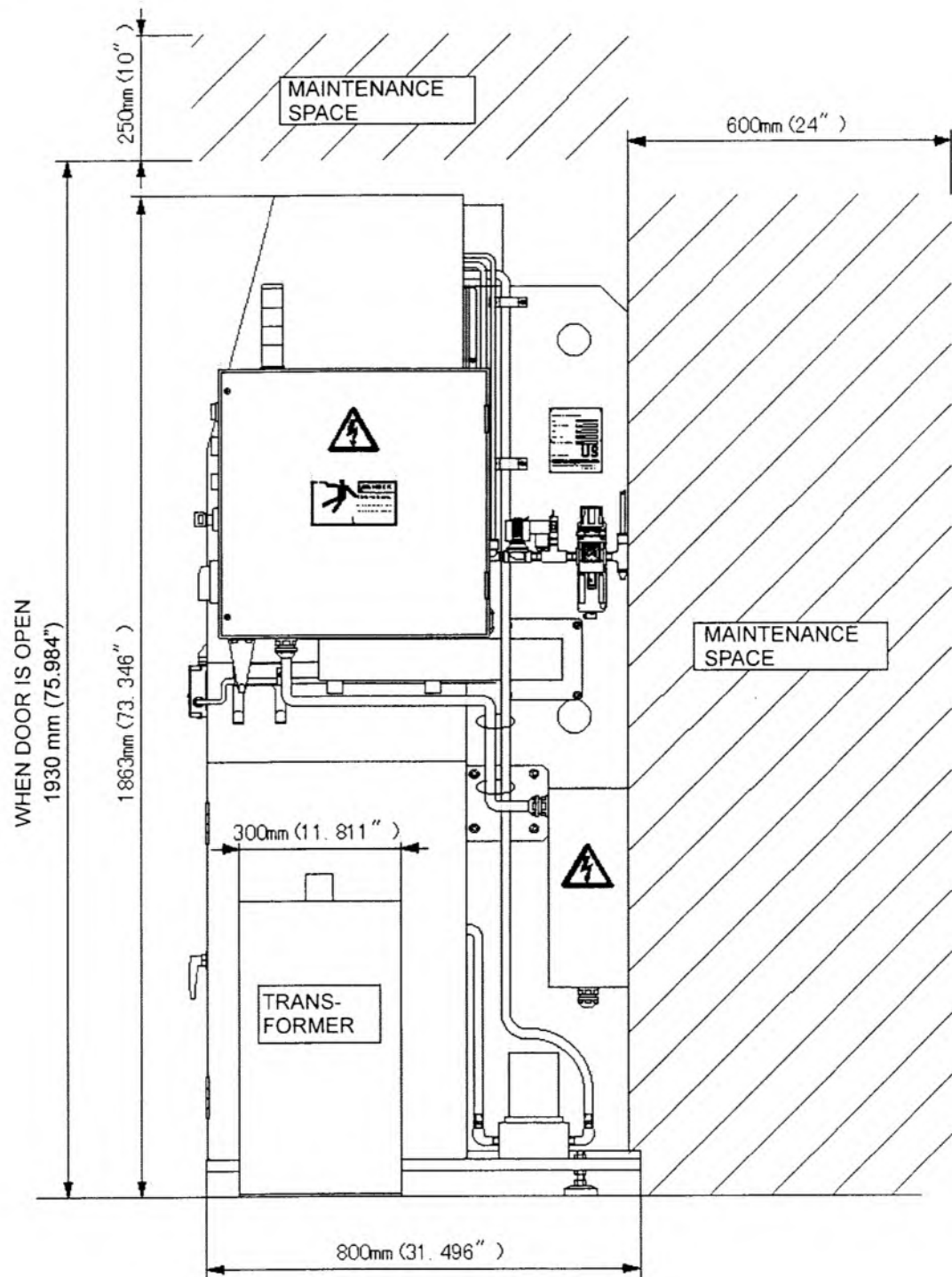
MACHINE DIMENSIONS AND INSTALLATION SPACES

Determine the place to install the machine by referring to the machine dimensions and maintenance spaces shown below. The dimensions of the transformer are those of the standard transformer.

Front view



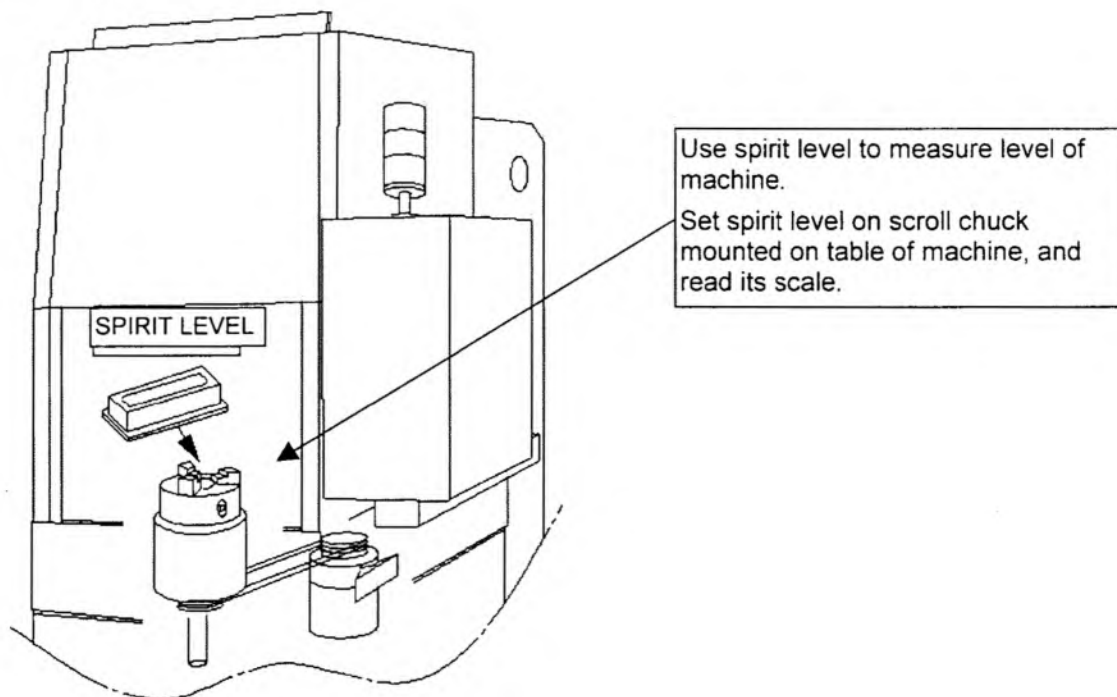
Side view



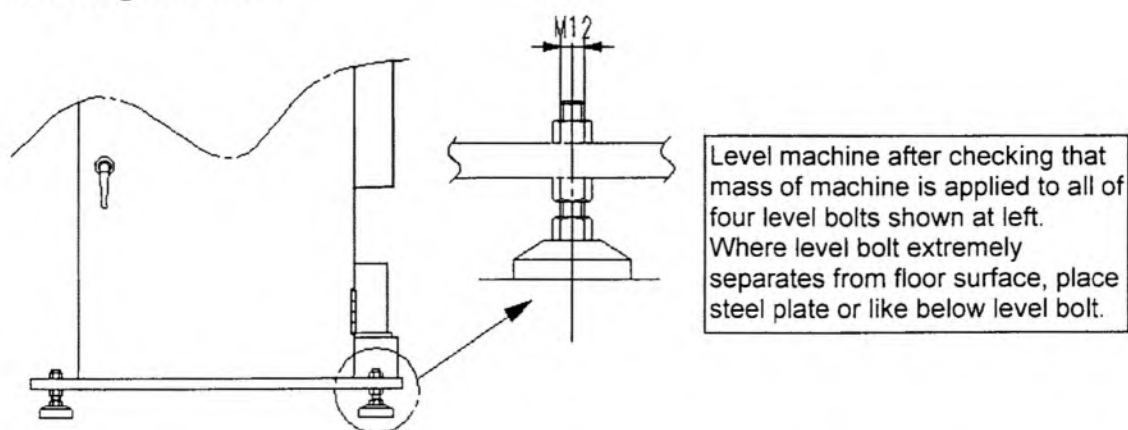
INSTALLING AND LEVELING

Install the machine on a flat floor where it is isolated from vibration.
After its installation, be sure to level the machine to 0.05 mm (0.002")/m as described below.

Setting spirit level



Leveling machine

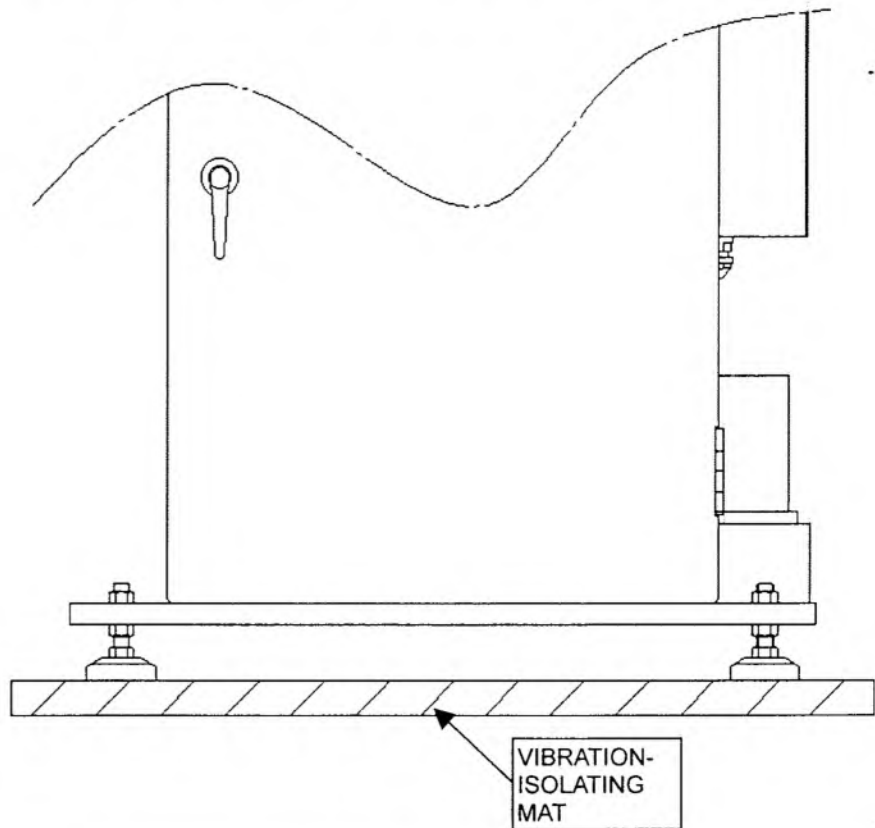


CAUTION

- If the machine is not installed level, it has poor grinding accuracy. Properly level the machine. Take particular care so that the mass of the machine is applied to all of the four level bolts.

Vibration

Install the machine where it is subject to as little vibration as possible. If the machine must be installed where it may be exposed to vibration, place a vibration-isolating mat below the level bolts as shown below.



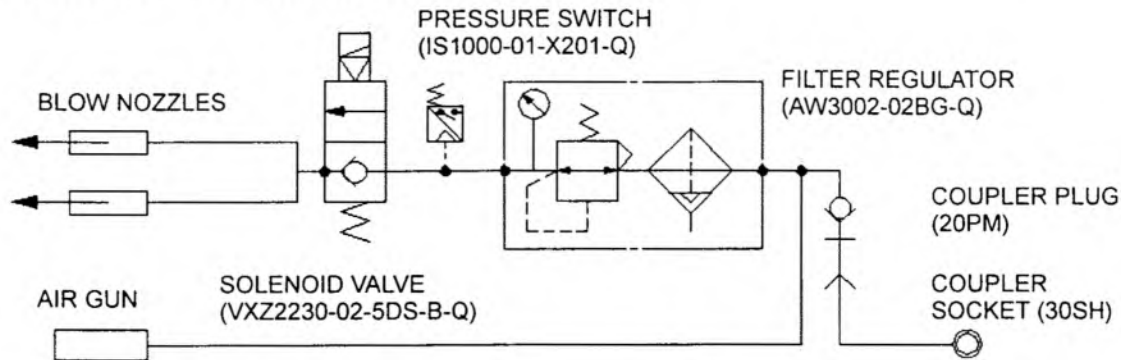
CAUTION

- When the machine is subjected to vibration while it is grinding a tool, the grinding wheel and tool also vibrate, and the tool is ground unevenly and with poor surface finish. If the machine is installed where it may be exposed to vibration greater than the installation criterion of 0.59 m/s^2 (0.06 G), be sure to take the vibration-isolating measure shown above.

SUPPLYING COMPRESSED AIR

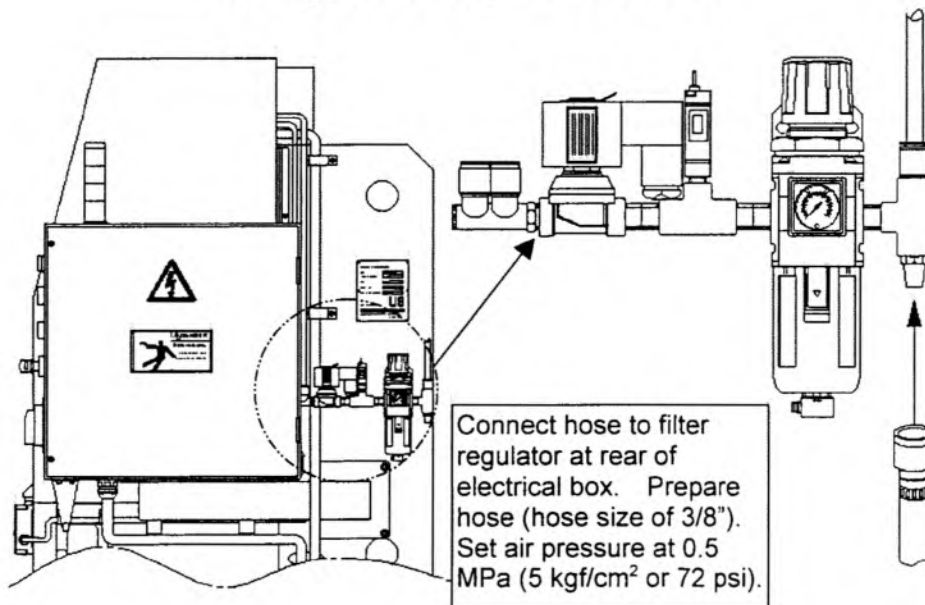
Supply compressed air to the machine as described below.

Pneumatic circuit diagram



Connecting compressed air

Connect a coupler socket of the shop's dry air line to the air supply opening of the filter regulator shown below.



CAUTION

- Be sure to set the air pressure at the specified level. When the air pressure drops below the specified level, an interlock deactivates the machine. The machine consumes compressed air at a rate of 1700 L (60 ft³)/min. Check that the shop's air compressor capacity is large enough to supply compressed air to the machine as well as other pieces of pneumatic equipment installed at the shop.

SUPPLYING ELECTRIC POWER

Supply electric power to the machine as described below.

Power cable

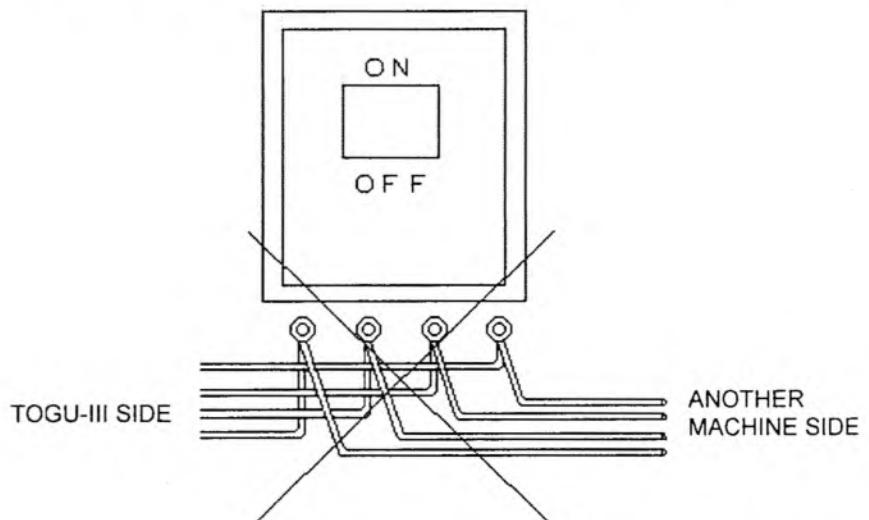
Prepare a power cable with four conductors each measuring 2.0 mm^2 (AWG #14) or more in size to supply electric power to the machine.

The main power cable inlet of the filter box is fitted with a cable clamp. Be sure to pull the cable through the cable clamp. Note that the maximum outside diameter of the cable that can be pulled through the cable clamp is 19 mm (0.748").

Making electrical connections at shop's power supply

Be sure to install a dedicated circuit breaker for the machine at the shop's power supply and to connect the power of the shop to the machine through an independent line from the circuit breaker. Never connect any other machine to the circuit breaker as shown below.

Since the machine uses DC 24 V electric sparks for positioning, be sure to ground it.

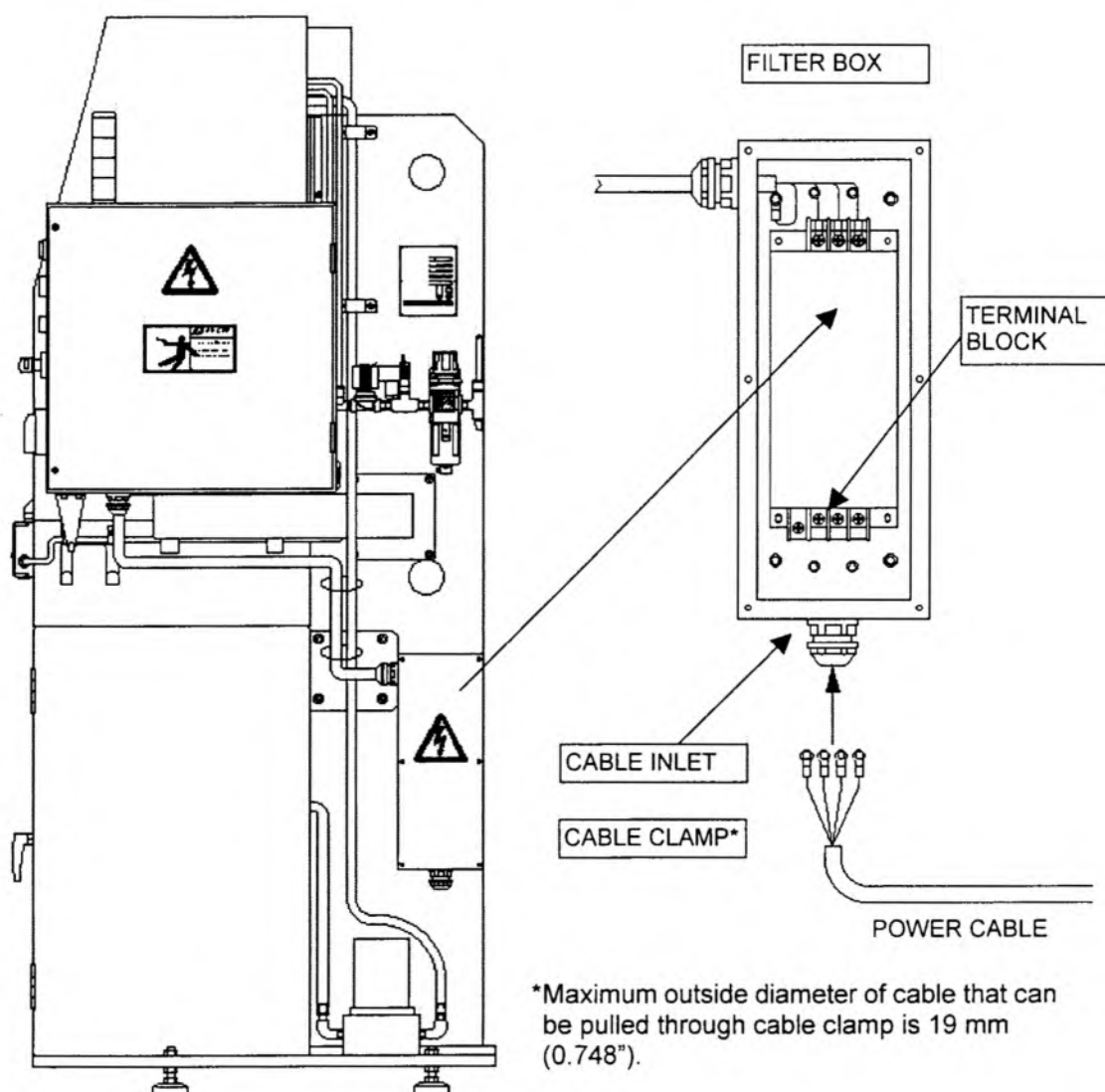


DANGER

- Given the possibility of an accident like a fire, never supply electric power to the machine through a circuit breaker to which another machine is also connected. Since the machine uses electric sparks for positioning, be sure to ground it to prevent electrical shock. Do not use a circuit breaker without ground terminal at the shop's power supply.

Making electrical connections at machine (AC 200/220 V)

Run the power cable through the cable clamp of the filter box installed in the lower section of the machine frame into the filter box, as shown below. Connect the conductors of the power cable to the line terminals at the input terminal block of the noise filter and the ground terminal in the filter box. Match the phases of the R, S, and T conductors connected to the noise filter output terminals with the corresponding phases of the power cable. When the electrical connections are completed, tighten the cable clamp to securely fix the cable and to prevent the cable conductors from being disconnected.



*Maximum outside diameter of cable that can be pulled through cable clamp is 19 mm (0.748").

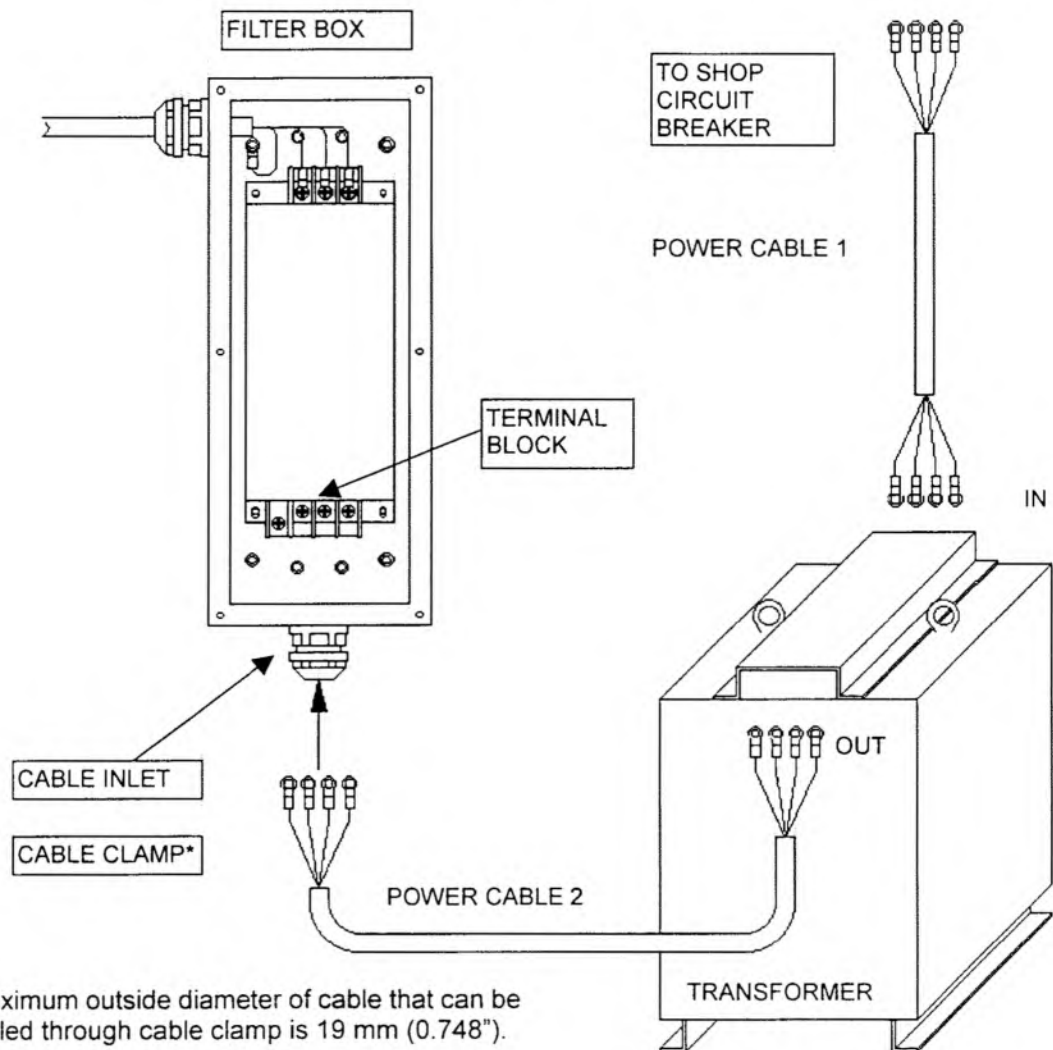


DANGER

- Before making necessary electrical connections at the machine, be sure to check that the shop power supply is cut off. Attach to the shop circuit breaker a tag indicating that the electrical work is under way.

Making electrical connections at machine (voltage other than AC 200/220 V)

Connect the power cable 1 from the shop circuit breaker to the input terminals of the transformer, as shown below. Run the power cable 2 from the output terminals of the transformer through the cable clamp of the filter box into the filter box. Connect the conductors of the power cable 2 to the line terminals at the input terminal block of the noise filter and the ground terminal in the filter box. Match the phases of the R, S, and T conductors connected to the noise filter output terminals with the corresponding phases of the power cable 2. When the electrical connections are completed, tighten the cable clamp to securely fix the cable and to prevent the cable conductors from being disconnected.



*Maximum outside diameter of cable that can be pulled through cable clamp is 19 mm (0.748").



DANGER

- Before making necessary electrical connections at the machine, be sure to check that the shop power supply is cut off. Attach to the shop circuit breaker a tag indicating that the electrical work is under way.

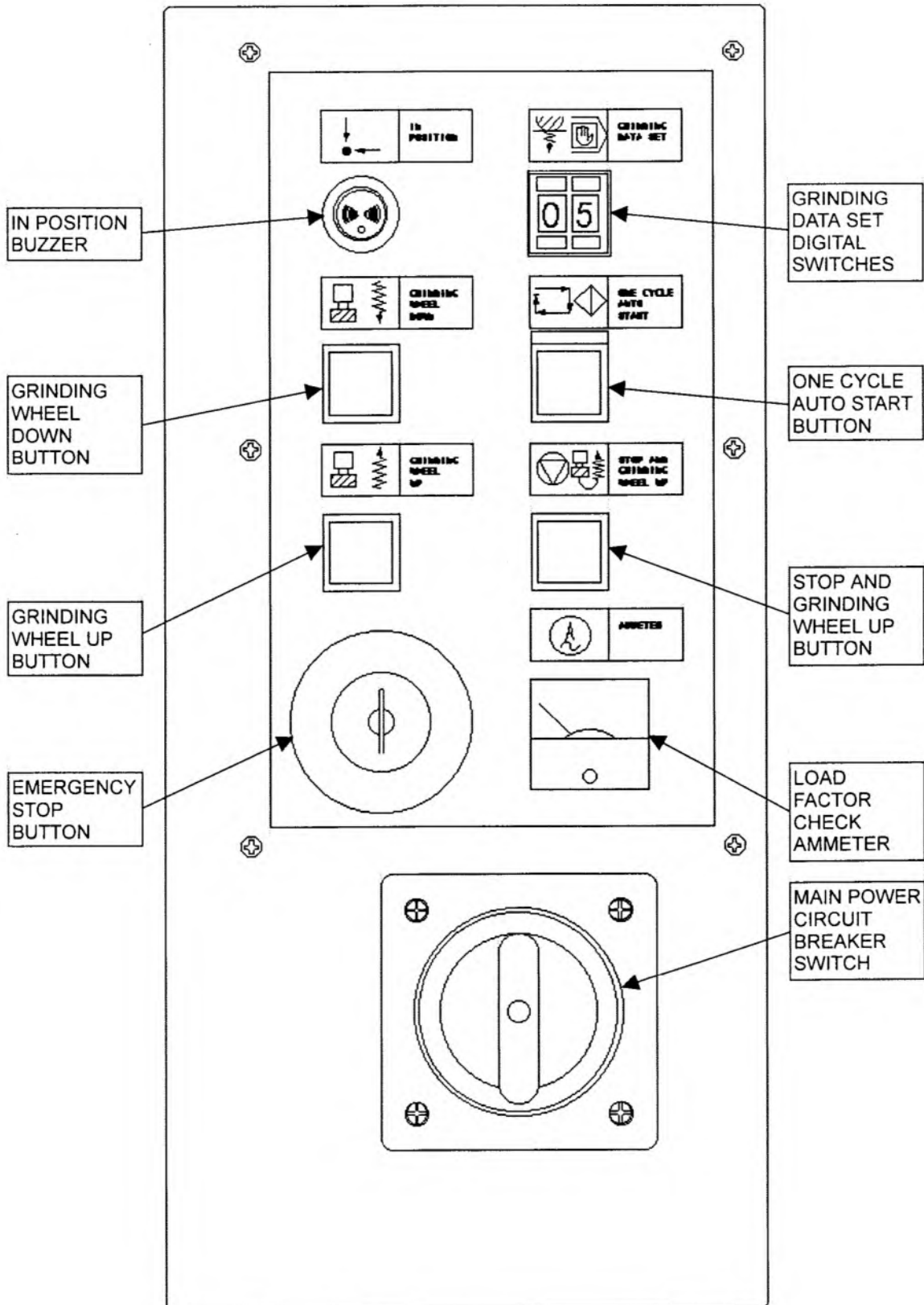
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CONTROL PANEL

The control panel of the machine is illustrated below.



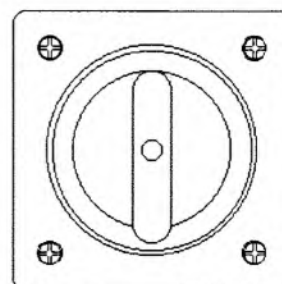
NAMES AND FUNCTIONS OF CONTROLS

The names and functions of the controls used for the operation of the machine are described below.

Main power circuit breaker switch

The main power circuit breaker is located in the lower part of the electrical box, and its switch is shown at right. It has a ground fault detection function. When a ground fault occurs, the trip coil trips to automatically interrupt the power to the machine.

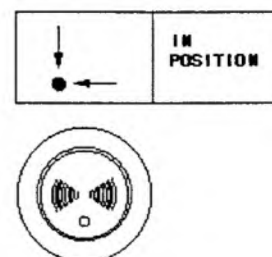
Turn the knob of the circuit breaker switch to turn on and off the power of the machine. The knob can be padlocked.



IN POSITION buzzer

The pictograph shown at right means the completion of positioning. The buzzer sounds to notify the completion of tool position detection or the completion of determination of the grinding start position.

The grinding start position is detected the instant the grinding wheel contacts the tool after the start of automatic operation. As soon as the buzzer sounds, the red LED comes on.



GRINDING DATA SET digital switches

The pictograph shown at right means the manual setup of the grinding amount. These switches are used to set the required grinding amount.

Before pressing the ONE CYCLE AUTO START button, enter the grinding amount in 1/1000" increments for the US machine and in 1/100-mm increments for the EXP. machine. The value set with the two digital switches and multiplied by the setup unit is the actual grinding amount. In the example shown at right, the actual grinding amount is 0.005" for the US machine and 0.05 mm for the EXP. machine.



 CAUTION	● Be sure to set the grinding amount before the start of automatic operation. Note that any change made to the grinding amount after the start of automatic operation is not effective.
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Relationship between grinding amount and time

The grinding time with respect to each preset grinding amount is as shown in the table below. The term "spark-out" refers to finish grinding.

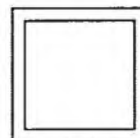
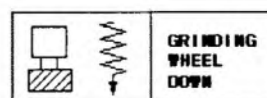
The actual operating time during automatic operation is the grinding time and spark-out time plus the positioning time, approach time, and reset time.

Grinding amount	Grinding time	Spark-out time
0.05 mm	50 sec	30 sec
0.1 mm	100 sec	30 sec
0.002"	51 sec	30 sec
0.004"	100 sec	30 sec

GRINDING WHEEL DOWN button (white)

The pictograph shown at right means the manual operation to lower the grinding wheel. The button is pressed and held to lower the grinding wheel head at high speed.

The grinding wheel continues to lower as long as the button is pressed and held, and stops when the button is released. The button is used to bring the grinding wheel close to the tool before the start of automatic operation.



WARNING

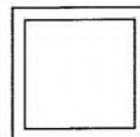
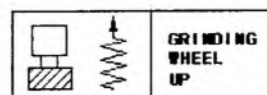
- The grinding wheel lowers as long as the button is pressed and held, except when the machine is stopped in an emergency, has its front door opened, or is in automatic operation. Pay attention to the grinding wheel while you hold the button. Otherwise the grinding wheel may strike against the tool and break.

GRINDING WHEEL UP button (white)

The pictograph shown below means the manual operation to raise the grinding wheel. The button is pressed and held to raise the grinding wheel head at high speed.

The grinding wheel continues to rise as long as the button is pressed and held, and stops when the button is released or the grinding wheel reaches the upper limit.

The button is used to bring the grinding wheel apart from the tool if the tool is likely to interfere with the grinding wheel when installing or removing the tool.



WARNING

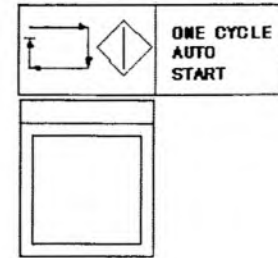
- The grinding wheel rises as long as the button is pressed and held, except when the machine is stopped in an emergency or is in automatic operation. Pay attention to the grinding wheel that rises even when the front door of the machine is open.

ONE CYCLE AUTO START button (with cover and white light)

The pictograph shown at right means the start of one cycle of automatic operation. The button is pressed to start one cycle of automatic operation. The button is enabled only when the front door of the machine is closed.

One cycle of automatic operation involves positioning, grinding, spark-out, rise and reset, and automatic stop.

The light of the button comes on to indicate that the machine is in automatic operation.



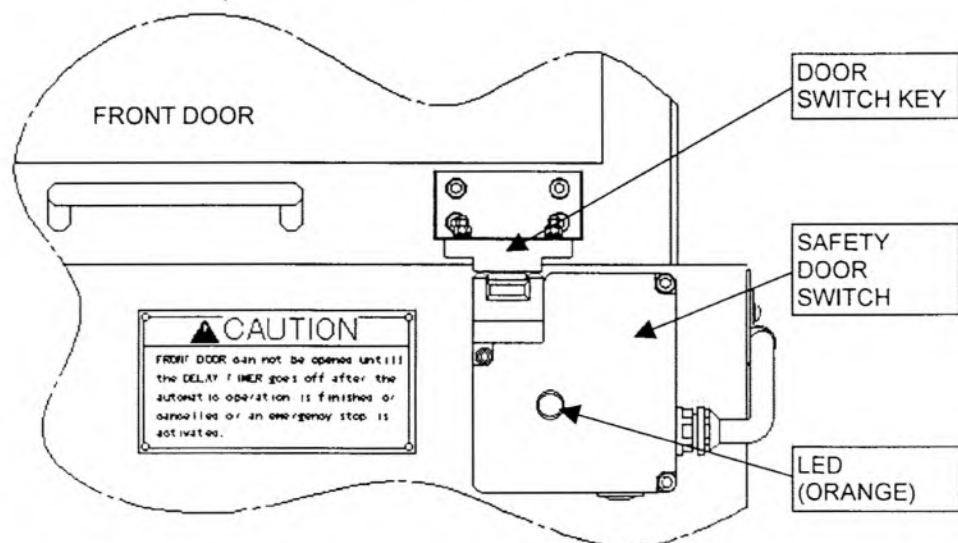
CAUTION

- The ONE CYCLE AUTO START button is enabled only when the front door of the machine is closed. The safety door switch attached to the machine proper monitors this condition. Unless the front door is properly closed, the machine cannot start its automatic operation.

Safety functions during automatic operation

As soon as automatic operation is started, the machine has the front door electromagnetically locked by the safety door switch shown below. The safety door switch is interlocked with the opening and closing of the front door, and electromagnetically locks the front door after the start of automatic operation.

The safety door switch keeps the front door locked as long as the grinding wheel is rotating under inertia after automatic operation is completed, interrupted, or stopped in emergency. The front door can be opened when the electromagnetic lock is released. (The LED of the safety door switch goes out to indicate the released condition.)



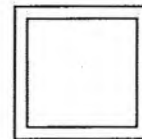
**WARNING**

- The safety door switch electromagnetically locks the front door of the machine usually when the grinding wheel is rotating. The electromagnetic lock is released when an electric power failure has occurred or the shop circuit breaker or the main power circuit breaker switch has tripped. In such a case, never open the front door if the grinding wheel is rotating.

STOP AND GRINDING WHEEL UP button (black)

The pictograph shown at right means the interruption of one cycle of automatic operation and the rise of the grinding wheel head. The button is pressed to interrupt one cycle of automatic operation.

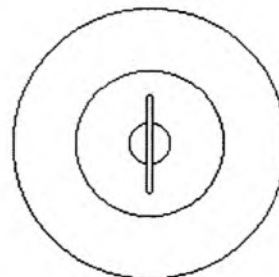
When the button is pressed after the start of automatic operation, the grinding operation is interrupted, the grinding wheel head rises about 50 mm (1.969"), and machine stops all of its motions.

**EMERGENCY STOP button**

(red on yellow background and with key)

This button is marked EMERGENCY STOP on a yellow plate and is pressed to instantaneously cut all power to the machine.

When the button is pressed, the machine immediately stops all of its motions without raising the grinding wheel head, unlike when the STOP AND GRINDING WHEEL UP button is pressed. Since the grinding wheel continues to rotate under inertia, the front door of the machine is locked by the safety door switch.

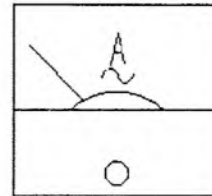
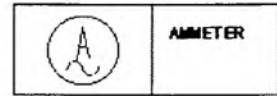
**CAUTION**

- The EMERGENCY STOP button has a key. Once locked, the button cannot be unlocked without the key. Take care not to lose the key.

Load factor check ammeter

The pictograph shown at right means an ammeter. The ammeter indicates the load applied to the spindle during grinding.

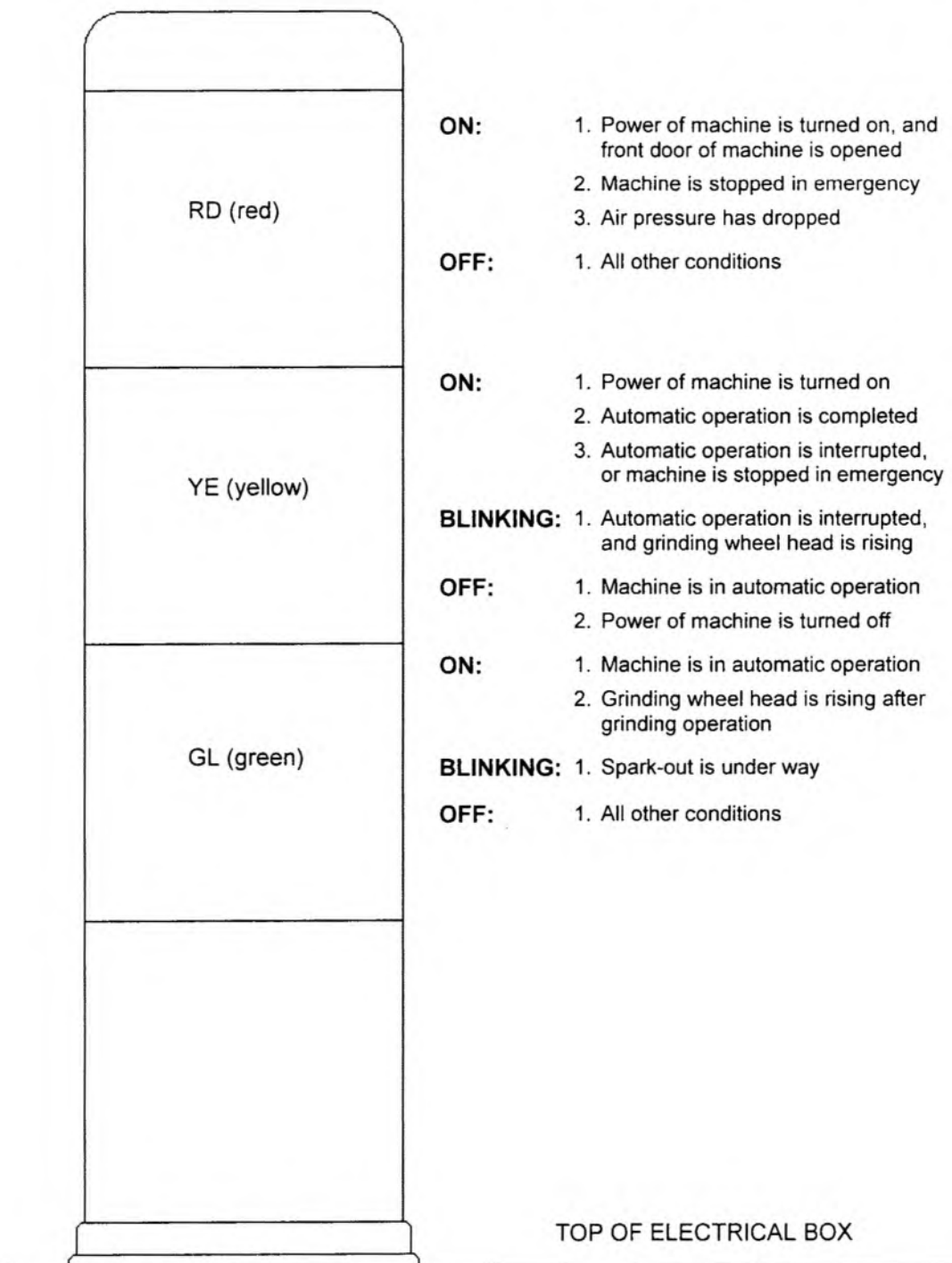
When the spindle load increases to cause the spindle motor current to continuously exceed 6.0 A, the spindle motor is stopped by a motor protection function. The pointer does not swing so much when the grinding area is small or the tool is 2 in. or less in size.



When the spindle starts running, the pointer momentarily swing to a great extend due to the starting current. This is not a trouble. The current that flows during the idle rotation of the spindle (no grinding performed) is approximately 3.5 A.

SIGNAL INDICATION

The machine indicates each operating condition and alarm by the color lights of the signal tower installed on the top of the electrical box. The operating conditions indicated by each color light are described below.



Part IV

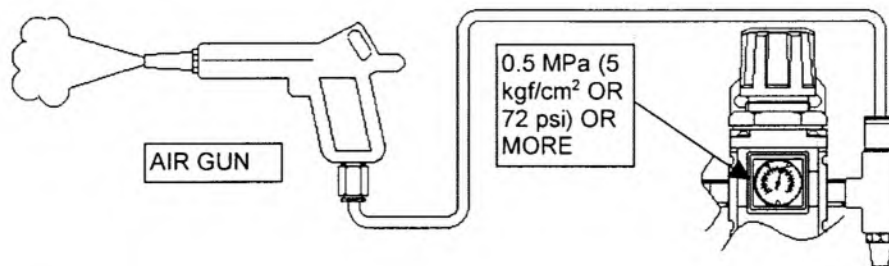
Operation

Preparing for operation	IV-2
Test operation	IV-5
Operating procedures	IV-7
Automatic operation chart	IV-15
Operation check flowchart	IV-16

PREPARING FOR OPERATION

Checking air discharge

Check that compressed air is discharged from the accessory air gun. At the same time, check the air pressure at the pressure gauge of the filter regulator. The compressed air is absolutely necessary for accurately determining the grinding start position. If no air is discharged from the air gun or the air pressure is lower than specified, the machine cannot be started. Solve the problem, and use the machine.

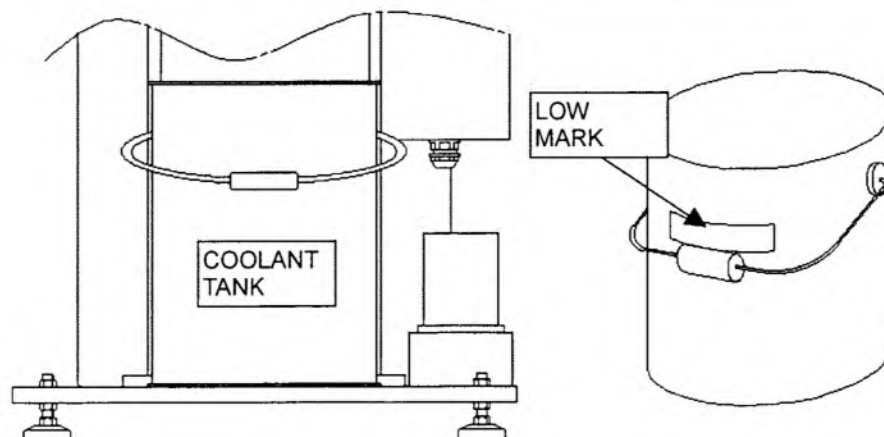


Preparing coolant

Add water into the coolant tank to about 90% of the height so that the coolant is diluted 30 to 50 times. (The full capacity of the coolant tank is 18 L (4.76 US gal).)

Be sure to check the coolant level before starting the operation of the machine. With the machine stopped, open the lower door, and check that the coolant is filled above the lower cooling water level marked on the coolant tank. If the coolant level is below the lower cooling water level, immediately add the coolant. Perform this coolant level check as one of the daily check items.

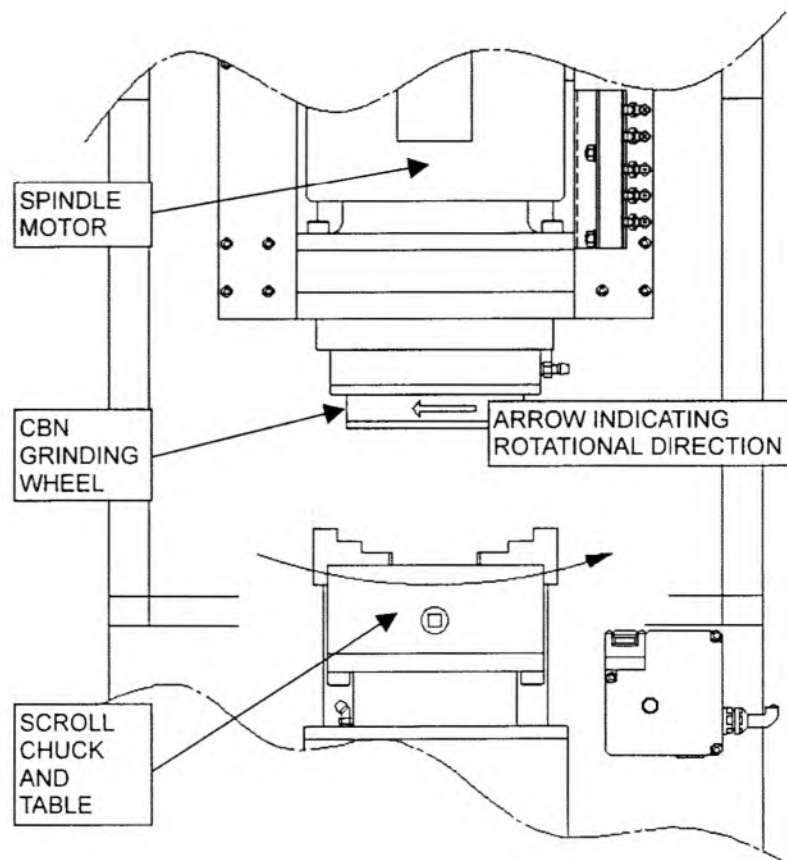
 WARNING	● A lack of the coolant burns the grinding wheel and a tool. The air introduced through the drain hose is drawn by the coolant supply hose into the coolant pump where it collects. The collected air interferes with the discharge of the coolant. Pay attention to this phenomenon.
--	---



Checking rotational directions of grinding wheel and table

Turn on the main power circuit breaker switch of the machine, start the machine, and check the rotational directions of the grinding wheel and table as described below.

- 1 When you have confirmed that the power of the machine is turned on, close the front door of the machine. If the front door is open, the grinding wheel and table cannot rotate.
- 2 Press the ONE CYCLE AUTO START button. The grinding wheel and table instantaneously start rotating.
- 3 After 1 to 2 sec, press the STOP AND GRINDING WHEEL UP button to stop the machine.
- 4 Since the table stops immediately, check its rotational direction. Its rotational direction is normal if the table rotates counterclockwise when viewed from above.
- 5 Next, check the operational direction of the grinding wheel rotating under inertia by looking at the arrow label. Its rotational direction is normal if the grinding wheel rotates in the direction of the arrow (or counterclockwise when viewed from below).
- 6 If the grinding wheel or table rotates in the reverse direction, interchange two of the three conductors of the power cable connected to the shop power supply.

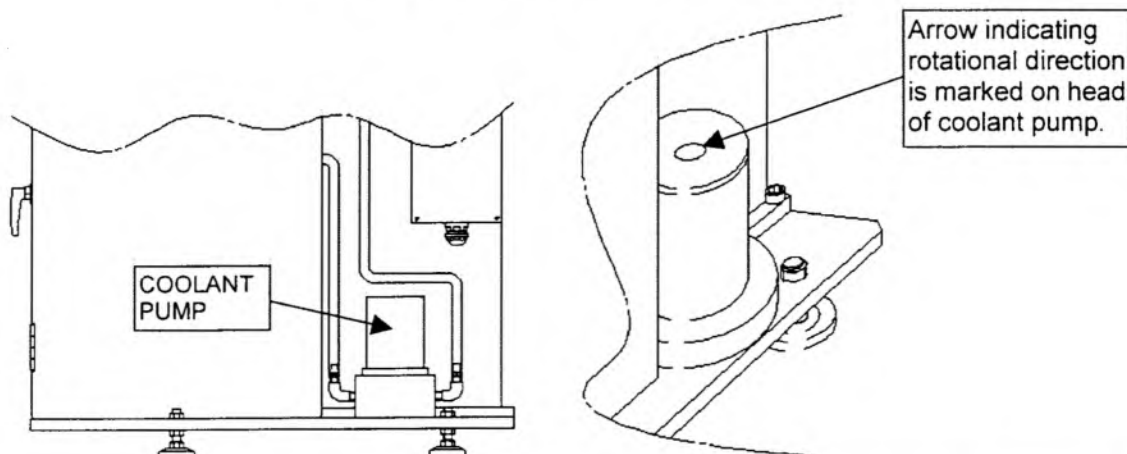


 DANGER	● Be sure to turn off the shop circuit breaker to cut off the shop power supply before interchanging two of the three conductors of the power cable. Be sure to interchange the power supply phases at the shop circuit breaker. If the power cable conductors are interchanged at the terminal block in the electrical box of the machine, the other motors run in the reverse direction. The grinding wheel and table must rotate in the direction opposite to each other.
---	--

Checking rotational direction of coolant pump

The coolant pump has a transparent cap installed on the head. The transparent cap can be removed. By looking at the arrow marked on the head, check the rotational direction of the coolant pump.

The coolant pump does not run unless the machine actually performs grinding. Test-operate the machine to check the rotational direction of the coolant pump. Its rotational direction is normal if the coolant unit discharges the coolant during the grinding motion in the test operation.



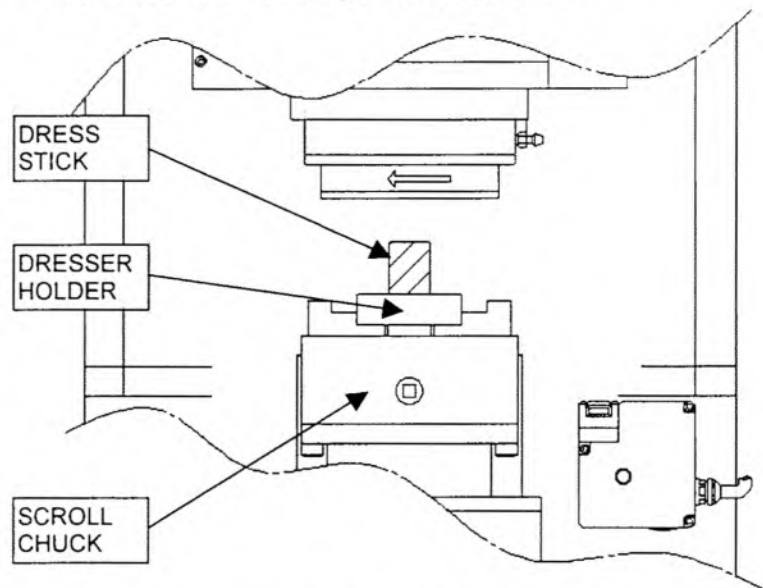
 WARNING	● Check the rotational direction of the coolant pump as one item of the test operation described in the next section. When a tool is ground without checking the rotational direction, the grinding wheel and tool are burned unless the coolant is discharged.
--	---

TEST OPERATION

Test operation procedure

Be sure to use the accessory dresser for the test operation of the machine. Test-operate the machine as described below.

- 1 Install the dresser in the scroll chuck. Mount the dresser in the dresser holder, and fix it with the set screw.
- 2 Set the grinding amount at 0.02 mm or 0.002". Set the GRINDING DATA SET digital switches at "02".



- 3 Close the front door of the machine, and press and hold the GRINDING WHEEL DOWN button until the grinding wheel moves down to about 15 mm (0.5") above the dresser. Then press the ONE CYCLE AUTO START button.
- 4 The grinding wheel starts rotating and lowering while discharging compressed air.
- 5 Check that the IN POSITION buzzer sounds when the grinding wheel contacts the dresser. When the positioning motion is completed, the grinding wheel rises by 0.2 mm (0.008").
- 6 Check that the coolant is discharged as soon as the compressed air is turned off. The grinding wheel resumes the lowering motion and starts the grinding motion after the completion of the approach.
- 7 The coolant may not be discharged immediately after the start of the grinding motion, but there is no problem if the coolant is discharged until the spark-out is completed.



CAUTION

- The dresser can be used dry. If the coolant is not discharged until the end of automatic operation, prime the coolant pump. The coolant pump in the machine is shipped empty. It must be primed before use.

Priming coolant pump

Prime the coolant pump as described below.

- 1 Remove from the coolant tank the end of the hose leading from the coolant pump to the coolant tank.
- 2 Raise the end of the hose as high as possible, and pour water into the hose using a funnel or the like.
- 3 Add the water until it comes close to the end of the hose.
- 4 Close the end of the hose with a finger, and return the hose back into the coolant tank.
- 5 The coolant starts flowing out of the coolant unit when the automatic operation of the machine is resumed.

OPERATING PROCEDURES

Operate the machine as described below.

Turning on power of machine

Check the compressed air supply condition and the coolant level, turn on the shop circuit breaker, and turn on the main power circuit breaker switch of the machine shown at right. The instant the power is supplied to the machine, some sound may come from the motors. This is not a trouble.

With the power supplied to the machine, check that the signal tower on the top of the electrical box indicates the following conditions:

RD (Red) light

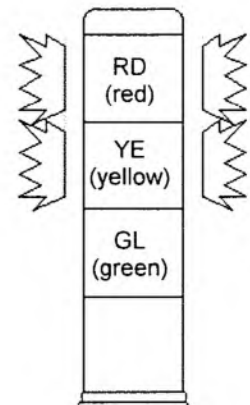
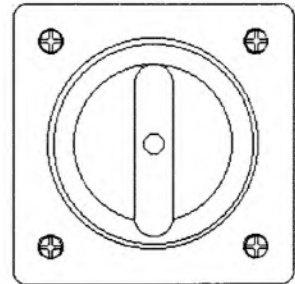
On: Front door of machine is open

Off: Front door of machine is closed

YE (Yellow) light

On: Power of machine is turned on

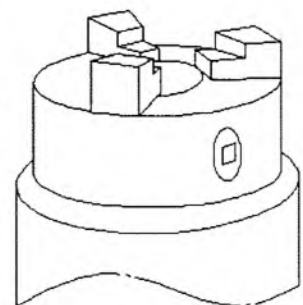
If the signal tower indicates any other condition when the power of the machine is turned on, there is some problem. Check the condition, and contact us.



Setting tool

It is basic practice to set a tool in the scroll chuck for grinding. If chips or other foreign matter is deposited on the jaws of the scroll chuck, the tool cannot be properly ground in the horizontal direction. Be sure to blow off the chips or the like with compressed air and to wipe the chuck jaws with waste cloth. Similarly clean the tool.

Special jigs are required for some types of tools. For detailed types and usage of jigs, refer to Part V.

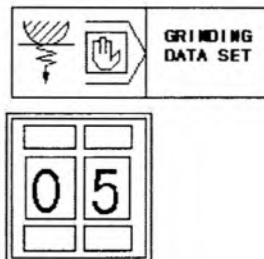


CAUTION

- Be sure that no foreign matter is deposited on the jaws of the scroll chuck and the surface portions of the tool that come into contact with the chuck jaws. If there is any such foreign matter, the tool cannot be properly ground in the horizontal direction.

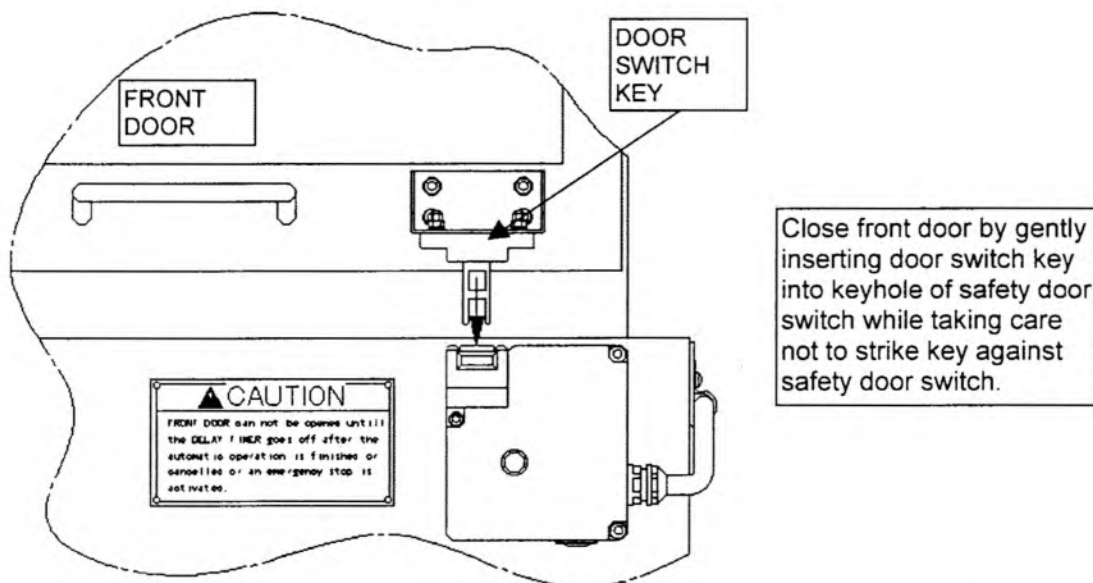
Setting grinding amount

Inspect the tool to be ground for wear, and check that the tool is properly mounted in the scroll chuck. Set the grinding amount with the GRINDING DATA SET digital switches shown at right. Be sure to set the grinding amount before the start of automatic operation. As described in Part III, Controls, the two-digit value set here is the grinding amount. If the digital switches are set at "05" as shown at right, the grinding amount is 0.005" for the US machine and 0.05 mm for the EXP. machine.



Preparing for automatic operation

Once the grinding amount is set, close the front door of the machine in order to lower the spindle. Close the front door by gently inserting the door switch key attached to the front door into the safety door switch attached to the table cover.



The safety door switch monitors whether or not the front door is open, and is interlocked with the front door. Unless the door switch key is properly inserted, the automatic operation of the machine cannot be started.



WARNING

- If the front door is violently closed, the safety door switch may strike the door switch key, and bend or break it. Note that if the key is broken, the machine cannot be used any more.

When the front door is properly closed, the signal tower indicates the following conditions:

RD (Red) light

Off: Front door is closed

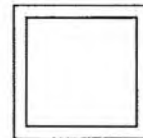
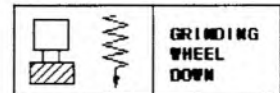
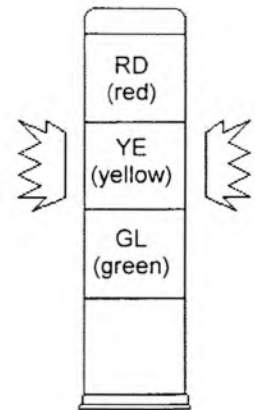
YE (Yellow) light

On

If the red light of the signal tower does not go out even though the front door is properly closed, there is some trouble. Close and open the front door several times. If the condition does not change, contact us.

If the red light of the signal tower goes out, press and hold the GRINDING WHEEL DOWN button shown below until the spindle (grinding wheel) lowers at high speed and the grinding wheel comes close to the tool.

Do not lower the grinding wheel less than 10 mm (0.5") close to the tool. If the grinding wheel is brought too close to the tool, the air blow time is shortened, the water deposited on the tool and grinding wheel cannot be properly removed, and the grinding start position cannot be accurately determined.

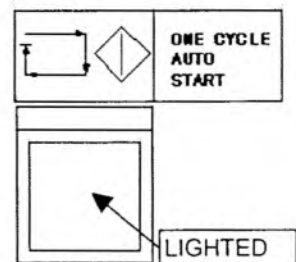


 WARNING	● When lowering the spindle (grinding wheel) at high speed, keep your eyes on the grinding wheel. The grinding wheel lowers as long as the GRINDING WHEEL DOWN button is held pressed. The grinding wheel may strike the tool and break.
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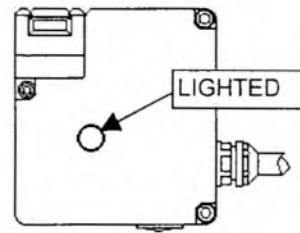
Starting automatic operation

When the grinding wheel is brought close enough to the tool, press the ONE CYCLE AUTO START button shown below. The respective steps of the automatic operation of the machine are described below.

- 1 As soon as the ONE CYCLE AUTO START button is pressed, its white light comes on. At the same time, the safety door switch electromagnetically locks the front door of the machine, and its orange LED comes on.
- 2 The grinding wheel head and table rotate. The grinding wheel head then lowers at medium speed while discharging compressed air.



- 3 The air blows water off the grinding wheel and tool, so that the grinding start position can be accurately detected.
- 4 The IN POSITION buzzer sounds, and the grinding wheel head rises by 0.2 mm (0.008") at medium speed.
- 5 The air blow is stopped, the coolant discharge is started, and the grinding wheel head lowers at medium speed to approach the tool.
- 6 When the grinding wheel head reaches the grinding start position, it changes to the grinding motion. It lowers at low speed and grinds the tool by the specified amount.
- 7 When the grinding of the tool by the specified amount is completed, the grinding wheel head stops lowering and changes to finish grinding (spark-out). The spark-out continues for 30 sec.
- 8 After the spark-out, the grinding wheel head rises by 50 mm (1.969") at high speed, stops, and completes the automatic operation.
- 9 After the end of the automatic operation, the safety door switch electromagnetically locks the front door as long as the grinding wheel rotates under inertia. The electromagnetic lock is released about 3 to 5 sec after the complete stop of the grinding wheel. When the electromagnetic lock is released, the orange LED of the safety door switch goes out. Check this condition, and open the front door.



During the automatic operation, the signal tower indicates the following conditions:

RD (Red) light

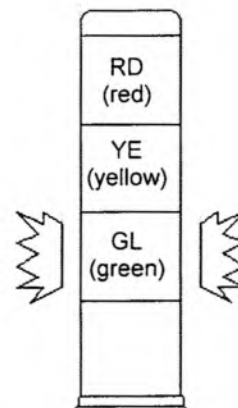
- Off: Automatic operation is under way
- On: Automatic operation is under way, and front door is open

Yellow (YE) light

- Off: Automatic operation is under way
- On: Automatic operation is stopped or completed

GL (Green) light

- On: Automatic operation is under way
- Blinking: Spark-out is under way
- Off: Automatic operation is stopped or completed

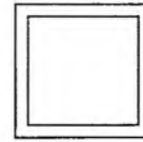


Interrupting automatic operation

Press the STOP AND GRINDING WHEEL UP button to interrupt the automatic operation of the machine due to an improper setup of the grinding amount, for example.



The interrupt function is effective in all motion areas after the start of automatic operation. (The grinding operation can also be interrupted.) As soon as the button is pressed, the automatic operation command is canceled, and the grinding wheel head starts rising at high speed.



The grinding wheel head stops after a rise of 50 mm (1.969") from the position where the button was pressed. Since the grinding wheel is still rotating under inertia, the safety door switch electromagnetically locks the front door of the machine. When the automatic operation is interrupted, the front door cannot be opened until 3 to 5 sec after the complete stop of the grinding wheel.

Usually, press the STOP AND GRINDING WHEEL UP button, not the EMERGENCY STOP button, to interrupt the automatic operation.

When the automatic operation is interrupted, the signal tower indicates the following conditions:

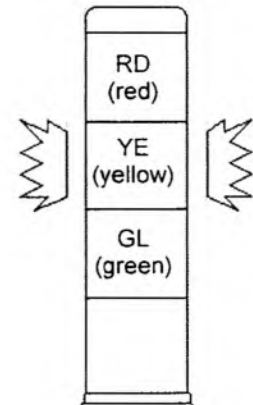
YE (Yellow) light

Blinking: Grinding wheel head is rising after interruption of automatic operation

On: Grinding wheel head has completed rising

GL (Green) light

Off



Pressing EMERGENCY STOP button

When such an emergency occurs that makes it unavoidable to interrupt the automatic operation of the machine, the EMERGENCY STOP button shown at right is pressed to stop the machine.

Unlike the interruption of automatic operation, the depression of the button instantaneously stops all power to the machine, so that the grinding wheel head does not rise either. Since the grinding wheel head is supported by the gas springs so that it does not fall under its own weight, it may sometimes rise slightly.

Since the grinding wheel continues to rotate under inertia, the safety door switch electromagnetically locks the front door of the machine. The front door cannot be opened until 3 to 5 sec after the complete stop of the grinding wheel.

The EMERGENCY STOP button is also used to clear an alarm that occurs in the servo system. For details, refer to Part VII.

When the machine is stopped in an emergency, the signal tower indicates the following conditions:

RD (Red) light:

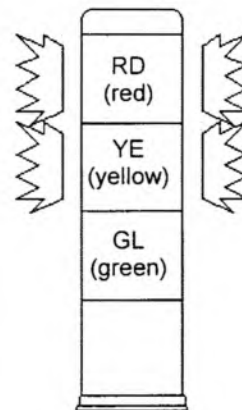
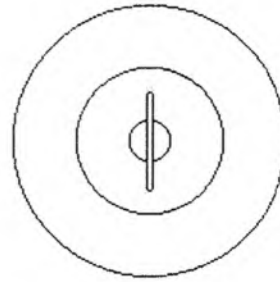
On

YE (Yellow) light:

On

GL (Green) light:

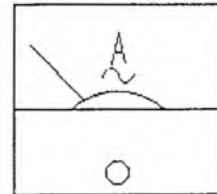
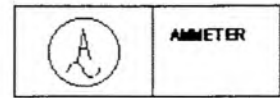
Off



Check items and precautions during automatic operation

Checking grinding wheel

When the automatic operation of the machine is started, the pointer of the ammeter indicating the load factor of the spindle starts to swing. The ammeter reads approximately 3.5 A when the spindle is idling. If the tool is 2 in. or less in size, the spindle motor current does not increase much when the grinding wheel starts grinding the tool. When the tool is more than 3-1/2 in. in size and made of high-speed tool steel (SKH), the pointer of the ammeter swings to a greater extent.



The current increases with decreasing sharpness of the grinding wheel. When the current increases to 6.0 or 6.5 A, the spindle motor is stopped by its protection function. Check the ammeter in daily use, and dress the grinding wheel when the ammeter indicates a current value close to 6.0 A.



CAUTION

- Unless the grinding wheel is dressed, the motor protection function frequently actuates, and a servo alarm occurs. If the machine operates without enabling the motor protection function, there occurs the surface polishing phenomenon (mirror condition) that no grinding is actually performed on the tool.

Precautions for safe operation



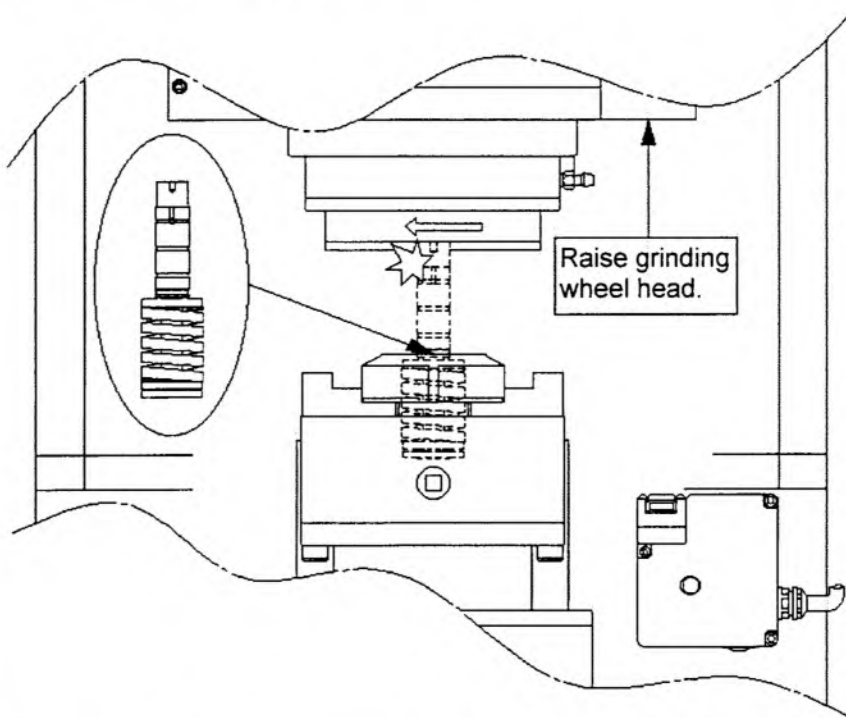
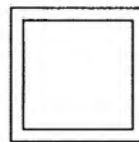
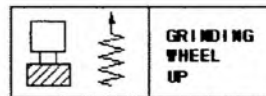
WARNING

- Never remove from the machine the safety door switch that monitors whether or not the front door of the machine is open and locks the front door during the automatic operation of the machine, although you may feel some inconvenience with it. The removal of the safety door switch not only causes the loss of the safety function, but disables the automatic operation.
- The front door is locked electromagnetically by a timer as long as the grinding wheel rotates under inertia after the completion or interruption of automatic operation, or the emergency stop of the machine. Never adjust the time preset with the timer without our permission.
- The electromagnetic lock of the safety door switch (front door) is released when the shop circuit breaker or the main power circuit breaker switch has tripped or the electric power has failed. Open the front door after checking that the grinding wheel has completely stopped.

Removing tool and ending grinding operation

When the grinding of the tool is completed, the grinding wheel head rises by 50 mm (1.969") from the grinding start position and stops. If the tool is likely to interfere with the grinding wheel when removing the tool or installing another tool, press and hold the GRINDING WHEEL UP button to raise the grinding wheel head.

If the grinding wheel is allowed to interfere with the tool, it may chip or break. Particularly when changing from the grinding of a die to that of a Type A (1/2") or B (1-1/4") punch, the grinding wheel interferes in that position. Raise the grinding wheel head beforehand.



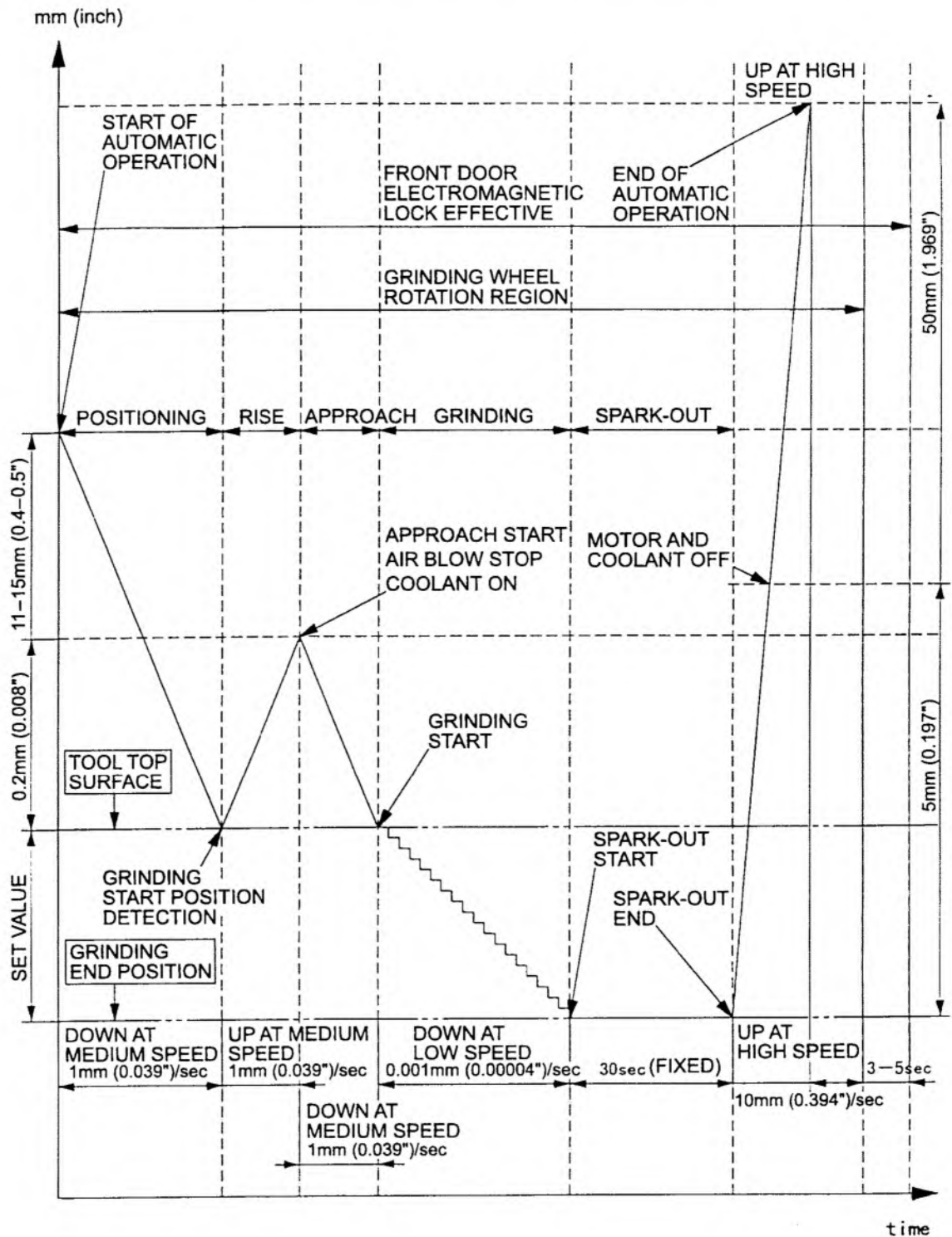
Before ending the grinding operation, blow the water and chips off the scroll chuck and surrounding parts with compressed air, wipe them with waste cloth, and spray rust-preventive oil to them.



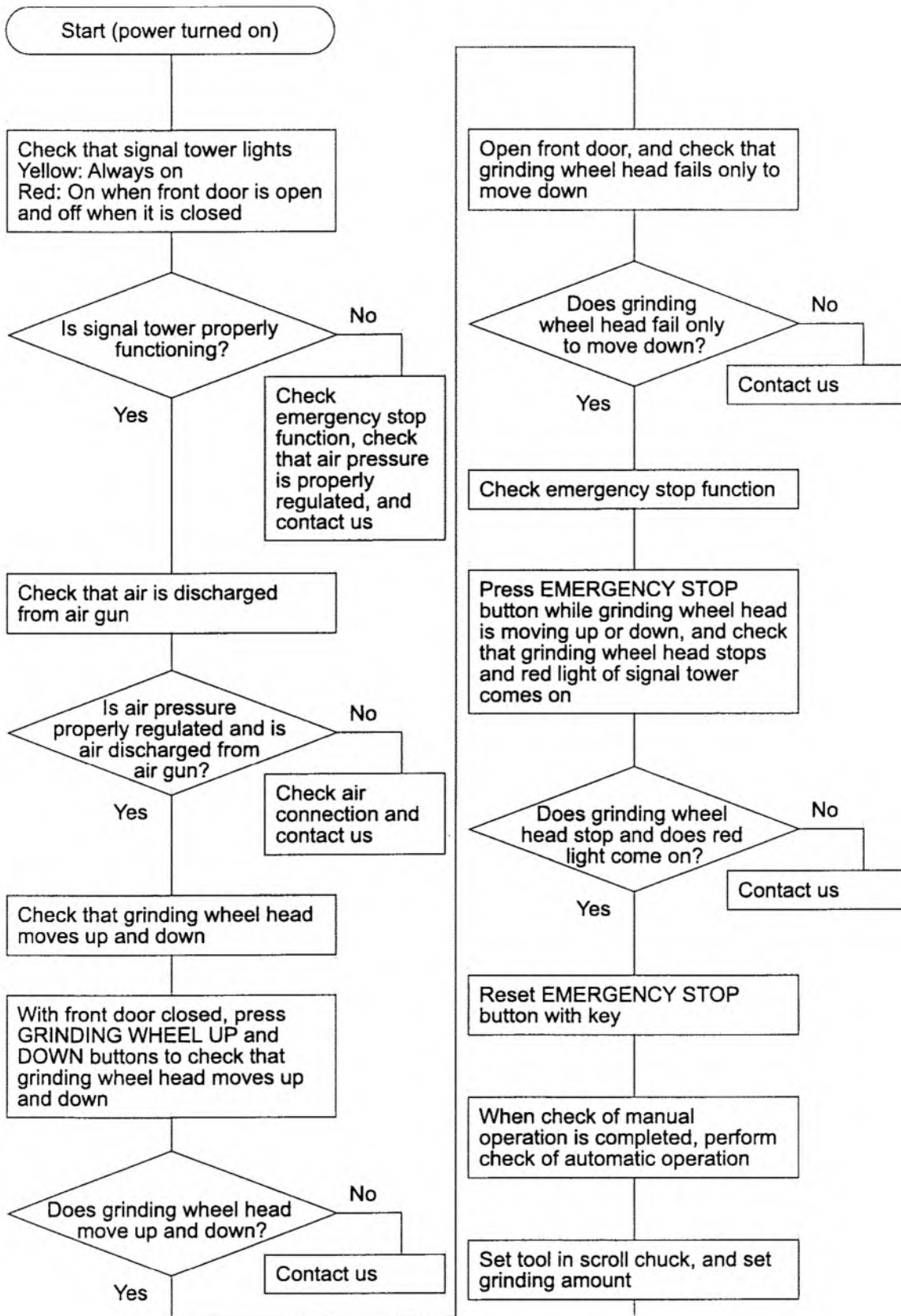
CAUTION

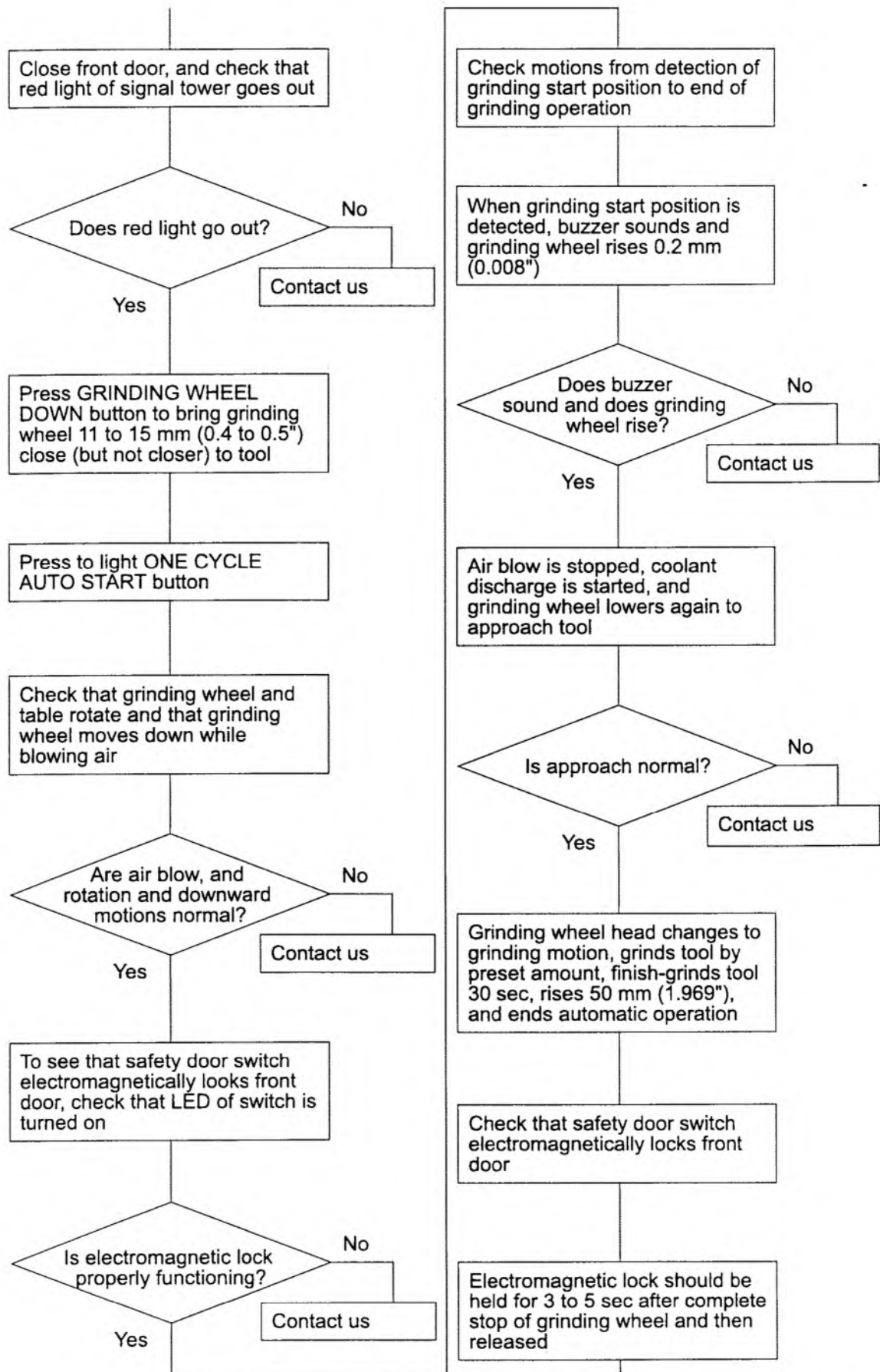
- The scroll chuck easily rusts if left to stand contaminated with the coolant for a long period of time. This rust prevents the chuck jaws from properly opening and closing.

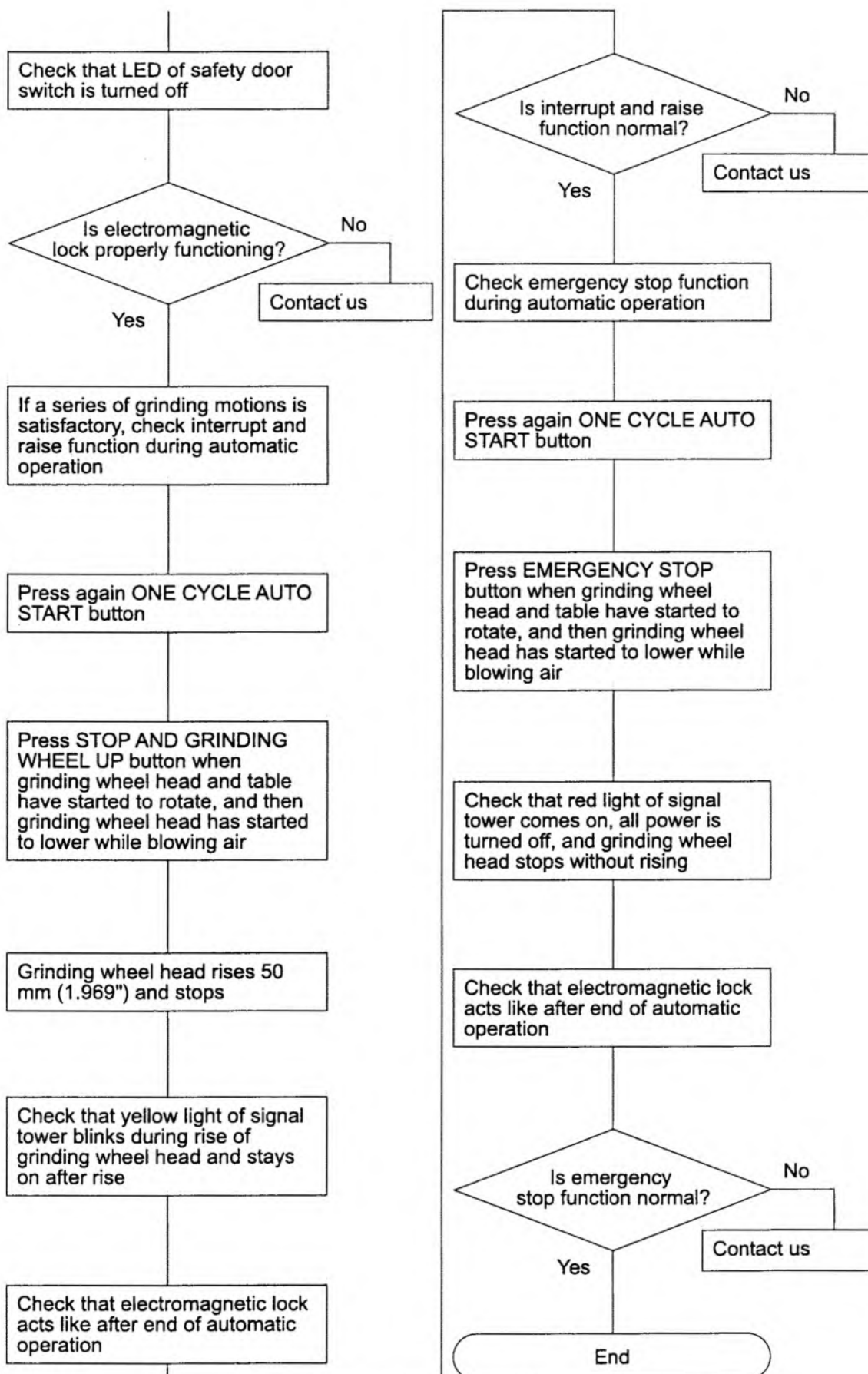
AUTOMATIC OPERATION CHART



OPERATION CHECK FLOWCHART







Part V

Types & Usage of Jigs

Methods and jigs for grinding dies	V-2
Methods and jigs for grinding punch bodies.....	V-4
Method and jigs for dressing grinding wheel.....	V-9

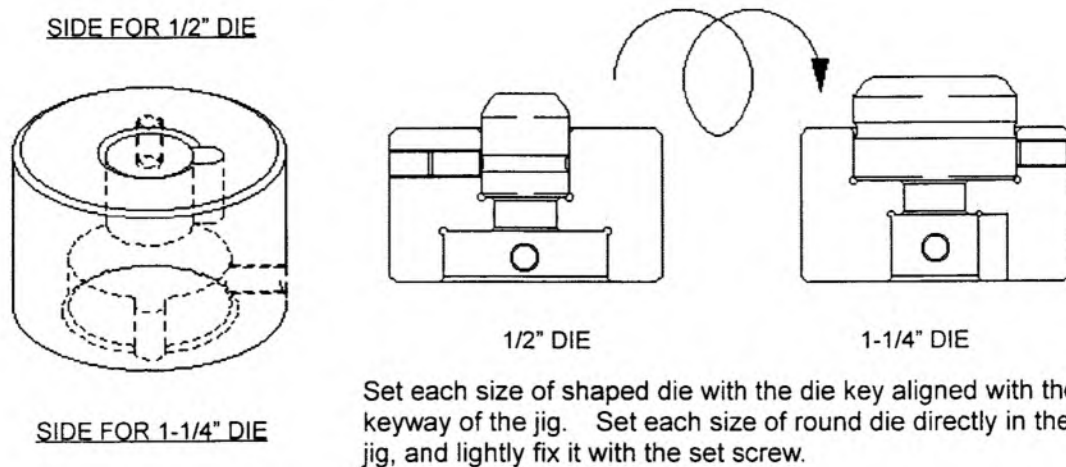
METHODS AND JIGS FOR GRINDING DIES

The methods and jigs for grinding specific sizes of dies to be used on the machine are described below.

Type A (1/2") and B (1-1/4") dies [Long and short dies]

The 1/2" and 1-1/4" dies are ground using the optional jig shown below. The jig is commonly used for grinding both of the 1/2" and 1-1/4" dies. It is turned over for use on either size of die.

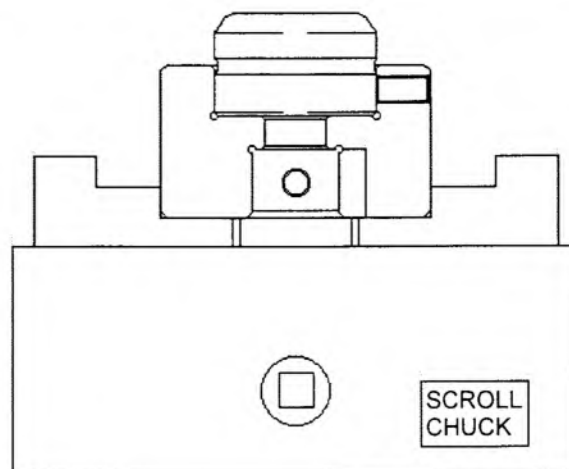
Common jig



CAUTION

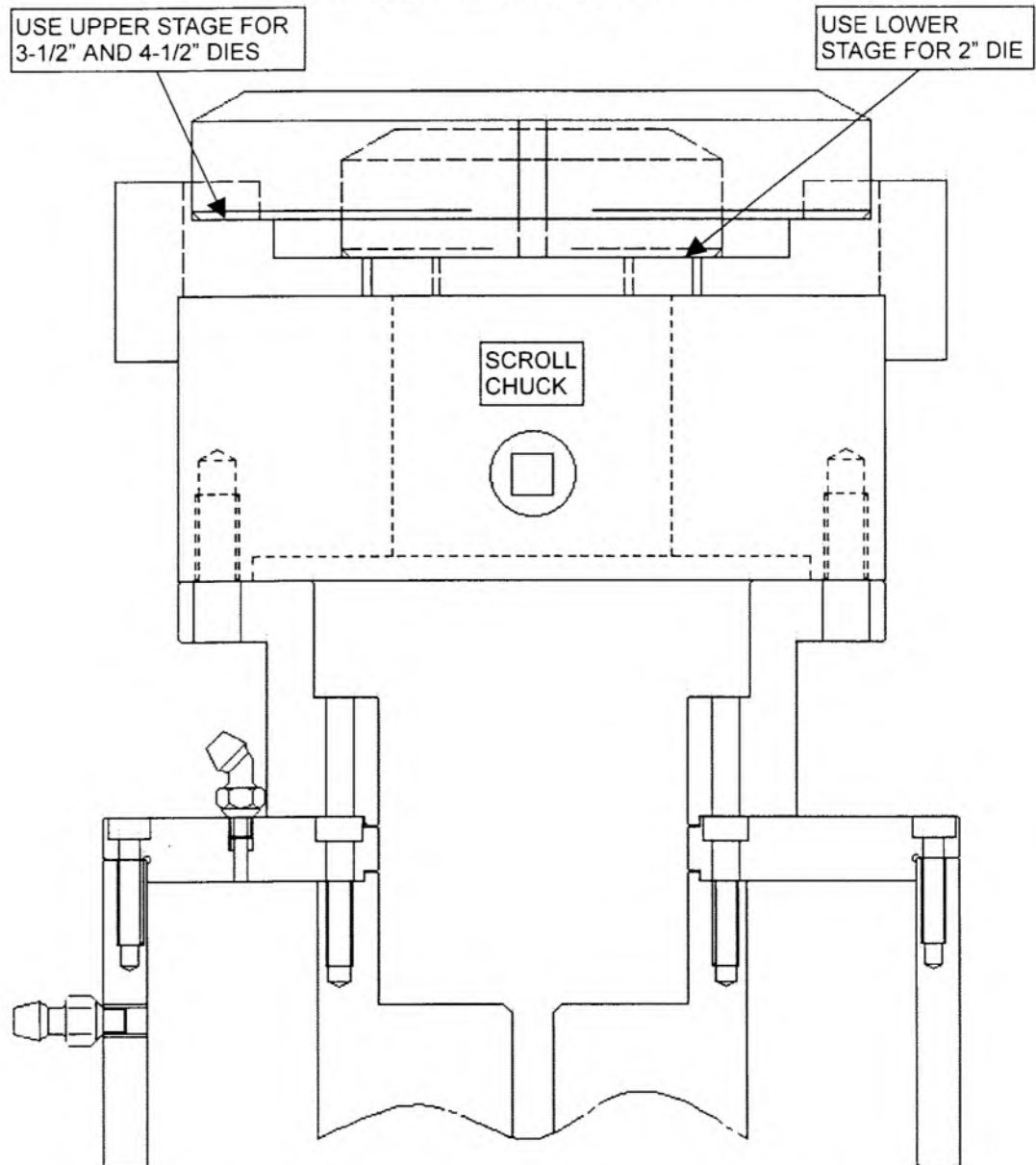
- Take care not to overtighten the set screw for fixing the round die. If the set screw is overtightened, the die may tilt, making it impossible to keep the top and bottom surfaces parallel.

Fix the jig holding the die in the scroll chuck mounted as standard accessory on the table as shown at right. Before fixing the jig with the scroll chuck, be sure to clean the jig contact surfaces of the chuck jaws and the bottom surface of the jig.



Type C (2"), D (3-1/2"), and E (4-1/2") dies [Long and short dies]

The scroll chuck supplied as standard accessory and mounted on the table as shown below is used for grinding the 2", 3-1/2", and 4-1/2" dies without special jigs. The 2" die is fixed in the lower stage of the scroll chuck, and the 3-1/2" and 4-1/2" dies are fixed in the upper stage of the scroll chuck. Be sure to clean the die contact surfaces of the chuck jaws and the bottom surface of the die.



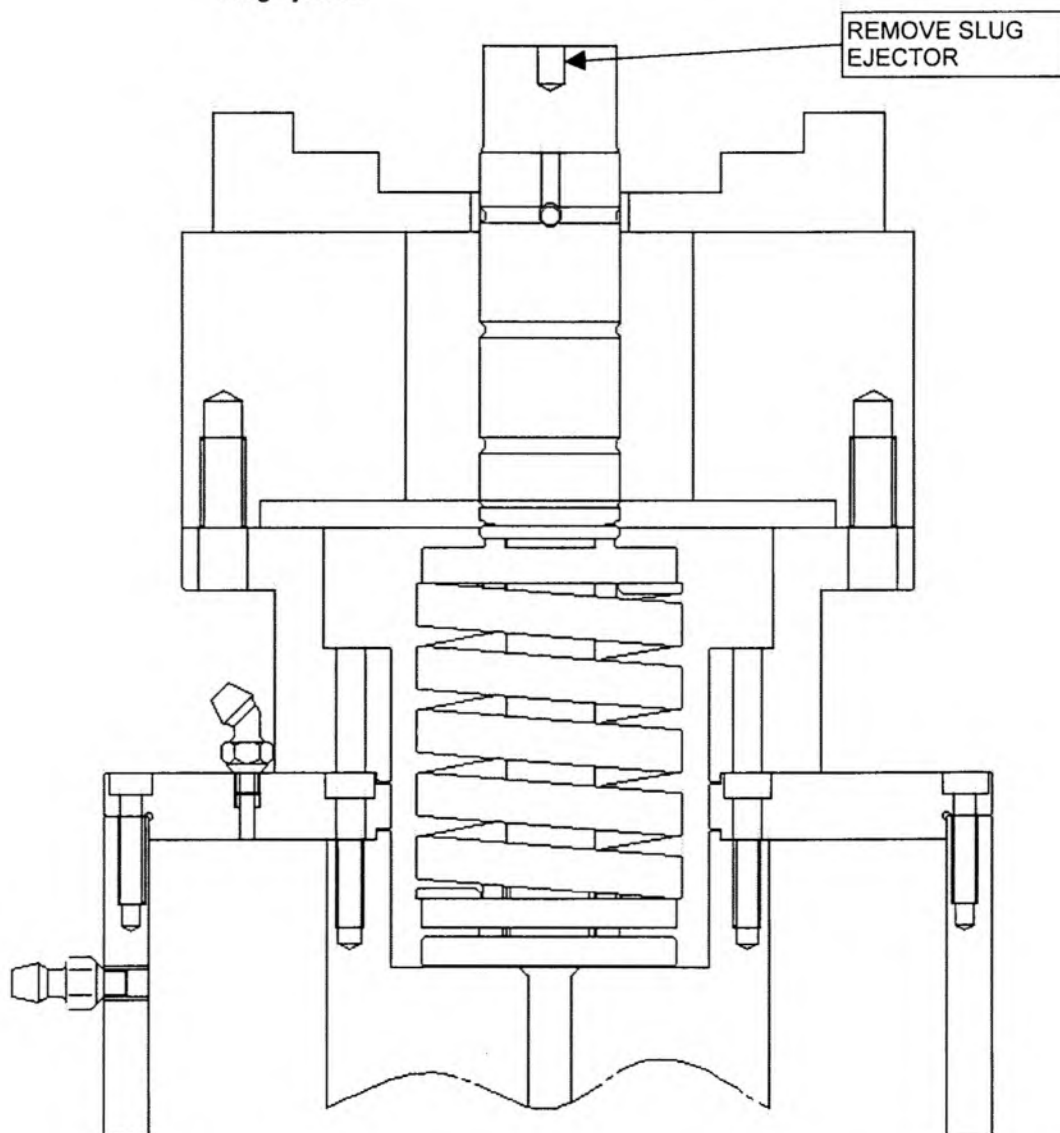
When grinding a large-diameter die, some portions of the die top surface may be left unground, despite the cleaning of the chuck jaws and die. In such a case, the die may be bowed. Grind the bottom surface of the die. Grind the entire bottom surface of the die, check that no portions are left unground, and grind the top surface of the die. The top and bottom surfaces of the die can be thus ground parallel.

METHODS AND JIGS FOR GRINDING PUNCH BODIES

The methods and jigs for grinding the punch bodies to be used on the machine are described below.

Type A (1/2") and B (1-1/4") punches [Long punches]

Remove the guide from the punch, and fix the punch with the spring in the scroll chuck as shown below. The punch body alone can be fixed for grinding, of course. There is no special jig. Be sure to remove the slug ejector.



CAUTION

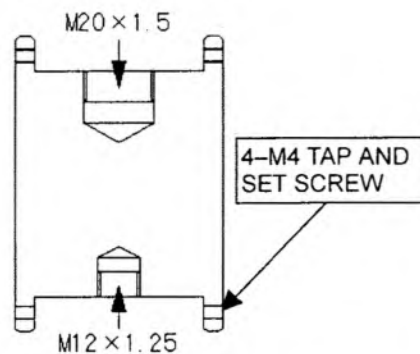
- After grinding a punch body with a spring, blow off all water from the spring, and apply rust-preventive oil to the spring.

Type A (1/2") and B (1-1/4") punches [Short punches]

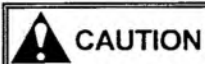
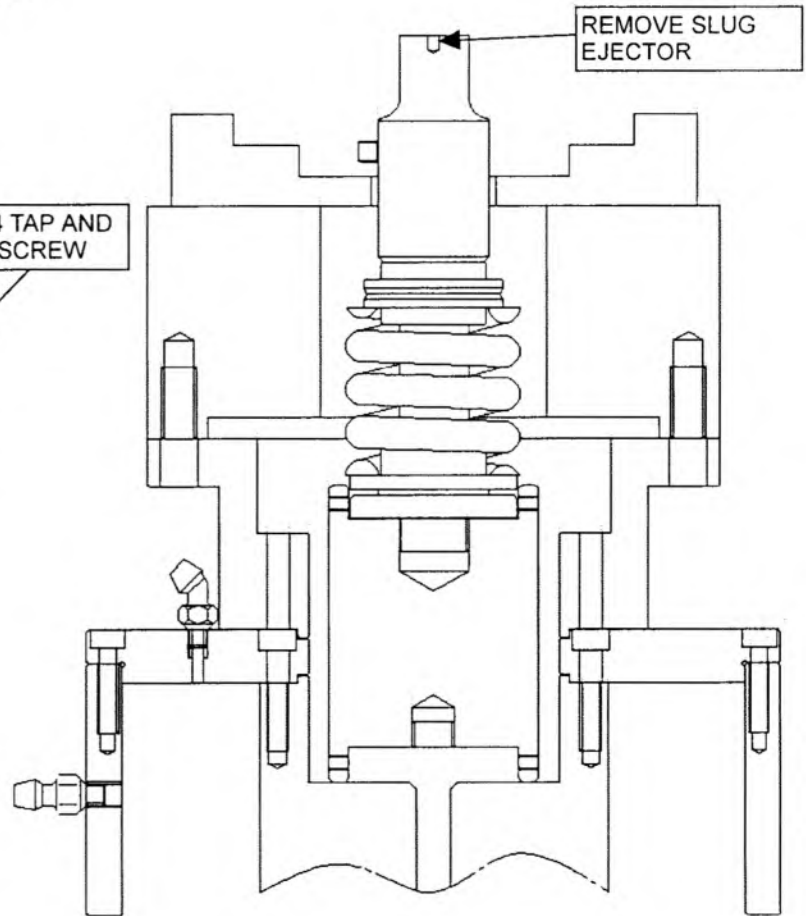
Fix the punch using the optional spacer jig as shown below. The jig is used for both 1/2" and 1-1/4" punches. It is turned over for use on either size of punch. Remove the guide from the punch, install the punch with the spring in the jig, fix the punch with the set screws, and fix the assembly with the scroll chuck. When fixing the punch body alone, screw its end into the hole of the jig, and install the assembly in the scroll chuck. Be sure to remove the slug ejector.

Short punch body spacer

SIDE FOR 1-1/4" PUNCH



SIDE FOR 1/2" PUNCH

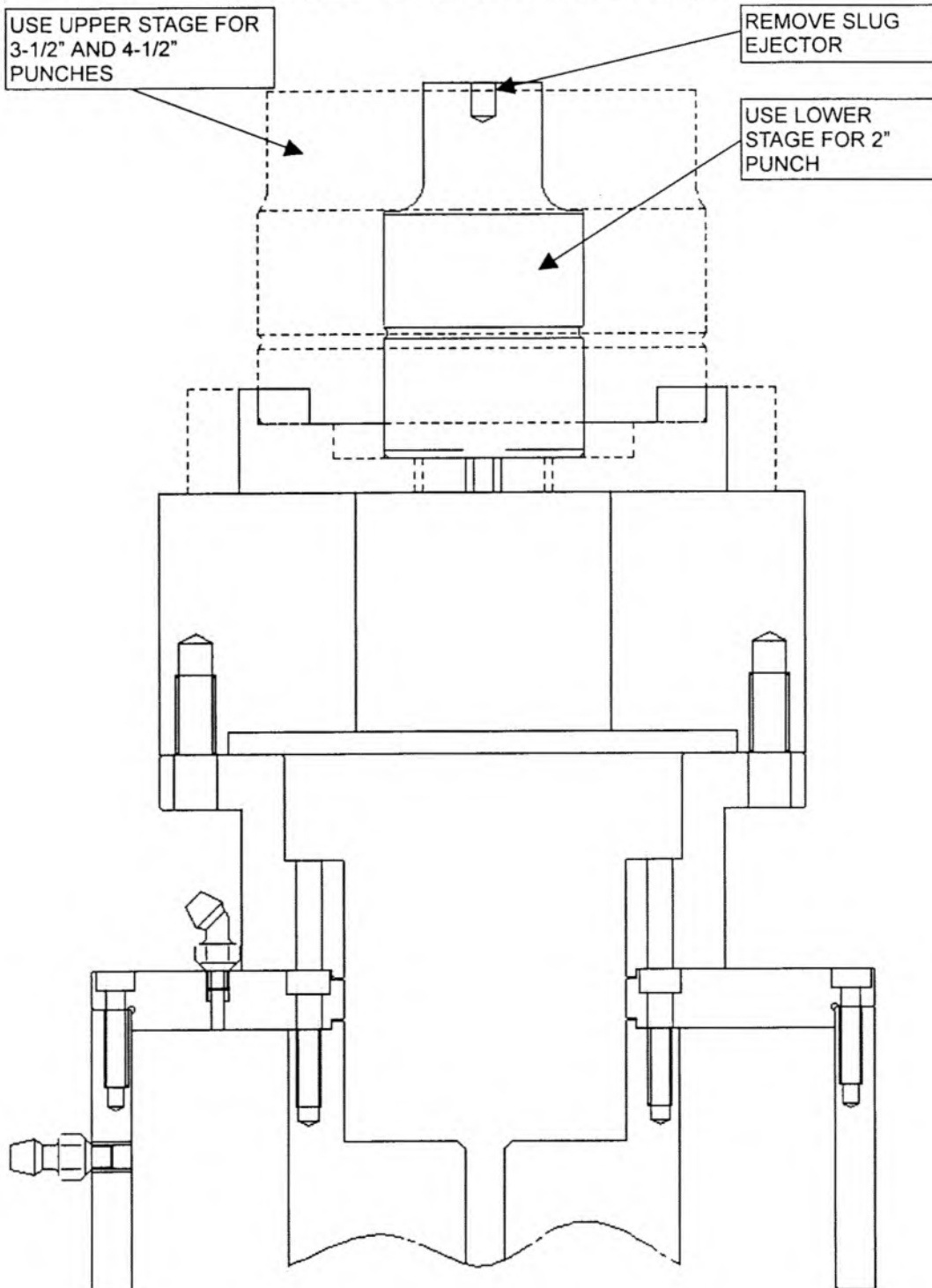


CAUTION

- After grinding a punch body with a spring, blow off all water from the spring, and apply rust-preventive oil to the spring.

Type C (2"), D (3-1/2"), and E (4-1/2") punches without shear angle
[Long and short punches]

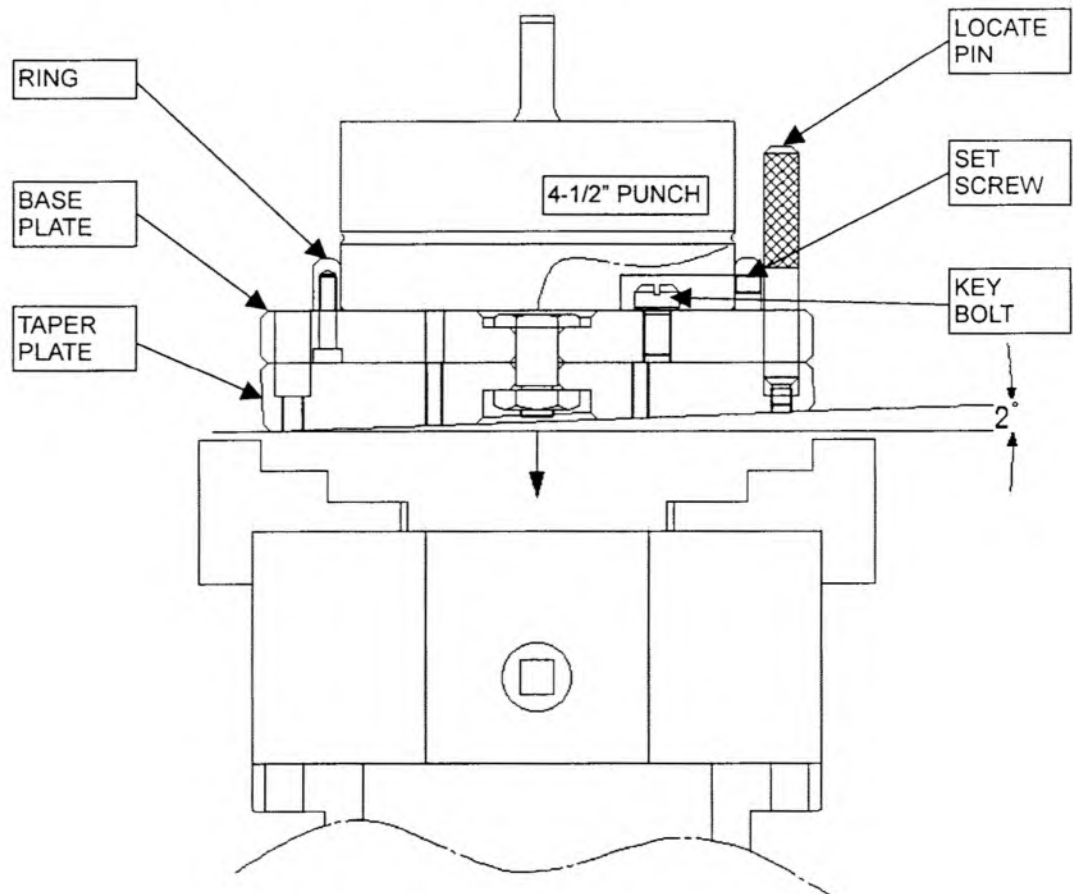
Remove the punch body from the guide, and fix it with the scroll chuck as shown below. Be sure to remove the slug ejector.



**Type C (2"), D (3-1/2"), and E (4-1/2") punches with shear angle
[Long and short punches]**

When the punch body is 2" or larger in diameter and has a standard shear angle of 2°, it requires the optional shear angle jig shown below. The body of the jig is designed for the 4-1/2" punch. For the 3-1/2" and 2" punches, a sleeve is installed on the jig, and the punch body is set in the sleeve. The jig is fixed with the scroll chuck.

Shear angle jig assembly

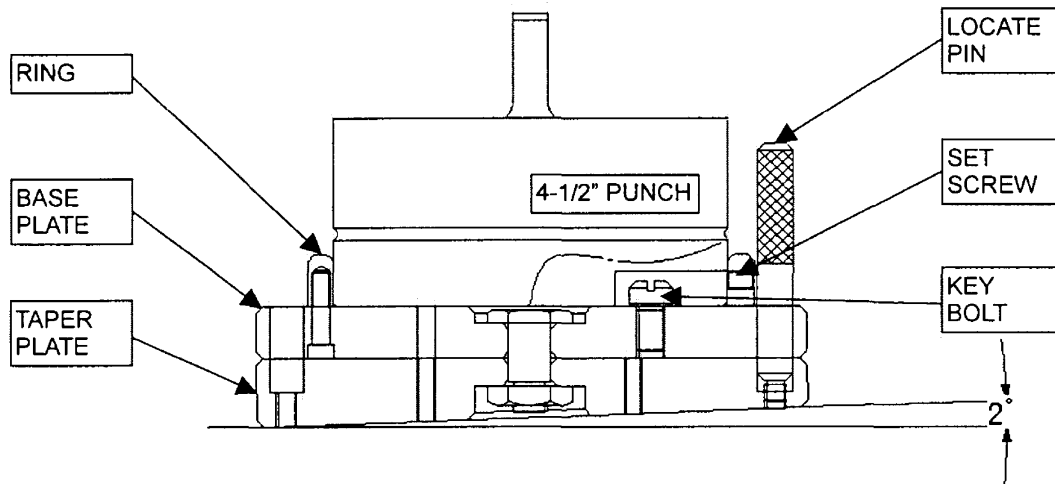


Use the jig as described below.

- 1 The key bolt is installed in the base plate of the jig and marked with a double circle. Set the jig in the scroll chuck so that the key bolt faces the front of the machine.
- 2 Align the key of the punch body with the key bolt, slightly tilt the punch body, and gently set the punch body in the jig. Never hammer down the punch body into the jig. Once the punch body is set in the jig, lightly turn it. Since the key is located at 90° with respect to the cutting edge in the longitudinal direction, the shear angle can be seen from the front of the machine. The jig has an angle of 2°. Check that the side of the cutting edge to be ground naturally becomes horizontal.

- 3 Lightly tighten the set screw at the circumference of the ring to fix the punch body.
- 4 The base plate and taper plate are provided with match marks. Holes are drilled in the match mark position and in the 180° opposite position for inserting and screwing the locate pin. Align the match marks of the base plate and taper plate, and screw in the locate pin for positioning the punch.
- 5 Grind one side of the cutting edge in that condition.
- 6 Remove the locate pin, turn the base plate through 180°, and screw in the locate pin. Check that the match mark size of the base plate is different from that of the taper plate.
- 7 Check that the other side of the cutting edge is horizontal, and grind it.

Shear angle jig assembly



CAUTION

- When grinding a punch with a shear angle, never change the preset grinding amount of each side during the grinding operation. Otherwise two sides of the cutting edge will be ground to different lengths.

When grinding a 2" or 3-1/2" punch body with a shear angle, install a sleeve for each size in the jig shown above.

Set the sleeve in the ring of the jig, and fix it with the set screw. Set the punch body in the sleeve, fix it with the set screw, and grind it in the same way as described for the 4-1/2" punch body.

CAUTION

- With whatever grinding method to be used, be sure to clean the jig and punch of any foreign matter before setting the punch in the jig. Otherwise the cutting edge of the punch may not become horizontal or the grinding wheel may be chipped during the grinding operation. After its use, be sure to clean the jig, apply rust-preventive oil to it, and store it.

METHOD AND JIGS FOR DRESSING GRINDING WHEEL

The method and jigs for dressing the grinding wheel are described below.

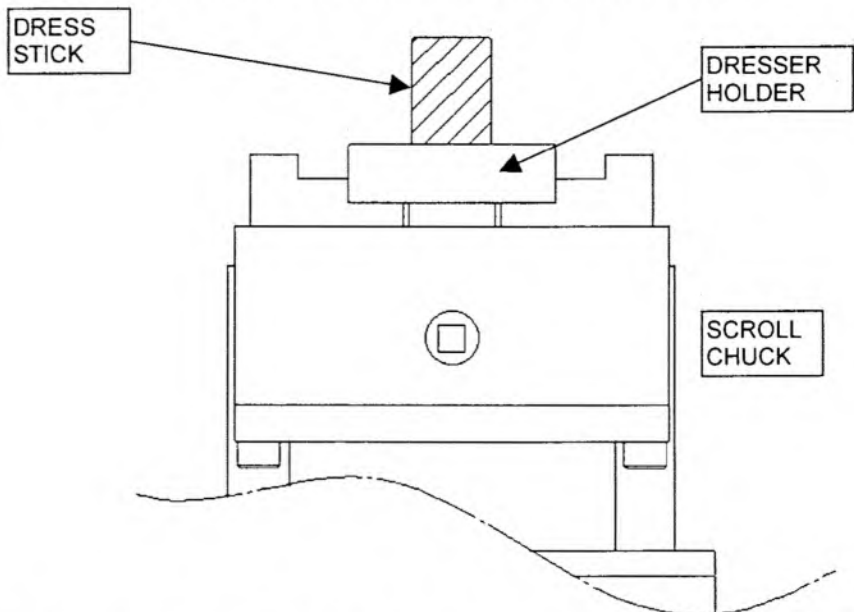
Dress the grinding wheel with the accessory dresser by the same procedure as described for test operation. Dress the grinding wheel as soon as it grinds tools not in the grinding mark condition but in the mirror condition or the spindle motor current continues to be in the vicinity of 6.0 A during the grinding operation.

When the grinding wheel is frequently used for grinding Type D (3-1/2") or E (4-1/2") dies, it is likely to be loaded. Check the grinding wheel for loading as often as possible.

When these large-diameter dies are made of high-speed tool steel (SKH), be sure to dress the grinding wheel every three grindings. Otherwise the machine may be frequently stopped by the spindle motor overload protection function.

Dress the grinding wheel as described below.

- 1 Set the dress stick in the dresser holder, lightly fix it with the accessory set bolt, and fix the dresser holder with the scroll chuck.
- 2 Set the GRINDING DATA SET digital switches at "08" for the US machine and at "20" for the EXP. machine, and press the ONE CYCLE AUTO START button. The dressing of the grinding wheel is completed when the automatic operation is completed.



WARNING

- The dress stick is made of special conductive material. If a dresser not specified by us is used, the machine cannot position the grinding wheel at the start of automatic operation, resulting in the breakage of the dresser and grinding wheel. Never use such a dresser.

Part VI

Maintenance

Changing grinding wheel	VI-2
Lubricating with grease	VI-4
Changing and disposing of coolant.....	VI-5
Changing acrylic sheet of front door	VI-6

CHANGING GRINDING WHEEL

The timing and procedure for changing the grinding wheel are described below.

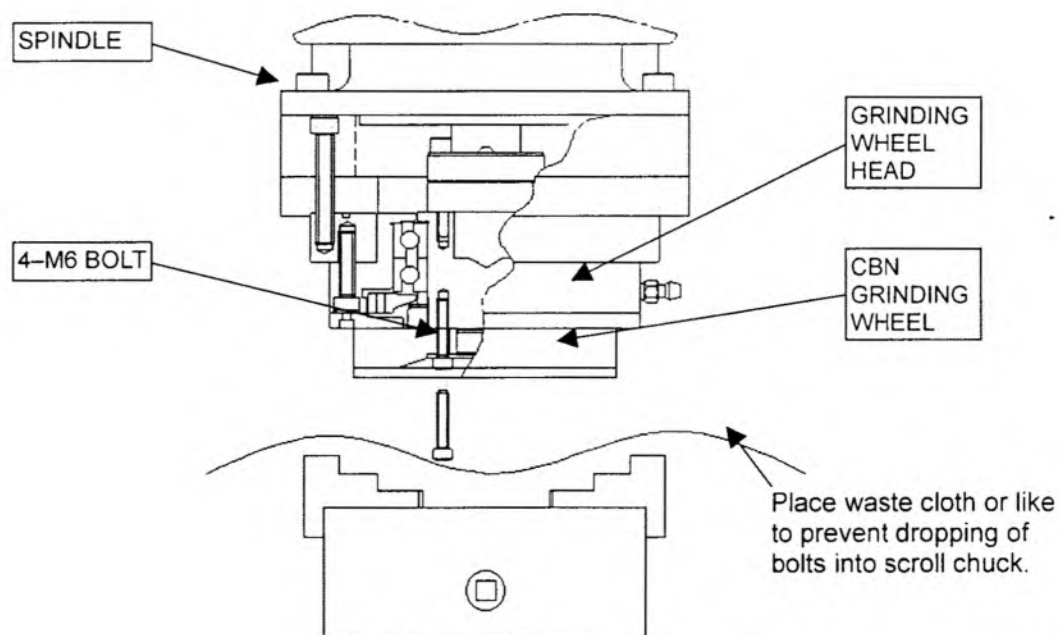
Timing for changing grinding wheel

The grinding wheel is about 5.0 mm (0.197") thick. Since there is a 0.5-mm (0.020") thick adhesive layer between the abrasive grains and wheel, the actual thickness through which the grinding wheel can be used is about 4.5 mm (0.177"). The life of the grinding wheel changes with the grinding conditions. The grinding wheel is worn by about 0.001 mm (0.00004") and 0.03 mm (0.0012"), respectively, when it grinds a Type B (1-1/4") die and a Type E (4-1/2") die by 0.1 mm (0.004") each. The abrasive grains cannot be reapplied to the grinding wheel.

Procedure for changing grinding wheel

Change the grinding wheel as described below.

- 1 Be sure to turn off the main power circuit breaker switch of the machine.
- 2 Wipe off water from the grinding wheel with waste cloth.
- 3 Remove the four M6 bolts securing the grinding wheel to the grinding wheel head. Cover the holes of the scroll chuck with waste cloth or the like so that the bolts are not dropped into the scroll chuck.
- 4 Remove the grinding wheel from the grinding wheel head.
- 5 Install the new grinding wheel in the grinding wheel head by reversing the above procedure.



WARNING

- The specified conductive grinding wheel alone can be used. Never use commercial grinding wheels. Use of such a grinding wheel breaks the machine.
- The grinding wheel has air and coolant nozzles at its rear surface. Wear protective gloves so that you do not get your hands hurt.

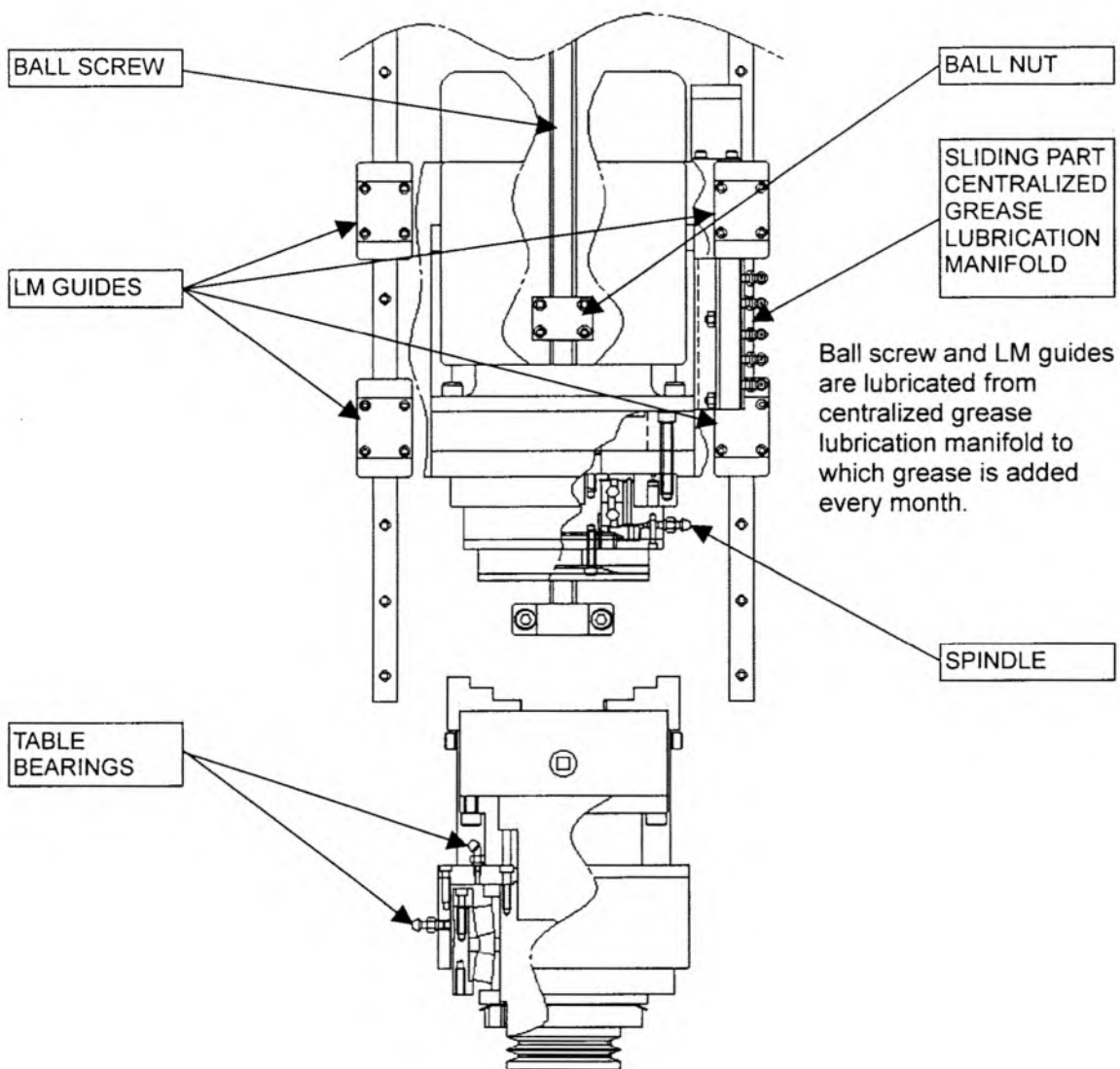
LUBRICATING WITH GREASE

Periodically lubricate the following parts of the machine with grease.

Lubrication methods: Lubrication with grease gun from centralized grease lubrication manifold and grease nipples

Manual lubrication interval: One month

Recommended lubricant: No. 1 grease



CHANGING AND DISPOSING OF COOLANT

Change and dispose of the coolant as described below.

A lack of the coolant causes air to be drawn into the coolant pump. The resultant low discharge rate of the coolant burns the grinding wheel and a tool. When the coolant is contaminated with a large amount of grinding chips, the tool is ground with poor finish. To prevent these phenomena, properly change the coolant as described below.

Changing coolant

Changing timing

Be sure to change the coolant every month, irrespective of the operating frequency of the machine. Be sure to check the coolant for level and contamination before the start of work every day. When the coolant is low in level or dirty, change it immediately, regardless of the interval specified first. Do not add a fresh coolant to the one already present in the coolant tank. When the coolant tank is dirty, clean it as well.

Changing procedure

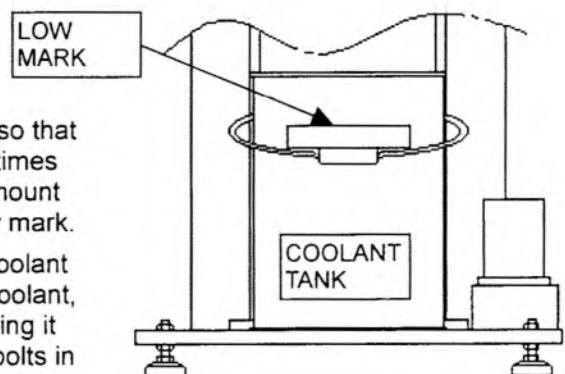
A label indicating the low mark is affixed to the coolant tank. Add water to the coolant so that the coolant is diluted 30 to 50 times and in a sufficient amount to rise above the low mark.

Specified coolant

As coolant, use the TOGU GRINDING OIL (Amada).

Prepare the coolant so that it is diluted 30 to 50 times and in a sufficient amount to rise above the low mark.

After removing the coolant tank to change the coolant, replace it by positioning it against the stopper bolts in the machine frame.



WARNING

- Never add a fresh coolant to the one already in the coolant tank. Unless the entire coolant is changed at a time, some of the grinding chips and other foreign matter remain and continue to contaminate the coolant. Such a dirty coolant has a serious effect on the finish of ground tools and causes the failure of the coolant pump.

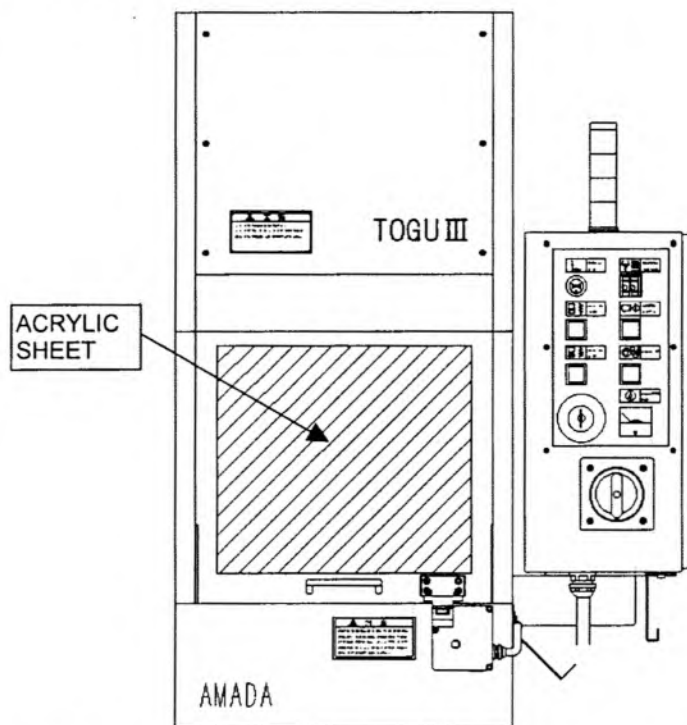
Disposing of coolant

It is prohibited to dump the used coolant. It must be incinerated and landfilled as prescribed by applicable law. If you cannot take this route, ask an authorized contractor to dispose of the used coolant. The material safety data sheet of the coolant used on the machine is attached in Part VIII. For the detailed precautions on the disposal of the coolant, refer to the material safety data sheet.

CHANGING ACRYLIC SHEET OF FRONT DOOR

The front door of the machine uses an acrylic sheet so that the grinding condition can be seen. Change the acrylic sheet when it is cracked or otherwise damaged.

The acrylic sheet is screwed to the frame of the front door. Be sure to change it for the specified repair part. If the specified repair part is not available in an emergency, use a commercial acrylic sheet of 6.0 mm (0.236") or more in thickness.



WARNING

- When you must use a commercial product in an emergency, be sure to use an acrylic sheet of the thickness specified in the manual. When a thinner acrylic sheet or sheet of different material is used, pieces of the tool, if broken during grinding, may break through the sheet in a dangerous manner.

Part VII

Alarm Indication & Troubleshooting

Alarm indication	VII-2
Troubleshooting	VII-4

ALARM INDICATION

When the machine develops an operating trouble, it is indicated as an alarm by one of the rotating beacon lights in the signal tower. The alarms that can be indicated by the signal tower are described below.

RD (Red) light

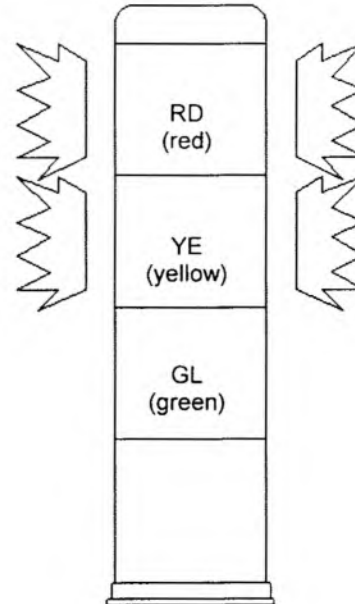
On: Servo alarm

Air pressure drop

YE (Yellow) light

Blinking: Battery alarm

Each alarm is described in detail below together with its clearing method.



Servo alarms

Servo alarms refer to servo system troubles and are classified into the following main types:

Overload: This alarm occurs when the servo motor used to move the spindle meets the greater than specified resistance.

Motor overheat: This alarm occurs when the heat generated in the servo motor exceeds the preset level. It is likely to occur especially when the grinding wheel is used as loaded for a long period of time.

Pulse overflow: This alarm occurs when the actual number of motor rotation pulses is different from the commanded number of motor rotation pulses.

Remedy: Each alarm can be cleared by pressing the EMERGENCY STOP button and canceling the servo command. After clearing the motor overheat alarm, allow 1 to 2 min before restarting the servo motor.

Low air pressure

The pressure of the compressed air supplied to the machine is lower than the specified level.

Remedy: Check the supply of the compressed air. If the filter regulator is improperly set, adjust it. If the air pressure is normal, the pressure switch is faulty.

Battery alarm

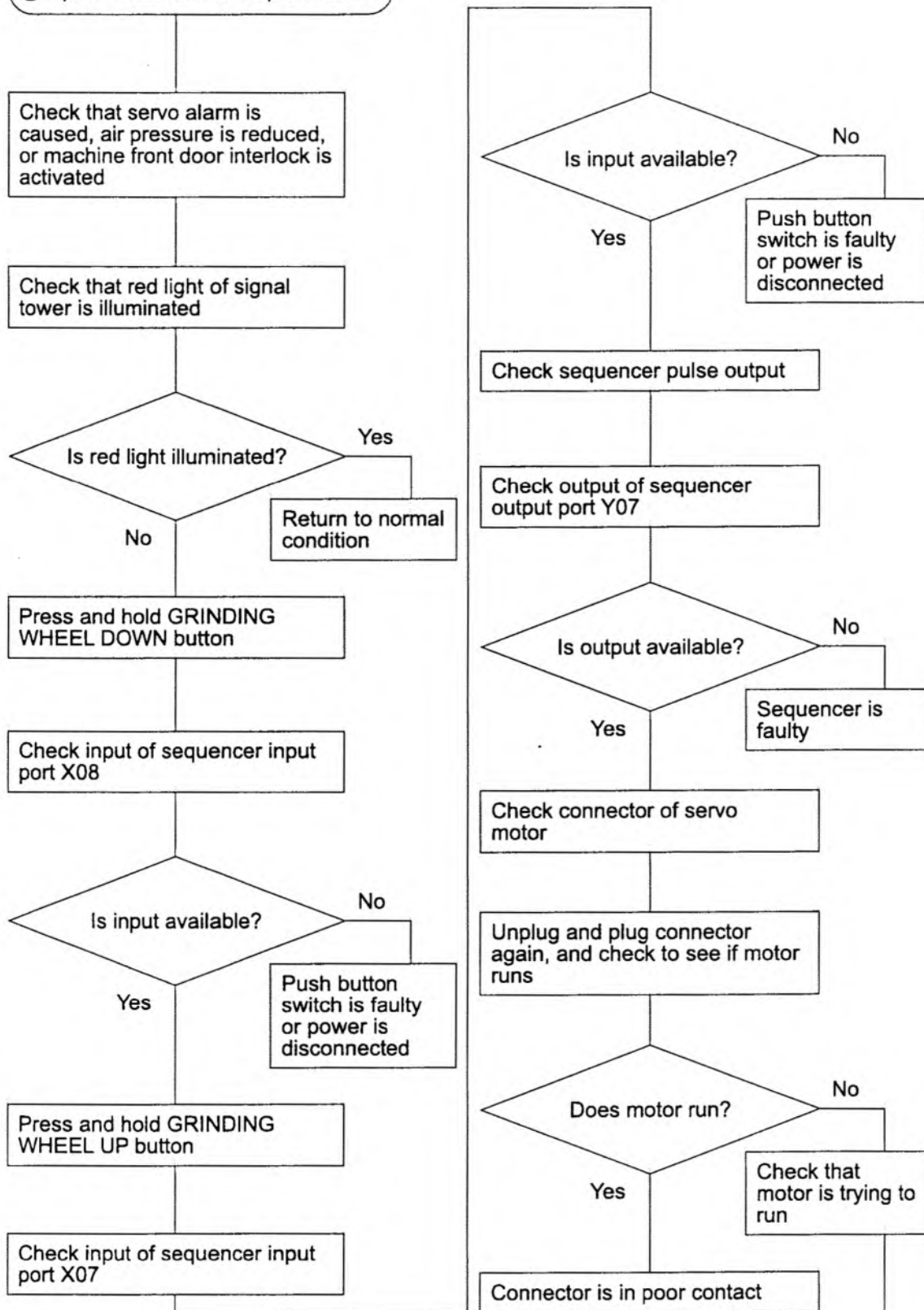
This alarm occurs when the program backup battery installed in the sequencer has run down.

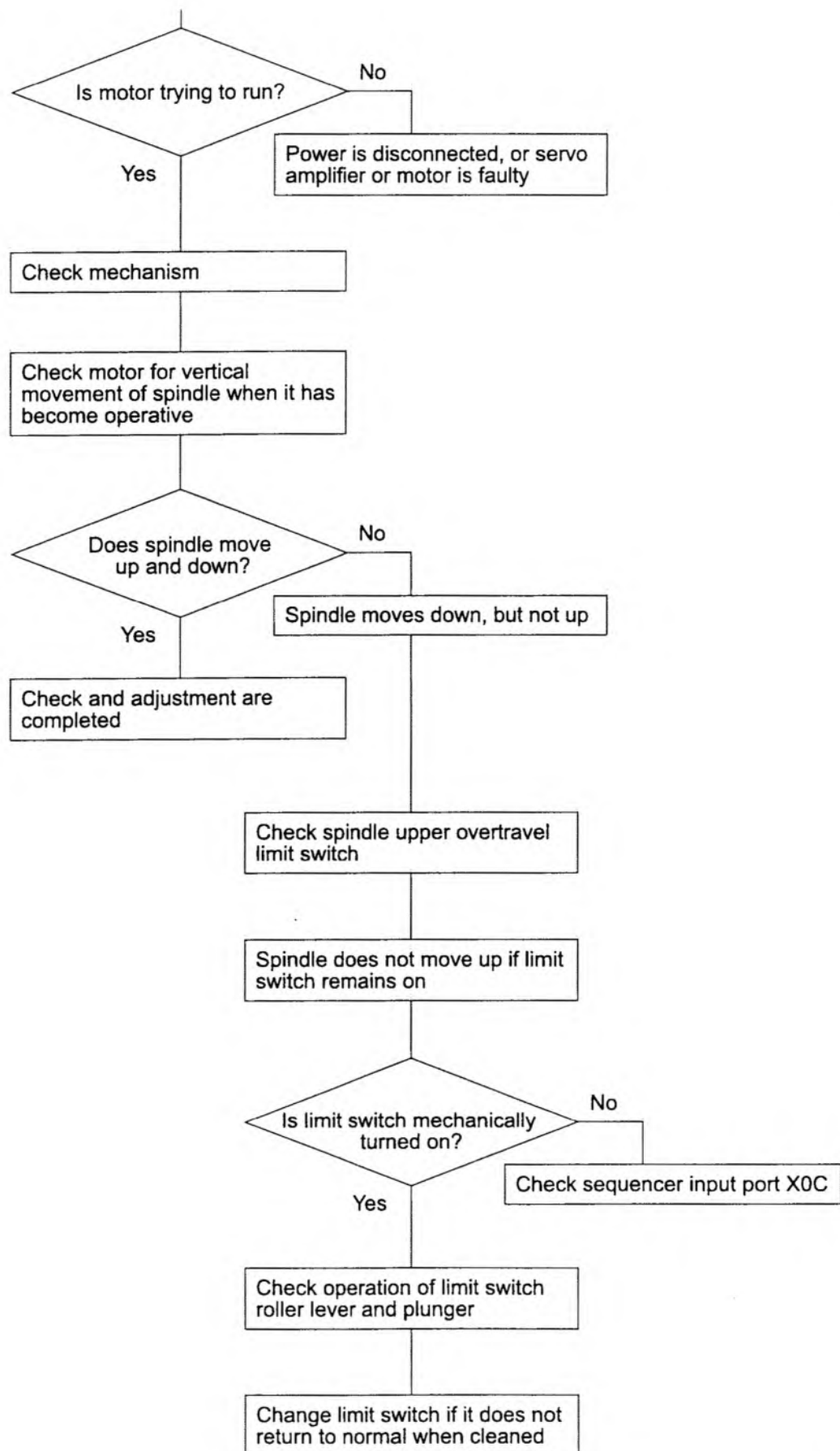
Remedy: Change the battery. The battery lasts about four years when the machine is used every day.

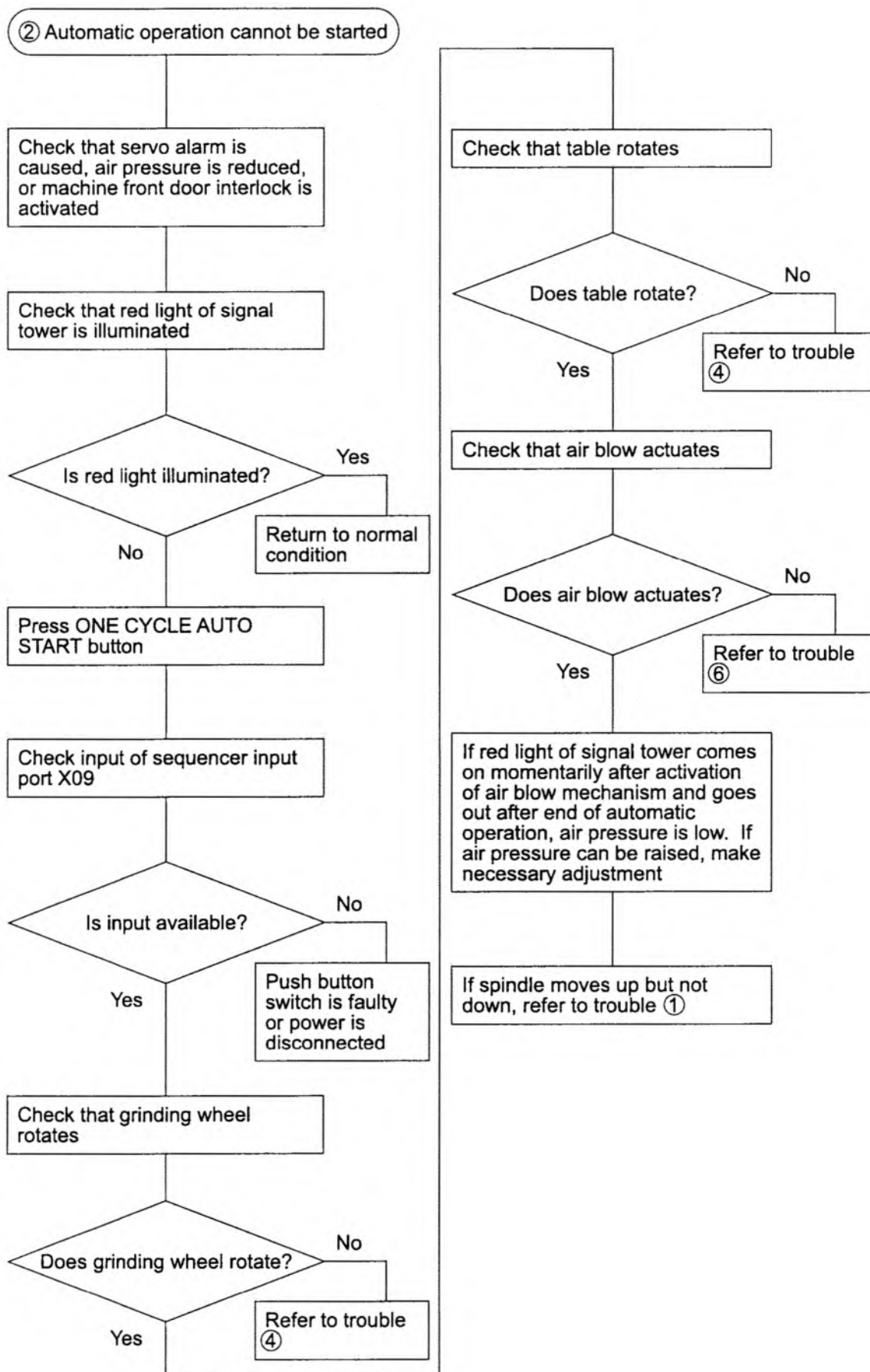
Type of battery: AFB8801 (Matsushita)

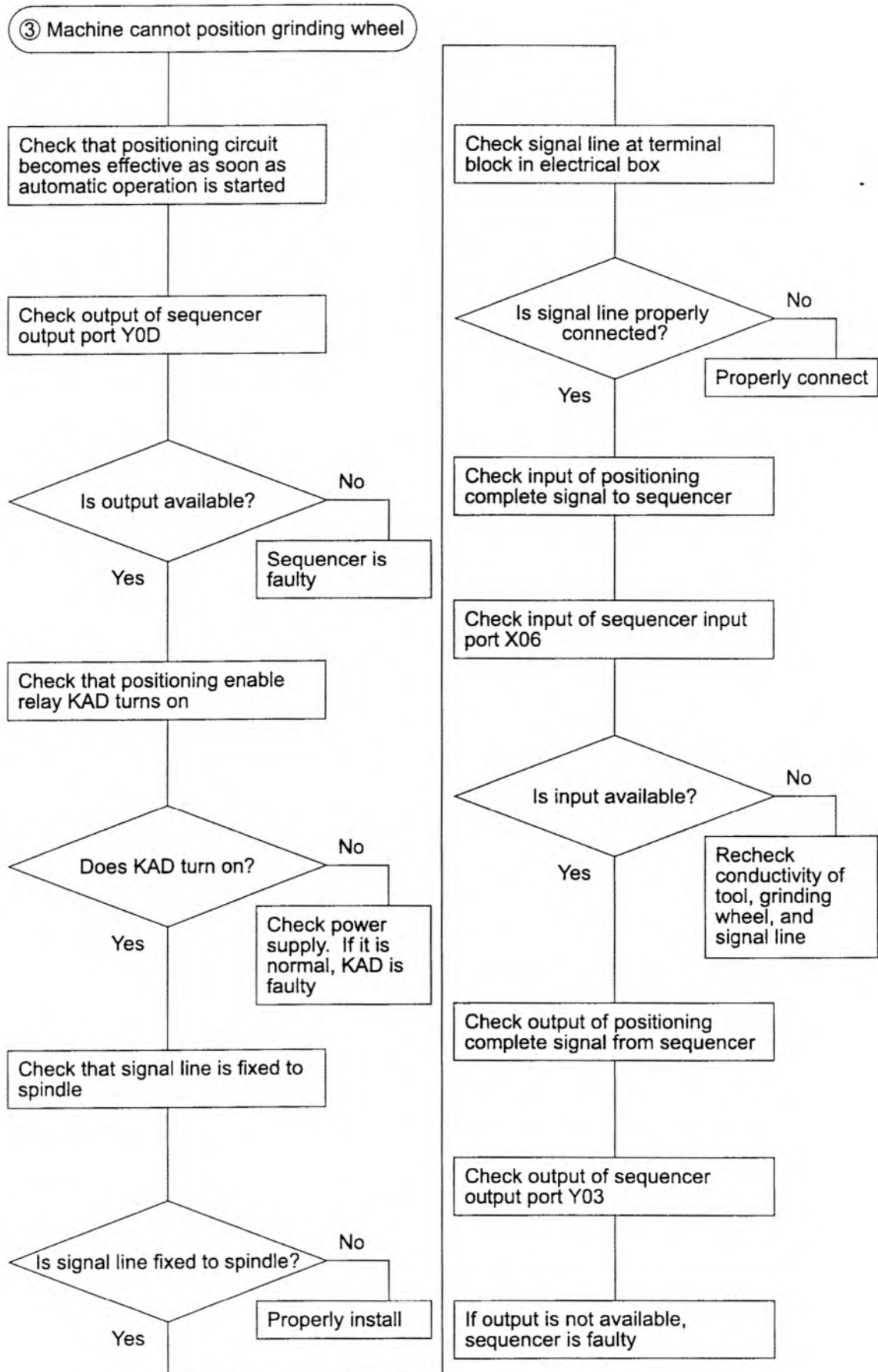
TROUBLESHOOTING

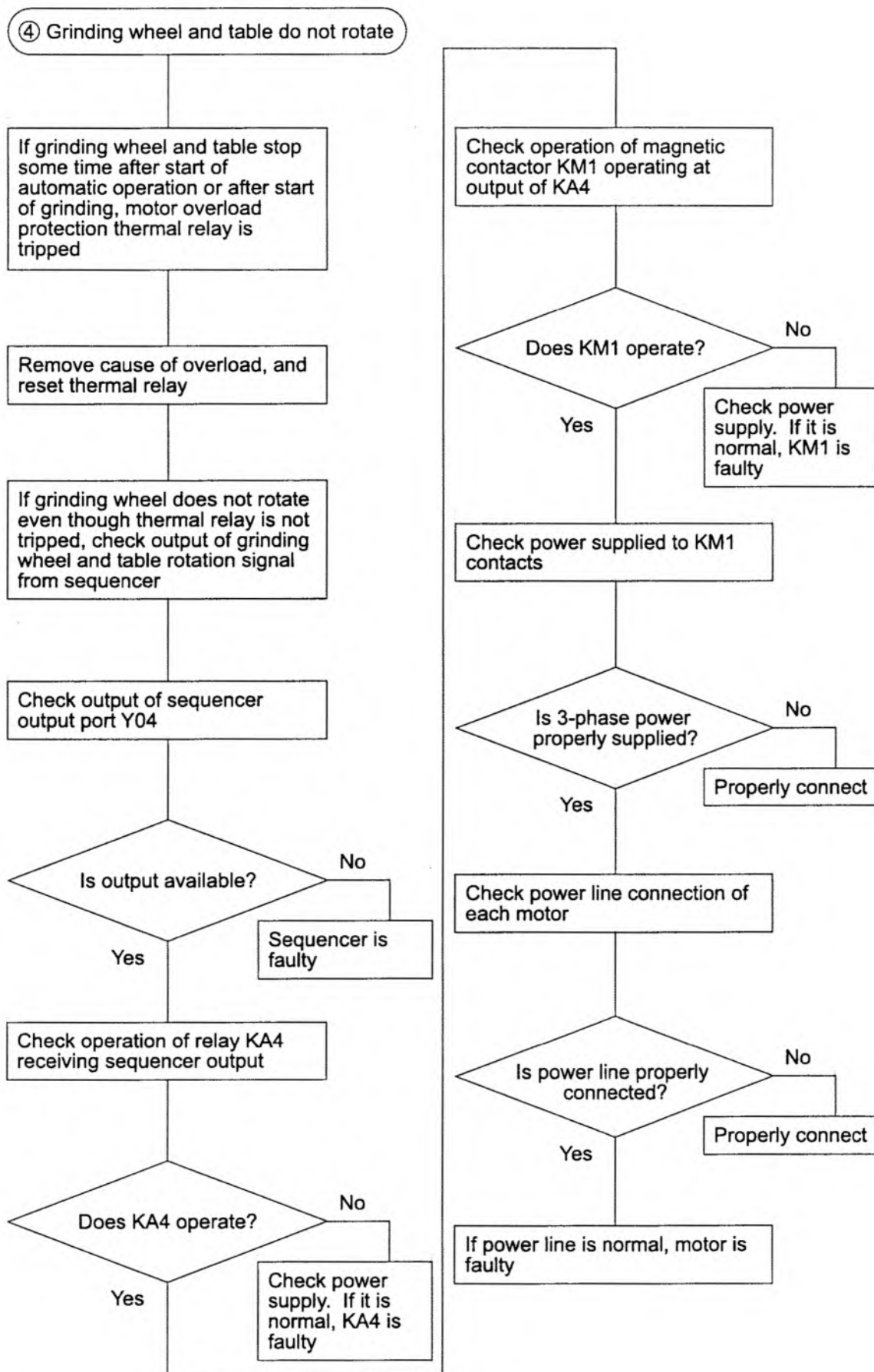
① Spindle cannot move up and down

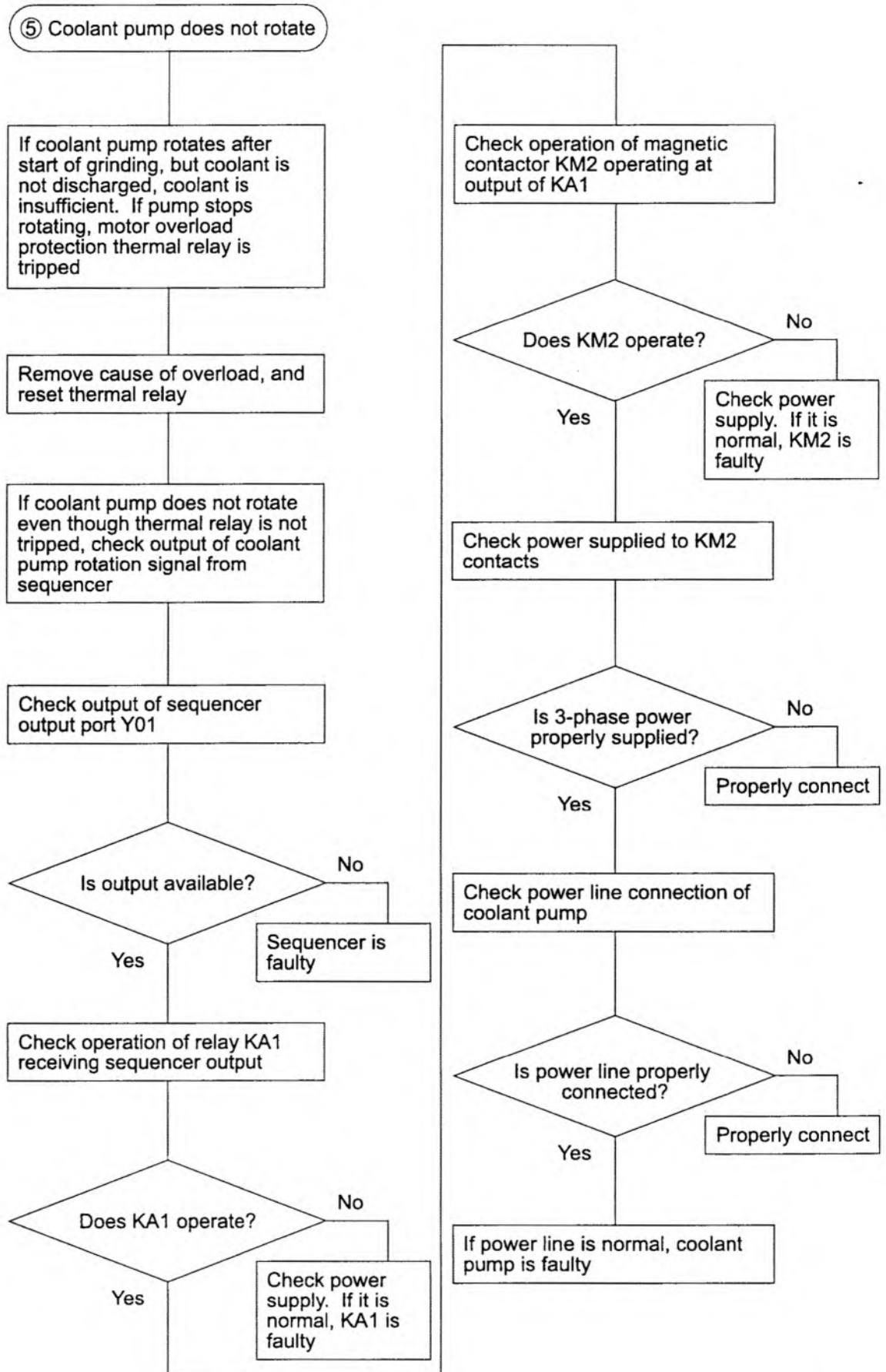


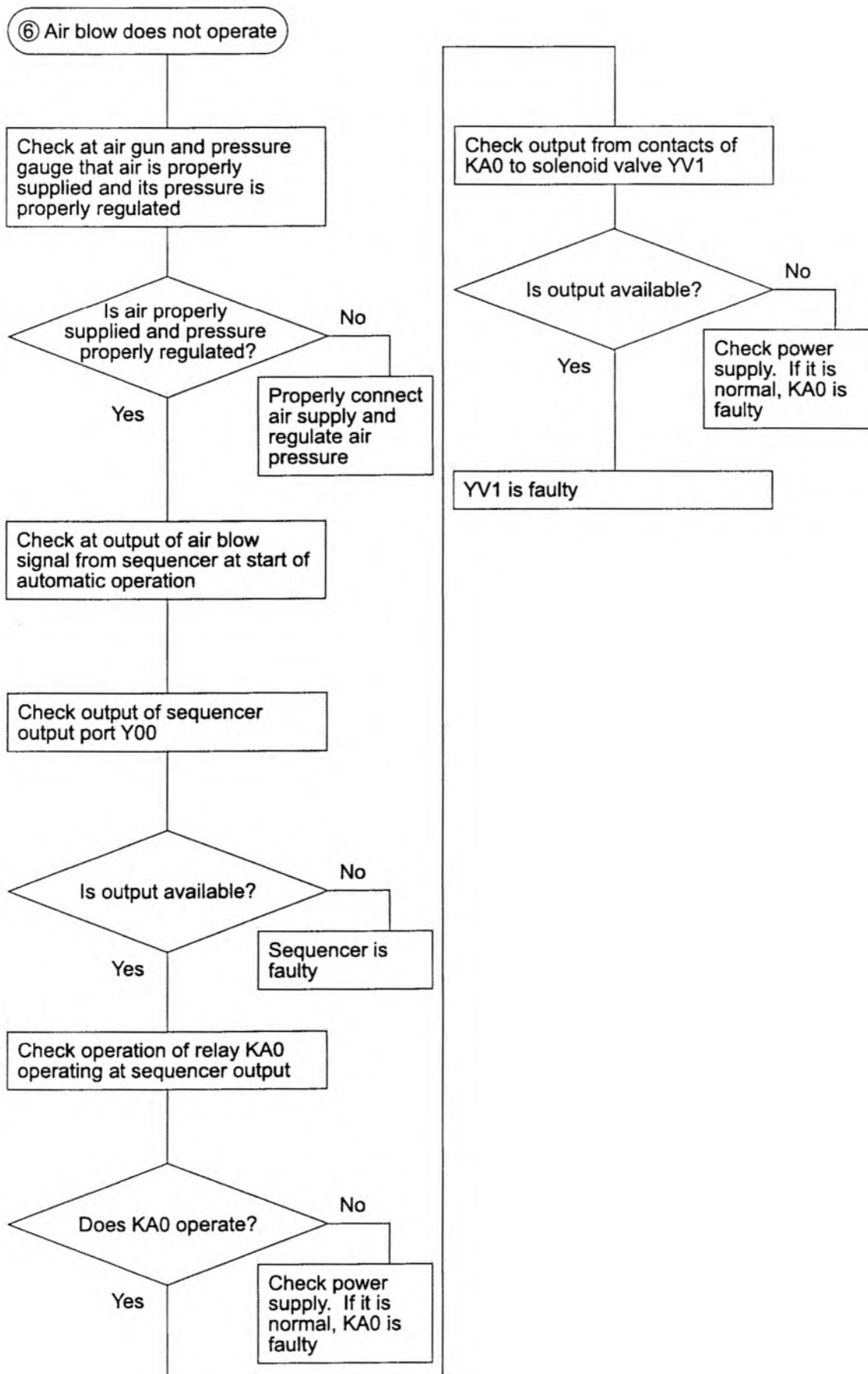


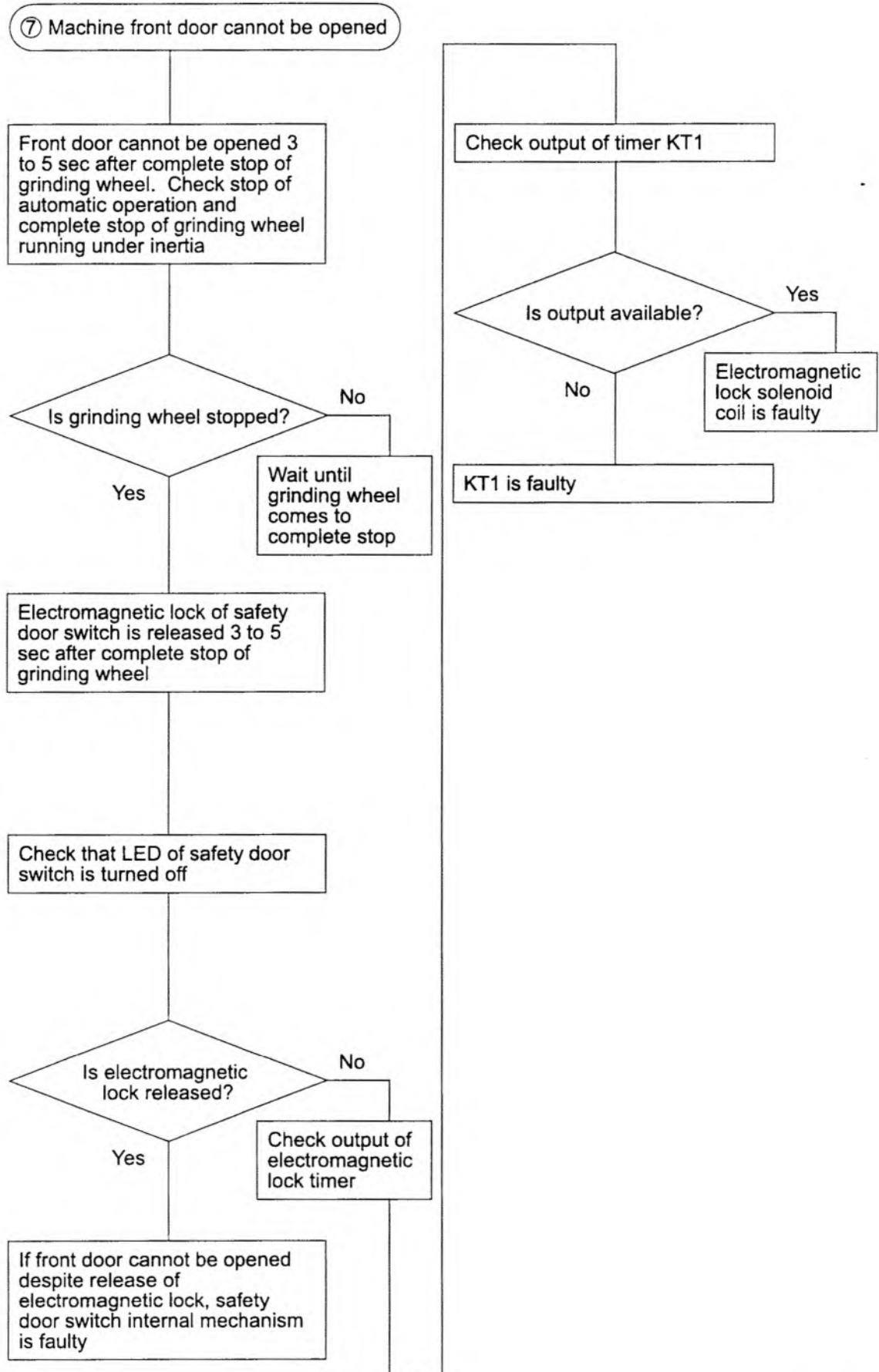












Part VIII

Appendix

Material safety data sheet.....	VIII-2
Mechanical parts list	VIII-7
Electric circuit diagram.....	VIII-10
Electric parts list	VIII-16

MATERIAL SAFETY DATA SHEET

Manufacturer information

Manufacturer's name: Amada Co., Ltd.
Address: Ishida 200, Isehara, Kanagawa Prefecture, Japan
Phone: 0463-96-3456 or 048-281-7767
Fax: 0463-96-3228 or 048-281-7768
Prepared or established: April 1st, 1998

Product name

Product name: TOGU GRINDING OIL

Product identification

Single product or mixture: Mixture

Chemical names: Organic rust inhibitor, alkali agent, water-soluble special lubricant, fatty acid derivative, biocide, other additives, water

Ingredients and contents (characteristic values):

Organic rust inhibitor	22%
Alkali agent	48%
Water-soluble special lubricant	10%
Fatty acid derivative	19%
Biocide and other additives	1%

Dissolve these ingredients in soft water, and adjust their concentrations as required.
--

Chemical or structural formula: Not identifiable

UN classification and UN number: Not applicable

Hazard and toxicity classification

Classification: Not classified as flammable

Hazard: Nonhazardous material under normal use

Toxicity: Alkaline and causes dermatitis after prolonged or repeated skin contact

Environmental impact: No useful information is available.

First aid measures

Eye contact: Flush eyes with clean water for at least 15 minutes, and call a physician.

Skin contact: Immediately wash with plenty of water and soap water, and apply skin adjustment cream to skin.

Inhalation: Move to fresh air, cover with blanket or the like, keep warm and still, and consult a physician if necessary.

Ingestion: Immediately induce vomiting, and consult a physician. If mouth is contaminated, wash it with plenty of water.

Fire fighting measures

Fire fighting instructions: Usually difficult to ignite. Combustible if water evaporates. Extinguish a peripheral fire developed in such a case as described below.

1. Remove the ignition source.
2. Use powder or carbon dioxide extinguishing medium on the initial fire.
3. Blocking supply of air with foam extinguishing agent is effective against large fire. Water expands the fire and is dangerous.
4. Shower water on surrounding equipment.
5. Fight the fire from upwind. Be sure to wear protective equipment.
6. Prohibit unauthorized personnel from entering the area around the fire.

Extinguishing media: Powder, carbon dioxide, foam, and strong foggy liquid are effective. Never use water in jet form.

Accidental release measures

Remove all ignition sources.

Large spill: Prohibit entry into the area of the spill by roping off the area. Be sure to wear protective equipment. Block flow of the spilled product with sand, guide it into a safe place, and recover it with a container as much as possible. Prevent the run-off of the spilled product to sewers, streams, or other bodies of water.

Small spill: Absorb the spilled product on sand, waste cloth, or sawdust, and transfer it into a container.

Spill on sea: When the spilled product floats on the water surface, spread an oil fence to prevent the expansion of the spill, and absorb the spilled product with absorbent mat or the like.

Handling and storage

Handling:

1. When the product enters the eyes, it may cause inflammation. When handling the product, avoid contact with the eyes by wearing protective goggles or the like.
2. When the product gets on the skin, it may cause inflammation. When handling the product, avoid contact with the skin by wearing protective gloves.
3. Do not ingest. (Ingestion may cause diarrhea or vomit.)
4. Inhalation of mist or vapor may cause discomfort. When handling the product, use a breathing apparatus or the like, in order to avoid inhalation of mist or vapor.
5. Place the product where it cannot be reached by children.
6. When using the product, refer to its catalog, check the dilution ratio, and dilute to the specified ratio with water.
7. Do not apply pressure to an empty container. Otherwise the container may break.
8. Do not weld, heat, drill, or cut the container. The product residues in the container may ignite and explode.

9. Avoid contact with flames, sparks, or hot materials.
10. When repairing mechanical equipment where the product remains, move the equipment to a safe place, and remove the product from the equipment.
11. Never siphon off the product with the mouth.

Storage:

1. After use, tightly close the container to prevent contamination with dirt, dust, moisture, or the like.
2. Keep the container in a dark place to avoid exposure to direct sunlight.
3. Prevent the container from freezing.

Exposure controls/personal protection

Engineering controls: Totally enclose the source of the mist or provide ventilation.

Personal protective equipment

Respiratory protection: Not usually required. Wear an organic gas mask if necessary.

Eye protection: Wear goggles where the product splashes.

Skin protection: Wear oil-resistant protective gloves for prolonged or repeated contact with the product.

Protective clothing: Wear oil-resistant, long-sleeved working clothing. As soon as clothing is wetted by the product, remove it, completely clean it, and rewear it.

Physical and chemical properties

Appearance, etc.: Dark blue and transparent liquid

Boiling point: No data

Vapor pressure: No data

Volatility: None (at room temperature)

Melting point: Not applicable

Specific gravity: 1.072 g/cm³ (1.051 kdyn/cm³) at 15/4°C

Initial boiling point: No data

Solubility in water: Homogeneous solution in water @ 15°C

Pour point: -15.0°C or less

Others:

Hazard information (stability and reactivity)

Flash point: Not applicable

Ignition point: Not applicable

Explosion limit: Not applicable

Combustibility: None, except when moisture evaporates

Ignition: None (spontaneous ignition and reactivity with water)

Oxidizing: None
Self-reaction and explosion: None
Dust explosion: None
Stability: Stable
Incompatibility: Avoid contact with strong oxidizing agents.
Others: No useful information is available.

Toxicological information (including case and epidemiological information)

Skin cauterization: No data
Skin and eye irritation: Prolonged or repeated contact may cause irritation.
Skin sensitization: No data
Acute toxicity (including lethal dose 50%): No data
Subacute toxicity: No data
Chronic toxicity: No data
Carcinogenicity: No data
Mutagenicity (microbial or chromosomal abnormality): No data
Reproductive toxicity: No data
Teratogenicity: No data
Others: No useful information is available (including generation of toxic gas by reaction with water).

Ecological information

Degradation: No data
Accumulation: No data
Aquatic toxicity: No data
Others: No useful information is available.

Disposal considerations

Waste disposal: Recycle or dispose of in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the contractor or deal satisfactorily with this type of product should be established beforehand.
Container disposal: Metal containers should be emptied and returned to the supplier or sent to a container reconditioner without removing or defacing markings or labels. Non-reusable small metal and plastic containers should be recycled where possible, or disposed of as domestic refuse.

Transportation information

Check that the product has not spilled from the container or is not likely to spill from the container. Transport so that the container is not excessively abraded or swayed.

Not dangerous for conveyance under UN, IMO, ADR/RID and IATA/ICAO codes.

Regulatory information

EC CLASSIFICATION: Not classified as dangerous under EC criteria

EINECS (EC): All components listed or polymer exempt

TSCA (USA): All components listed

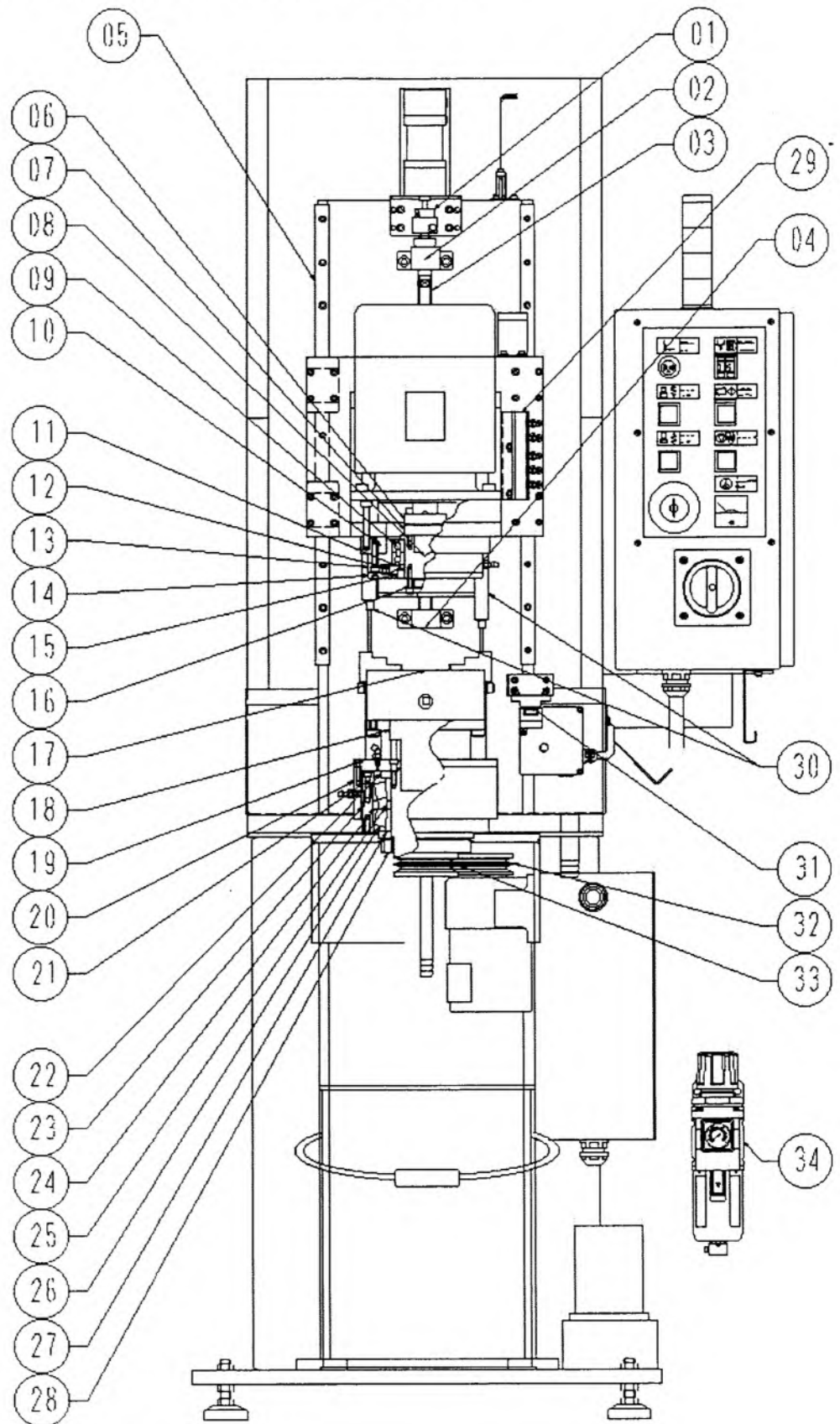
MITI (JAPAN): All components listed

Other information

Contact: Refer to "Manufacturer information" in this section.

This material safety data sheet is furnished to users who handle the product as reference information to ensure safe handling. The users should refer to the material safety data sheet and use the product with the understanding that they must handle the product by appropriate methods under their own responsibility. The material safety data sheet is not to be taken as a safety warranty.

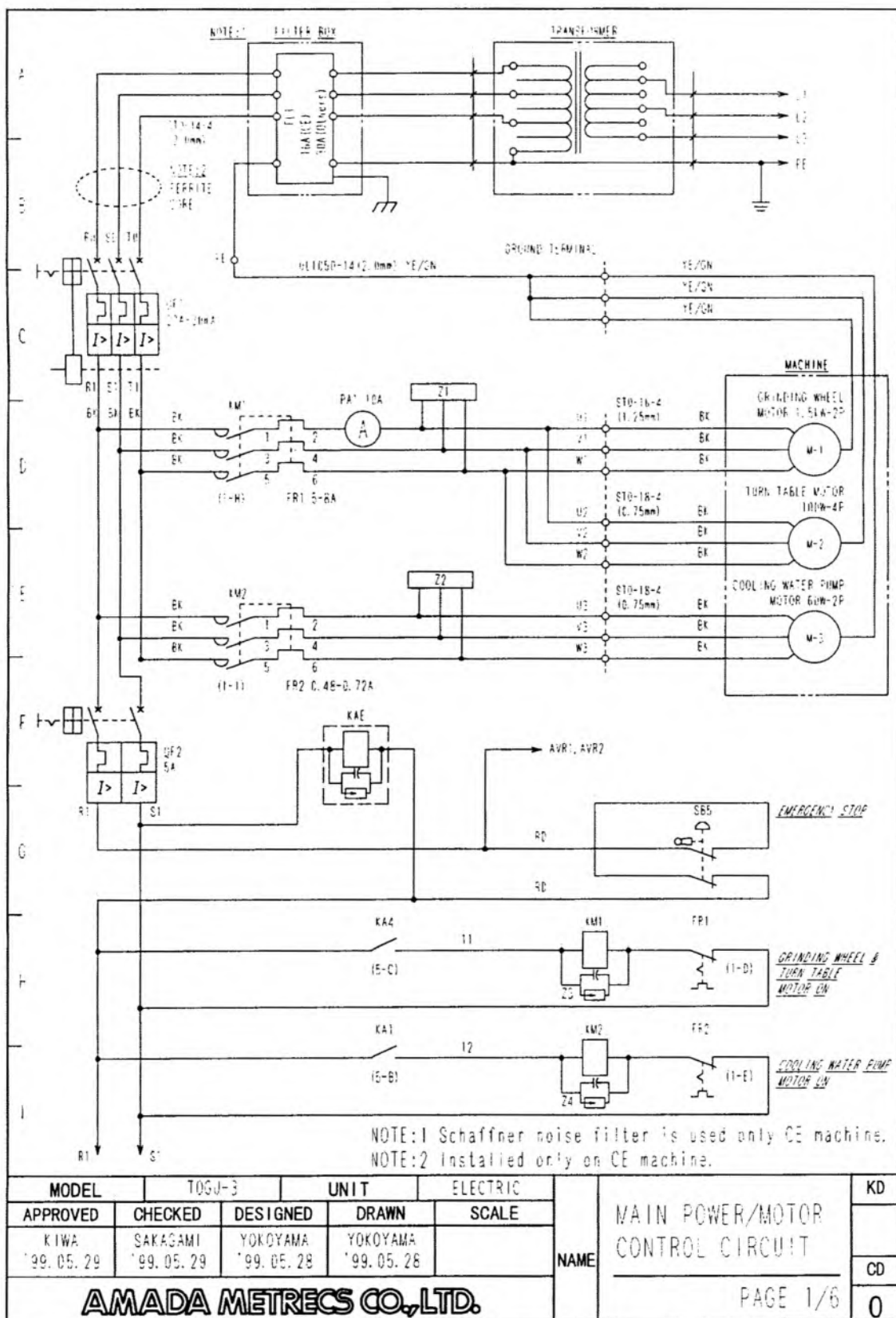
MECHANICAL PARTS LIST

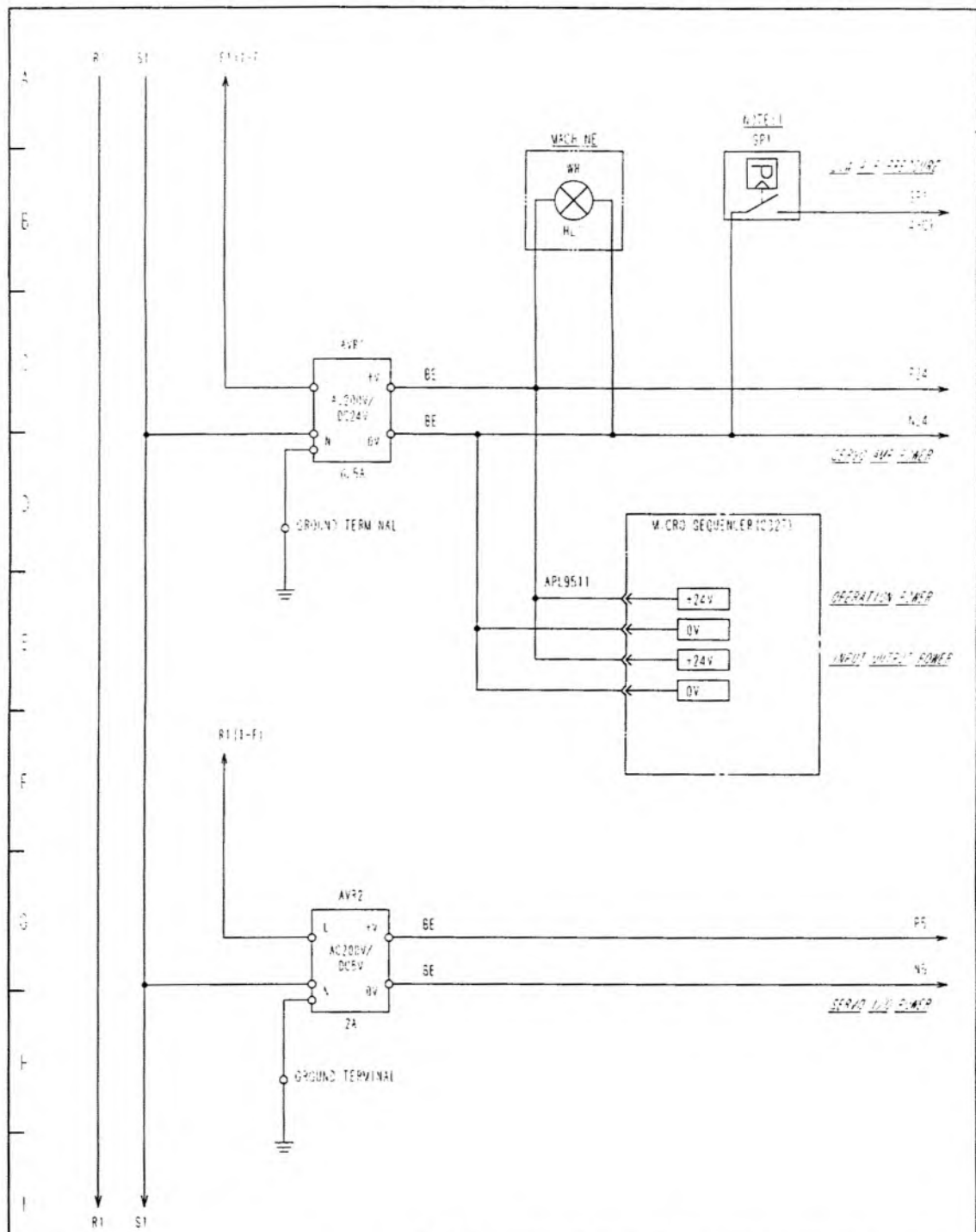


No.	Name	Type or DWG No.	Maker	Qty
01	Coupling	ASJU35-12/ASJU26-8	ASA DENSHI	1 set
02	Support unit	SUP15-K/7002DF/GMP5	HIWIN	1 set
03	Ball screw	R20-5B1-SSV-470-560-0.05	HIWIN	1 set
04	Support unit	SUP15-S/6002ZZ	HIWIN	1 set
05	LM guide	LGH20-CA-L640-Z1-C	HIWIN	2 sets
06	Coupling A	5109594	TAIWA	1
07	Coupling B	5109595	TAIWA	1
08	Spindle	5109599	TAIWA	1
09	Bearing	7012-5DBLP5	KOYO	1 set
10	Plastic spacer	5109596	TAIWA	2
11	Spacer	5109601	TAIWA	1
12	Bearing nut	5109600	TAIWA	1
13	Housing	5109597	TAIWA	1
14	Spindle cover	5109602	TAIWA	1
15	Nut washer	5109603	TAIWA	1
16	CBN grinding wheel	5109604	TAIWA	1
17	Scroll chuck	5103577	TAIWA	1
18	Chuck plate	5103562	TAIWA	1
19	Top plate	5103563	TAIWA	1
20	Water deflector ring	5103571	TAIWA	1
21	Bearing retainer	5103569	TAIWA	1
22	Collar	5103565	TAIWA	1
23	Outer casing	5103570	TAIWA	1
24	Bearing holder (outer)	5103567	TAIWA	1
25	Bearing holder (inner)	5103568	TAIWA	1
26	Bearing	32020JR	KOYO	2

No.	Name	Type or DWG No.	Maker	Qty
27	Spacer	5103573	TAIWA	1
28	Bearing nut washer	5103574	TAIWA	1
29	Centralized lubrication manifold	5109605	TAIWA	1
30	Gas spring	GS075-3036C/GS068-3016C	TOKIKO	2 sets
31	Door switch key	D4DS-K3	OMRON	1
32	Pulley bushing	SPZ90-2 1610-φ19	NBR	1
33	V-belt	3V × 265	BANDO	2
34	Air filter regulator	AW3002-02BG-Q	SMC	1

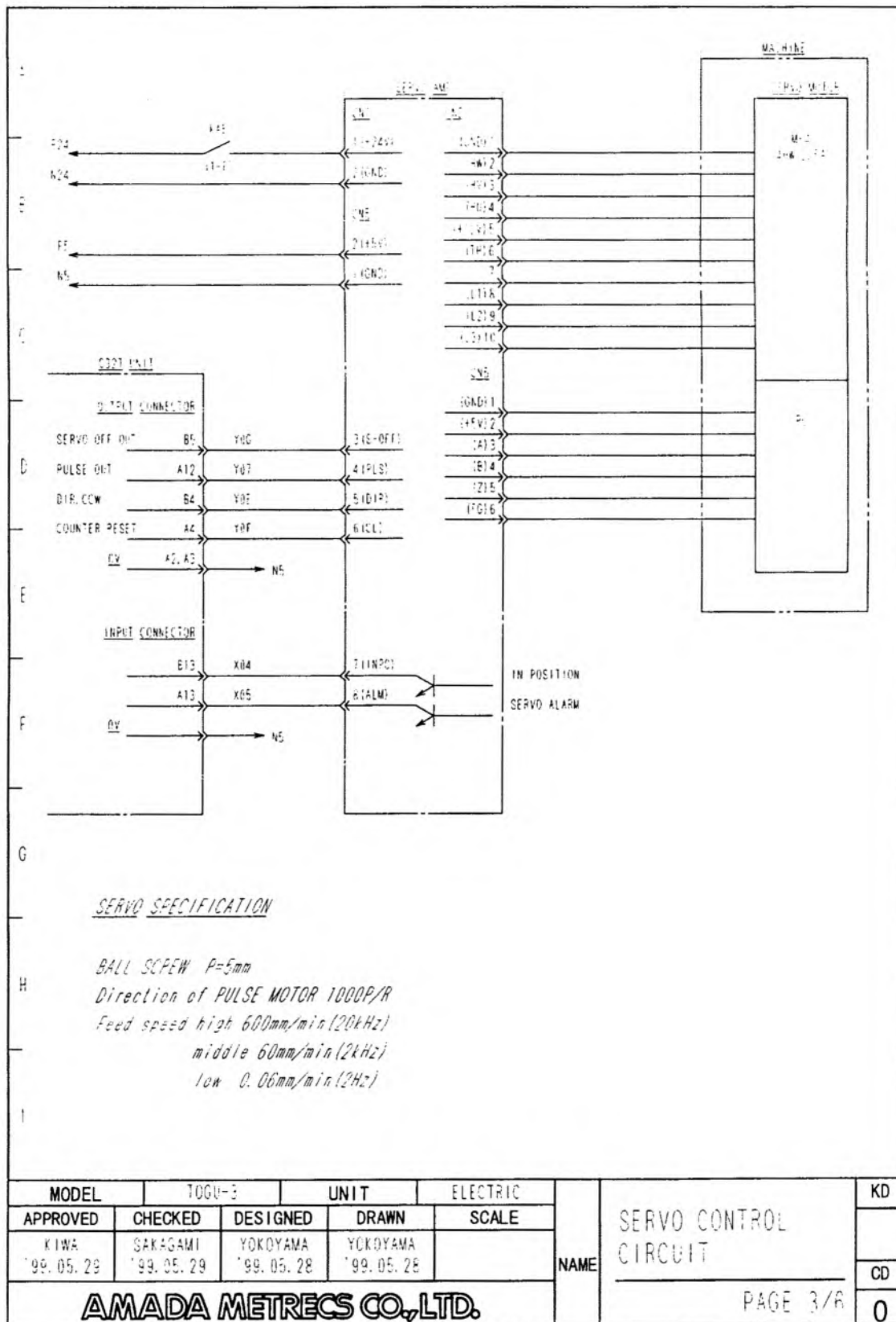
ELECTRIC CIRCUIT DIAGRAM

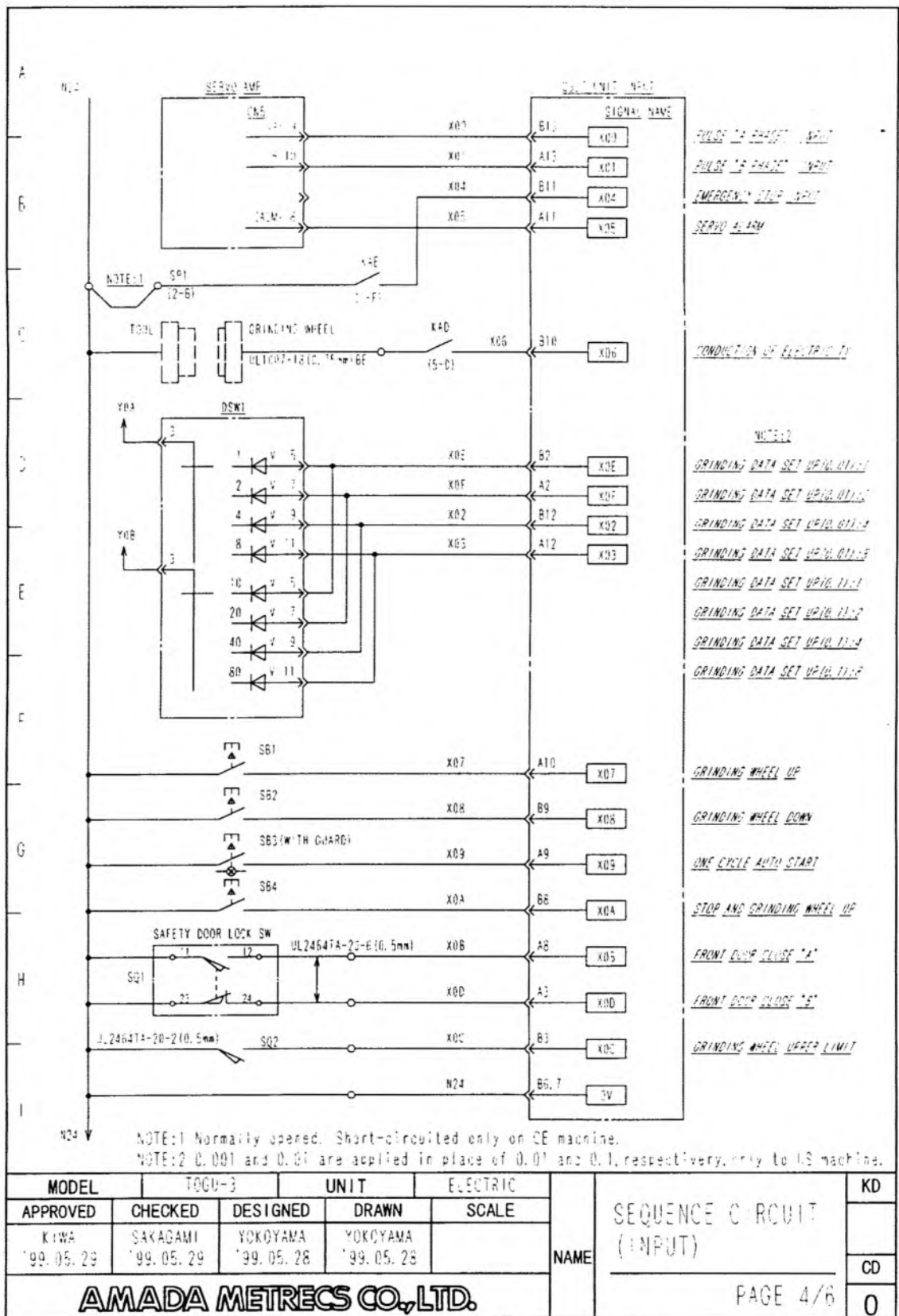


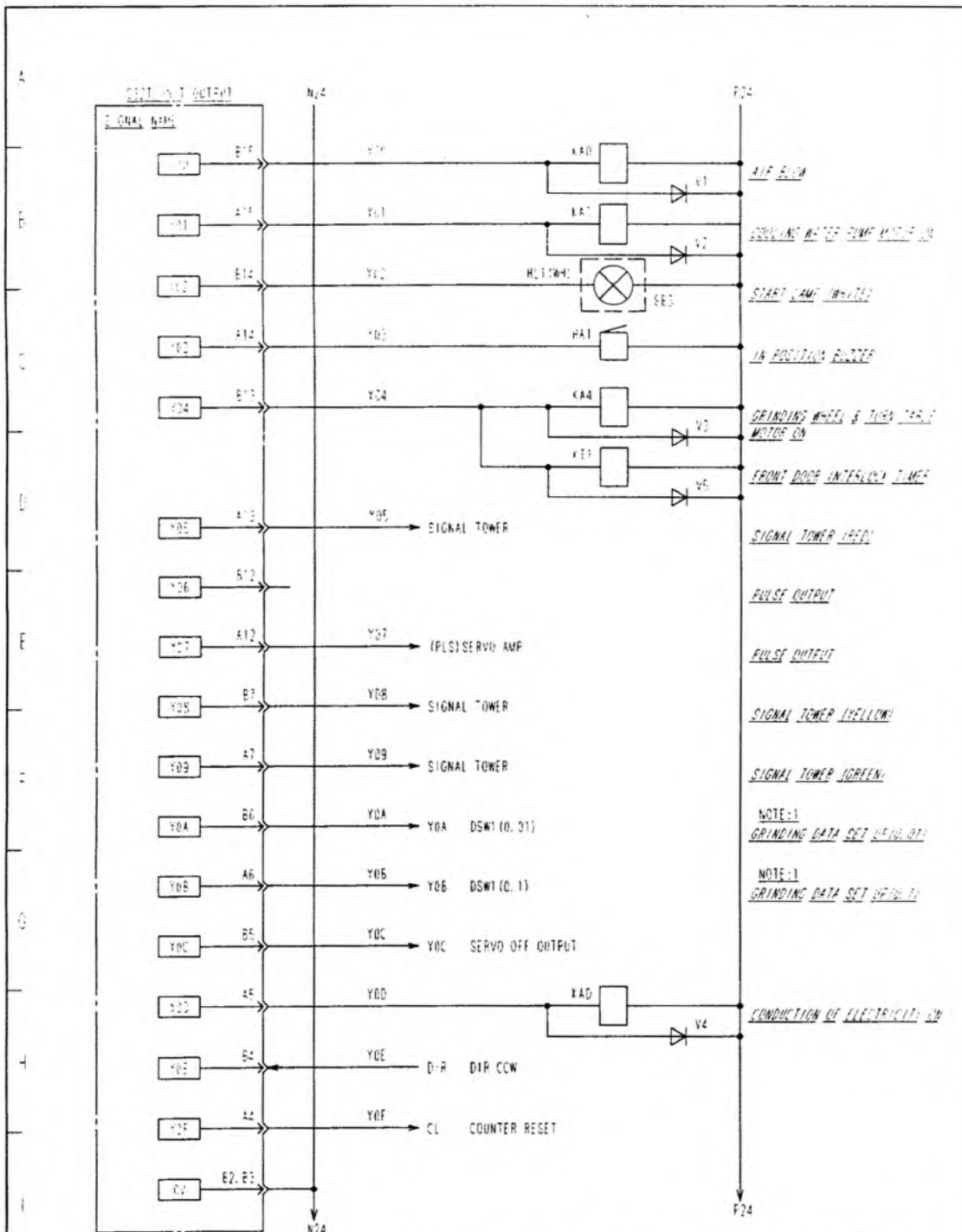


NOTE:1 Installed on machines other than DE machine.

MODEL	750H-5	UNIT	ELECTRIC		KD
APPROVED	CHECKED	DESIGNED	DRAWN	SCALE	
CIWA '99.05.29	SAKAGAMI '99.05.29	YOKOYAMA '99.05.28	YOKOYAMA '99.05.28		
AMADA METRECS CO., LTD.				NAME	CD
				CONTROL POWER CIRCUIT	0
				PAGE 2/2	

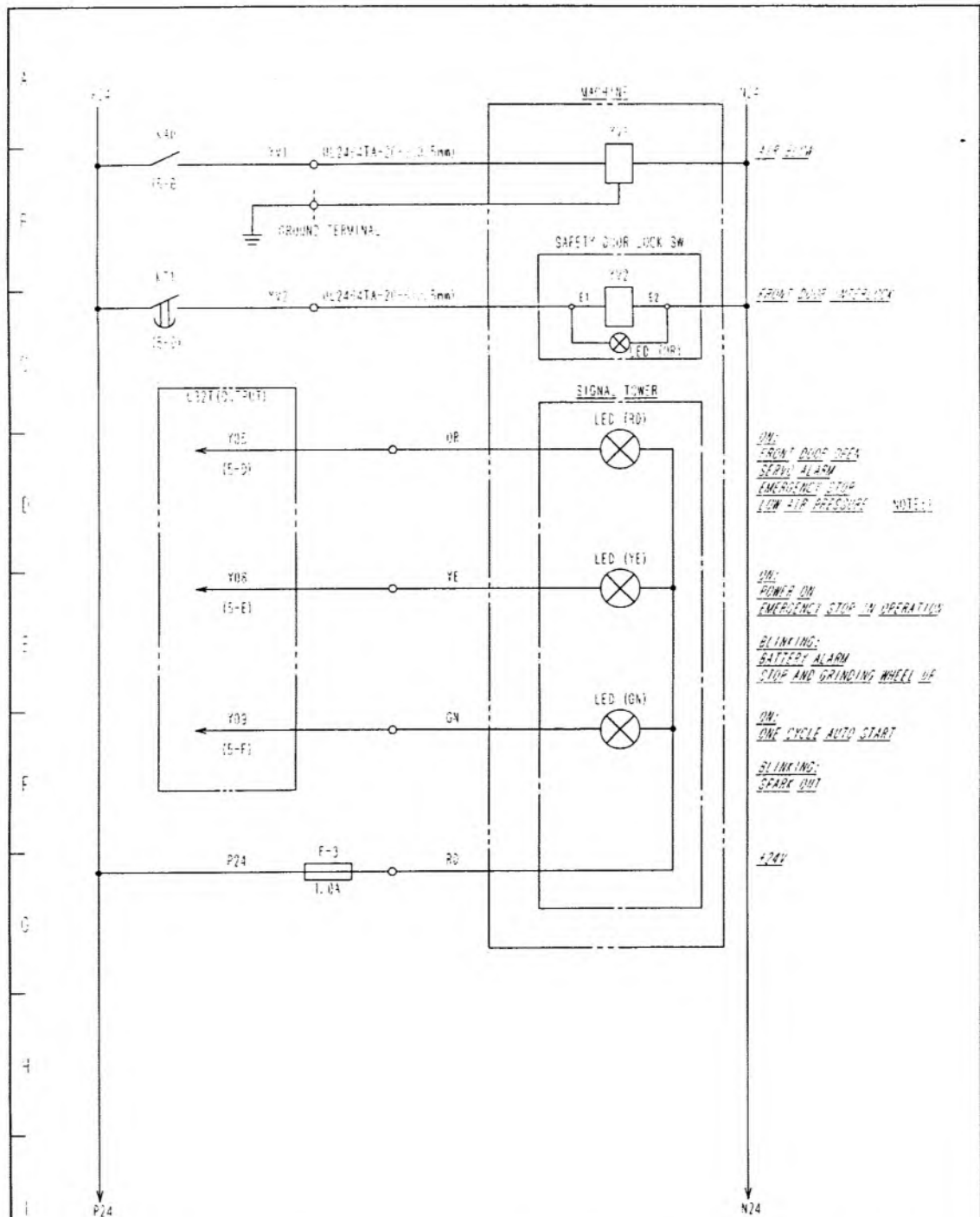






NOTE: 1 0.00" and 0.01" are applied in place of 0.01 and 0.1, respectively, only to US machine.

MODEL	TOCH-E	UNIT	ELECTRIC	NAME	KD
APPROVED	CHECKED	DESIGNED	DRAWN		
KIWA '99.05.29	SAKAGAMI '99.05.29	YOKOYAMA '99.05.28	YOKOYAMA '99.05.28		CD
AMADA METRECS CO., LTD.				SEQUENCE CIRCUIT (OUTPUT 1/2)	0
				PAGE 5/6	



ON: FRONT DOOR DEEP
 SERVO ALARM
 EMERGENCY STOP
 LOW AIR PRESSURE NOTE:1

 ON: POWER ON
 EMERGENCY STOP IN OPERATION

 BLINKING: BATTERY ALARM
 STOP AND GRINDING WHEEL UP

 ON: ONE CYCLE AUTO START

 BLINKING: SPARK OUT

 4.24V

NOTE:1 On machines other than CE machines.

MODEL		F000-E		UNIT		ELECTRIC		NAME	SEQUENCE C-ROUT (OUTPUT2/2)	KD
APPROVED	CHECKED	DESIGNED	DRAWN	SCALE						
KIWA	SAKAGAMI	YOKOYAMA	YOKOYAMA							
'99.05.29	'99.05.29	'99.05.28	'99.05.28							
AMADA METRECS CO.,LTD.									PAGE 6/6	0

ELECTRIC PARTS LIST

No.	SYMBOL	LOCATION	NAME	TYPE	MAKER	Q' TY
1	FL1	1-A	*1 NOISE FILTER	FN258-16-29	SCHAFFNER	1
2	FL1	1-A	*2 NOISE FILTER	3SUP-HL30-ER-6B	OKAYA DENKI	1
3		1-B	*1 FERRITE CORE	MSFC13KEX	OKAYA DENKI	1
4	QF1	1-C	CIRCUIT BREAKER	EG33B/20-30MA	FUJI	1
5	QF1	1-C	CIRCUITBREAKER HANDLE	BZ-V200-E	FUJI	1
6	PA1	1-D	AMMETER	FS-45(10A)	FUJI	1
7	Z1	1-D	SURGE ABSORBER	SZ-ZM2	FUJI	1
8	M-1	1-D	GRINDING WHEEL MOTOR	VTF0-5-K(1.5kW2P)	HITACHI	1
9	M-2	1-E	TURN TABLE MOTOR	CA19-010-30(O.1kW)	HITACHI	1
10	Z2	1-E	SURGE ABSORBER	SZ-ZM2	FUJI	1
11	M-3	1-E	COOLING WATER PUMP	HCP60S(60W)	ARYU	1
12	QF2	1-F	CIRCUIT PROTECTOR	BCP32T/5-S(5A)	FUJI	1
13	KAE	1-F	RELAY	MY2N-CR	OMRON	1
14	KAE	1-F	RELAY SOCKET	PYFOBA	OMRON	1
15	SB5	1-G	PUSH BUTTON SWITCH	AH22-VJR02	FUJI	1
16	KM1	1-H	MAGNET CONTACTOR	SW-03 AC200V	FUJI	1
17	FR1	1-H	THERMAL RELAY	TK-ON(5-8A)	FUJI	1
18	Z3	1-H	SURGE ABSORBER	SZ-Z5	FUJI	1
19	KM2	1-I	MAGNET CONTACTOR	SW-03 AC200V	FUJI	1
20	FR2	1-I	THERMAL RELAY	TK-ON(O.48-O.72A)	FUJI	1
21	Z4	1-I	SURGE ABSORBER	SZ-Z5	FUJI	1
22	HL1	2-B	LAMP	5103622-3(25W)	TAIWA	1
23	SP1	2-B	*2 PRESSURE SWITCH	1S1000-01-X201-Q	SMC	1
24	AVR1	2-C	SWITCHING POWER SUPPLY	S82J-15024B2(6.5A)	OMRON	1
25		2-D	MICRO SEQUENCER	C32T (1/0-16/16)	MATSUSHITA	1
26	AVR2	2-G	SWITCHING POWER SUPPLY	S82J-2105(2A)	OMRON	1

No.	SYMBOL	LOCATION	NAME	TYPE	MAKER	Q' TY
27		3-A	SERVO AMP	DA402-051TW	SOFTRONICS	1
28	M-4	3-A	SERVO MOTOR	DLM6402-051-G (40W)	SOFTRONICS	1
29	DSW1	4-D	DIGITAL SWITCH	A7PH-207-1	OMRON	1
30	DSW1	4-D	SWITCH FIXED PANEL	A7P-M-1	OMRON	1
31	DSW1	4-D	CONNECTOR	NRT-C	OMRON	1
32	DSW1	4-D	DIODE	DC24V	FUJI	8
33		4-D	EEP-ROM	M27C 256B-12F1	SGS TOMSON	1
34	SB1	4-F	PUSH BUTTON SWITCH	AH22-SFW10	FUJI	1
35	SB2	4-G	PUSH BUTTON SWITCH	AH22-SFW10	FUJI	1
36	SB3	4-G	PUSH BUTTON SWITCH	AH22-SFLW10E3	FUJI	1
37	SB3	4-G	SWITCH GUARD	AHX760	FUJI	1
38	SB4	4-G	PUSH BUTTON SWITCH	AH22-SFB10	FUJI	1
39	SQ1	4-H	SAFETY DOOR SWITCH	D4DL-2CFG-B	OMRON	1
40	SQ2	4-I	LIMIT SWITCH	D2VW-5L3-1M	OMRON	1
41	KA0	5-B	TERMINAL RELAY	G6B-4BND DC24V	OMRON	1
42	KA1	5-B	TERMINAL RELAY	G6B-4BND DC24V	OMRON	1
43	HA1	5-C	BUZZER	AH22-XBE DC24V	FUJI	1
44	KA4	5-C	TERMINAL RELAY	G6B-4BND DC24V	OMRON	1
45	KT1	5-D	TIMER	H3CR-HBL-M DC24V	OMRON	1
46	KT1	5-D	TIMER SOCKET	P2CF-08	OMRON	1
47	V5	5-D	DIODE	DC24V	FUJI	1
48	KAD	5-H	TERMINAL RELAY	G6B-4BND DC24V	OMRON	1
49	YV1	6-B	SOLENOID VALVE	VXZ2230-02-5DS-B-Q	SMC	1
50		6-D	SIGNAL TOWER	LOGS-24-3	ARROW DENSHI	1
51	F-1	6-G	FUSE	DC24V 1.0A	FUJI	1

*1 This part is applied to CE Machine.

*2 This part is applied to other Machines.