2002-03

disco

INSTALLATION MANUAL

Fully Automatic In-Feed Surface Grinder

DFG841

Software Version: ENM0000X-Series

Copyright of this document is owned by Disco Corporation ("Disco"). No part of this document may be copied or reproduced in any form or by any means, without the express written permission of Disco. Also, this document may not be disclosed or transferred to third parties.

This document is printed on recyclable Lint-Free Paper.
- The blue paper is recyclable as used paper just like plain paper.
- The cover paper and adhesive portions are non-recyclable.
(Remove the cover and adhesive portions before recycling.
Recycle the blue paper only.)

UHWSNE*001A

READ CAREFULLY BEFORE USING THIS MANUAL

Introduction

This machine grinds silicon wafers (hereinafter called wafers) and, therefore, has rotary sections which rotate at high speed, high-voltage sections which present electric shock hazard and drive sections which may catch the operating personnel's body and clothing.
If the machine is not properly operated, safety hazards that could result in serious injury or death may occur.

Read before using the manual

Thoroughly read this manual beforehand and follow the instructions set forth in it when you handle the machine.

To assure safety in operating and maintaining the machine, it is important that you know the locations of the potential safety hazards. It is difficult for DISCO to predict each and every potential hazard. However, this manual carries various precautionary notes and warnings for the machine wherever presence of any safety hazard is foreseeable. For increased safety assurance, therefore, it is essential that you observe all the precautions and other relevant instructions set forth in this manual.

If you modify the machine without prior consent of DISCO or repair it in a manner not stated in this manual, the safety assurance features of the machine may be seriously affected.

Never attempt to modify or repair the machine in a manner not approved by DISCO.

Hazard level

The safety precautions set forth in this document are classified into DANGER, WARNING and CAUTION categories, representing the three levels of hazards latent in the machine. These categories are defined as detailed below in accordance with the seriousness and occurrence probability of the hazards. In addition to the above three safety precaution levels, CAUTION without the safety alert symbol (⚠) and NOTICE are used to give safety usage instructions to the user.

Before using the machine, be sure to read and understand all the associated safety precautions set forth in the manual.

The hazard levels defined for the machine are detailed as follows:

⚠ DANGER	A critical situation in which either critical injury or death is very likely to result if the incident in question cannot be avoided. This symbol is used for the incident in which the injury is critical and there is a high probability of occurring it.
⚠ WARNING	A serious situation in which either critical injury or death may result if the incident in question cannot be avoided This symbol is used for the incident in which the injury is serious but the probability of occurring it is not so high.
⚠ CAUTION	If you cannot avoid the incident in question, a medium or slight injury may result. This symbol is used for the incident in which the injury is slight and the probability of occurring it is not so high.
CAUTION	If you cannot avoid the incident in question, an accident involving property damage may result.
NOTICE	Indicates the safe way of using the machine as well as the instructions to prevent accidents involving property damage from occurring.

Safety labels

The safety labels as defined below are attached to the hazardous sections of the machine. Before using the machine, confirm the label positions and thoroughly read and understand the precautions and warnings represented by the labels.

Label	Hazard Level	Meaning of Label
Rotary Blade Label 	WARNING	Your hands or fingers may be cut off by the rotating blade. Observe the following precautions for at least 15 seconds after stopping spindle rotation. - Do not position your hands or fingers near the wheel. - Keep the safety cover closed.
Capture Label 	CAUTION	There is a danger that your hands, fingers or clothing may be captured and, as a result, wounded or cut off. Do not position your hands or fingers in any drive section.
Driving Section Label 	CAUTION	There is a danger that your hands or fingers may get caught in a drive section. Do not position your hands or fingers in any drive section.
Electrical Shock Hazard Label 	WARNING	A risk of receiving an electric shock exists. Be alerted.
General Label 	WARNING	Warnings (including danger/caution) in general

INTRODUCTION

About this manual

This manual describes about the installation and adjustment procedures of Fully Automatic In-Feed Surface Grinder Model DFG841.

To ensure safety

To ensure safety, be sure to thoroughly read and understand the contents of this manual before installing and adjusting the machine. Note that this manual is based on the software version of ENM0000X-series

In installing and adjusting the machine, which should be performed by the qualified maintenance personnel (hereinafter referred to as maintenance personnel) who have completed DISCO's maintenance training, make sure that the procedures set forth in this manual are followed.

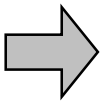
Definition of a manager and an operator

This manual defines a manager and an operator of the machine as follows:

Category	Applicable Personnel	Job and Responsibility
Manager	Management representative	Engages in overall management of the machine and its operators.
Operator	Maintenance personnel	Qualified person who has completed DISCO's machine maintenance training to engage in maintenance of the machine.
	Data maintenance personnel	Qualified person who manages the software data of the machine.
	Machine operator	Engages in operation of the machine for grinding wafers.

Documentation for this machine

The following five manuals are provided for the machine.
This manual is the Installation Manual in the list below indicated by an arrow.

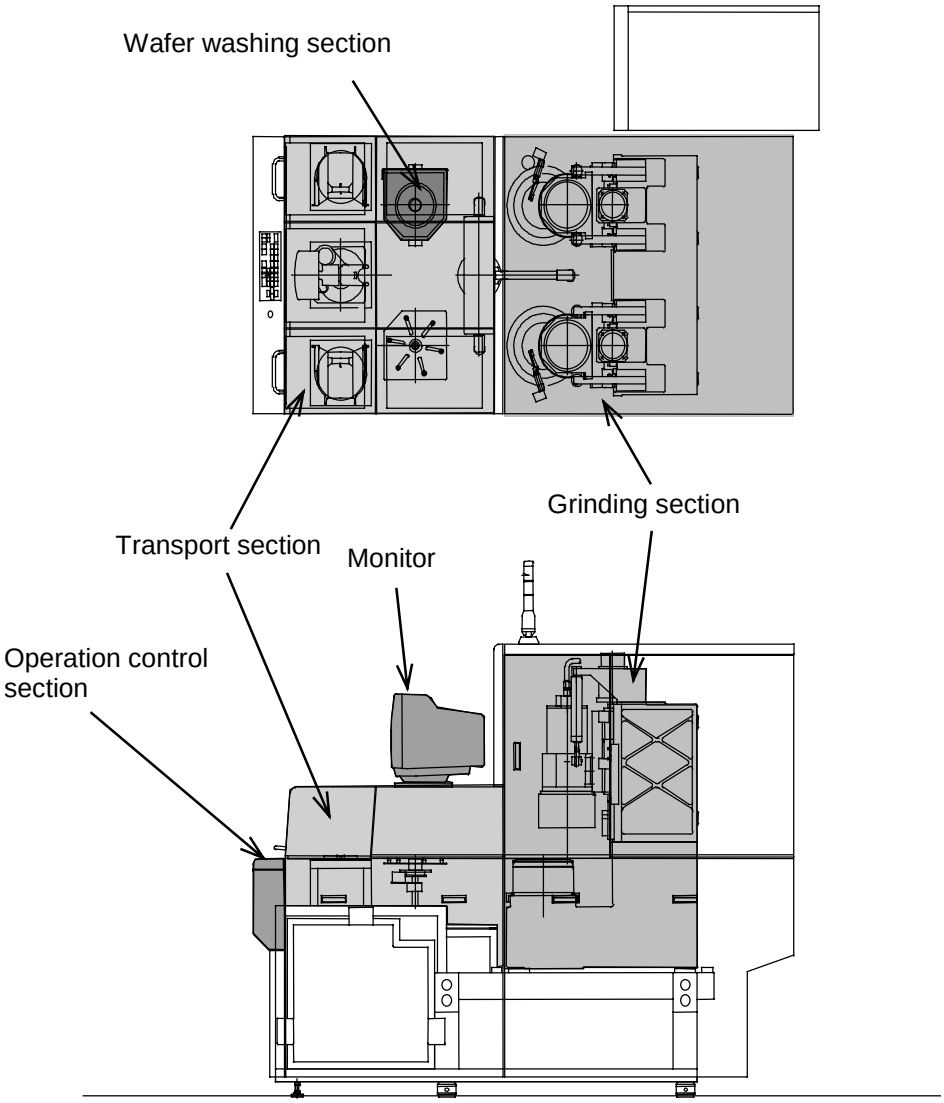


Manual	Who should read	Contents
Installation Manual	Maintenance personnel	Procedures to install the machine and to make installation-related adjustments
Operation Manual	Machine operator	Operational procedures to be performed by the machine operator
Data Maintenance Manual	Data maintenance personnel	- Contents of the screens on which data entries are made - Data setting procedures
Maintenance Manual	Maintenance personnel	Servicing, inspection and adjustment procedures to be performed by the customer
Technical Reference	Maintenance personnel	Machine specifications, circuit diagrams, illustrations and part lists

Unit notation

International System of Unit is adopted to express any unit. The values in the parenthesis are reference data. Also, all the pressure values are expressed in gauge pressure.

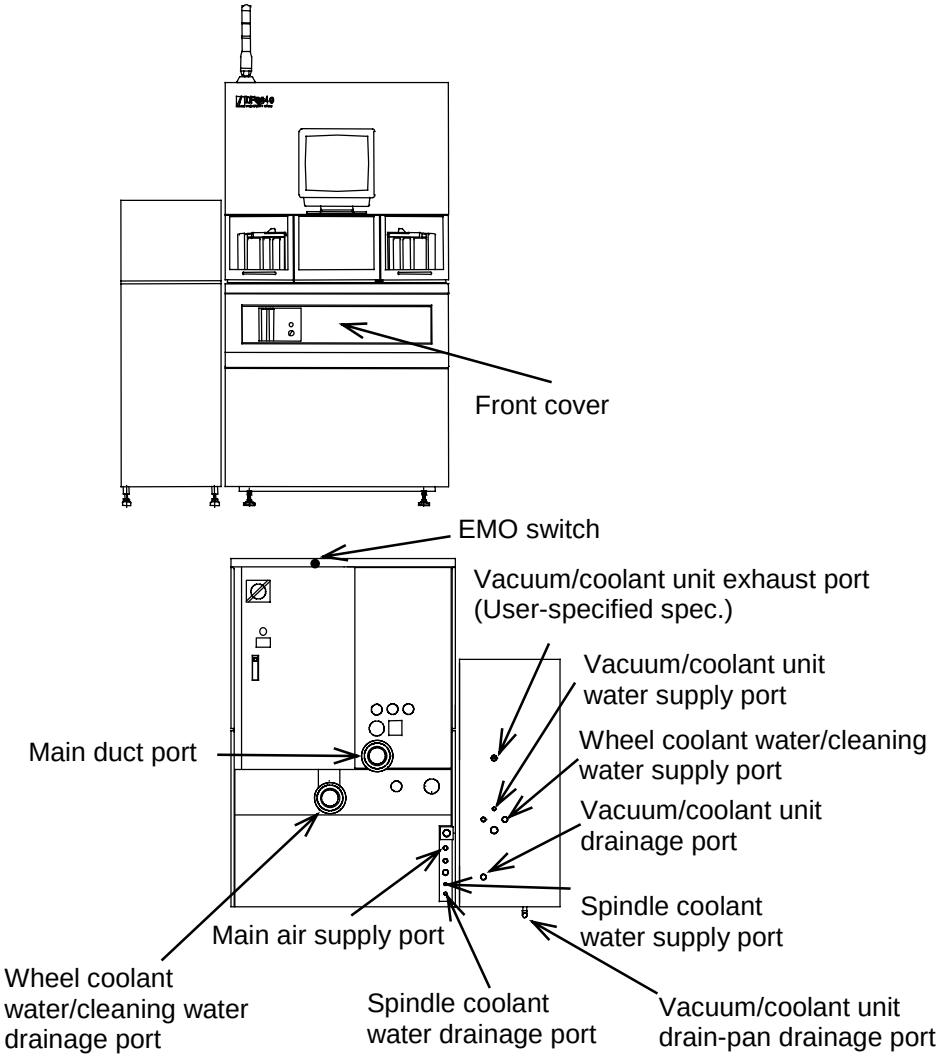
The machine consists of the following sections.



Name	Function
Operation control section	Through its operation panel, inputs machine data and manipulates various operations.
Monitor	Displays the various screens operated from the operation panel.
Transport section	- Takes out wafers from the cassette to transport them to the grinding section. - Returns the ground wafers back into the cassette.
Wafer washing section	Washes the ground wafers on the spinner table.
Grinding section	Grinds wafers.

External view (Machine front-side and rear-side)

The external views of the machine front-side and rear-side are described here.



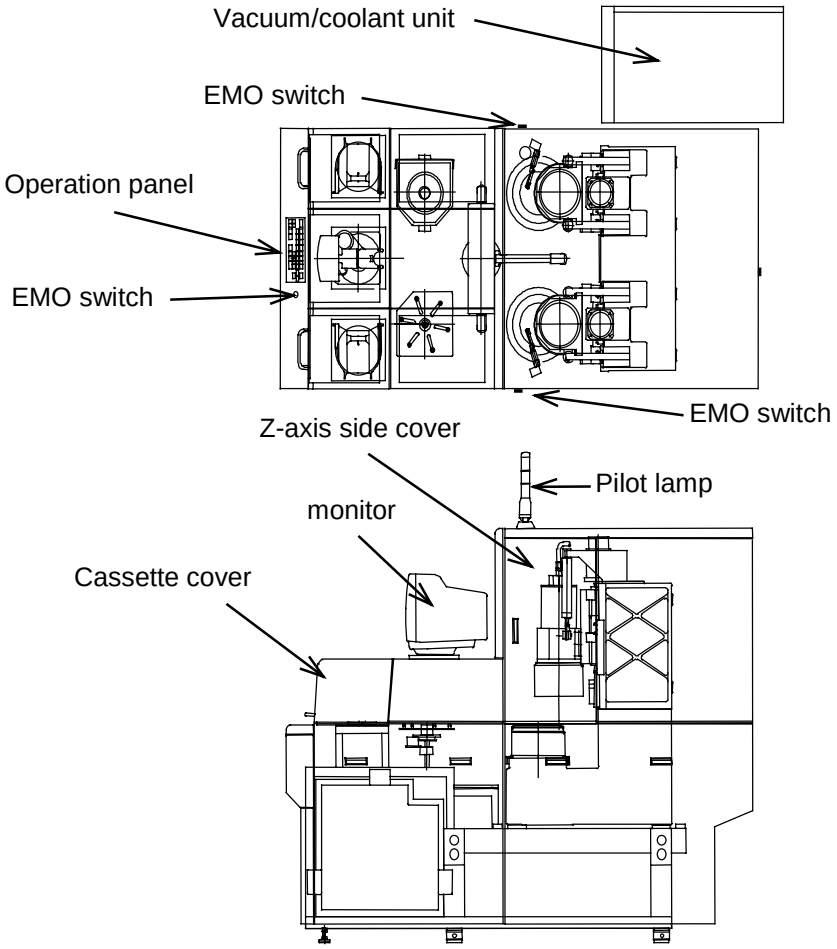
Name	Function
EMO switch	Switch used to shut OFF the machine power when the machine becomes faulty or acts abnormally.
Front cover	Inside of this cover are the meters and gauges of the machine.
Vacuum/coolant unit exhaust port (User-specified spec.)	Exhaust port of the vacuum/coolant unit
Vacuum/coolant unit water supply port	Water supply port of the vacuum/coolant unit

External view (Machine front-side and rear-side) (Continued)

Name	Function
Wheel coolant water/cleaning water supply port	Supply port of wheel coolant water and cleaning water (Vacuum/coolant unit)
Vacuum/coolant unit drainage port	Drainage port of the vacuum/coolant unit
Spindle coolant water supply port	Supply port of spindle coolant water
Vacuum/coolant unit drain-pan drainage port	Drainage port of the vacuum/coolant unit drain-pan
Spindle coolant water drainage port	Drainage port of spindle coolant water
Main air supply port	Supply port of main air
Wheel coolant water/cleaning water drainage port	Drainage port of wheel coolant water and cleaning water
Main duct port	Duct port of the machine main body

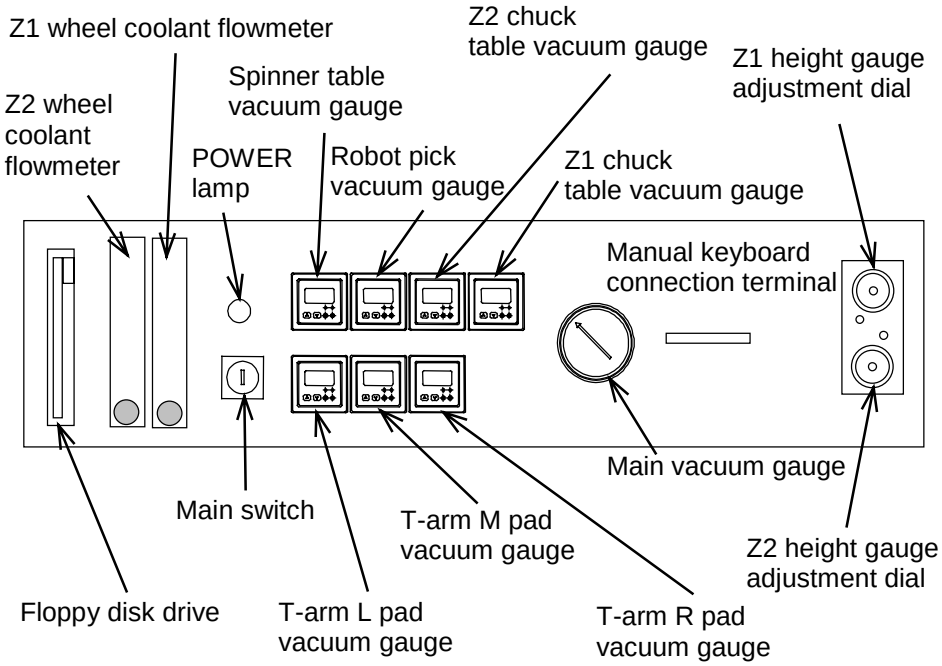
External view (Machine top side and right side)

The external views of the machine top-side and right-side are described here.



Name	Function
Operation panel	Operating control key panel.
EMO switch	Switch used to shut OFF the machine power when the machine becomes faulty or acts abnormally.
Vacuum/coolant unit	- Produces a vacuum and supplies it to the machine main body. - Pressurizes wheel coolant water and supplies it to the machine main body.
Cassette cover	Functions as a safety device.
Monitor	Displays the various operation screens used to operate the machine.
Z-axis side cover	Functions as a safety device.
Pilot lamp	The green and yellow lamps of the signal tower indicate the operating status of the machine. The red lamp flashes when an error occurs.

Gauges and meters inside the front cover

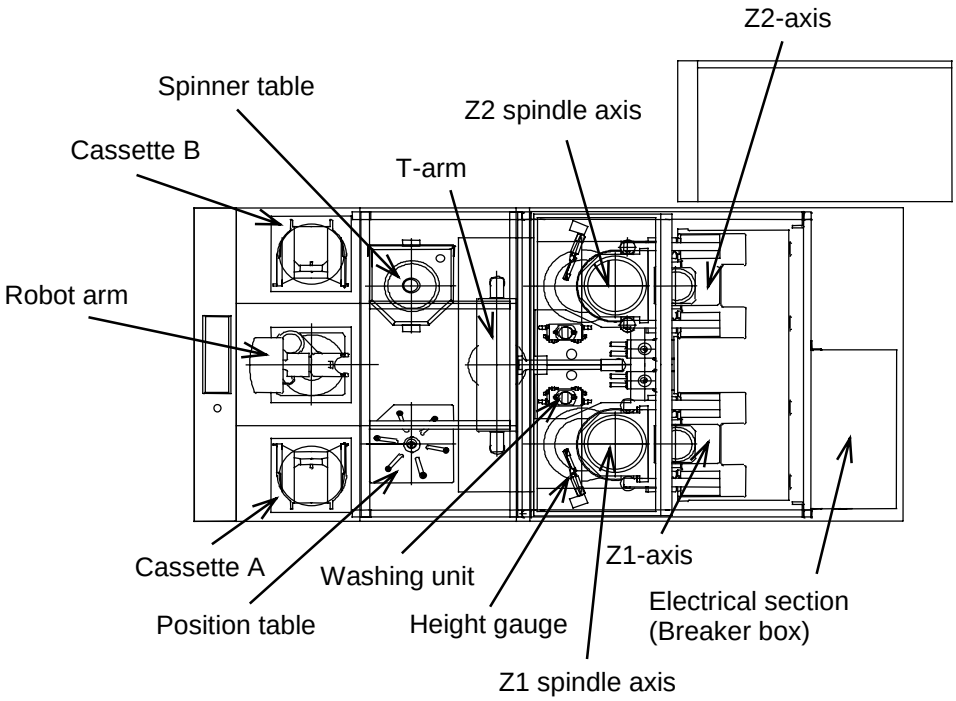


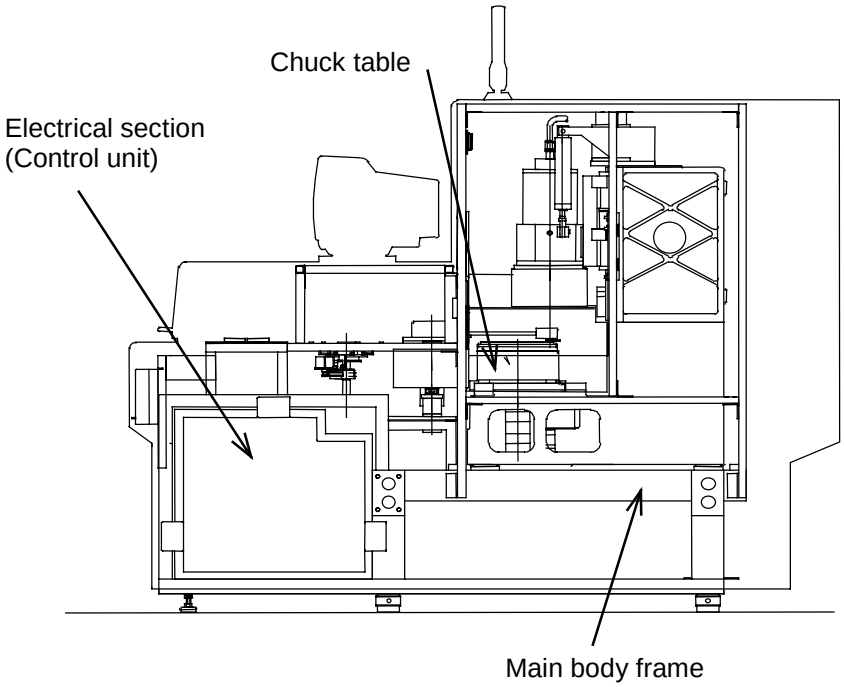
Name	Function
Z2 wheel coolant flowmeter	Flow meter of Z2 wheel coolant water
Z1 wheel coolant flowmeter	Flow meter of Z1 wheel coolant water
POWER lamp	Lamp that lights while the machine power is turned ON.
Spinner table vacuum gauge	Gauge to indicate the vacuum pressure of the spinner table
Robot pick vacuum gauge	Gauge to indicate the vacuum pressure of the robot pick
Z2 chuck table vacuum gauge	Gauge to indicates the vacuum pressure of the Z2 chuck table
Z1 chuck table vacuum gauge	Gauge to indicates the vacuum pressure of the Z1 chuck table
Z1 height gauge adjustment dial	Adjustment dial for the Z1 height gauge.
Z2 height gauge adjustment dial	Adjustment dial for the Z2 height gauge.
Main vacuum gauge	Gauge to indicates the supply pressure of vacuum supplied from the vacuum/coolant unit.
Manual keyboard connection terminal	Terminal (front-side) for connecting the manual keyboard to individually operate such machine units as the robot, position table, T-arm and spinner table for maintenance purposes.

Gauges and meters inside the front cover (Continued)

Name	Function
T-arm R pad vacuum gauge	Gauge to indicates the vacuum pressure of the T-arm R pad (located at the right-hand side of the T-arm as viewed from the machine front side)
T-arm M pad vacuum gauge	Gauge to indicates the vacuum pressure of the T-arm M pad (located at the center of the T-arm as viewed from the machine front side)
T-arm L pad vacuum gauge	Gauge to indicates the vacuum pressure of the T-arm L pad (located at the left-hand side of the T-arm as viewed from the machine front side)
Main switch	Machine power switch. The switch key is inserted here to turn ON/OFF the machine power.
Floppy disk drive	External data storage device.

The composing parts of the machine and their functions are described here.





Name	Function
Robot arm	- Takes wafers (before grinding) out of the cassette to transport them onto the position table. - Stores the ground wafers (after they are washed and dried on the spinner table) into the cassette.
Cassette B	Platform onto which a cassette containing wafers to be ground is placed (left-hand side platform as viewed from the machine front side)
Spinner table	Table on which the ground wafers are washed and air-dried
T-arm	Transports wafers to/from the grinding section and between the Z1-side chuck table and the Z2-side chuck table.
Z1/Z2 spindle axis	Rotates the wheel mounted on its end to grind wafers.
Z2-axis	Moves the Z2 spindle axis up and down.
Electric section	Electric section to control the machine movements.
Z1-axis	Moves the Z1 spindle axis up and down.
Height gauge	Measures the thickness of wafers in the grinding process.
Washing unit	Washes the chuck table surface.
Position table	Table on which wafers are centered
Cassette A	Platform onto which a cassette containing wafers to be ground is placed (right-hand side platform as viewed from the machine front side)
Chuck table (Z1-side / Z2-side)	Table on which wafers are ground. The chuck table rotates while a wafer is ground on it.
Main body frame	Supports the machine main body.

CONTENTS

CONTENTS

CONTENTS

A. IMPORTANT SAFETY INFORMATION

Contents of this chapter

This chapter describes about the various precautions to be observed for safety assurance when you handle the machine, as well as the protective mechanisms incorporated into the machine.

Section No.	Title	Contents
1	General Safety Precautions	- Overall safety precautions to be fully understood before you handle the machine. - Overall safety precautions to be observed when you handle the machine.
2	Safety Precautions in Hoisting/Lowering and Transferring the Machine	- Safety precautions to be observed when you hoist/lower and transfer the machine
3	Safety Precautions in Installing and Adjusting the Machine	- Safety precautions to be fully understood before you install and adjust the machine. - Safety precautions to be observed when you install and adjust the machine.
4	Inherently Hazardous Areas and Ways to Avoid Hazards	- Potentially hazardous sections of the machine and the ways to avoid hazards (explained by hazard type)
5	Emergency OFF Switch (EMO Switch)	- Explanation about the emergency OFF switch (EMO switch)
6	Power Circuit Breaker	- Explanation about the power circuit breaker
7	Interlock Mechanism	- Explanation about the interlock mechanisms incorporated into the machine
8	Safety Labels	- Types of the safety labels used for the machine - Locations of the safety labels attached to the machine

1. General Safety Precautions

General safety precautions

This section describes about the general safety precautions that should be understood and observed when you handle the machine.

NOTICE

- Responsibility of instructing workers
  Make sure to instruct the workers who engage in installing and adjusting of the machine to thoroughly read the safety precautions set forth in the Installation Manual before proceeding to work. Also, if the workers perform various tasks, direct them to read the safety instructions set forth in the associated manuals as well.
  For this machine, the Installation Manual, Operation Manual, Data Maintenance Manual, Maintenance Manual, and Technical Reference are provided.
- Providing guidance to workers who seem to have difficulty in understanding safety instructions
  Thoroughly explain to workers who seem to have difficulty in understanding the safety instructions set forth in chapter A of this manual until they full grasp their meanings.
- Periodical inspection
  The machine must be inspected on a periodic basis.
  If any accidents occur while an appropriate periodic inspection program is not adhered to, DISCO shall assume no responsibility for any consequences arising therefrom.
- Maintenance personnel
  Machine maintenance must be carried out by the qualified maintenance personnel who have completed DISCO's training program.
- Installing safety devices without fail
  If any parts or covers incorporating safety interlocks (automatic stop function, etc.) are broken, immediately stop operating the machine and contact your nearest DISCO office or DISCO service office.
- Air exhaust, water drainage, and contamination (cutting dust) control
  Due to the nature of its processing characteristics, the machine may produce harmful substances depending on the types of the wafers it grinds. Air exhaust, water drainage, and contamination control/disposal must be properly implemented in compliance with the applicable environmental protection codes.

NOTICE

- Machine installation environment
  If the employed machine installation environment does not comply with DISCO's recommendations, rust formation may be incurred by moisture condensation or other unfavorable elements to the detriment of grinding accuracy. It is therefore essential that the recommended machine installation environmental conditions (room temperature, humidity, wheel and spindle coolant water temperatures, etc.) be complied with.
  For the recommended environmental conditions, refer to section 1, [Specifications and Environmental Requirements of the Machine] in chapter C of the Installation Manual.
- Machine transfer/disposal
  When it is necessary to transfer or dispose of the machine, contact your nearest DISCO office or DISCO service office. Disco will provide you with detailed information and precautions required in carrying out such works.

2. Safety Precautions in Hoisting/Lowering and Transferring the Machine

Safety precautions in hoisting/lowering and transferring the machine

Safety precautions that should be observed when you hoist/lower the machine and transfer it by forklift are described here.

DANGER

- Hoisting the machine
  While the machine is hoisted or lowered, stay away from the area beneath and around the machine. If the machine should fall, a person in such area may be crushed to death or severely injured, or if the machine should swing like a pendulum, the person may be caught between the machine and wall or hit by the machine to death or severely injured.
- Hoisting crane, jig
  If the machine should fall while the machine is hosted or lowered, a person beneath or near the machine may be crushed to death or severely injured.
  Make sure to use the dedicated hoisting jigs and secure the machine with them. Note that the machine weighs approximately 2,300 kg. Ensure that the employed crane is rated for a hoisting load of 3,000 kg or heavier and withstands the machine weight, boom length and hoisting angle.
- Forklift
  When you transfer the machine by forklift, make sure that the gravity center of the machine is on the fork center. If the machine is transferred while its gravity is not properly centered on the fork of the forklift, it may fall to cause severe personal injury or death.
  The machine weighs approximately 2,300 kg. The employed forklift must be capable of moving up and down and transporting a load of 2,500 kg and be equipped with a fork of 1,200 mm or longer.

3. Safety Precautions in Installing and Adjusting the Machine

Safety precautions to be observed in installing and adjusting the machine

This section describes about the safety precautions that should be fully understood and observed when you install and adjust the machine.

WARNING

- Facility-side power supply shutoff
  If you come into contact with a live part of the machine while the facility-side power is turned ON, you may receive an electric shock that could result in severe injury or death. Before installing the machine, make sure to shut OFF the facility-side power and lock it out with a padlock or the like.
- Wheel section
  The wheel has a sharp blade edge. If your hands or fingers come into contact with it, they may be wounded or cut off. Do not place your hands or fingers beneath the wheel. While the spindle rotates, do not touch the wheel nor attempt to open the wheel cover.
  Note that it takes up to 15 seconds for a rotating spindle (7000 min^{-1}(rpm)) to come to a standstill. It is also well to remember that once the spindle enters the free-running state (in which the rotation cannot be braked) due to power failure or error occurrence, it continues to run for about 30 minutes. Never position your hands in the spindle section.
- Use of Air
  The only gaseous material allowed to be used with this machine is air. If nitrogen (N_2) or other gas is used instead of air, it may fill the machine room and cause oxygen deficiency for breathing, thereby incurring serious personal illness or death.
- Use of water
  The only liquid material allowed to be used with this machine is water. Using other liquid than water may bring about detrimental effects on your health. If any harmful liquid contacts your skin or you inhale its vapor, it could cause serious illness or death. It may also corrode the machine to invoke abnormal movements.
- Evolution of hydrogen gas
  Waste water containing silicon particles must not be kept in airtight containers or the like. It may cause evolution of hydrogen gas that could react explosively with heat or flame when they are closely present.

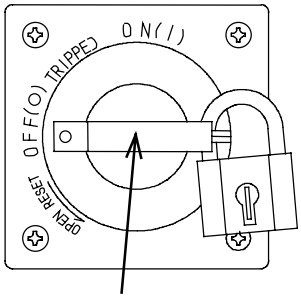
WARNING

- Movable parts
  If your hands or fingers are positioned in a drive section in action, they may be caught or cut off. While a drive section is operating, do not touch it. Also, avoid placing your hands or fingers in an operating space of movable parts.
- Robot section/wafer transport section
  If your hands or fingers are positioned in the robot section or wafer transport section in action, they may be caught or cut off. Keep your hands and fingers away from such sections or their operating space while they are in action.
- Spinner and chuck table rotary sections
  If your hands or fingers are positioned in the rapidly rotating spinner or chuck table section, they may be wounded or cut off. Do not place your hands and fingers in such sections.
- Spinner cover
  The spinner cover moves up and down. If your hands or fingers are positioned in the spinner cover section in action, they may be caught or cut off by the moving cover. While the spinner cover is operating, keep your hands and fingers away from it or its operating space.
- When the machine or floor is wet with water
  Operating the machine while its interior or floor is wet with water may cause an electric shock hazard that could result in serious injury or death. If the machine or floor is wet with water, shut off electrical power supply at the circuit breaker of this machine and at the facility power source, lock them out with padlocks or the like, and wipe the machine and floor dry. Do not turn ON the facility-side power supply until the machine and floor completely dry.

WARNING

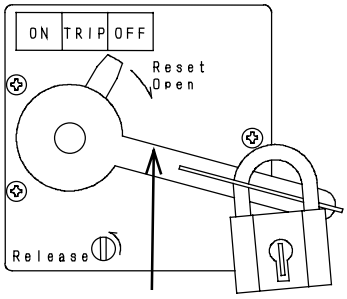
- Power circuit breaker lever lockout
  When you perform a maintenance work with the machine power turned OFF, lock out the power circuit breaker lever of the machine with a padlock or the like to prevent the machine from being inadvertently activated by other persons.
  1) Turn the machine main switch key to "OFF" position and pull the key out.
  2) Turn the power circuit breaker lever on the rear of the machine to "OFF" position.
  3) Lock out the breaker lever with a padlock or the like.

[Standard type]



Breaker lever

[SEMI type]



Breaker lever

- Emergency OFF switch (EMO switch)
  When the emergency OFF switch (EMO switch) is pressed, the machine power is turned OFF. However, a hazardous voltage still remains in the machine even after the machine power is turned OFF. Do not position your hands in an energized section as you may get an electric shock that could result in serious injury or death. When you perform a maintenance work, shut OFF the facility side power first.
- Broken wafer removal and cleanup
  When you remove a broken wafer or clean the affected area, wear protective gloves and goggles and use tweezers. If you perform such works with bare hands, your hands or fingers may be cut or stuck.
  Before proceeding with the works, turn OFF the machine power and make sure that all axes are brought to a stop.
- Interlock mechanism deactivation during unit operation
  The interlock mechanism is deactivated when a unit operation is conducted from the unit operation screen. In such an occasion, make sure to keep your hands and fingers away from the movable sections of the machine to protect them from possible hazards such as capture or cutoff.

WARNING

- Manual keyboard storage
  The manual keyboard is used to operate the machine units individually (unit operation) for maintenance purposes.

  The manual keyboard must be carefully operated and, when it is not used, kept in safe custody by a qualified maintenance personnel.

- Handling of Solenoid valve
  When you manually operate a solenoid valve, the interlock mechanism of the machine is deactivated. In such an occasion, make sure to keep your hands and fingers away from the movable sections of the machine to protect them from possible hazards such as capture or cutoff.
  It can also happen that a drive axis interferes to damage a machine part. Use care when you manually operate solenoid valves.

- Air supply ON/OFF during machine power OFF
  Even if the machine power is turned OFF, the air-operated parts of the transport section and the spinner section may move when you turn ON/OFF the air system.

  Keep your hands and fingers away to prevent them from being caught or cut off from those air-operated parts and their operating spaces when you turn ON/OFF the air system.

- Machine with UPS unit (optional accessory)
  Even if the facility-side power is turned OFF, a hazardous voltage still remains in the machine equipped with the uninterruptible power supply unit (UPS). Never position your hands or fingers in an energized section of the machine, or you may receive an electric shock that could result in severe injury or death.

- Jacking up of the machine
  While the machine is jacked up, do not position your feet or hands under the machine. If the machine should fall off a leveling block, they may be caught or cut off by the machine.

- Anchoring the machine
  Disco provides the optional machine anchors for human/equipment protection in the event of earthquake or other disasters. It is recommended that the installed machine be secured with these anchors.

- Provision of the work step
  The EMO switches provided on each side (1 each) and on the rear side (1) of the machine are positioned relatively high to reach. Use adequately wide (flat) steps as needed during maintenance so that the EMO switches are easily accessible all the time.

CAUTION

- Maintenance work with the machine outer covers removed
  The machine outer covers removed for performing a maintenance work on the machine should be placed sufficiently away from the working area. If the covers are placed against the machine, they may fall when an earthquake or other accident occurs and injure a person performing maintenance on the machine.
- If the operation panel is wet with water
  The operation panel is waterproofed. However, if the machine is operated while the operation panel is considerably wet with water, electric leakage may occur to invoke erratic machine movements, thereby causing an accident.
  If the operation panel is wet, immediately wipe it dry with a dry cloth.
- Convenience power outlet within the machine
  The convenience power outlet within the machine (an extra power outlet provided inside the machine) should be used for DISCO-designated ancillary equipment only.
  If any equipment other than the specified ancillary equipment is connected to the convenience power outlet within the machine, the power supply to the machine may become inadequate or the machine may malfunction to incur an accident.

CAUTION

- Turning the power back ON
  When turning ON the machine power, be sure that at least one minute has elapsed since the last power OFF. If the power is turned ON/OFF successively, the hard disk or other machine components may fail.
- Spindle idling before machine shut off
  The spindle section is designed so that the spindle shaft is lifted by means of air. If the spindle is stopped without being allowed to idle or stopped with air supply immediately turned OFF, grinding dust may adhere to the spindle section, causing the spindle to gall.
  Before stopping spindle rotation for machine shutoff, allow it to idle for at least 10 minutes with the wheel coolant system turned ON. Then, stop the spindle and place the machine in the stand-by condition for 10 minutes with the wheel coolant system turned OFF but the air blow system turned ON.

CAUTION

- Spindle seizure
  If air supply is shut off during spindle rotation, the spindle seizes up. Be sure to stop spindle rotation before shutting off the air supply.
- Wheel installation/removal

  A wheel installation/removal work itself could cause the spindle to gall. Make sure that air is kept supplied to the spindle while the wheel is installed or removed. Also be careful not to exert any force to the spindle in its axial direction.
- Axis lock during machine transportation
  Make sure to install the retainer jigs for the Z1-axis, Z2-axis, and robot to secure them in position when you transport the machine.
- Periodic change of spindle coolant water (when the temperature control unit or spindle coolant supply unit is used)
  If the same spindle coolant water is circulated for a long time, microbes contained in the water may propagate and adhere to the inner walls of the water circuit to cause a decrease in spindle coolant flow.
  Make sure to change spindle coolant water at specified intervals referring to the coolant water change procedures described in the instruction manual for the temperature control unit or spindle coolant supply unit.

NOTICE

- Coping with abnormal machine movements
  If the machine acts abnormally, its investigation, adjustment, and repair must be carried out by qualified maintenance personnel.
- Cautioning against power/air/water supply ON/OFF by irrelevant persons during machine operation or maintenance
  While operating or servicing the machine, be sure that the power, air, or water supply system is not turned ON/OFF by other persons. This precaution must be strictly observed particularly when the machine shares the same facilities with other equipment.
- Spindle free-run
  To prevent the spindle from entering into the free-running state (in which the rotation cannot be braked), make sure to stop spindle rotation before turning OFF the machine power.

NOTICE

- Related equipment power OFF
  Before troubleshooting or repairing the machine with its power turned OFF, turn OFF the power of the electrically connected equipment as well.
- Tools/materials storage
  Make sure that no tools or materials are inadvertently left inside the machine.
- Machine transportation
  When transferring the machine, use a flat transfer route. If the machine is carried over floor irregularities or varying floor surface levels, it may be shocked to the detriment of grinding accuracy.
- Installation space
  When installing the machine, be sure to secure an adequate maintenance space. Ensure that nothing is placed in the maintenance area.

4. Inherently Hazardous Areas and Ways to Avoid Hazards

Summary of this section

This section illustrates the inherently hazardous sections of the machine and describes the ways to avoid such potential hazards by hazard type.

Section No.	Title
4-1	Locations and Preventive Measures of Operation-related Potential Hazards
4-2	Locations and Preventive Measures of Maintenance-related Potential Hazards

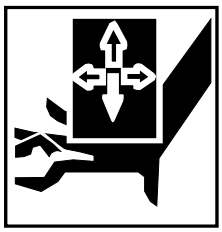
4-1. Locations and Preventive Measures of Operation-related Potential Hazards

Summary of this section

This section describes the locations where operation-related mechanical hazards may be latent and the measures to prevent them by hazard type.

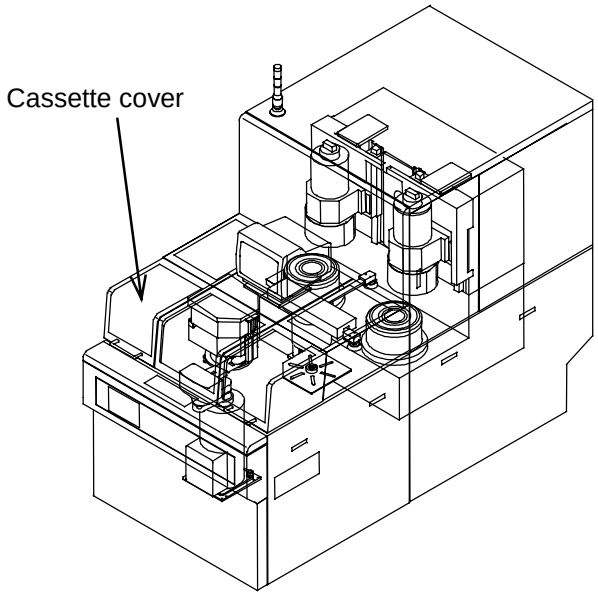
Hazardous sections where your hands or fingers may be caught or cut off

Hazardous sections where your hands or fingers may be caught or cut off are shown in the following figure. Measures to avoid such hazards are also described.



Hazardous sections where your hands or fingers may be caught or cut off

The machine has the cassette covers that move up and down.



Inherently hazardous area	Cassette covers
Cause of hazard	If you place your hands or fingers under the cover when the cassette cover opens/closes, they may be caught or cut off by the cover.
Avoidance method	When you open the cassette cover, make sure that the opened cover is completely stopped.

4-2. Locations and Preventive Measures of Maintenance-related Potential Hazards

Summary of this section

This section describes the locations where maintenance-related mechanical hazards may be latent and the measures to prevent them by hazard type.

Hazardous locations inside the machine outer covers

There are the locations inside the machine outer covers where catching, cutoff, capture, or electric shock hazards may be latent as shown in the figure below.

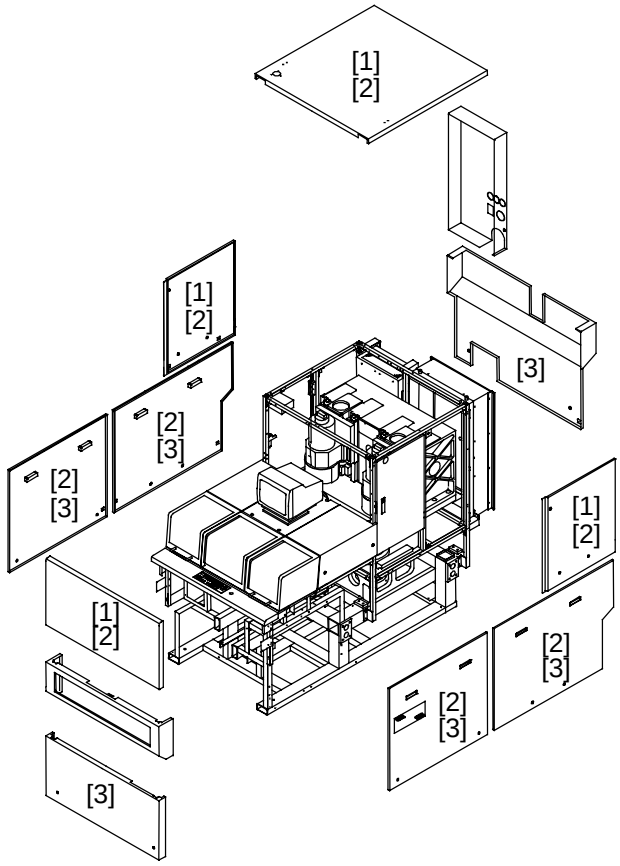
Hazardous locations inside the machine outer covers

Machine outer cover removal reveals hazardous sections of the machine where parts of your body or clothing may be captured, cut off, and caught or you may receive an electric shock.

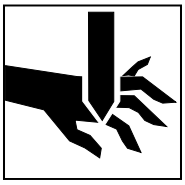
[1]: Catching/cutoff hazard locations 

[2]: Capture hazard locations 

[3]: Electric shock hazard locations 

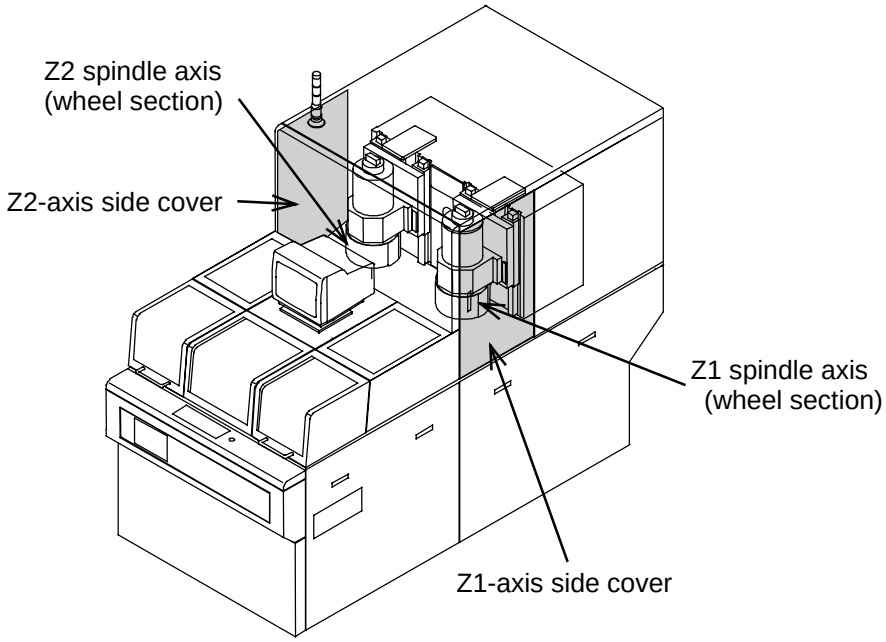


Cut-off hazard locations in the machine are shown in the following figure. Measures to avoid such hazards are also described.



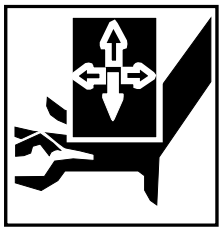
Cut-off hazard locations in the machine

The machine has the spindle axes (wheel section) which rotate in high speed.



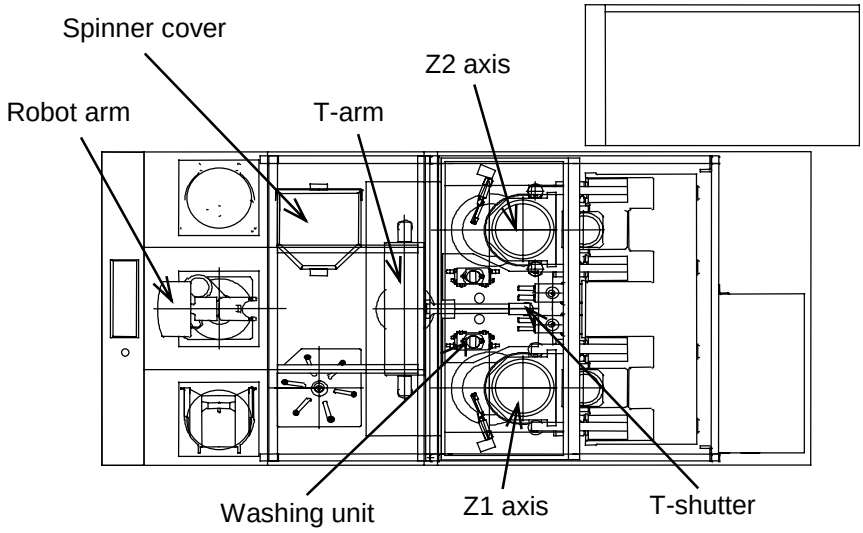
Inherently hazardous area	Spindle axis (wheel section)
Cause of hazard	If your hands or fingers are placed in the spindle section when the spindle is rotating or moving up and down, they may be cut off.
Avoidance method	It takes up to 15 seconds for a rotating spindle (7000 min^{-1}(rpm)) to come to a standstill. When you open the grinding section side cover, wait for at least 15 seconds after stopping spindle rotation. Also make sure that spindle rotation is completely stopped when you open the wheel cover.

Catching and cut-off hazard locations in the machine are shown in the following figure. Measures to avoid such hazards are also described.



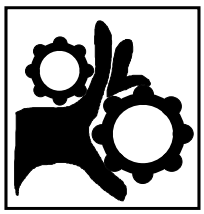
Catching/cut-off hazard locations in the machine

The machine has drives in such sections as the Z1-axis, Z2-axis, T-arm, T-shutter, robot arm, washing unit, and spinner cover sections.



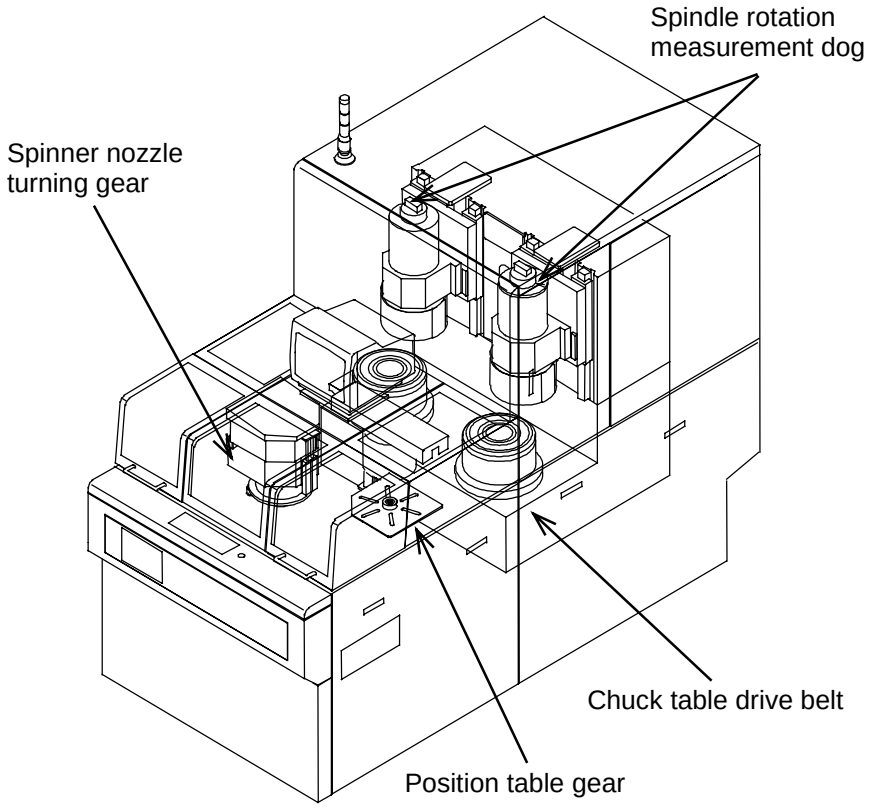
Inherently hazardous area	- Z1-axis / Z2-axis - T-arm rotating area - T-arm extension/contraction area - T-shutter - Robot arm - Spinner cover vertical motion area - Washing unit drive area
Cause of hazard	If your hands or fingers are positioned in a motor-driven or air-cylinder operated section in action, they may be caught or cut off.
Avoidance method	Machine maintenance works must be performed by qualified maintenance personnel. Before performing a maintenance work, make sure that the motor driven or air-cylinder operated sections are brought to a complete stop.

Capture hazard locations in the machine are shown in the following figure. Measures to avoid such hazards are also described.



Capture hazard locations in the machine

The machine has rotary drives in such sections as the chuck table drive belt, position table gear, spinner nozzle turning gear, and spindle rotation measurement dog.



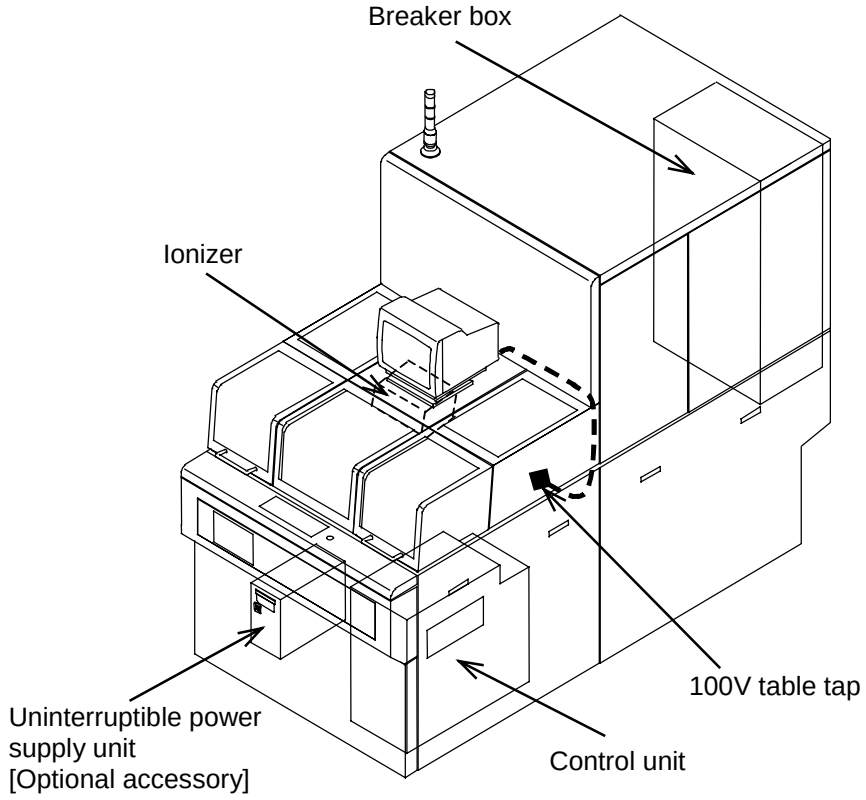
Inherently hazardous area	- Chuck table drive belt - Position table gear - Spinner nozzle turning gear - Spindle rotation measurement dog
Cause of hazard	If your hands or fingers are placed in a rotary section in action, they or your clothing may be captured. As a result, you may get severely injured.
Avoidance method	Machine maintenance works must be performed by qualified maintenance personnel. Before performing a maintenance work, make sure that the drive sections are brought to a complete stop.

Electric shock hazard locations in the machine

Electric shock hazard locations in the machine are shown in the following figure. Measures to avoid such hazards are also described.

Hazardous sections where you may receive an electric shock

This machine has the breaker box, control unit, uninterruptible power supply unit (optional accessory), Ionizer, and 100V table tap which potentially pose electric shock hazard.



Inherently hazardous area	- Breaker box - Control unit - Uninterruptible power supply unit [optional accessory] - Ionizer - 100V table tap
Cause of hazard	If you come into contact with an energized section, you may receive an electric shock that could be fatal.
Avoidance method	Before performing maintenance on any of the above units, turn OFF the facility-side power and lock it out with a padlock or the like instrument.

5. Emergency OFF Switch (EMO Switch)

Function of EMO switch

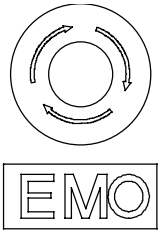
The EMO switch is a device to shut OFF machine power and avoid hazardous consequences when the machine becomes abnormal or faulty during its operation.

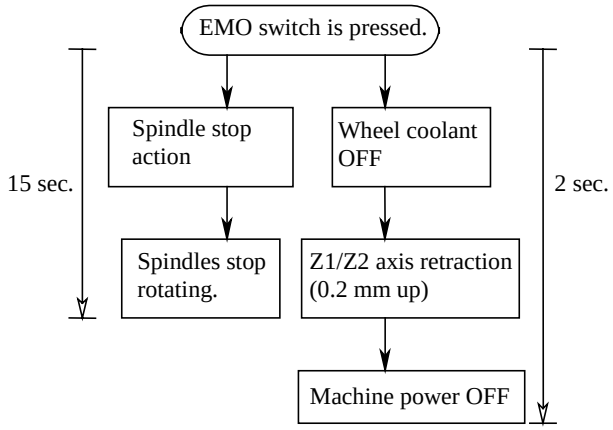
WARNING

- It takes up to 15 seconds for a rotating spindle to come to a stop. To open the grinding section side cover after the EMO switch is pressed, wait for at least 15 seconds. If your hands or fingers come into contact with a rotating spindle, they may be cut off.
- The machine power is automatically turned OFF upon emergency off switch activation. However, the power is still supplied to the main breaker primary side and the EMO circuit. Do not position your hands in an energized section, or you may receive an electric shock that could result in severe injury or death.
- The EMO switches provided on each side (1 each) and on the rear side (1) of the machine are positioned relatively high to reach. Use adequately wide (flat) steps as needed during maintenance so that the EMO switches are easily accessible all the time.

NOTICE

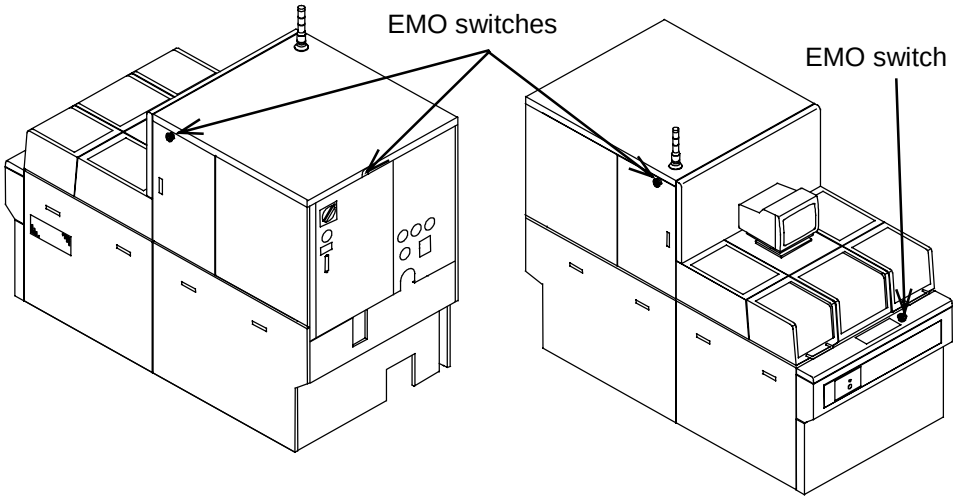
Once a spindle enters the free-running state (in which the rotation cannot be braked) due to power failure or error occurrence, it takes about 30 minutes for the spindle to come to a complete stop. Make sure that air supply is not stopped until the spindle completely stops rotating.



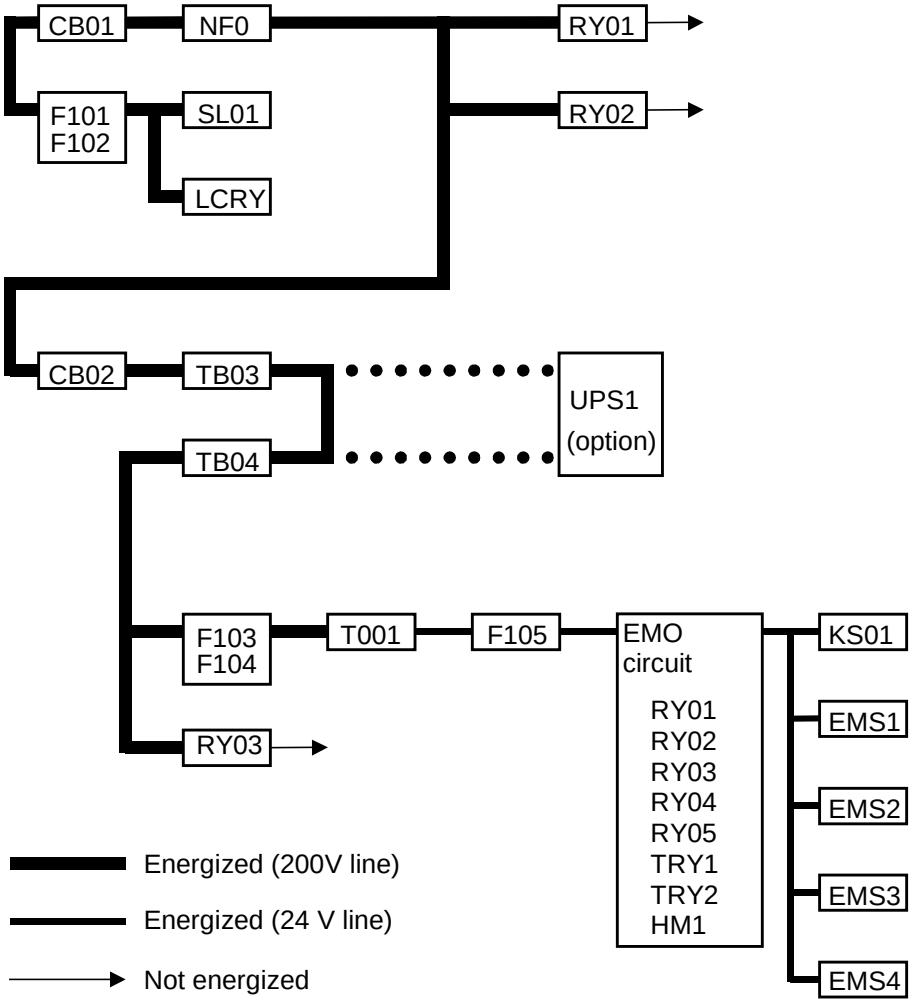
To activate EMO switch	Press the EMO switch button.
To reset EMO switch	Rotate the EMO switch button clockwise (in the direction of the arrows). The switch then pops up to clear the emergency OFF condition.
What will happen after EMO switch is pressed	The following process follows EMO switch activation. It takes about 15 seconds for a rotating spindle to come to a complete stop. 

EMO switch locations

The locations of the EMO switches are indicated here.



Energized lines during emergency power OFF



6. Power Circuit Breaker

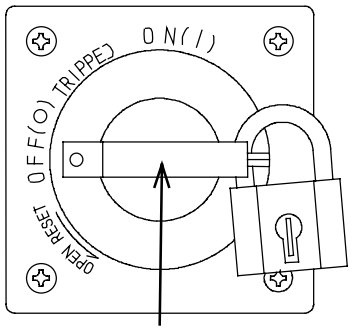
About power circuit breaker

When a current beyond the rated capacity flows through the machine during its operation, the power circuit breaker automatically shuts OFF the power supply to the machine.

Specifications and ratings of power circuit breaker

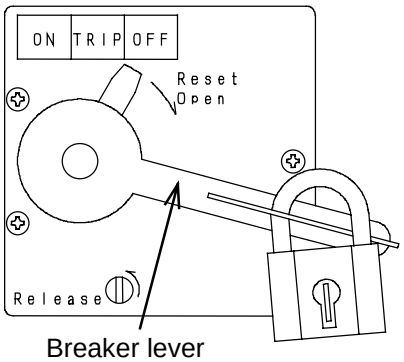
Specifications and electrical ratings of the power circuit breaker of the machine are described here.

[Standard type]



Breaker lever

[SEMI type]



Breaker lever

ON	Turns ON the machine power.
TRIPPED	If a larger-than-the-rated current is loaded, the breaker lever automatically moves to this position to turn OFF the machine power. (To turn the power back ON, move the lever to "OFF" position once and then move it to "ON" position.)
OFF	Turns OFF the machine power. To turn the power back ON, wait at least one minute and then move the lever to "ON" position.
OPEN/RESET	To open the breaker box, move the lever to this position and then pull it toward you.

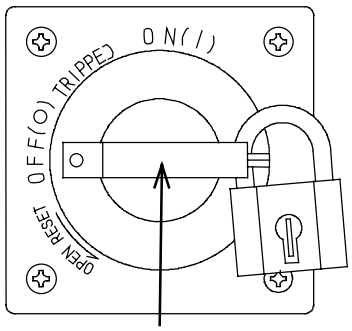
[Electrical ratings of the breaker]

	Standard type	SEMI type
AC supply system	3-phase, 3-wire	3-phase, 3-wire
Number of poles	3	3
Rated current	60 A	60 A
Interrupting capacity	10 kA (at 230 VAC) (IEC947-2)	22 kA (at 240 VAC) (UL489)

Power circuit breaker lever lockout

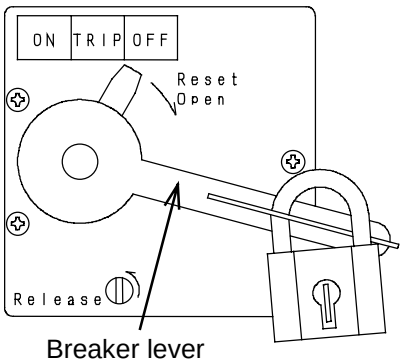
Before you perform a maintenance work with the machine power turned OFF, lock out the power circuit breaker lever with a padlock or the like to prevent the machine from being inadvertently activated by other persons.

[Standard type]



Breaker lever

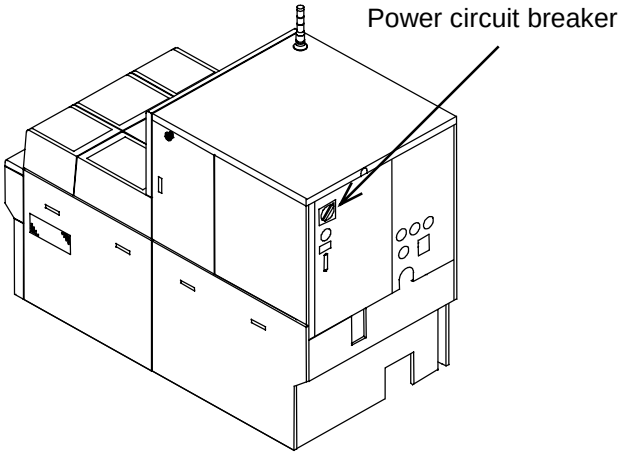
[SEMI type]



Breaker lever

Power circuit breaker location

The location of the power circuit breaker is shown in the figure below.



7. Interlock Mechanism

About interlock mechanism

The interlock mechanisms of the machine are the devices that detect impending hazards to avoid their consequences.
This section describes the locations of the interlocks in the machine as well as the contents of the hazards they detect.

WARNING

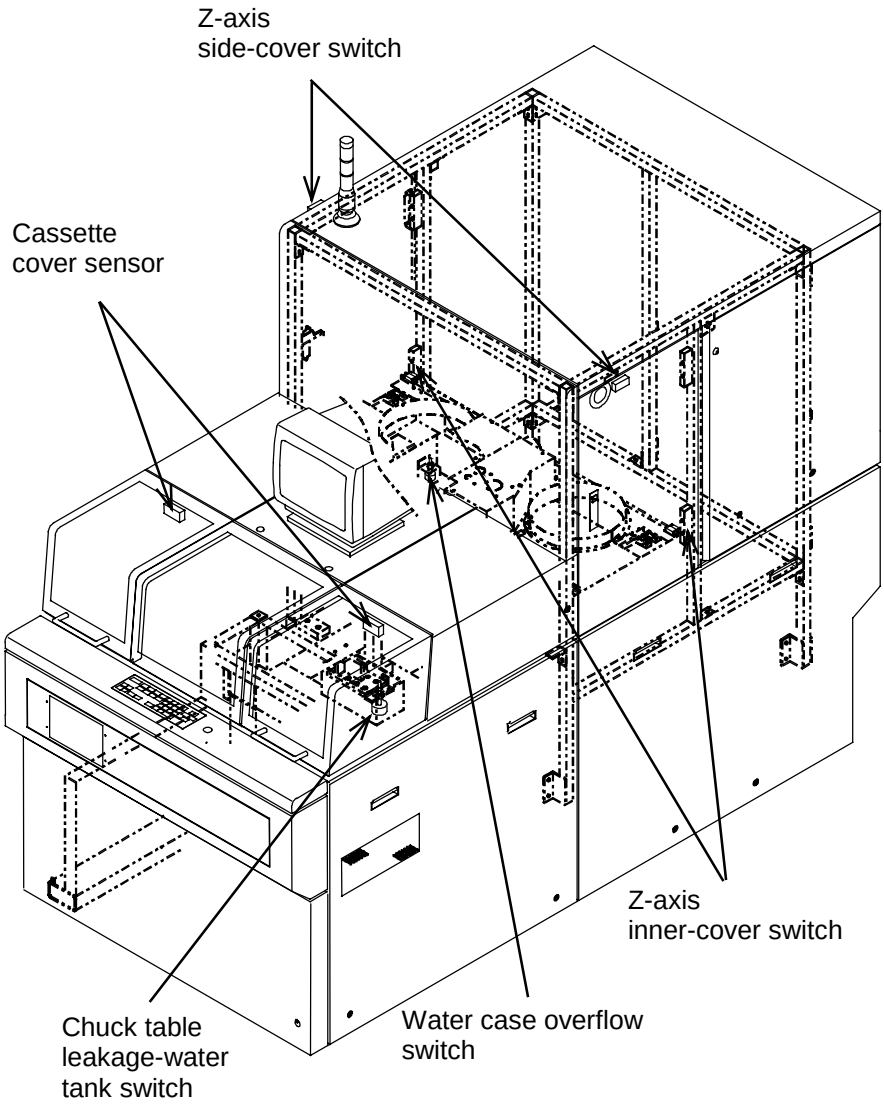
- It takes up to 15 seconds for a rotating spindle to come to a standstill. Never position your hands or fingers near its rotary section while the spindle is still rotating. Before performing a maintenance or inspection work, make sure that spindle rotation is completely stopped.
- If any water leak is detected, keep away from the wet portions of the machine or floor, shut off the machine power and facility power supplies, and lock them out with padlocks or the like. If you come into contact with the machine body or the floor wet with water, you may receive an electric shock that could result in serious injury or death. Even if the machine is turned OFF, it remains energized until the facility-side power supply is shut OFF.

NOTICE

It takes up to 15 seconds for a rotating spindle (7000 min^{-1} (rpm)) to come to a standstill. Air supply must not be shut off until spindle rotation is completely stopped.

Locations of interlock devices

This machine incorporates the following switches and sensors that function as safety interlock mechanisms.



Contents of hazards detected by interlock devices

Hazards detected by the interlock devices of this machine are classified as follows. Actions taken by the machine upon hazard detection (during initialization, warming up and full auto operation) are also described.

Hazard detector	Hazard category	Hazardous section	Hazard level	Actions taken upon hazard detection
(1) Z-axis inner-cover switch	 Cutoff hazard  Catching hazard	- Spindle rotation section - Z1-axis drive - Z2-axis drive - T-shutter drive	[2]	- The Z1- and Z2-axes move upward to retreat. - The spindle rotation and wheel coolant supply systems come to an immediate stop. * It takes about 15 seconds for a spindle rotating at a speed of 7000 min^{-1} (rpm) to come to a standstill.
(2) Z-axis side-cover switch	 Cutoff hazard  Catching hazard	- Spindle rotation section - Z1-axis drive - Z2-axis drive - T-shutter drive	[2]	- The Z1- and Z2-axes move upward to retreat. - The spindle rotation and wheel coolant supply systems come to an immediate stop. * It takes about 15 seconds for a spindle rotating at a speed of 7000 min^{-1} (rpm) to come to a standstill.
(3) Cassette cover sensor	 Catching hazard	- Robot drive	[2]	- The robot operation comes to an immediate stop.
(4) Water case overflow switch	 Electric shock hazard due to water leakage	- Machine main body - Floor	[2]	- The Z1- and Z2-axes move upward to retreat. - The spindle rotation and wheel coolant supply systems come to an immediate stop. - Machine power is shut OFF.
(5) Chuck table leakage-water tank switch	 Electric shock hazard due to water leakage	- Machine main body - Floor	[2]	- The Z1- and Z2-axes move upward to retreat. - The spindle rotation and wheel coolant supply systems come to an immediate stop. - Machine power is shut OFF.

The definitions of the detected hazard levels are as follows.

Hazard level	Hazard condition
[1]	A grave hazard to the human body exists (an impending hazardous situation which, if not avoided, will result in death or severe injury).
[2]	A hazard to the human body exists (a potentially hazardous situation which, if not avoided, may result in death or severe injury).
[3]	A hazard to the human body exists (a potentially hazardous situation which, if not avoided, may result in minor or moderate injury).

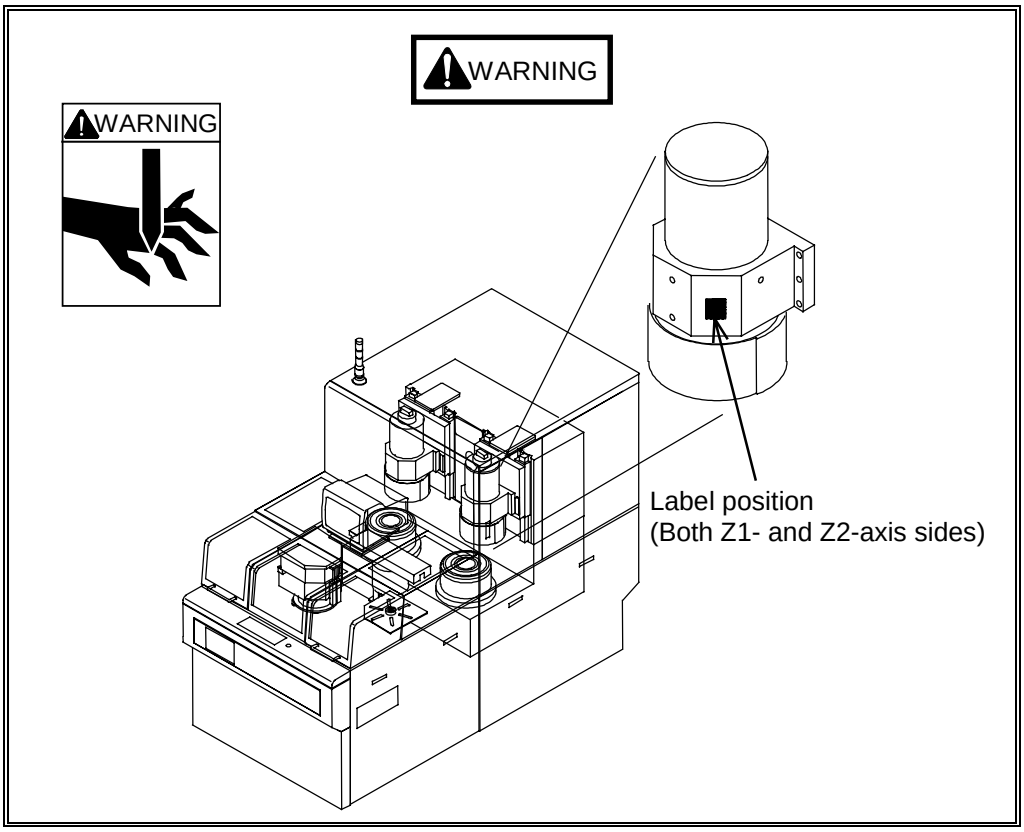
8. Safety Labels

About safety labels

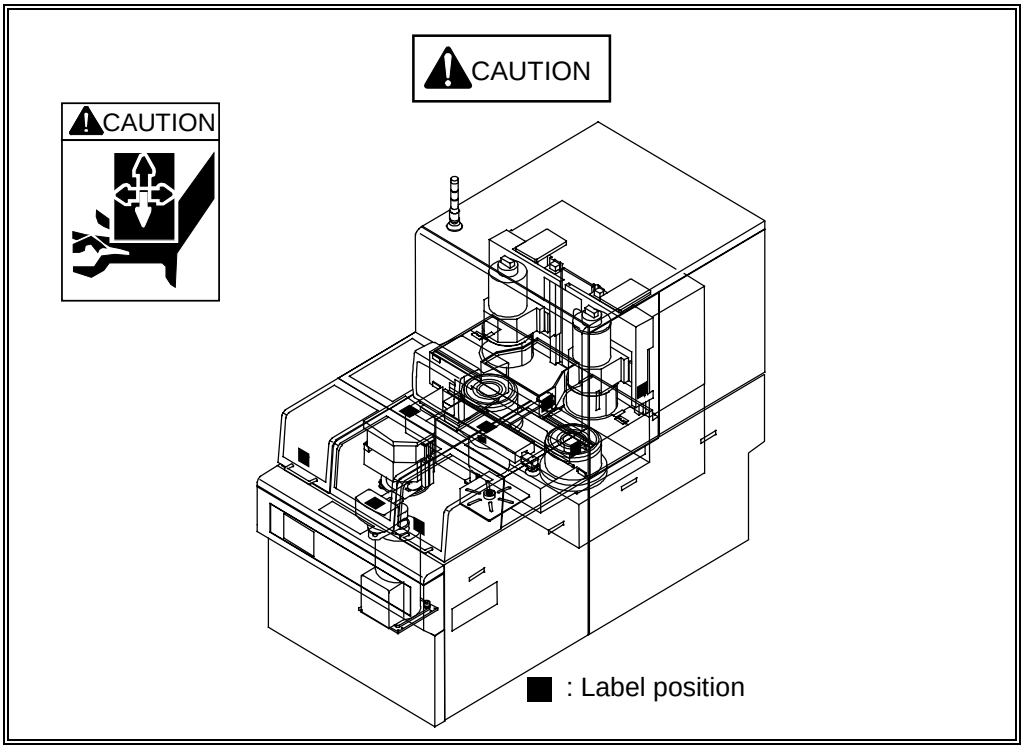
The safety labels carrying hazard descriptions are attached to the locations in the machine where potential hazards exist and they are defined as follows.

Label	Hazard Level	Meaning of Label
Rotary Blade Label 	WARNING	There is a danger that your hands or fingers may be cut off by the rotating blade. Observe the following precautions for at least 15 seconds after stopping spindle rotation. - Do not position your hands or fingers near the wheel. - Keep the safety cover closed.
Capture Label 	CAUTION	There is a danger that your hands, fingers or clothing may be captured and, as a result, wounded or cut off. Do not position your hands or fingers in any drive section.
Driving Section Label 	CAUTION	There is a danger that your hands or fingers may get caught in a drive section. Do not position your hands or fingers in any drive section.
Electrical Shock Hazard Label 	WARNING	A risk of receiving an electric shock exists. Be alerted.
General Label 	WARNING	Warnings (including danger/caution) in general

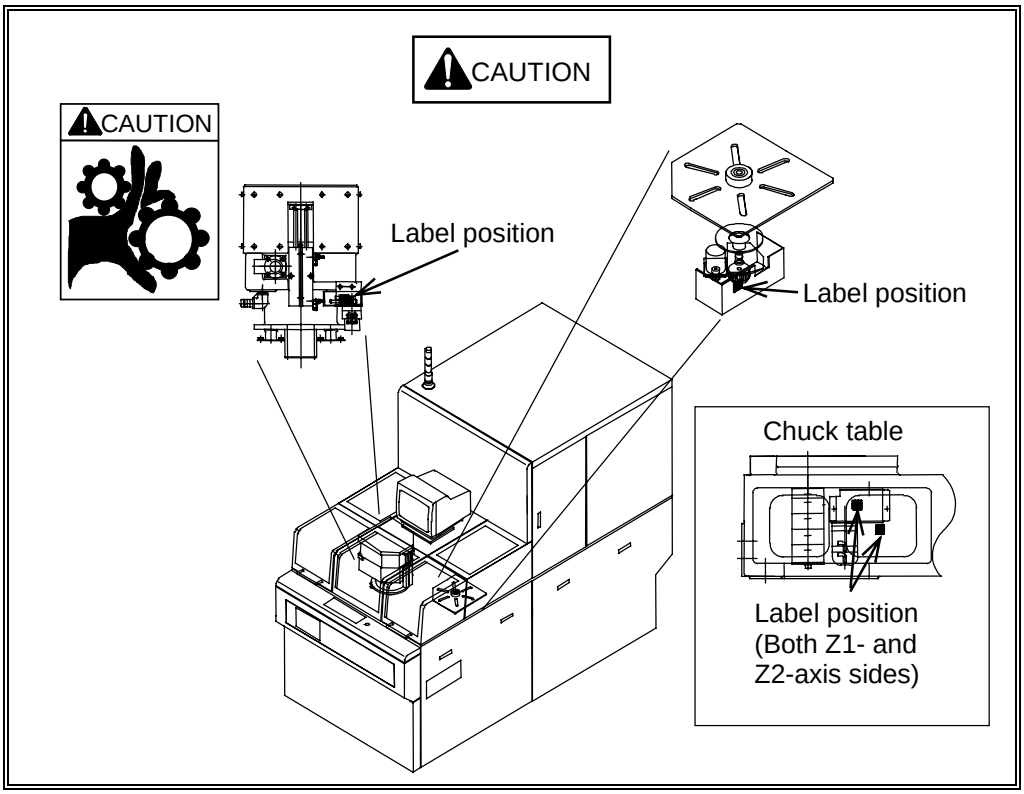
Locations of labels for warning against rotary blade



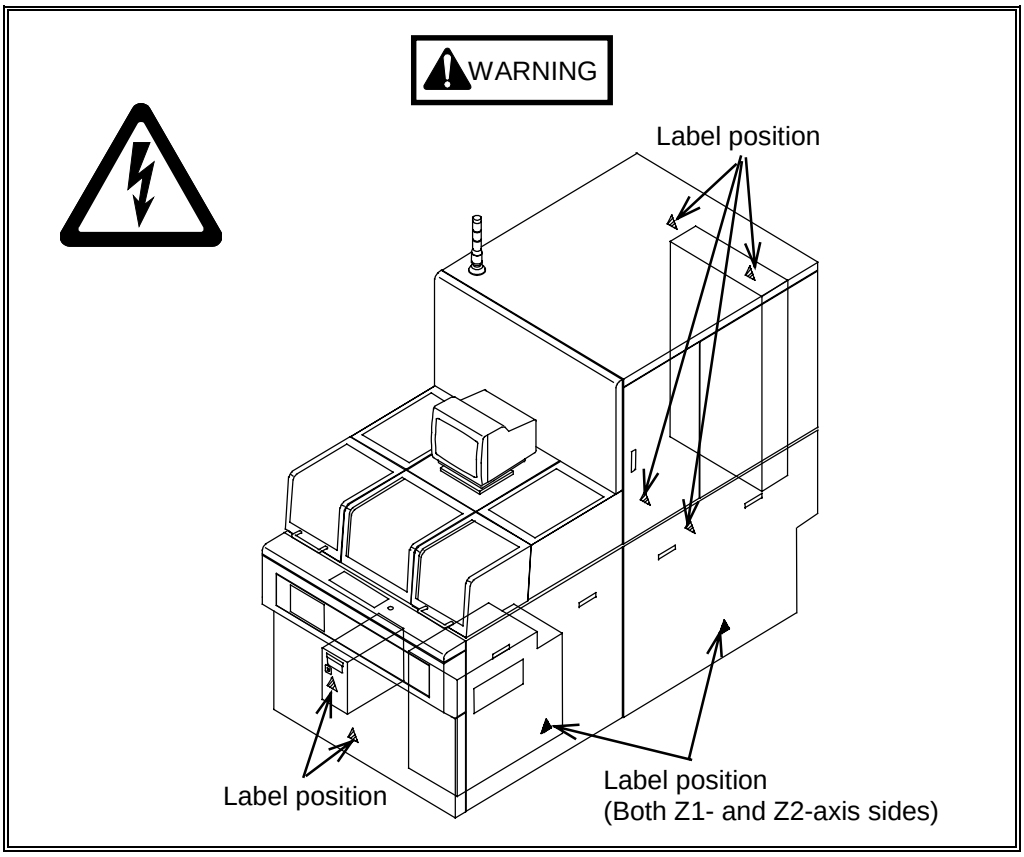
Locations of labels for cautioning against drive section



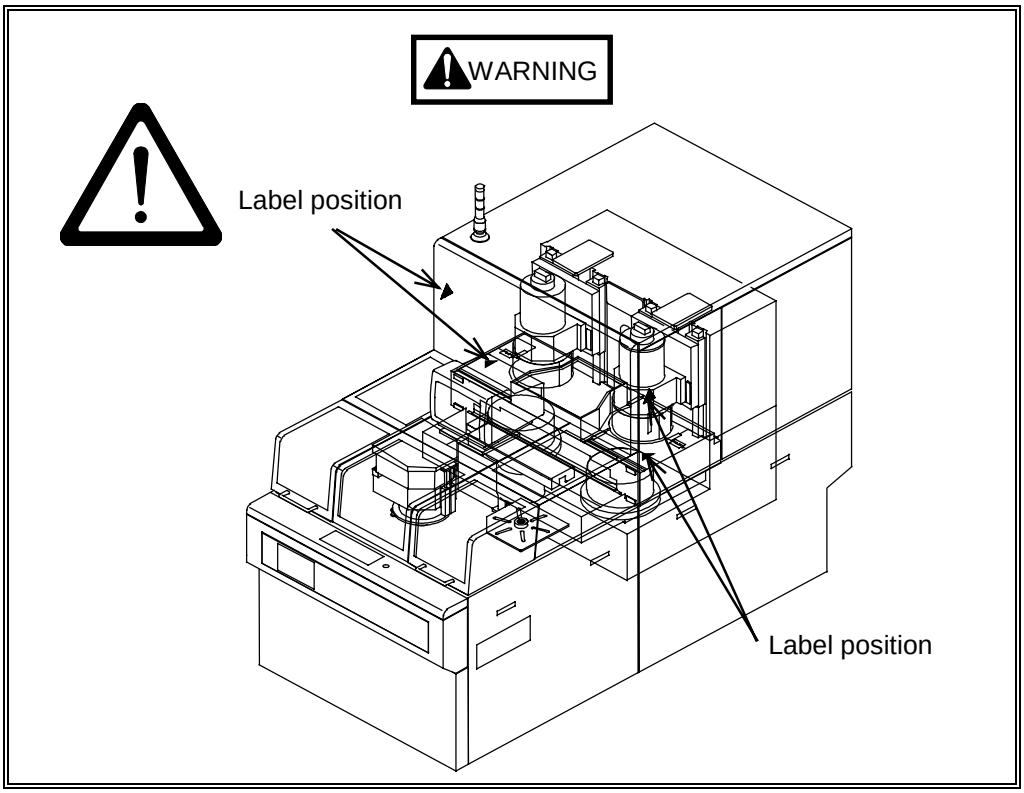
Locations of labels for cautioning against capture



Locations of labels for warning against electric shock



Locations of general warning labels



B. WHOM TO CONTACT IN AN EMERGENCY

Contents of This Chapter

This chapter shows addresses of DISCO offices to contact in an emergency. Immediately get in touch with the following nearest DISCO or DISCO Service Office if a situation arises where an accident has occurred or might occur that involves injury or death during the operation of DISCO equipment.

Section No.	Regions	Locations
1	JAPAN	Tokyo
		Osaka
		Kyusyu
		Sendai
		Suwa
		Nagoya
2	ASIA	Singapore
		Thailand
		Malaysia
		Philippines
		Korea
		Taiwan
		Hong Kong
		India
		China
3	U.S.A.	U.S.A.
		Canada
4	EUROPE	Germany
		France
		United Kingdom
		Israel

1. JAPAN OFFICE ADDRESS

JAPAN

DISCO CORPORATION

Japan Head Office	14-3, Higashi Kojiya 2-chome Ota-ku, Tokyo 144-8650 Phone 81-3-3743-0111 FAX 81-3-3743-5810
Overseas Sales / PS Company	Phone 81-3-3743-5813
Osaka Branch Office	3-12, Nishi Nakajima 6-chome Yodogawa-ku, Osaka 532-0011 Phone 81-6-6302-4501 FAX 81-6-6302-0258
Kyushu Branch Office	16-14, Kamisuizenji 2-chome Kumamoto-shi 862-0951 Phone 81-96-385-3411 FAX 81-96-384-1410
Sendai Regional Office	2nd. Floor, Sendai Bldg. Ekimae-kan 1-17, Itsutsubashi 1-chome Aoba-ku, Sendai-shi, Miyagi 980-0022 Phone 81-22-262-3345 FAX 81-22-262-3346
Suwa Regional Office	3rd. Floor, Center Bldg. 12, Okita-machi, 3-chome Suwa-shi, Nagano 392-0013 Phone 81-266-52-0814 FAX 81-266-52-0815
Nagoya Regional Office	1st. Floor, Kitamura No.4 Bldg. 80, Akegaoka, Meito-ku Nagoya-shi, Aichi 465-0033 Phone 81-52-776-6350 FAX 81-52-776-6380

2. ASIA OFFICE ADDRESS

SINGAPORE

DISCO HI-TEC (SINGAPORE) PTE., LTD.

Blk 2 Kaki Bukit Ave 1
#03-06/08 Kaki Bukit Industrial Estate
Singapore 417938
Singapore
Phone 65-7473737
FAX 65-7450266

THAILAND

DISCO HI-TEC (THAILAND) CO., LTD.

16th Floor, Lao Peng Nguan Tower 1
333 Viphavadi-Rangsit Road
Lard Yao, Cnatuchak
Bangkok 10900, Thailand
Phone 66-2-6188441
FAX 66-2-6188440

MALAYSIA

DISCO HI-TEC (MALAYSIA) SDN. BHD.

21A Tingkat 1
Jalan USJ 10/1D UEP
47620 Subang Jaya
Selangor, Darul Ehsan, Malaysia
Phone 60-3-563-72606
FAX 60-3-563-72439

Penang Regional Office

1-02-01 Persiaran Bukit Jambul Satu
Kompleks Sri Relau
11900 Penang, Malaysia
Phone 60-4-644-5502
FAX 60-4-645-2285

PHILIPPINES

AUROTECH SYSTEMS (PHIL'S), INC.

121 Buencamino Street
Alabang, Muntinglupa
Philippines
Phone 63-2-809-0155
FAX 63-2-807-7419

KOREA

D.I. CORPORATION

Disco Sales & Service Department

D.I Building
58-6, Nonhyun-Dong
Kangnam-ku, Seoul, Korea
Phone 82-2-546-5501
FAX 82-2-3446-8087

TAIWAN

HAPPY POLE, LTD.

8th Floor, 8-1, No.41
Section 2, Roosevelt Road
Taipei, Taiwan R. O. C.
Phone 886-22-3960651
886-22-3960652
886-22-3966717
FAX 886-22-3943943

HONG KONG (CHINA)

NEW TRONICS CO., LTD.

Flat F, 11th Floor, Valiant Ind. Bldg.
2-12 Au Pui Wan Street, Fotan
Shatin, N.T., Hong Kong
Phone 852-26871431
FAX 852-26874283

INDIA

H. FILLUNGER & CO., PVT. LTD.

Post Box No.2526
11/4, Pusa Road
New Delhi 110 005
India
Phone 91-11-5787428
91-11-5726052
FAX 91-11-5762961

CHINA

DISCO TECHNOLOGY (SHANGHAI) CO., LTD.

4th Floor, Block A, FaZhan Mansion
No. 51 RiJing Road
WaiGaoQiao Free Trade Zone
Shanghai, P. R. China 200131
Phone 86-21-58662516
FAX 86-21-58662517

3. U.S.A. OFFICE ADDRESS

U.S.A.

DISCO HI-TEC AMERICA, INC.

USA Head Office	3270 Scott Blvd. Santa Clara, CA 95054-3011 U. S. A. Phone 1-408-987-3776 FAX 1-408-987-3785
Eastern Regional Sales & Service Office	360 Harvey Road, Building B, Unit 202 Manchester, NH 03103 U. S. A. Phone 1-603-656-9019 FAX 1-603-656-9018
Southeastern Regional Sales & Service Office	4460 Brookfield Corporate Drive, Suite B Chantilly, VA 20151 U. S. A. Phone 1-703-815-2727 FAX 1-703-815-3573
Central Regional Sales & Service Office	4392 Sunbelt Drive Addison, TX 75001 U. S. A. Phone 1-972-267-9500 FAX 1-972-267-5612
Southwestern Regional Sales & Service Office	4411 South 40th Street, Suite D-5 Phoenix, AZ 85040-2950 U. S. A. Phone 1-602-431-1412 FAX 1-602-431-1437
Northwest Regional Sales & Service Office	7931 SW Cirrus Drive Beaverton, OR 97008-5971 U. S. A. Phone 1-503-644-0323 FAX 1-503-643-8108

LYONS & ASSOCIATES

832 Bellevue Avenue
Hulmeville, PA 19047
U. S. A.
Phone 1-215-750-6346
FAX 1-215-752-3216
Territory in charge: PA, DE, MD, VA, WV

MATRIX ASSOCIATES

303 Sweetwater Blvd. So.
Longwood, FL 32779
U. S. A.
Phone 1-407-862-1120
FAX 1-407-862-1123
Mobile phone 1-407-421-2341
Territory in charge: FL, GA, AL

LYONS & ASSOCIATES

620 Swamp Road
Doylestown, PA 18901
U. S. A.
Phone 1-215-345-7915
FAX 1-215-345-8089
Territory in charge: NY, NJ

LYONS & ASSOCIATES

c/o Resources for Electronics
24577 Green Valley Parkway
Elkhart, IN 46517
U. S. A.
Phone 1-219-875-1133
FAX 1-219-875-6873
Territory in charge: WI, IL, IN (Area Code 219 only)
MI (Area Codes 517, 616 only)

LYONS & ASSOCIATES

c/o Resources for Electronics
7800 John Elwood Drive
Centerville, OH 45459
U. S. A.
Phone 1-937-434-4941
FAX 1-937-434-9445
Territory in charge: OH, KY,
IN (Except Area Code 219)
MI (Except Area Codes 517, 616)

NET MERCURY

13438 Floyed Circle
Dallas, TX 75243
U. S. A.
Phone 1-972-783-1501
FAX 1-972-783-1574
Territory in charge: North half of TX, OK

NET MERCURY

2204 Forbes Drive, Suite 101
Austin, TX 78754
U. S. A.
Phone 1-512-835-2794
FAX 1-512-832-5274
Territory in charge: South half of TX, AR, LA, MO, KS

JOHN CRANE & ASSOCIATES

PMB 147
34522 No. Scottsdale Road, D-8
Scottsdale, AZ 85262
U. S. A.
Phone 1-480-488-9898
FAX 1-480-488-9848
Territory in charge: Mexico (Central & East)

SEMITORR MIDWEST

19175 Market Avenue
Belle Plain, MN 56011
U. S. A.
Phone 1-612-873-2873
FAX 1-612-873-2327
Territory in charge: MN, IA, NE, ND, SD

UKE ENTERPRISES

631 East Chapman Avenue
Orange, CA 92866
U. S. A.
Phone 1-714-633-0463
FAX 1-714-639-4359
Territory in charge: Southern CA (South of San Luis Obispo), Mexico (West)

U.S.A. (Continued)

UKE ENTERPRISES

4200 Beacon Place
Byron, CA 94514
U. S. A.
Phone 1-925-240-5483
FAX 1-925-513-3442
Mobile phone 1-408-209-9681
Territory in charge: Northern CA

SALES & SERVICE

17853 Santiago Blvd.
Bldg. 107, Suite 333
Villa Park, CA 92861
U. S. A.
Phone 1-714-532-6500
FAX 1-714-532-6131
Territory in charge: ID

CANADA

HEPAIRE PRODUCTS CORP.

P. O. Box 11026
Station "H"
Nepean, Ontario
Canada K2H7T8
Phone 1-613-831-3234
FAX 1-613-831-3235
Territory in charge: Eastern Canada

4. EUROPE OFFICE ADDRESS

GERMANY

DISCO HI-TEC EUROPE GmbH

Liebigstrasse 8
D-85551 Kirchheim b. Muenchen
Germany
Phone 49-89-90903-0
FAX 49-89-90903-199

FRANCE

DISCO HI-TEC FRANCE SARL

Provence Office

Espace Beauvalle-Bat. C
6, rue Mahatma Gandhi
F-13090 Aix-en-Provence
France
Phone 33-442910020
FAX 33-442910029

UNITED KINGDOM

DISCO HI-TEC UK LTD.

151 London Road
East Grinstead/West Sussex RH19 1ET
United Kingdom
Phone 44-1342-313165
FAX 44-1342-313177

ISRAEL

NEW TECHNOLOGY R.K. LTD.

3 Ben Gurion Street
P.O. Box 2227
Kfar-Azar 55000
Israel
Phone 972-3-6356650
FAX 972-3-6357750

C. INSTALLATION

Contents of this chapter

This chapter describes about the procedures to install and relocate the machine as well as the procedures to adjust the machine after installation/relocation.

The machine specifications and environmental requirements for installing the machine are also detailed.

Section No.	Title	Contents
1	Specifications and Environmental Requirements of the Machine	- Specifications of the machine - Installation space - Environmental requirements for installing the machine
2	Machine Installation	- Procedures to install the machine - Adjustment of the machine associated with installation
3	Machine Relocation	- Procedures to relocate the machine

1. Specifications and Environmental Requirements of the Machine

Summary of this section

This section describes the specifications of DFG841 as well as the environmental requirements for installing the machine such as site space and piping connection port locations.

Section No.	Title	Contents
1-1	Machine Specifications	- Specifications of DFG841
1-2	Dimensions and Weight of Machine on Delivery	- Dimensions and weight of the machine upon delivery
1-3	Environmental Conditions	- Environmental requirements for installing the machine
1-4	Piping and Wiring Diagram	- Connection points of the pipes and wires of the machine

1-1. Machine Specifications

Machine specifications

Specifications of DFG841 are described here.

Power requirements	Supply power	200 VAC ± 10 %, 3-phase, 50/60 Hz
	Power consumption	- during warming up : 2.1 kW - during grinding : 3.8 kW (The above values are reference values. They may vary depending on the operating conditions.)
	Maximum consumpiton	17 kVA
	Noise	Less than 2000 V with a pulse width at 500 ns (square wave)
	Ground	A ground connection must be made. The grounding method should comply with the applicable regulations of the area the machine is installed.
Air supply	Pressure	0.5 to 0.8 MPa (approx. 5.0 to 8.0 kgf/cm^2)
	Pressure variation	0.03 MPa or less (approx. 0.3 kgf/cm^2)
	Flow rate	300 L/min or higher (A.N.R.)
	Dew point	-15 °C or lower
	Residual oil content	0.1 ppm
Water	(For wheel coolant and cleaning use)	
	Water used	Deionized water
	Pressure	0.2 to 0.3 MPa (approx. 2 to 3 kgf/cm^2)
	Flow rate	15 L/min or higher
	Water temperature	Room temperature ± 2 °C (the maximum permissible hourly temperature variation is 1 °C)
	(for spindle coolant and vacuum pump water use)	
	Water used	City water or tap water (if the chlorine, iron, copper or sodium content or electrical conductivity is high, mechanical parts corrosion or piping tube clogging may be caused.)
	Pressure	0.2 to 0.3 MPa (approx. 2 to 3 kgf/cm^2)
	Flow rate	Spindle coolant water: 4 L/min or higher Vacuum pump water: 5 L/min or higher
	Water temperature	20 to 25 °C (the maximum permissible hourly temperature variation is 2 °C)

Exhaust	Displacement	4 m^3/min (at the duct hose connection port of the machine main body when static pressure is as below mentioned)
	Static pressure	0.4 kPa (at the duct hose connection port of the machine main body)
	Duct hose connection port	Machine main body: 88.9 mm ID x 100.1 mm OD
Machine dimensions	Main body	1,050 (W) × 2,150 (D) × 1,710 (H) mm (excluding protrusions)
	Vacuum/ coolant unit (DVC010)	470 (W) × 1,050 (D) × 1,235 (H) mm
Machine dry weight	Main body	Approx. 2,300 kg
	Vacuum/ coolant unit (DVC010)	Approx. 100 kg
Paint color		Munsell No. 2.5 GY 8.0/0.5 and N2.4

1-2. Dimensions and Weight of Machine on Delivery

Dimensions and weight of the machine

Dimensions and weight of the machine upon delivery are as follows.

	Dimension (mm)	Weight (kg)
Main body	1,050 (W) × 2,150 (D) × 1,710 (H)	Approx. 2,300
Vacuum/ coolant unit (DVC010)	470 (W) × 1,050 (D) × 1,235 (H)	Approx. 100

1-3. Environmental Conditions

Summary of this section

This section describes about the environmental requirements for installing the machine including the installation space.

Section No.	Title	Contents
1-3-1	Installation Space	- Installation drawing of the machine with required space indications
1-3-2	Environmental Conditions for Installation	- Environmental conditions required for installing the machine

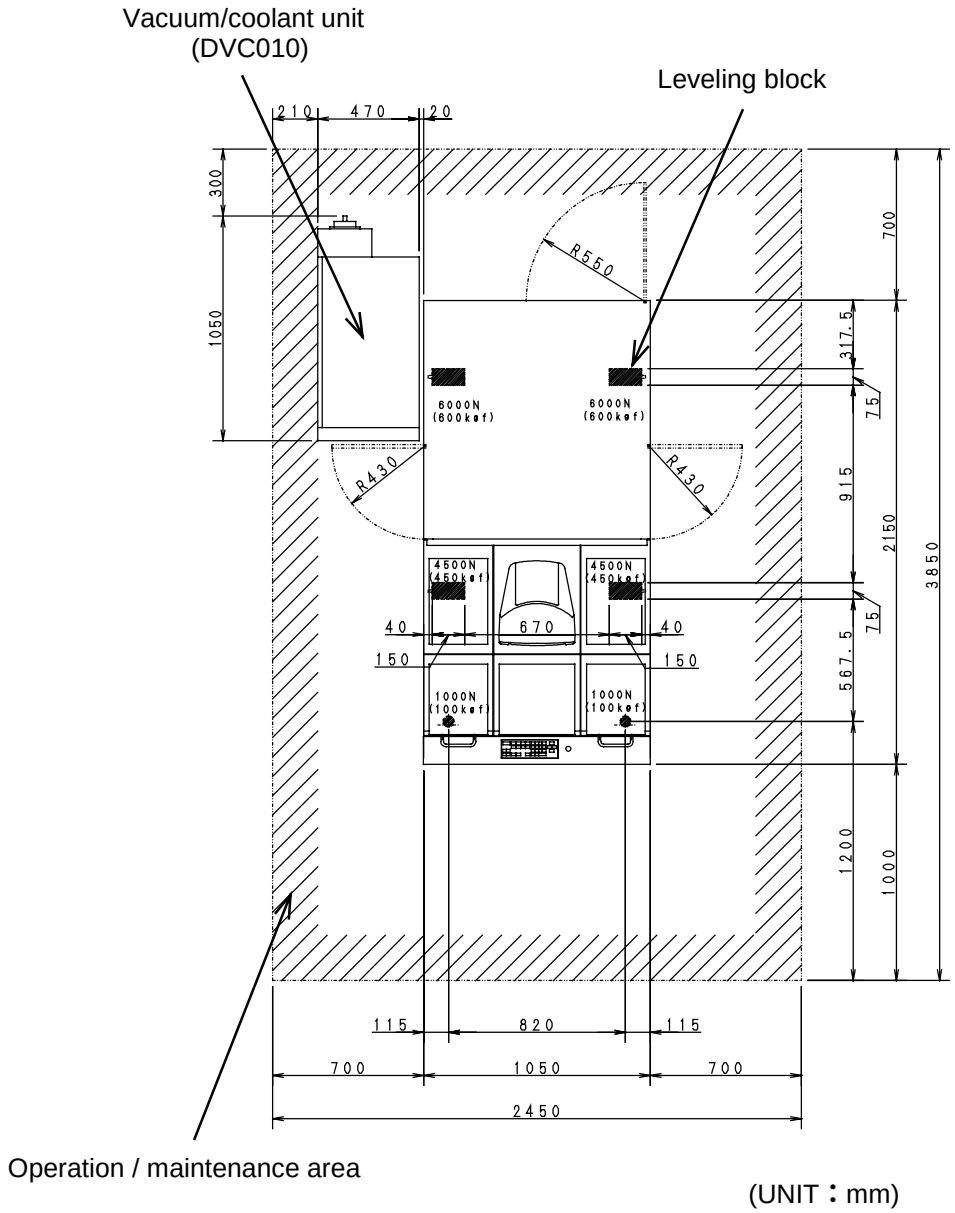
1-3-1. Installation Space

Considerations in selecting installation site

- Secure enough space taking operational and maintenance ease into account.
- Avoid places where temperature greatly changes.

Installation diagram (standard set up)

The installation diagram of DFG841 (standard set up) is described here.



(UNIT：mm)

1-3-2. Environmental Conditions for Installation

Environmental conditions required for installing the machine

Grinding accuracy of the machine is greatly affected by the environmental conditions in which the machine is installed. Make sure to use the machine in the following operating condition ranges.

Ambient temperature (room temperature)	20 to 25 °C (variation: ± 1 °C max.)
Ambient humidity	55 ± 15 % (non-condensing)
Wheel coolant temperature	Room temperature + 2 °C (hourly temperature variation: 1 °C max.)
Spindle coolant temperature	20 to 25 °C (hourly temperature variation: 2 °C max.)
Power requirements	200 VAC ± 10%, 3-phase - The employed power source must be free from significant voltage variations. - The employed power source must be free of noises equivalent to a voltage of 2000 V or higher at a noise stepping width of 500 ns. - A momentary power failure must not occur with the employed power source.
Vibration	Amplitude: 5 μm max. (10 Hz or lower) Acceleration: 0.02 m/s^2 max (10 Hz or higher)
Ground	A grounding connection must be made according to the associated regulations of the area the machine is installed.
Others	- Make sure that the air, water, and power sources and the water drain ports are positioned near the machine. - Ensure that the insides of the employed pipes and hoses are free of dirt. - Install the machine on the floor of adequate strength (refer to section 1-3-1, [Installation Space] in this chapter for the required load-carrying capacity of the floor). - Do not install the machine in places where noise, vibration, heat, or oil mist is generated or near fans and ventilation openings. - Machine anchors are optionally available. They are designed to provide human/equipment protection in the event of earthquake or other disasters. It is recommended that the installed machine be secured with these anchors.

1-4. Piping and Wiring Diagram

Summary of this section

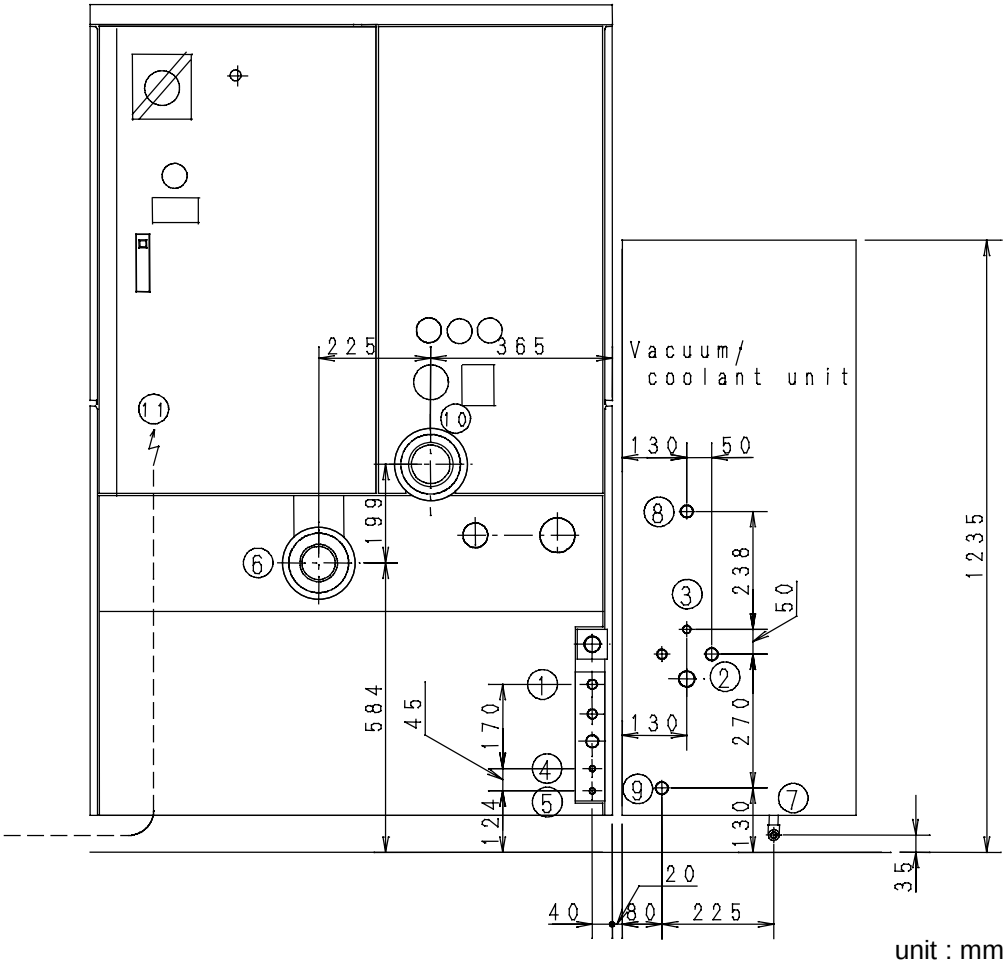
This section provides the piping/wiring diagram of the machine as well as the drawing of the piping/wiring connection ports on the machine rear side.

Section No.	Title	Contents
1-4-1	Piping and Wiring Connection Ports on Machine Rear Side	- Drawing of the piping and wiring connection ports on the machine rear side
1-4-2	Piping/Wiring Diagram	- Piping/wiring diagram (outline) of the machine

1-4-1. Piping and Wiring Connection Ports on Machine Rear Side

Piping and wiring connection ports on the machine rear side

The piping and wiring connection ports on the rear side of the machine are described here.



Piping and wiring connection ports on the machine rear side (Continued)

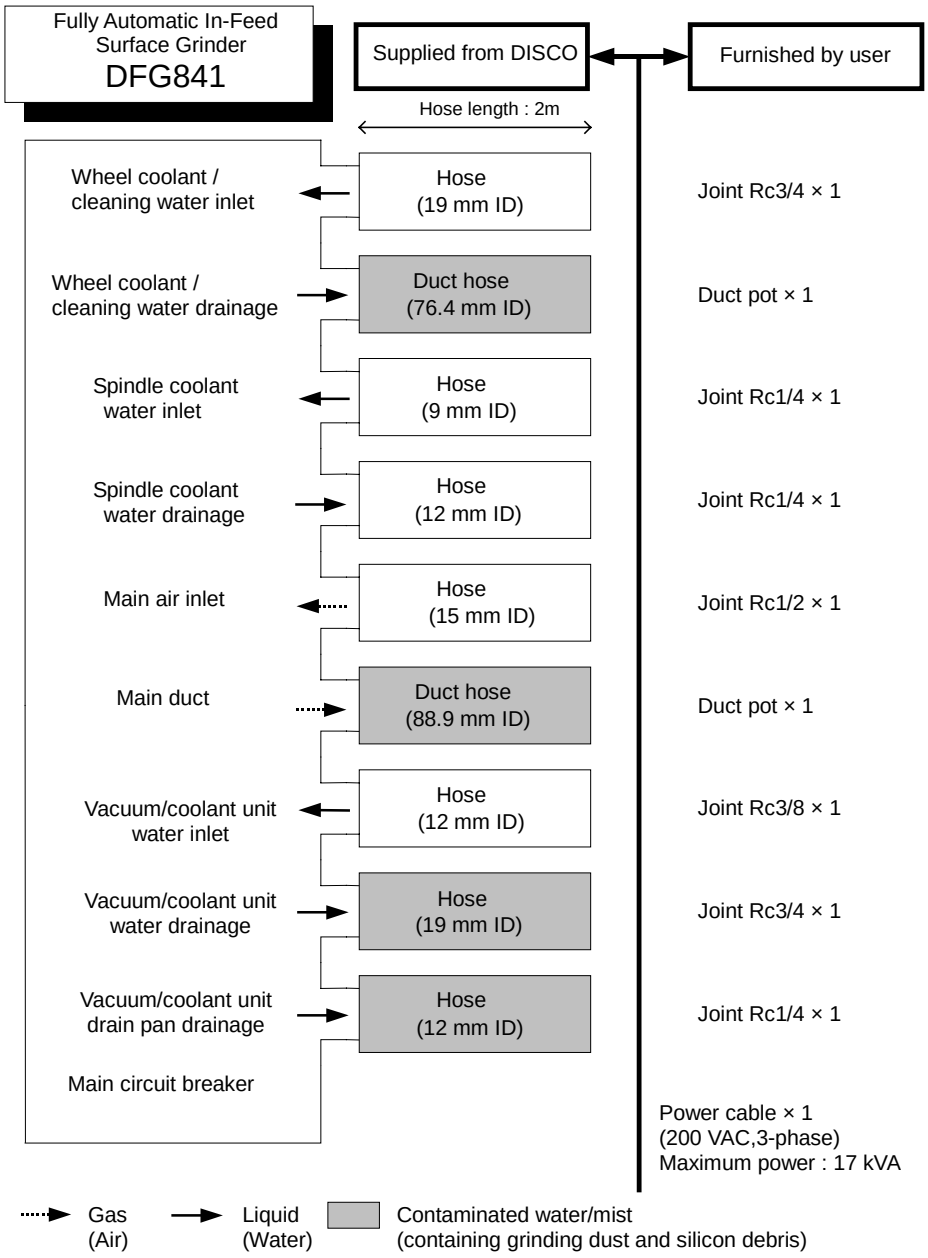
No.	Name	Applicable hose (Unit: mm) / cable	Connection Port (*1)
1	Main air supply	Braided hose (15 ID × 22 OD)	Rc1/2 (※2)
2	Wheel coolant/cleaning water supply	Braided hose (19 ID × 26 OD)	Rc3/4 (※2)
3	Vacuum/coolant unit water supply	Braided hose (12 ID × 18 OD)	Rc3/8 (※2)
4	Spindle coolant water supply	Braided hose (9 ID × 15 OD)	Rc1/4 (※2)
5	Spindle coolant water drainage	Braided hose (12 ID × 18 OD)	Rc1/4 (※2)
6	Wheel coolant/ cleaning water drainage	Duct hose (76.4 ID × 87 OD)	Pipe OD: 76 (※3)
7	Vacuum/coolant unit drain pan drainage	Braided hose (12 ID × 18 OD)	Rc1/4 (※2,※3)
8	Vacuum/coolant unit air exhaust (User-specified spec.)	Duct hose (32.4 ID × 38.6 OD)	Pipe OD: 32 (※4)
9	Vacuum/coolant unit water drainage	Braided hose (19 ID × 26 OD)	Rc3/4 (※3)
10	Main duct	Duct hose (88.9 ID × 100.1 OD)	Pipe OD: 90 (※3)
11	Power supply	Cable（AWG4）	R22-8

(*1) Diameter of the hose or piping screw to be furnished by the user.
(*2) Connection port of hard piping to be made by the user.
(*3) Discharges contaminated water or mist that contains grinding dust or silicon debris.
(*4) For outdoor exhaust use (user-specified spec.)
In the standard set up, the silencer is mounted here.

1-4-2. Piping/Wiring Diagram

Piping/wiring diagram

The outlined piping and wiring diagram of the machine (standard type) is described here.



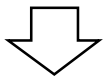
- No optional piping is included in the above diagram.
- The indoor-type system is employed for vacuum pump exhaust unless otherwise specified by the user. If you want to employ the outdoor-type exhaust system, contact your nearest DISCO office or DISCO service office.
- The connection accessories (hard piping, etc.) to be furnished by the user may differ from the ones indicated in the above diagram depending on the machine installation site conditions and connection method. Contact your nearest DISCO office or DISCO service office for details.
  The swage lock type is recommended for the joints to be used.

2. Machine Installation

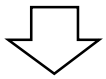
Operation flow

This section describes about the procedures to install the machine in the flow of the operation steps as described below.

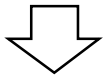
2-1 Hoisting and Lowering the Machine



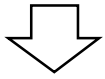
2-2 Transferring the Machine



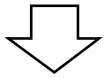
2-3 Installation of Leveling Screws



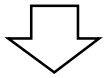
2-4 Leveling the Machine



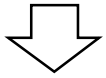
2-5 Installation of Machine Anchors [Optional Accessory]



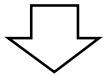
2-6 Piping Connection



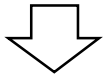
2-7 Electric Wiring Connection



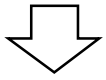
2-8 Air Supply



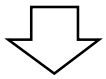
2-9 Removal of Retainers Used for Machine Transportation



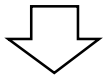
2-10 Installation of Pilot Lamp and Machine Outer Covers



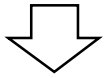
Operation flow (Continued)



2-11	Power Supply



2-12	Turning ON the Machine Power



2-13	Wheel Coolant and Spindle Coolant Water Supply

Safety precautions in installing the machine

WARNING

- Due to the nature of its processing characteristics, the machine may produce harmful substances depending on the types of wafers it grinds.
  Air exhaust, water drainage, and contaminant control/disposal must be properly implemented in compliance with the applicable environmental protection codes.
- Disco provides the optional machine anchors for human/equipment protection in case of earthquake or other disasters. It is recommended that the installed machine be secured with these anchors.

2-1. Hoisting and Lowering the Machine

Operation flow

This section describes about the procedures to hoist and lower the machine using a crane.

Prior to starting the work

The following jigs and equipment should be readied to hoist and lower the machine by crane.

Crane (rated for a hoisting load of 3,000 kg or heavier)
Dedicated hoisting jig set (See the table below.)
Safety shoes, protective gloves
Allen wrench (10 mm)

(Composing parts of the dedicated hoisting jig set)

Part name	Part No.	Qty.
Hoisting jig	MOENJ003	1
Shackle	MOCAJ006--A	4
Shackle	MOENJ035	4
Sling	MOENJ037	2
Sling	MOENJ038	4
Hook	MOENJ006	4
Hexagon socket-head screw	MGSSM12035U	16
Washer	MGW-M12U	16

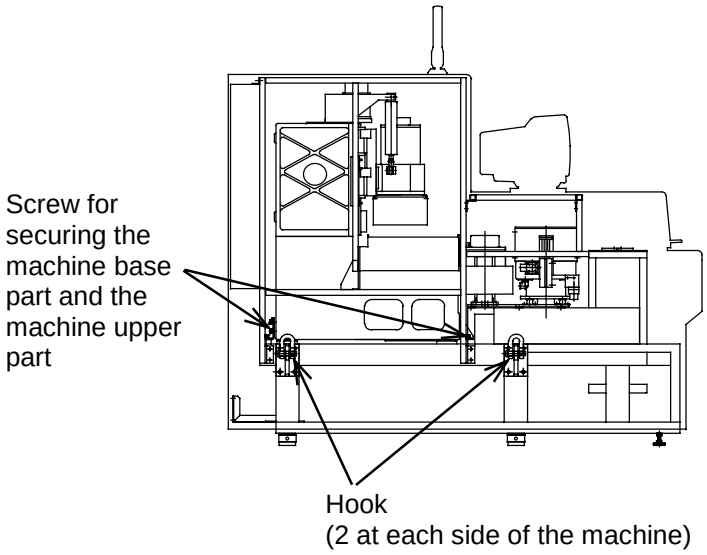
Safety precautions in hoisting and lowering the machine

DANGER

While the machine is hoisted or lowered, clear the area beneath and around the machine. If the machine should fall, a person in such area may be crushed to death or severely injured.
Note that the machine weighs approximately 2,300 kg. Ensure that the employed crane is rated for a hoisting load of 3,000 kg or heavier and withstands the machine weight, boom length and hoisting angle.

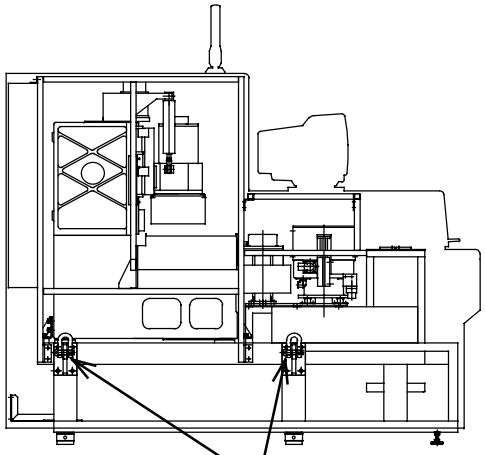
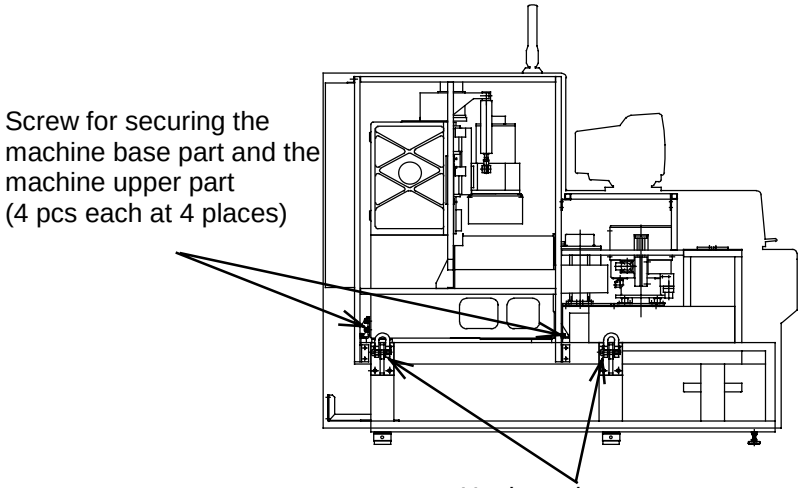
WARNING

- Make sure to use the designated hoisting jigs only to hoist the machine. If you use any other jigs having inadequate strength, they may break and cause the machine to lose balance and fall, thereby severely injuring or killing a person nearby or damaging the machine.
- If any of the screws securing the hooks to the machine comes off during machine hoisting, it may cause the machine to lose balance and fall. Check to make sure that those retaining screws (M12 × 4 pcs per hook) and the screws securing the machine base part and the machine upper part are securely fastened before hoisting the machine.

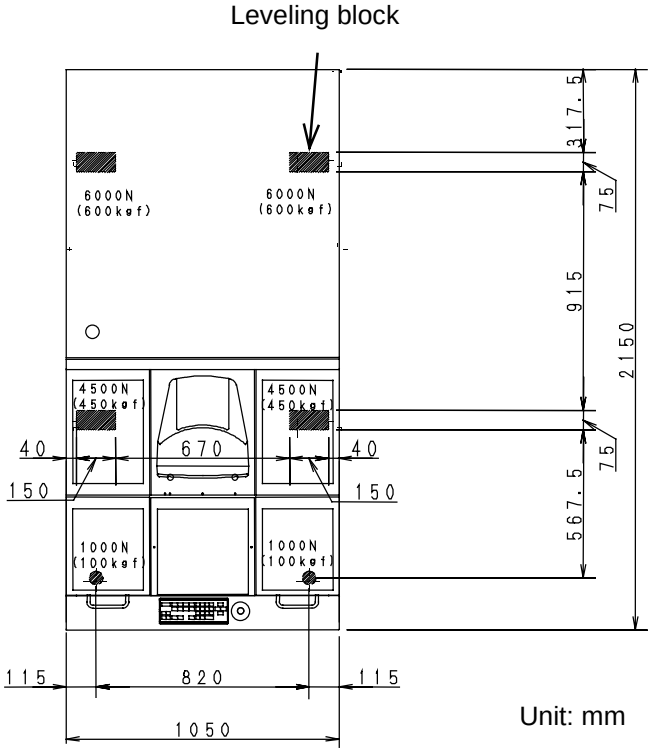


- Your feet or hands could be caught or cut off by the machine while the machine is hoisted or lowered. Make sure to wear safety shoes and protective gloves throughout the machine hoisting/lowering process.
- Make sure that the four blocks placed on the machine lowering site are equal in height. If the blocks vary in height, the machine may lose balance and topple, causing a person nearby severely injured or crushed to death.

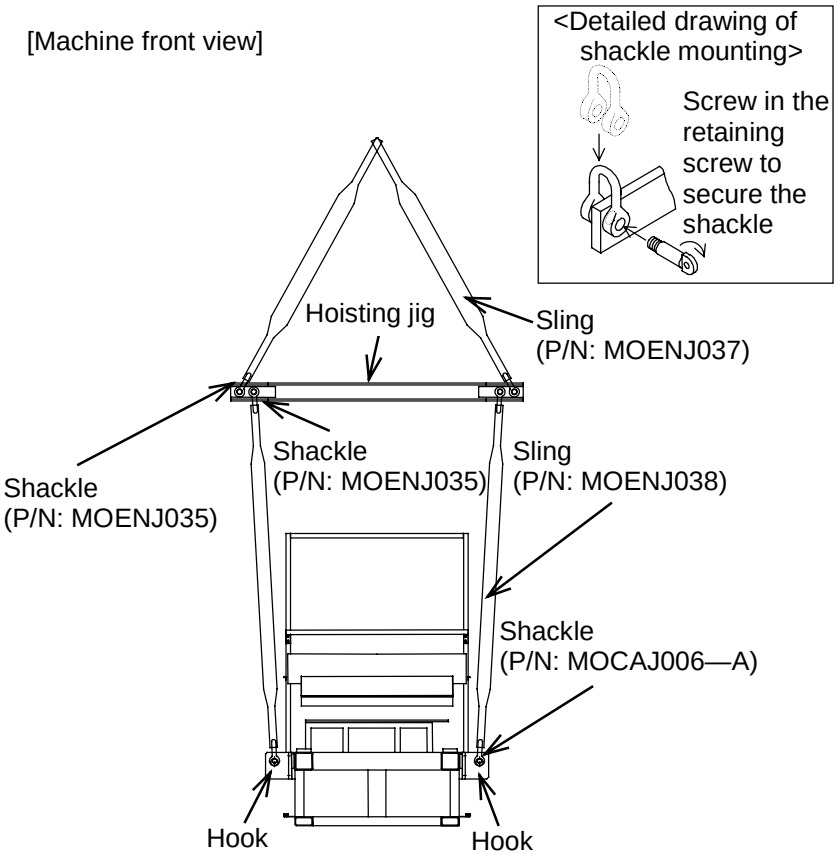
Procedure to hoist and lower the machine

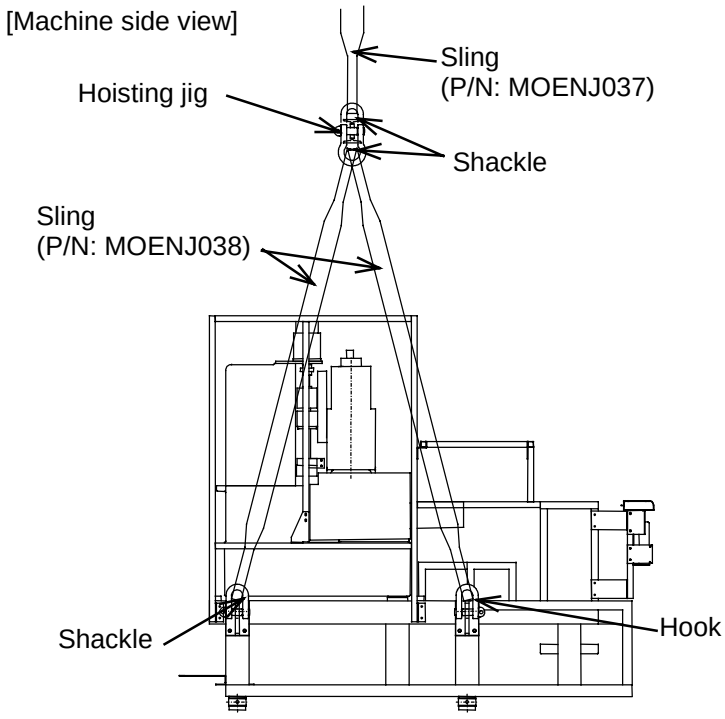
Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Check the dedicated hoisting jig set to make sure that all the parts in the specified numbers are readied.
3	Install the hooks (2) to the machine body frame at each side of the machine.  Hook (2 at each side of the machine: total 4)
4	Check to make sure that the hook retainer screws and the screws securing the machine base part and the machine upper part are firmly tightened.  Screw for securing the machine base part and the machine upper part (4 pcs each at 4 places) Hook retainer screw (4 pcs for each hook)

Step No.	Do This
5	Place the four blocks of the same height on the machine lowering site. - Check to be sure that the four blocks are equal in height. - A forklift is used to transfer the unloaded machine to the installation site. Make sure that the blocks are high enough to have the clearance for accepting the fork of the forklift. - The layout of the four blocks here should be the same as that of the four leveling blocks at the machine installation site. (See the figure below.)



Step No.	Do This
6	Thread the dedicated slings through the shackles and then install the shackles (to the hoisting jig and to the hooks on the machine body frame) as shown in the figure below.





Procedure to hoist and lower the machine (Continued)

Step No.	Do This
7	After verifying that the slings do not come into contact with any part of the machine, hoist the machine slowly so that it should not be shocked. - The machine weighs about 2,300 kg. - Ensure that the employed crane is rated for a hoisting load of 3,000 kg or heavier and withstands the machine weight, boom length and hoisting angle.
8	Place the machine on the blocks. - Slowly lower the machine so as not to shock it.
9	Remove the hooks (total 4) from the machine after removing the hexagon socket-head screws retaining the hooks (4 screws per hook).

2-2. Transferring the Machine

Operation flow

This section describes the procedures to transfer the machine to the machine installation site using a forklift.

Prior to starting the work

The following tools as well as a forklift should be readied for transferring the machine.

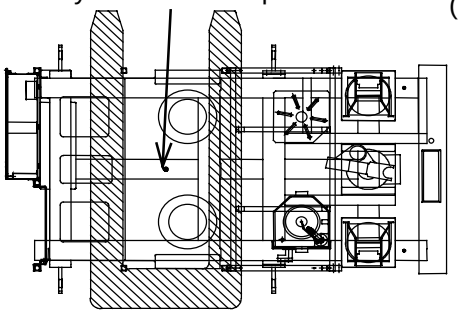
Forklift	Load transporting capacity: 2,500 kg or heavier Fork length: 1,200 mm or longer
Allen wrench (10mm)	
Safety shoes, protective gloves	

Safety precautions in transferring the machine

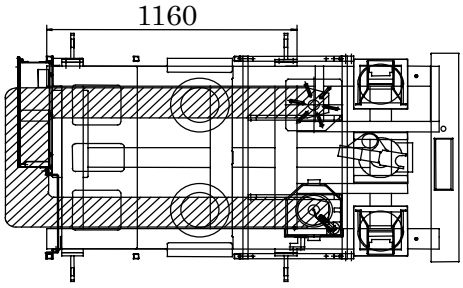
DANGER

- When transferring the machine by forklift, ensure that the gravity center of the machine is on the center of the fork. If the machine is transferred while its gravity is not properly centered on the fork of the forklift, it may fall off the forklift to cause an accident involving serious personal injury or death.
  The machine weighs about 2,300 kg. The employed forklift must be capable of moving up and down and transporting a load of 2,500 kg and be equipped with a folk of 1,200 mm or longer.
- If the fork of the forklift is not inserted to a correct position under the machine, it may cause the machine to topple or fall off the forklift during transportation, causing a person standing nearby seriously injured or crushed to death. Make sure that the fork of the forklift is correctly inserted into the designated position and that the gravity center of the machine is on the center of the fork.

Gravity center: Z axis position



(The fork should go as far as shown below.)



WARNING

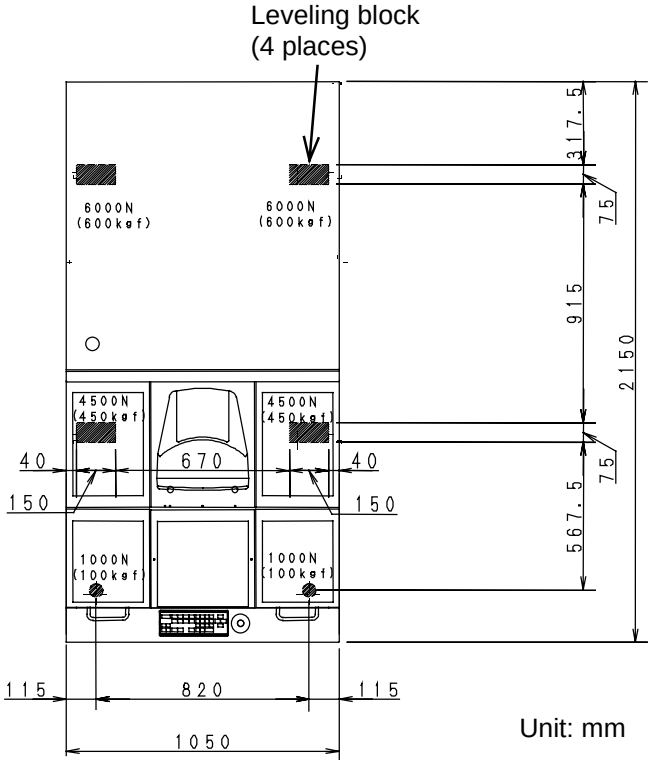
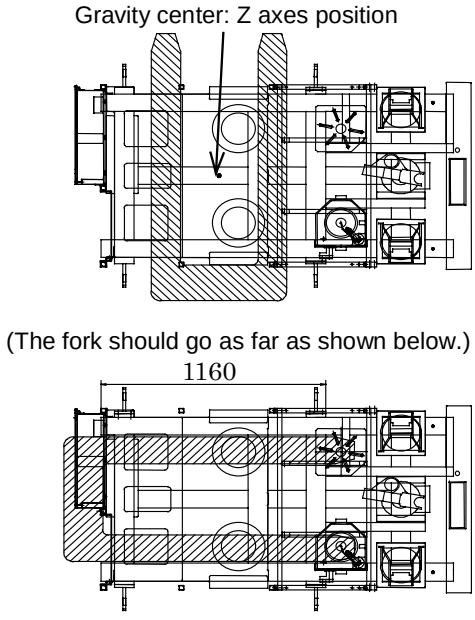
- Ensure that there is no person in the machine transfer route and the area around. If the machine should topple or fall off the forklift, a person in such area may be severely injured or crushed to death.
- When positioning the leveling blocks on the installation site, ensure that all of them are equal in height. If they differ in height, the machine may fall off the leveling blocks to cause an accident involving catching or cutting off of your feet and hands by the machine.
- During the machine installation process, do not position your feet or hands under the machine. If the machine should fall off the forklift or the leveling blocks, they may be caught or cut off by the machine.

NOTICE

- Before transferring the machine, make sure that the retainer jigs are respectively mounted to the Z1/Z2 axes and the robot. If the machine is transferred without securing these movable components in their positions, it may take a great deal of time later to readjust and restore the machine's grinding accuracy.
- When transferring the machine on the forklift, use a flat transfer route. If the machine is carried over floor irregularities or varying floor surface levels, it may be shocked to the detriment of its grinding accuracy.

Procedure to transfer the machine to the installation site

The procedure to transfer the unloaded machine to the installation site is described here.

Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Place the four leveling blocks at the machine installation site. - Check to be sure that the four leveling blocks are equal in height. 
3	Insert the fork of the forklift under the machine. - Check to be sure that the gravity center of the machine is on the center of the fork. 

Procedure to transfer the machine to the installation site (Continued)

Step No.	Do This
4	Transfer the machine to the installation site.
5	When the machine arrives at the installation site, gradually lower the fork until the machine is mounted on the leveling blocks. - Mount the machine on the four leveling blocks while adjusting its position.

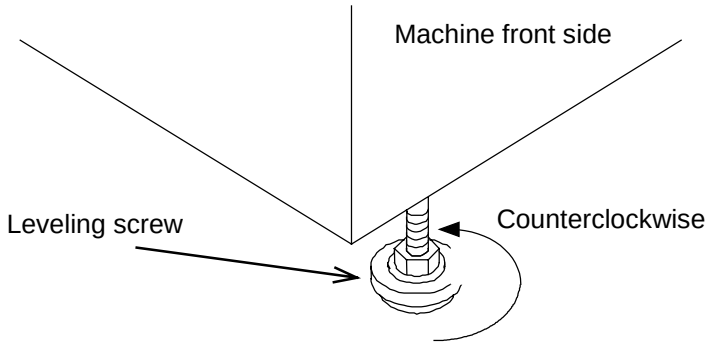
2-3. Installation of Leveling Screws

Prior to starting the work

The following tools as well as the leveling screws should be readied to install the leveling screws to the machine.

Adjustable wrench
Wrench
Leveling screws (2)

Procedure to install the leveling screws to the machine

Step No.	Do This
1	Screw in the leveling screws at the bottom of the machine front corners (2 places) and turn them fully counterclockwise. 

2-4. Leveling the Machine

Prior to starting the work

The following tools should be readied to level the machine.

Level gauge (Minimum calibration: 20 μm/m)
Allen wrench (10 mm)

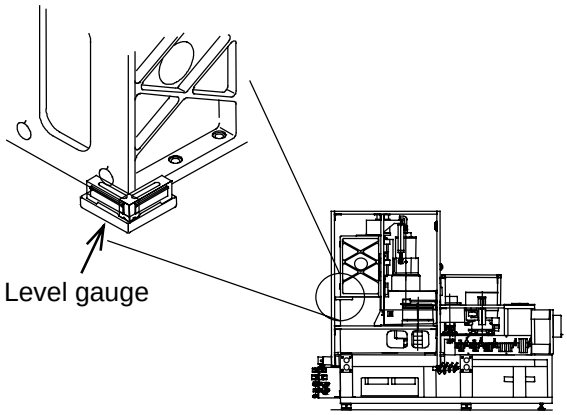
Procedure to level the machine

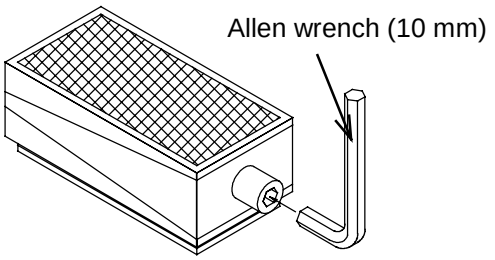
WARNING

- While the machine is jacked up, do not position your feet or hands under the machine. If the machine falls off the leveling blocks, they may be caught or cut off by the machine.
- If you jack up the machine excessively, it may cause the leveling blocks to split apart. If the machine should fall off the leveling blocks, your feet or hands may be caught or cut off by the machine. Ensure to adjust the leveling block height from the floor surface within the range of 53 to 63 mm.

NOTICE

When you place the level gauge on the chuck table surface for measurement, make sure to gently place it. If the chuck table surface is flawed, it may adversely affect the machine's grinding accuracy.

Step No.	Do This
1	Check to make sure that there is no foreign matter observed on the upper surface and bottom surface of the level gauge and then place the gauge on the level gauge rest in the machine. 
2	Check how much the machine is horizontally deviated and then start jacking up the machine.

Step No.	Do This
3	Level the machine in right/left direction by adjusting the height of the associated leveling blocks while checking the level gauge indication for right/left direction. - To adjust the height of the leveling blocks, use an Allen wrench (10 mm). - Rotating the wrench clockwise raises and rotating it counterclockwise lowers the leveling block. - There are four leveling blocks. Adjust the two right-hand or two left-hand leveling blocks equally at a time. - Check the level gauge indication to determine which corner is lower than the others and raise the leveling block for that corner. 
4	If the gauge indications for both right/left leveling and front/rear leveling respectively become 20 μm/m or less, allow the machine to stand for 3 to 4 hours. - Since the leveling blocks are made of elastic material to provide for vibration-proof property, it takes a long time to stabilize them.
5	After 3 to 4 hours, recheck the level gauge indications to see if the machine is properly leveled. - If the level gauge indications show any deviation from the values obtained in the step 4, repeat the steps 3 to 5 for readjustment.
6	Turn the leveling screws (2) at the bottom of the machine front corners clockwise until they lightly touch the floor and then secure them there.

2-5. Installation of Machine Anchors [Optional Accessory]

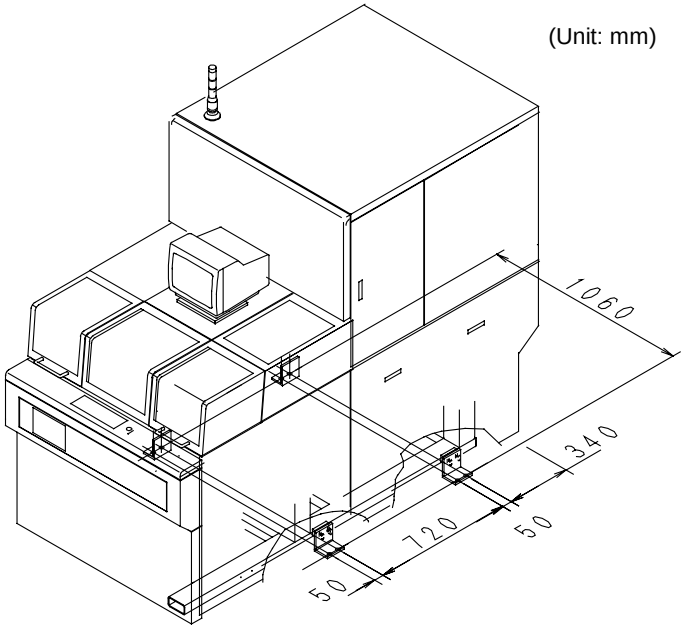
Prior to starting the work

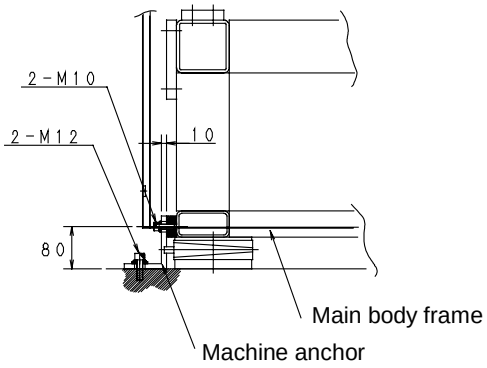
The following tools should be readied to install the machine anchors. The floor work for installing the anchors should be made by the user.

Allen wrench (8 mm)
Allen wrench (10 mm)

Procedure to install the machine anchors

Step No.	Do This
1	Referring to the figure below, install the machine anchors (2 pcs at each side of the machine).



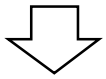


2-6. Piping Connection

Operation flow

This section describes the procedures to make piping connection to the machine main body and the vacuum/coolant unit following the operation steps as described below.

2-6-1	Drain and Duct Piping Connection



2-6-2	Utility Piping Connection

Safety precautions in making piping connection

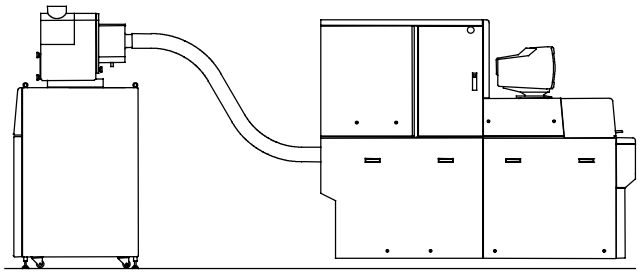
WARNING

- The only gaseous material allowed to be used with this machine is air. If nitrogen (N_2) or other gas is used instead of air, it may fill the machine room and cause oxygen deficiency for breathing, thereby incurring serious personal illness or death.
- The only liquid material allowed to be used with this machine is water. Using other liquid than water may bring about detrimental effect on your health. If any harmful liquid contacts your skin or you inhale its vapor, it could cause serious illness or death. It may also corrode the machine to invoke abnormal movements.
- Make sure to use the air and water hoses supplied as accessories to the machine. Using of any other hoses may cause their bursting or unexpected disconnection to incur a personal injury.
- Use the air and water piping joints that are rated as follows. Using of the joints that are out of the following specifications may cause pipe/hose burst or displacement to incur a personal injury.
  <Air piping joints withstanding:>
  Working pressure of 0.8 MPa or higher
  Burst pressure of 2.4 MPa or higher
  <Water piping joints withstanding:>
  Working pressure of 0.3 MPa or higher
  Burst pressure of 1.2 MPa or higher

CAUTION

- A hose or hard piping line between the machine air duct port and the facility exhaust system (such as duct unit) must be properly inclined. If it is not properly inclined, water may build up in it, preventing the smooth flow of air exhaust from the machine. This may cause mist leakage from the grinding chamber and resultant serious machine failure. Use props or the like to support the hose/pipe as needed.

[Good Example]



- Ensure that air source coupling is properly completed. Inadequate coupling may incur unexpected piping disconnection. If an air pipe is disconnected while the spindle is rotating, the spindle may seize up.

NOTICE

A hose or hard piping line between the machine drain port and facility drain port must be properly inclined. If the machine drain port is not positioned higher than the facility drain port, water may remain in the drain tank, thereby causing an overflow error.

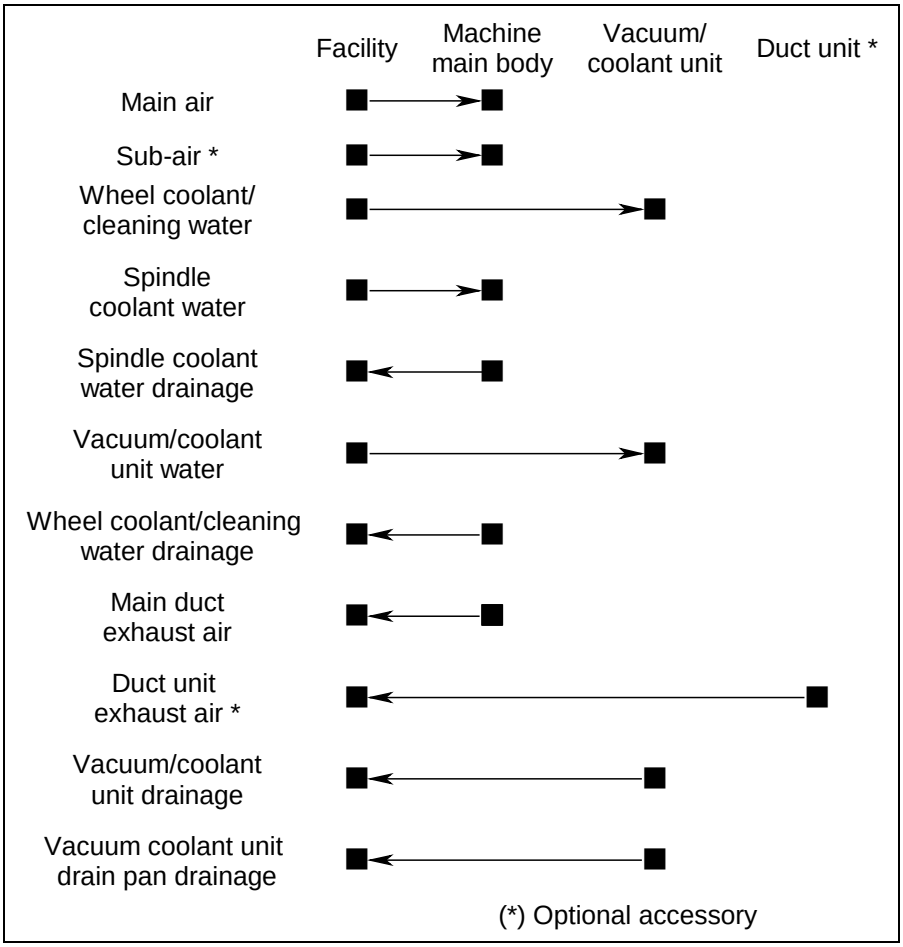
The following tools should be readied to make piping connection.

The sizes and numbers of the joints to be furnished by the user may differ from the ones indicated below depending on the machine installation site conditions and connection method. Contact your nearest DISCO office or DISCO service office for details.

Adjustable wrench	
Wrench	
silicone sealant	
Joint	for 9 × 15 braided hose: Rc1/4 (1 pc.) for 12 × 18 braided hose: Rc1/4 (2 pcs.) for 12 × 18 braided hose: Rc3/8 (1 pc.) for 15 × 22 braided hose: Rc1/2 (1 pc.) for 19 × 26 braided hose: Rc3/4 (2 pcs.)
Hose (Accessory to the machine)	Hose (ID: 9 mm): 1 pc. Hose (ID: 12 mm): 3 pcs. Hose (ID: 15 mm): 1 pc. Hose (ID: 19 mm): 2 pcs. Duct hose (76.4 mm ID) (with hose band and cuff): 1pc. Duct hose (88.9 mm ID) (with hose band and cuff): 1pc.

Piping system diagram

The piping system diagram of the machine is indicated as follows.



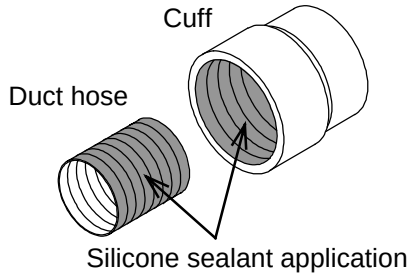
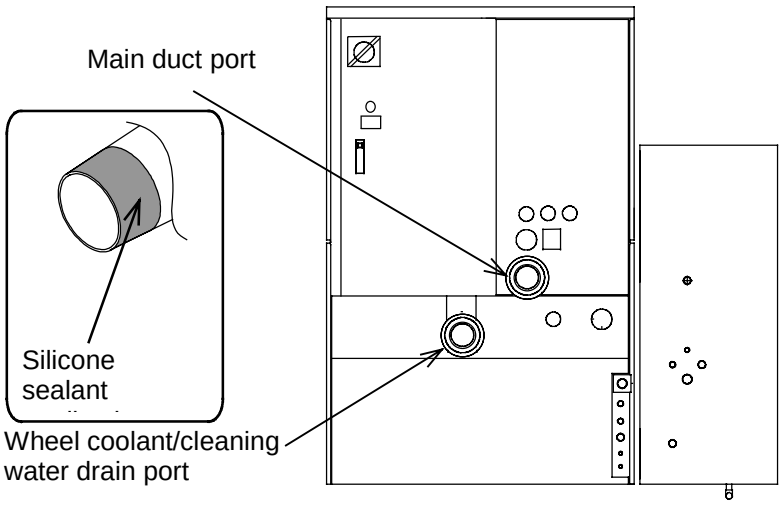
2-6-1. Drain and Duct Piping Connection

Procedures to connect drain/duct hoses

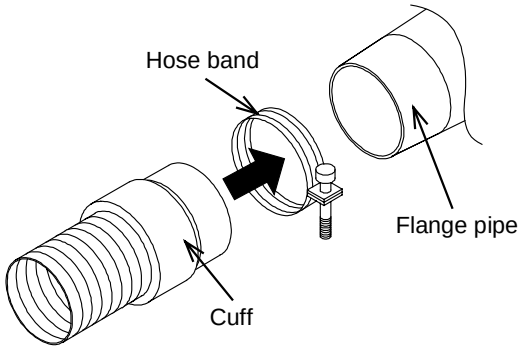
The procedures to connect the drain/duct hoses to their connection ports on the rear of the machine are described here.

NOTICE

When you connect a hose to the drain port or duct port of the machine, make sure that no undue force is exerted on the flange pipe of the drain port or duct port. Applying undue force to the flange pipe may cause the pipe to break.

Step No.	Do This
1	Liberally apply silicone sealant to the outer surface of the duct hose (or drain hose) and the inner surface of its cuff, and screw the cuff onto the duct hose (or drain hose). 
2	Apply silicone sealant on the outer surface of the flange pipe of the duct port (or drain port). 

Procedure to connect the drain/duct hoses (Continued)

Step No.	Do This
3	Connect the cuffed hose onto the flange pipe of the duct port (or drain port) and secure them with the dedicated hose band. 
4	Allow the silicone sealant to harden for a period of at least 10 hours.

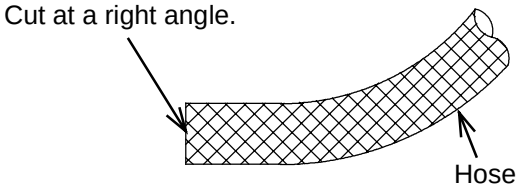
2-6-2. Utility Piping Connection

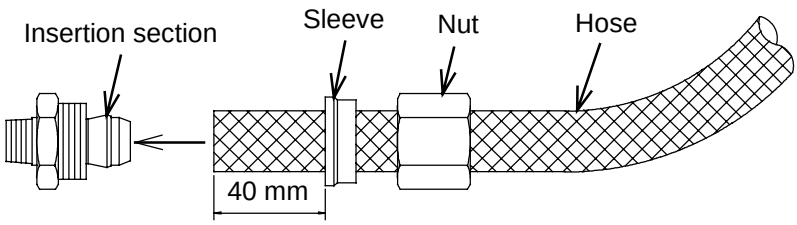
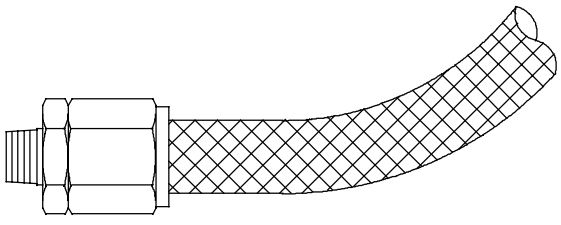
Procedure to make utility piping connection

The procedures to connect utility hoses using joints to the utility supply ports located on the rears of the machine main body and the vacuum/coolant unit are described here.

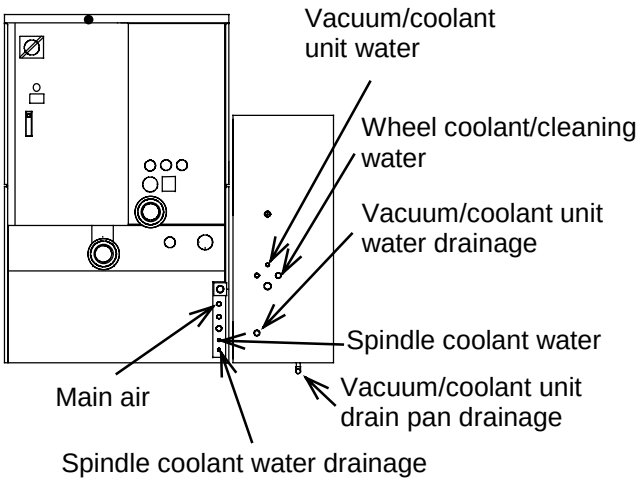
NOTICE

When you prepare a hose for utility piping connection, cut its edge at a right angle using a dedicated tool for the purpose. If you use a hose having an improperly cut edge for connection, it may cause leaking of air or water from the connection section to burst the hose.



Step No.	Do This
1	Remove the nut and sleeve from the hose joint. As shown below, install the removed nut and sleeve over the hose. Ensure that the sleeve is 40 mm apart from the hose end. 
2	Connect the hose over the insertion section of the joint until it bottoms.
3	Fasten the nut to the joint by rotating it clockwise using a wrench. - Make sure to securely fasten the nut so that the hose does not rotate. 

Procedure to make utility piping connection (Continued)

Step No.	Do This
4	Securely connect the utility hose joints to the corresponding connection ports on the rears of the machine main body and vacuum/coolant unit by turning them clockwise. 

2-7. Electric Wiring Connection

Summary of this section

This section describes the procedures to make electric wiring connection to the machine main body and other related units in the flow of the following operation steps.

2-7-1	Electric Wiring Connection to Machine Main Body

⇩

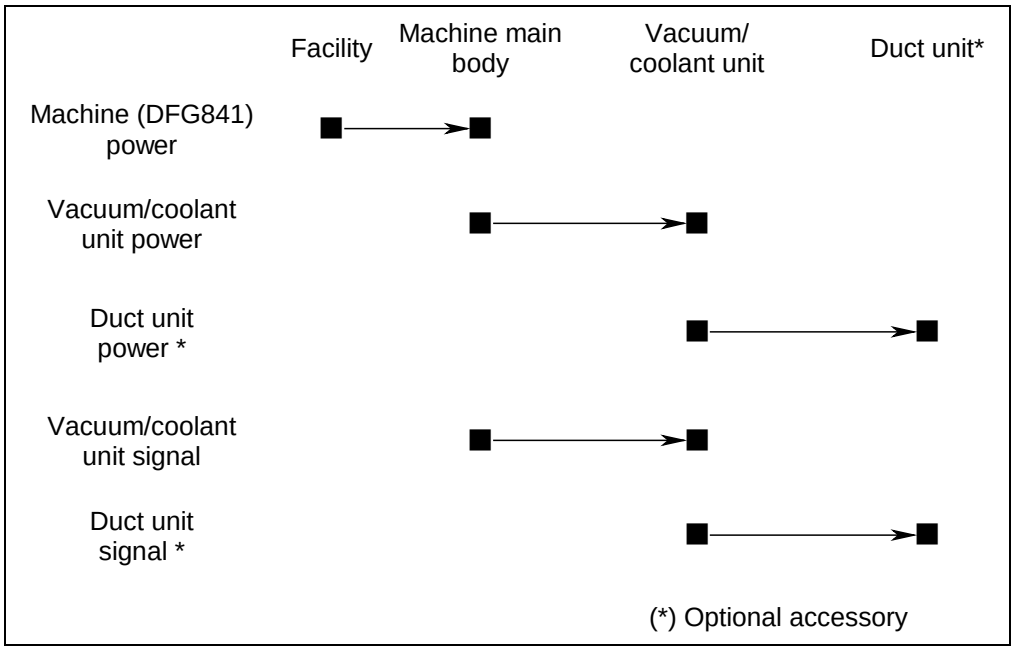
2-7-2	Electric Wiring Connection to Vacuum/Coolant Unit

⇩

2-7-3	Electric Wiring Connection to Monitor

Electric wiring connection diagram

The electric wiring connection diagram of the machine is indicated as follows.



2-7-1. Electric Wiring Connection to Machine Main Body

Prior to starting the work

The following tool and cable should be readied to make power line connection.

Phillips screwdriver
Power cable complying with the applicable local standards)

Specifications of power cable and main circuit breaker

The specifications of the power cable and main circuit breaker are described here. Make sure to use the cable and terminals that are in compliance with the following specifications.

The cable should also comply with the applicable standards of the area the machine is installed.

- Power cable specifications

Rated voltage	600 VAC
Size	AWG6
Number of conductors	4

- Main circuit breaker specifications (standard type)

AC supply system	3-phase, 3-wire
Number of poles	3
Rated current	60 A
Interrupting capacity	10 kA (at 230 VAC) (IEC 947-2)

- Main circuit breaker specifications (SEMI type)

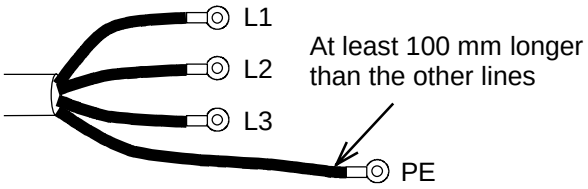
AC supply system	3-phase, 3-wire
Number of poles	3
Rated current	60 A
Interrupting capacity	22 kA (at 240 VAC) (UL489)

Procedures to connect the power cable

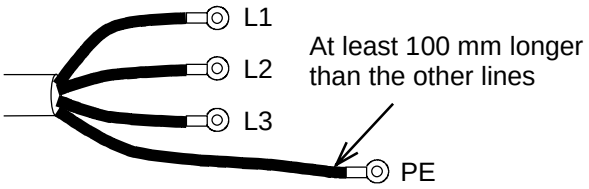
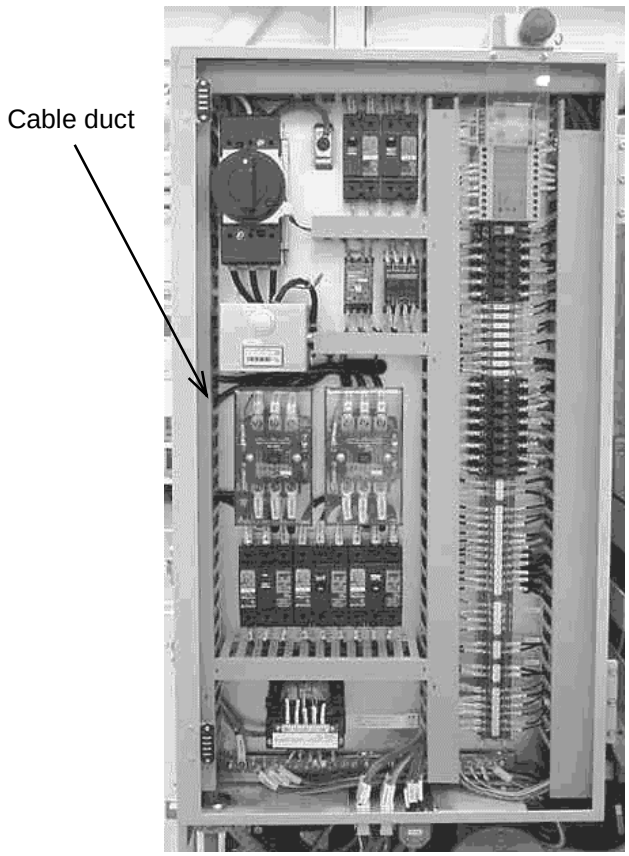
The procedures to connect the power cable to the machine are described here. The cable and terminals used for connection are not supplied as the accessories to the machine. They should be furnished by the user.

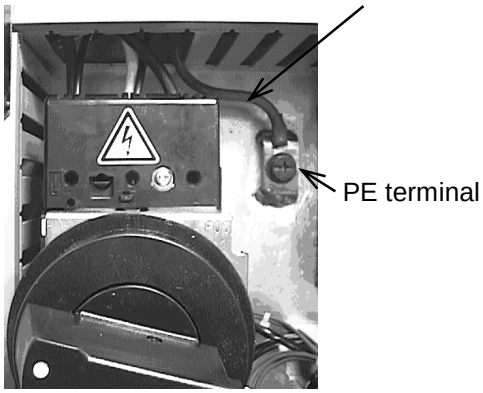
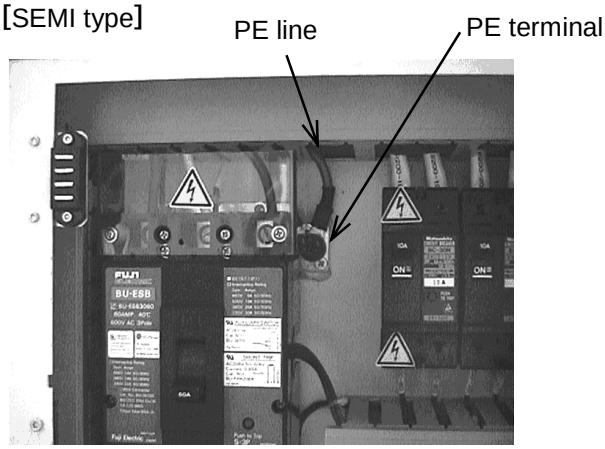
WARNING

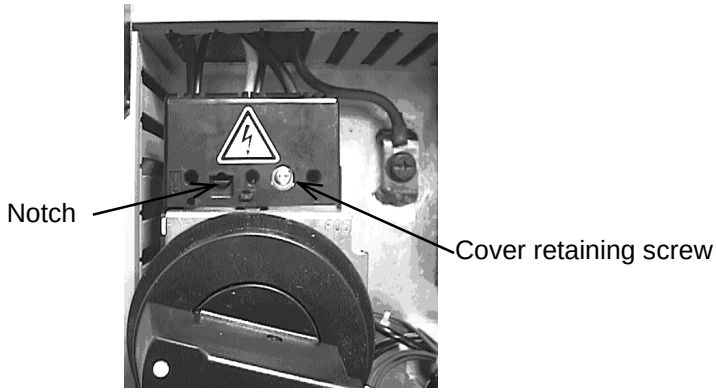
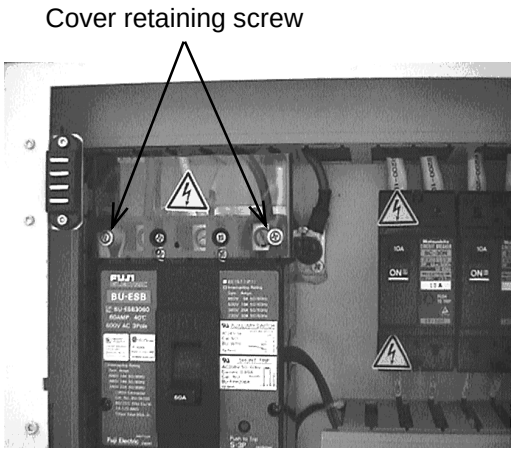
- If you come into contact with a live part of the machine while the facility-side power is turned ON, you may receive an electric shock that could result in severe injury or death. Before making power cable connection, make sure to lock out the facility-side power with a padlock or the like instrument.
- If the PE line (of the cable) is disconnected, you may receive an electric shock from leaked current. To prevent the PE line from disconnecting under strain, make sure that the PE line of the power cable is at least 100 mm longer than the L1/L2/L3 lines.

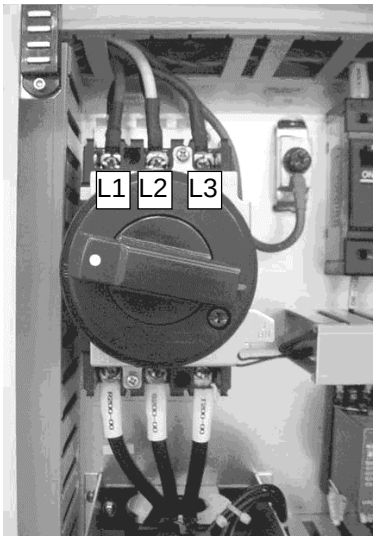
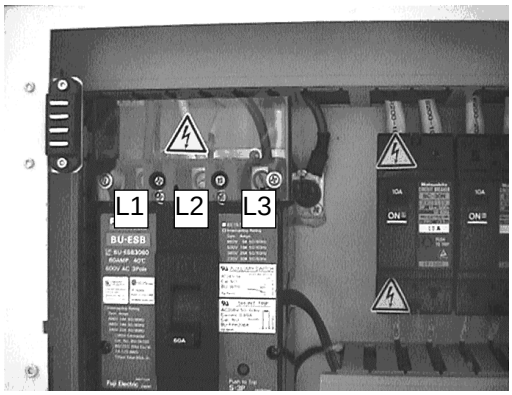


- If you come into contact with the machine when it is not grounded, you may receive an electric shock that could result in severe injury or death. When connecting the power cable, make sure to connect its PE line first.
- Handling the machine while its interior or the floor is wet with water may cause an electric shock hazard that could result in severe personal injury or death.
  If the machine is wet with water, do not turn ON the facility-side power supply until it dries. Likewise, if the floor is wet with water, shut off the facility-side power supply and then wipe the floor to dry.

Step No.	Do This
1	Have on hand the cable, terminals and other items required for power cable connection. - Make sure that the PE line of the power cable is at least 100 mm longer than the L1/L2/L3 lines. 
2	Check to be sure that the facility-side power supply is shut OFF and locked out.
3	Open the cover of the breaker box on the machine rear side. - If the breaker lever is locked out, open the lockout and then pull the cover toward you while moving the lever to "OPEN" position. (If you release the lever, it returns to "OFF" position.)
4	Draw the power cable into the breaker box from under and route it through the cable duct at the left of the breaker box. [Breaker box] 

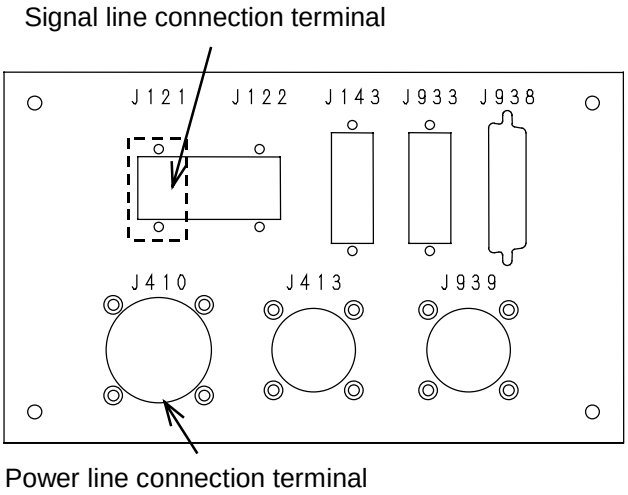
Step No.	Do This
5	Connect the PE line of the power cable to its terminal with a retaining screw. - Make sure to securely tighten the retaining screw. [Standard type]  [SEMI type] 

Step No.	Do This
6	Remove the terminal section cover in the breaker box. [Standard type] - To remove the cover, first remove the cover retaining screw and then pull the cover toward you while raising the notch shown in the figure below with a screwdriver or the like.  [SEMI type] - The cover becomes removable if you remove the cover retaining screws. 

Step No.	Do This
7	Connect each power line of the power cable to the corresponding terminals on the terminal block. - Connect the L1/L2/L3 lines to their terminals with retaining screws. - Make sure to securely tighten the retaining screws. [Standard type]  [SEMI type] 
8	Replace the terminal section cover removed in the step 6. - Securely fasten the cover retaining screw(s) here.
9	Close the breaker box and lock out the breaker lever with a padlock or the like with the lever at "OFF" position.
10	Make sure that the facility-side power is shut off and locked out and then connect the other end of the power cable to its facility-side connection terminal. -When connecting the power cable, make sure to connect its PE line (with enough length) first.

2-7-2. Electric Wiring Connection to Vacuum/Coolant Unit

Procedures to make electric wiring connection to the vacuum/coolant unit

Step No.	Do This
1	Connect the power line and signal line from the vacuum/coolant unit to the terminal J410 (power line) and terminal J121 (signal line) at the lower right on the machine rear side respectively 

2-7-3. Electric Wiring Connection to Monitor

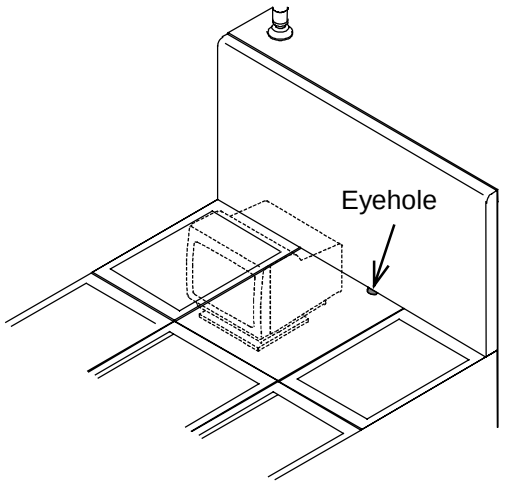
Procedures to make electric wiring connection to the monitor

The procedures to make electric wiring connection between the monitor and the machine are described here.

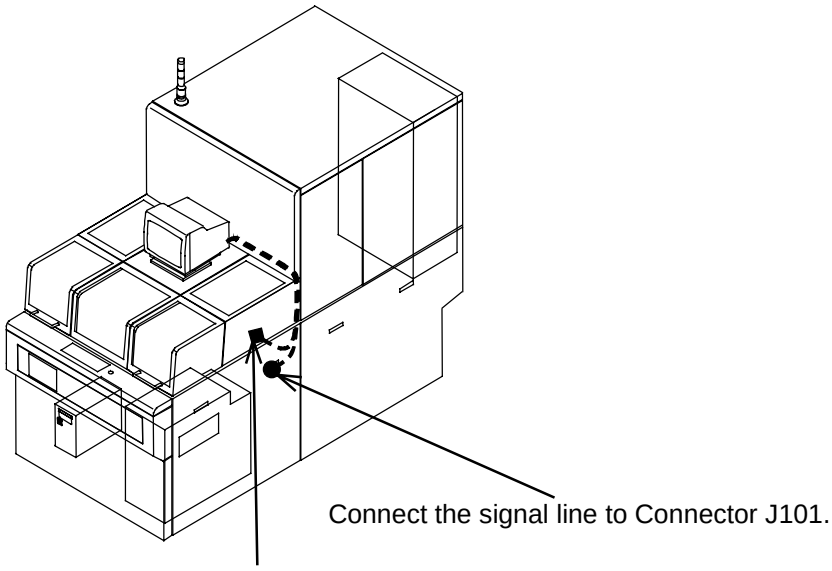
The monitor is packaged separately from the machine for delivery.

CAUTION

The convenience power outlet within the machine (an extra power outlet provided inside the machine) should be used for DISCO-designated ancillary equipment only.
If any equipment other than the specified ancillary equipment is connected to the convenience power outlet within the machine, the power supply to the machine may become inadequate or the machine may malfunction to incur an accident.

Step No.	Do This
1	Route the power line and signal line of the monitor through the eyehole behind the monitor as shown in the figure below for their connection to their corresponding connectors underneath. 

Procedures to make electric wiring connection to the monitor (Continued)

Step No.	Do This
1	Connect the signal line to the Connector J101 and the power plug to the 100V table tap located at the lower right of the machine as shown in the figure below. 

2-8. Air Supply

Air supply procedure

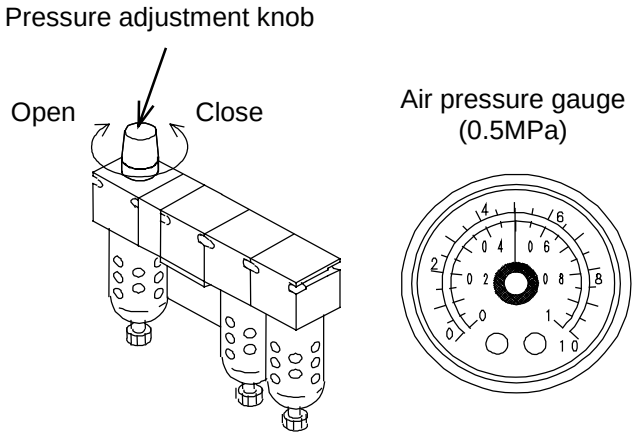
WARNING

Even if the machine power is turned OFF, the air-operated parts of the transport section and the spinner section may move when you turn ON/OFF the air system.

Keep your hands and fingers away to prevent them from being caught or cut off from those air-operated parts and their operating spaces when you turn ON/OFF the air system.

CAUTION

If the filters of the air unit clog, it may cause a decrease in air supply to the machine and resultant machine failure or breakage. If you find the air filters clogged, immediately replace them (filter elements) with new ones.

Step No.	Do This
1	Open the air valve at the plant facility side.
2	Check to make sure that the air pressure gauge on the rear of the machine reads 0.5 MPa. If a value other than 0.5 MPa is indicated, turn the pressure adjustment knob of the air unit shown in the figure below to obtain the correct value. The air unit locates inside the cover (upper right cover) on the machine rear side. 
3	Check to make sure that the differential pressure gauge that detects clogging of the filters in the air unit reads 0.01 MPa or smaller value. If the indicated value exceeds 0.01 MPa, the filters may be clogged. Replace the filters with new ones referring to the Maintenance Manual.

Step No.	Do This
4	Open the side cover, water case cover, and wheel cover. Hold the flange part of the spindle and manually rotate it to make sure that it lightly rotates. If the rotation is obstructed, contact your nearest DISCO office or DISCO service office.
5	Close the water case cover, wheel cover, and side cover.

2-9. Removal of Retainer Jigs Used for Machine Transportation

Operation flow

This section describes the procedures to remove the retainer jigs that have been used for transportation of the machine in the flow of the operation steps as described below.

2-9-1	Removal of Z-axis Retainer Jigs

⇩

2-9-2	Removal of Robot Retainer Jig

About retainer jigs used for machine transportation

Retainer jigs fix drive sections of the machine to their positions during machine transportation. They are attached to the following sections of the machine.

- Z1-axis/Z2-axis (see Section 2-9-1)
- Robot (see Section 2-9-2)

NOTICE

The removed retainer jigs (for the Z1-axis/Z2-axis and the robot) should be kept in safe custody, as they will be necessary when you relocate the machine in the future.

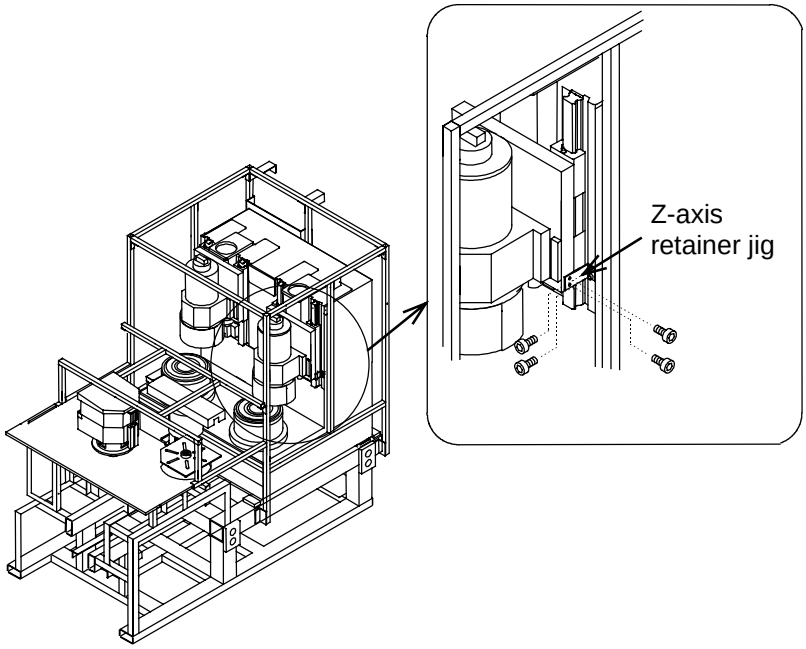
2-9-1. Removal of Z-axis Retainer Jigs

Prior to starting the work

The following tool should be readied to remove the Z-axis retainer jigs from the machine.

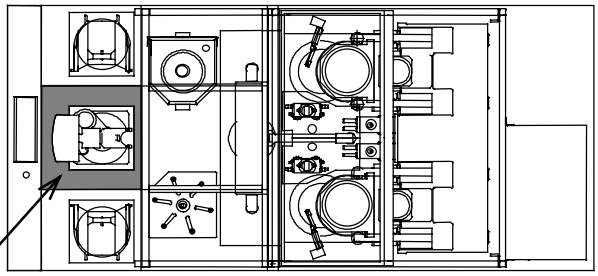
Allen wrench (5 mm)

Procedure to remove the Z-axis retainer jigs from the machine

Step No.	Do This
1	Open the grinding section side cover at the Z1 and Z2 sides respectively.
2	Remove the Z1-axis and Z2-axis retainer jigs from the machine. To remove the retainer jig, you should first remove the hexagon socket-head screws (M6 × 4) fixing the jig. 
3	Put the removed jigs in safe custody.

2-9-2. Removal of Robot Retainer Jig

Procedure to remove the robot retainer jig from the machine

Step No.	Do This
1	Remove the robot retainer jig that is laid out in the robot axis driving area.  Robot retainer jig
2	Put the removed retainer jig in safe custody.

2-10. Installation of Pilot Lamp and Machine Outer Covers

Operation flow

Installation of the pilot lamp and the machine outer covers should proceed following the operation steps as described below.

2-10-1	Installation of Pilot Lamp

2-10-2	Installation of Machine Outer Covers

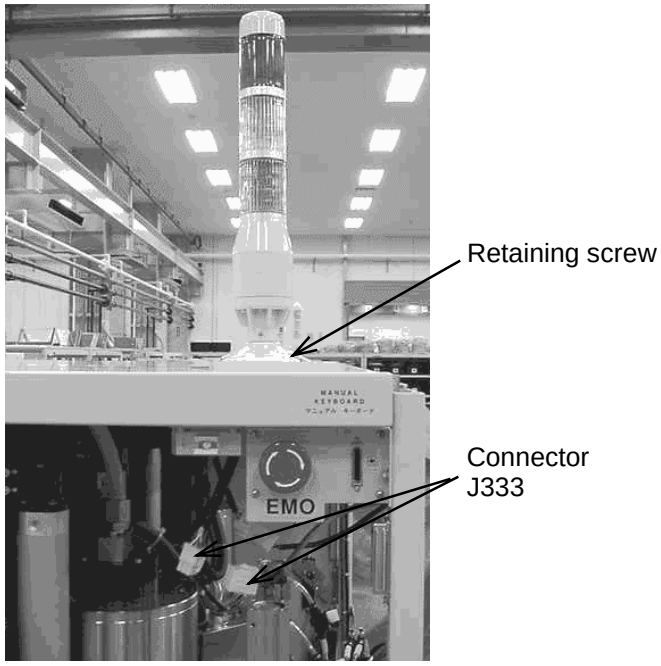
2-10-1. Installation of Pilot Lamp

Prior to starting the work

The following tool should be readied to install the pilot lamp.

Allen wrench (3 mm)

Procedure to install the pilot lamp

Step No.	Do This
1	From the machine top side, route the pilot lamp line (connector J333) through the mounting hole of the pilot lamp before installing the pilot lamp.
2	Install the pilot lamp and secure it with its retaining screws (3 pcs). 
3	Connect the pilot lamp line connector J333 with its corresponding connector in the machine.

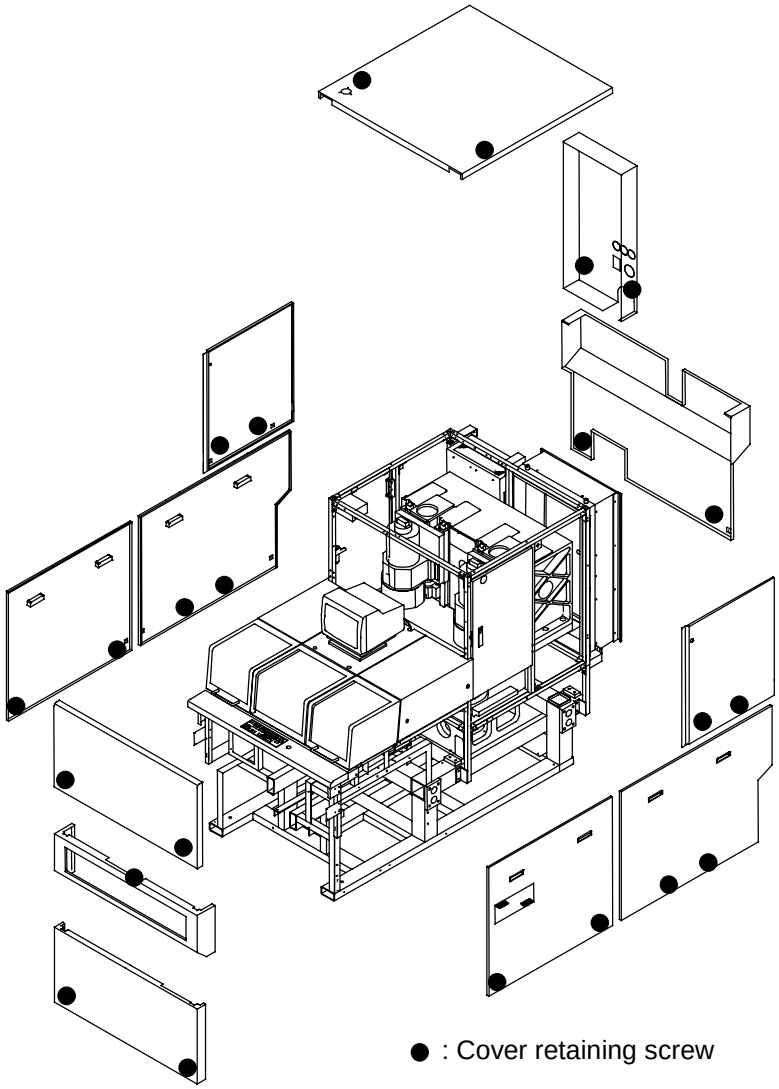
2-10-2. Installation of Machine Outer Covers

Prior to starting the work

The following tools should be readied to install the machine outer covers.

Allen wrench (2.5 mm)

Procedure to install the machine outer covers

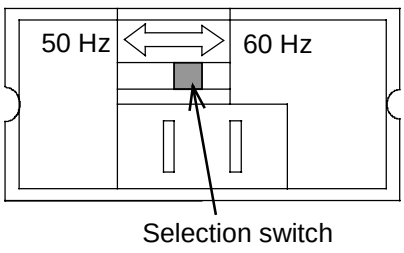
Step No.	Do This
1	Install the machine outer covers referring to the figure shown below.  ● : Cover retaining screw

2-11. Power Supply

Power supply procedure

WARNING

If you come into contact with a live part of the machine while the facility-side power is turned ON, you may receive an electric shock that could result in severe injury or death. Before starting the work described here, make sure that the facility-side power supply is shut OFF.

Step No.	Do This
1	Check to make sure that the facility-side power supply is shut OFF. Open the lockout of the main circuit breaker lever of the machine and then open the breaker box.
2	Check to make sure that all the circuit breaker switches in the breaker box are turned ON.
3	Check to make sure that all the EMO switches (4 places) are released. - Refer to Section 5, [Emergency OFF Switch (EMO Switch)] in Chapter A for details of the EMO switches.
4	Check to make sure that the power frequency setting of the hour meter (power application time counter) agrees with the facility-side power frequency. - The power frequency selector switch is mounted on the rear of the hour meter. When viewed from the rear of the hour meter, the left-hand switch position is for 50Hz and the right-hand switch position is for 60Hz. <Hour meter rear view> 
5	Close the cover of the breaker box.
6	Turn ON the facility-side power. - The power-receiving lamp on the rear of the machine lights. - If the power receiving lamp does not light, check if electric wiring connection to the machine has been correctly made referring to Section 2-7, [Electric Wiring Connection] in Chapter C.

2-12. Turning ON the Machine Power

Procedure to turn ON the machine power

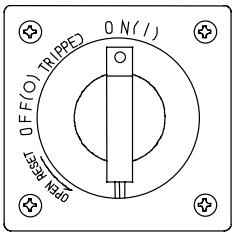
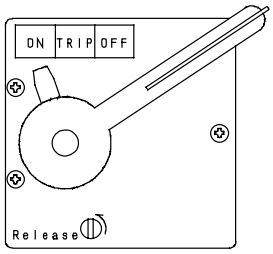
The procedure to turn ON the machine power is described here.

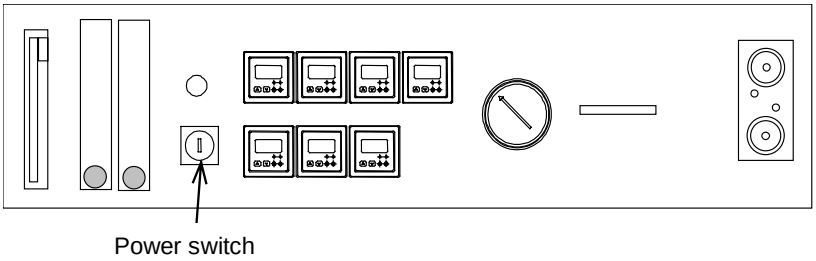
WARNING

Operating the machine while its interior or floor is wet with water may cause an electric shock hazard that could result in serious injury or death. If the machine or floor is wet with water, shut off electrical power supply at the circuit breaker of this machine and at the facility power source, lock them out with padlocks or the like, and wipe the machine and floor dry. Do not turn ON the facility-side power until the machine and floor completely dry.

NOTICE

Vacuum pressure check of the vacuu/coolant unit must be completed in a short period of time. If the vacuum pump is allowed to operate in an abnormal condition for long, it may fail.

Step No.	Do This
1	Turn the main circuit breaker lever to "ON" position. Standard type  SEMI type 

Step No.	Do This
2	Turn ON the machine using the power switch located inside the machine front cover.  Power switch Check to make sure that the vacuum pressure of the vacuum/coolant unit rises when the power switch is turned ON. - If the vacuum pressure does not rise, it is conceivable that the power supply phase is incorrect. Shut OFF the facility power supply and contact your plant facility supervisor.
3	Wait about several seconds and then turn OFF the power.

2-13. Wheel Coolant and Spindle Coolant Water Supply

Operation flow

This section describes the procedures to supply wheel coolant water and spindle coolant water to the machine following the operation steps as described below.

2-13-1 Water Supply

↓

2-13-2 Calling up the SIGNAL OPERATION/MONITOR Screen

↓

2-13-3 Air Purge

↓

2-13-4 Water Supply Condition Check

2-13-1. Water Supply

Water supply procedure

Operating the machine while its interior or floor is wet with water may cause an electric shock hazard that could result in serious injury or death. If the machine or floor is wet with water, shut off electrical power supply at the circuit breaker of this machine and at the facility power source, lock them out with padlocks or the like, and wipe the machine and floor dry. Do not turn ON the facility-side power until the machine and floor completely dry.

Step No.	Do This
1	Open the water valves (for wheel coolant water and spindle coolant water) at the plant facility side.
2	Turn the (supply) water valve on the rear of the vacuum/coolant unit counterclockwise to open it. - Water to the vacuum/coolant unit is turned ON when the vacuum/coolant unit is turned ON. Refer to the instruction manual of the vacuum/coolant unit for the procedure to turn ON the vacuum/coolant unit.
3	Check the water flowmeter in the vacuum/coolant unit to make sure that the indicated value is 5 L/m (standard value) or higher. - If the flow rate falls, an error occurs to stop the operation of the machine.

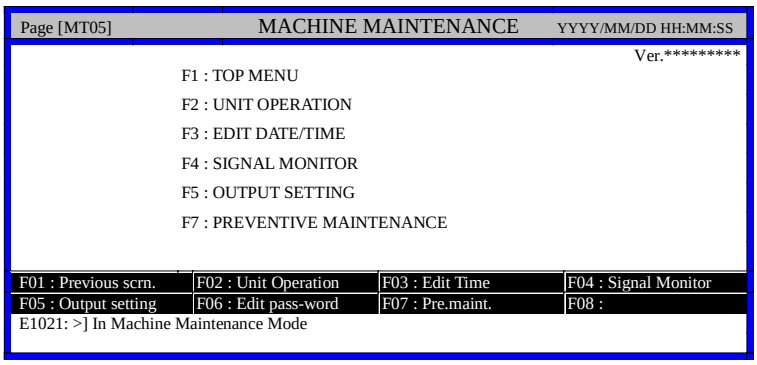
2-13-2. Calling up the SIGNAL OPERATION/MONITOR Screen

Procedure to call up the SIGNAL OPERATION/MONITOR screen

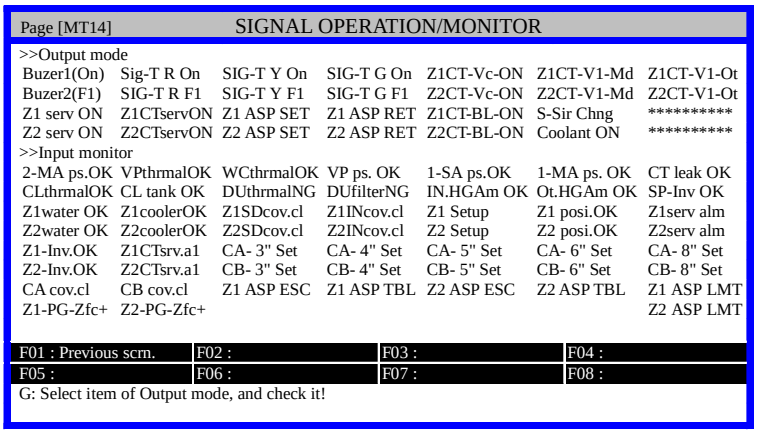
WARNING

When you perform maintenance works involving signal monitoring from the MACHINE MAINTENANCE screen, the interlock system is deactivated, posing a danger of human injury or machine breakage. Such maintenace works must always be carefully performed by qualified maintenance personnel.

Also, make sure that no other persons touch the machine while maintenance works are performed on the machine.

Step No.	Do This
1	Turn ON the machine power. - The top menu screen appears on the monitor.
2	Press the <F5: Machine Maint.> key on the top menu screen. - The MACHINE MAINTENANCE screen appears. - If the screen is password-protected, enter the password (MAINTENANCE) and then press the <ENTER> key. 

Step No.	Do This
3	Press the <F4: Signal Monitor> key. - The SIGNAL OPERATION/MONITOR screen appears.



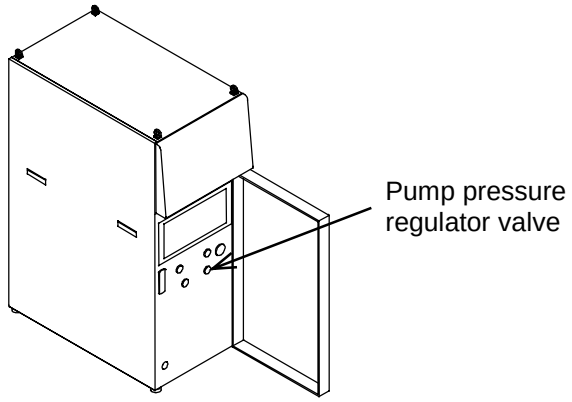
Continued to the next section.

2-13-3. Air Purge

Air purge procedure

The procedure to expel air in the pump and pipes is described here.

> **WARNING**
>
> When you perform maintenance works involving signal monitoring from the MACHINE MAINTENANCE screen, the interlock system is deactivated, posing a danger of human injury or machine breakage. Such maintenace works must always be carefully performed by qualified maintenance personnel.
>
> Also, make sure that no other persons touch the machine while maintenance works are performed on the machine.

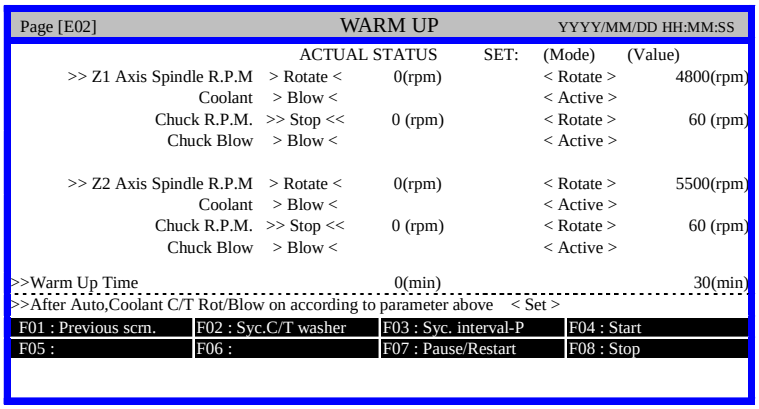
Step No.	Do This (Continued from the previous section)
1	Move the cursor to "Z1CT-BL-ON" and press the <ENTER> key. - "Z1CT-BL-ON" is highlighted and the air blow system of the Z1-side chuck table turns ON.
2	Move the cursor to "Z2CT-BL-ON" and press the <ENTER> key. - "Z2CT-BL-ON" is highlighted and the Z2-side chuck table turns ON.
3	Check to make sure that the indicated pump pressure value of the vacuum/coolant unit is in the range of 0.25 to 0.3 MPA. - If the indicated value is outside this range, adjust the pump pressure regulator valve to obtain an appropriate value. 
4	With the air blow systems turned ON, wait for about 2 to 3 minutes to expel air from the pump and pipes.

Continued to the next section.

2-13-4. Water Supply Condition Check

Water supply condition check procedure

The procedure to check if water is normally supplied to the machine is described here.

Step No.	Do This (Continued from the previous section)
1	Start up the vacuum/coolant unit (DVC010) and check/adjust its operating conditions. Refer to the instruction manual of the vacuum/coolant unit (DVC010) for the procedures to start up the vacuum/coolant unit and check/adjust its operating conditions.
2	Press the <F01：Previous scrn.> key to return to the MACHINE MAINTENANCE screen. Press the <F01：Previous scrn.> key on the MACHINE MAINTENANCE screen to return to the top menu screen.
3	Press the <WARM UP>key on the top menu screen to call up the WARM UP screen. - Tun ON the Z1 wheel coolant and Z2 wheel coolant systems on the WARM UP screen. - Press the <F4：Start> key to start warm up operation. 
4	Check to make sure that Z1 and Z2 wheel coolant waters are flowing. - Soon after the wheel coolant system is turned ON, it may happen that the flow rate of wheel coolant water may be unstable due to trapped air bubbles in the pipe to trigger a flow rate error. In such a case, redo the procedures from Section 2-13-3, [Air Purge] over again.
5	Press the <F01: Previous scrn.> key to return to the top menu screen.

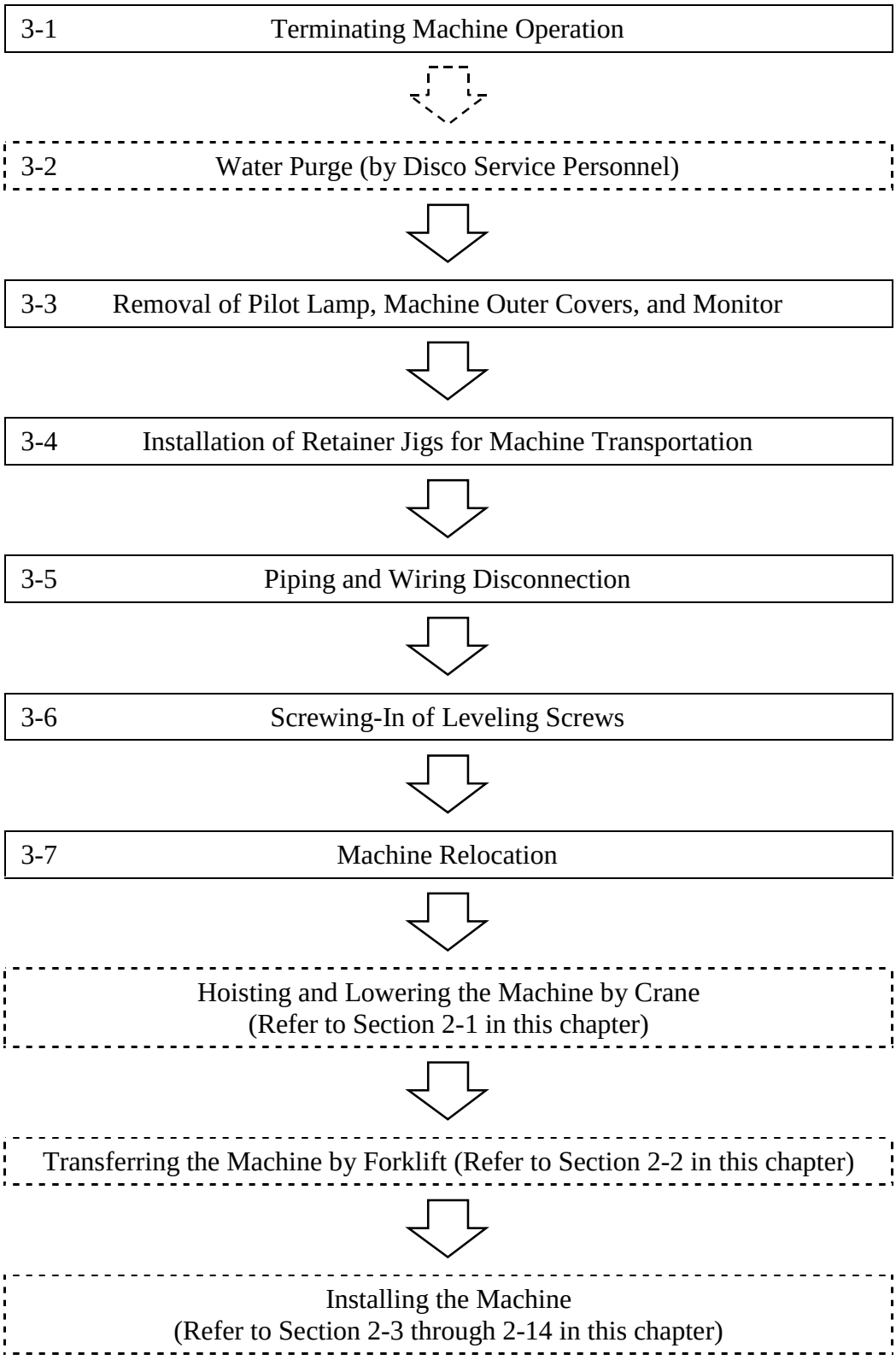
Water supply condition check procedure (Continued)

Step No.	Do This
6	Turn OFF the machine power using the switch key located inside the machine front cover. - The machine power can also be turned OFF from the POWER OFF screen. Refer to the Operation Manual for details of turning OFF the machine from the POWER OFF screen.
7	Shut OFF power supply at the plant facility side and lock it out with a padlock or the like.
8	Close the valves of air and water at the plant facility side.

3. Machine Relocation

Operation flow

This section describes about the procedures to relocate the machine in the flow of the operation steps as described below.



CAUTION

When relocating the machine out of plant (involving transportation by truck or ship), it is necessary to drain off machine water pipes. If the machine is transported without draining water off its pipes, it may fail or break due to freezing or leaking of water remained in the pipes. Ask DISCO service engineers for the draining work, since the special tools and jigs are used for the work.

NOTICE

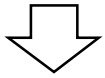
When it is necessary to transfer or dispose of the machine, contact your nearest DISCO office or DISCO service office. Disco will provide you with detailed information and precautions required in carrying out such works.

3-1. Terminating Machine Operation

Operation flow

This section describes about the procedures to terminate machine operation in the flow of the operation steps as described below.

3-2-1	Calling up the UNIT OPERATION/MONITOR Screen



3-2-2	Adjustment of Z1-axis (Z2-axis) Position

Safety precautions in terminating machine operation

WARNING

- The wheel has a sharp blade edge. If your hands or fingers come into contact with it, they may be wounded or cut off. Do not place your hands or fingers beneath the wheel.

  While the spindle rotates, do not touch the wheel nor attempt to remove the wheel cover. Note that it takes up to 15 seconds for a rotating spindle (7000 min^{-1}(rpm)) to come to a standstill.

- When you perform maintenance works involving unit operation from the MACHINE MAINTENANCE screen, the interlock system is deactivated, posing a danger of human injury or machine breakage. Such maintenace works must always be carefully performed by qualified maintenance personnel.

  Also, make sure that no other persons touch the machine while maintenance works are performed on the machine.

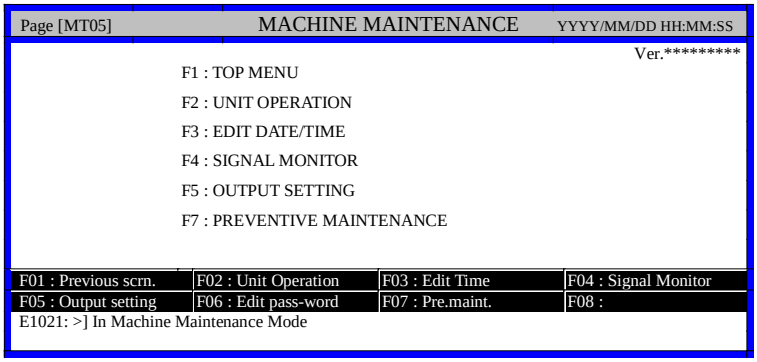
3-1-1. Calling up the UNIT OPERATION/MONITOR Screen

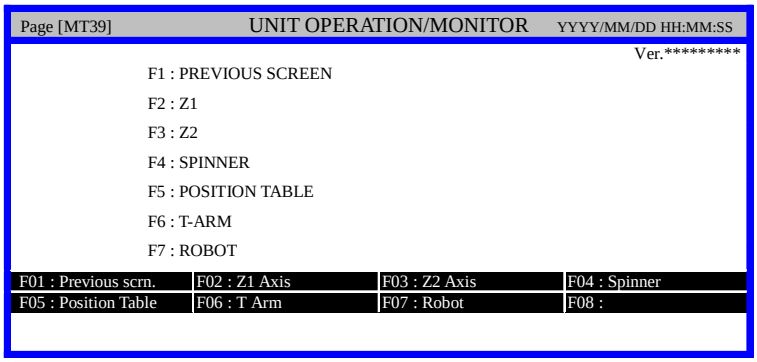
Procedure to call up the UNIT OPERATION/MONITOR screen

WARNING

- When you perform maintenance works involving unit operation from the MACHINE MAINTENANCE screen, the interlock system is deactivated, posing a danger of human injury or machine breakage. Such maintenace works must always be carefully performed by qualified maintenance personnel.

  Also, make sure that no other persons touch the machine while maintenance works are performed on the machine.

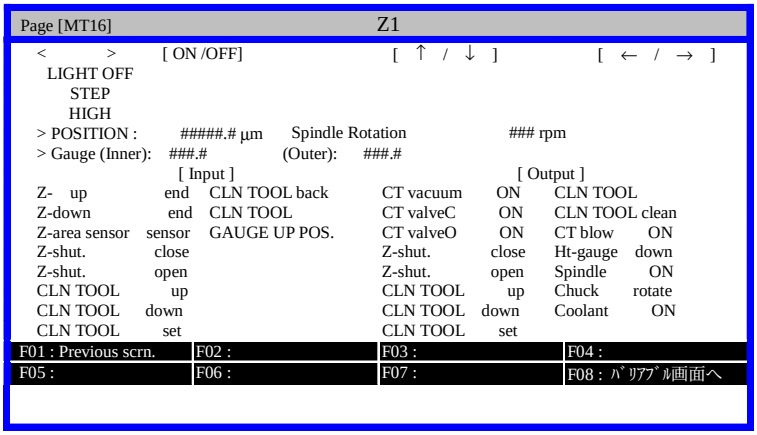
Step No.	Do This
1	Remove the wheels from the Z1-axis wheel and Z2-axis wheel ends respectively. - Refer to the Maintenance Manual for the procedures to remove the wheels.
2	Press the <F5: Machine Maint.>] key on the top menu screen. - The MACHINE MAINTENANCE screen appears. - If the screen is password-protected, enter the password (MAINTENANCE) and then press the <ENTER> key. 

Step No.	Do This
3	Press the <F2: Unit Operation> key. - The UNIT OPERATION/MONITOR screen appears. 

Continued to the next section.

3-1-2. Adjustment of Z1-axis (Z2-axis) Position

Procedure to adjust the location of the Z1/Z2 axis

Step No.	Do This (Continued from the previous section)
1	Press the <F02: Z1 Axis> key on the UNIT OPERATION/MONITOR screen to call up the Z1 screen. 
2	Open the side cover on the machine right side (Z1-axis side) to connect the manual keyboard to its connector inside the cover.
3	Using the [∨] key on the manual keyboard, lower the Z1-axis to its down-end position.
4	When adjusting of the Z1-axis position in unit operation completes, press the <F01: Previous scrn.> key to return to the UNIT OPERATION/MONITOR screen and then disconnect the manual keyboard from its connector.
5	Press the <F03: Z2 axis> key on the UNIT OPERATION/MONITOR screen to call up the Z2 screen. Using the same method as used for adjusting the Z1-axis position, adjust the Z2-axis position (by connecting the manual keyboard to its connector inside the side cover on the machine left side).
6	When adjusting of the Z2-axis position in unit operation completes, disconnect the manual keyboard from its connector.
7	Press the <F01: Previous scrn.> key to return to the top menu screen and then turn OFF the machine using the switch key inside the machine front panel.
8	Turn OFF the main circuit breaker on the rear of the machine.
9	Shut OFF power supply at the plant facility side and lock it out with a padlock or the like.
10	Close the valves of supply air and water at the plant facility side.

3-2. Water Purge (by Disco Service Personnel)

About water purge

Before transporting the machine by truck or ship, it is necessary to drain water off the machine water pipes. Ask Disco service engineers to drain off the pipes when you relocate the machine.

CAUTION

When relocating the machine out of plant (involving transportation by truck or ship), it is necessary to drain off the machine water pipes. If the machine is transported without draining water off its pipes, it may fail or break due to freezing or leaking of water remained in the pipes. Ask DISCO service engineers for the draining work, since the special tools and jigs are used for the work.

3-3. Removal of Pilot Lamp, Machine Outer Covers, and Monitor

Operation flow

Removal of the pilot lamp, machine outer covers, and monitor should proceed following the operation steps as described below.

3-3-1	Removal of Pilot lamp

⇩

3-3-2	Removal of Machine Outer Covers

⇩

3-3-3	Removal of Monitor

Safety precautions in removing the pilot lamp, machine outer covers, and monitor

WARNING

Removal of the machine outer covers reveals the sections of the machine which pose such hazards as cathing or cutoff. Make sure to turn OFF the machine and shut OFF power supply at the plat facility side before you remove the machine outer covers.

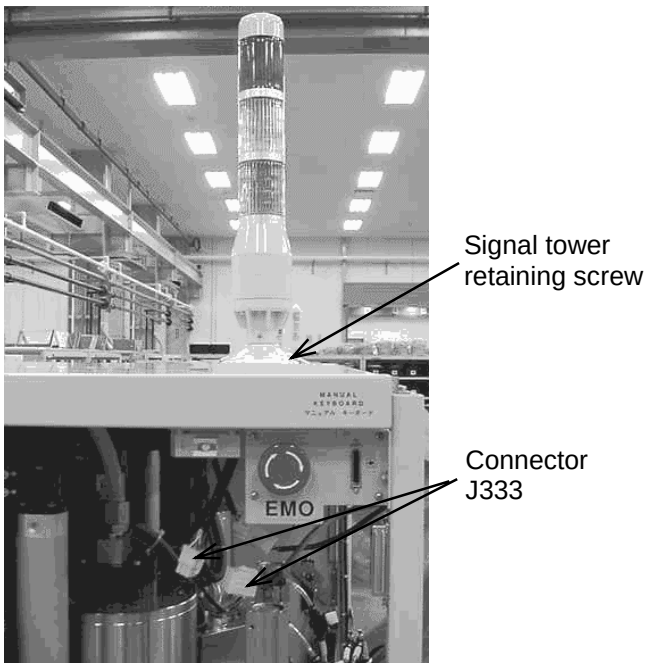
3-3-1. Removal of Pilot lamp

Prior to starting the work

The following tool should be readied to remove the pilot lamp.

Allen wrench (3mm)

Procedure to remove the pilot lamp.

Step No.	Do This
1	Disconnect the pilot lamp line (connector J333) from its connector in the machine. 
2	Remove the screws (3) securing the pilot lamp to the machine.
3	Remove the pilot lamp. Put the removed pilot lamp and retaining screws into a package.

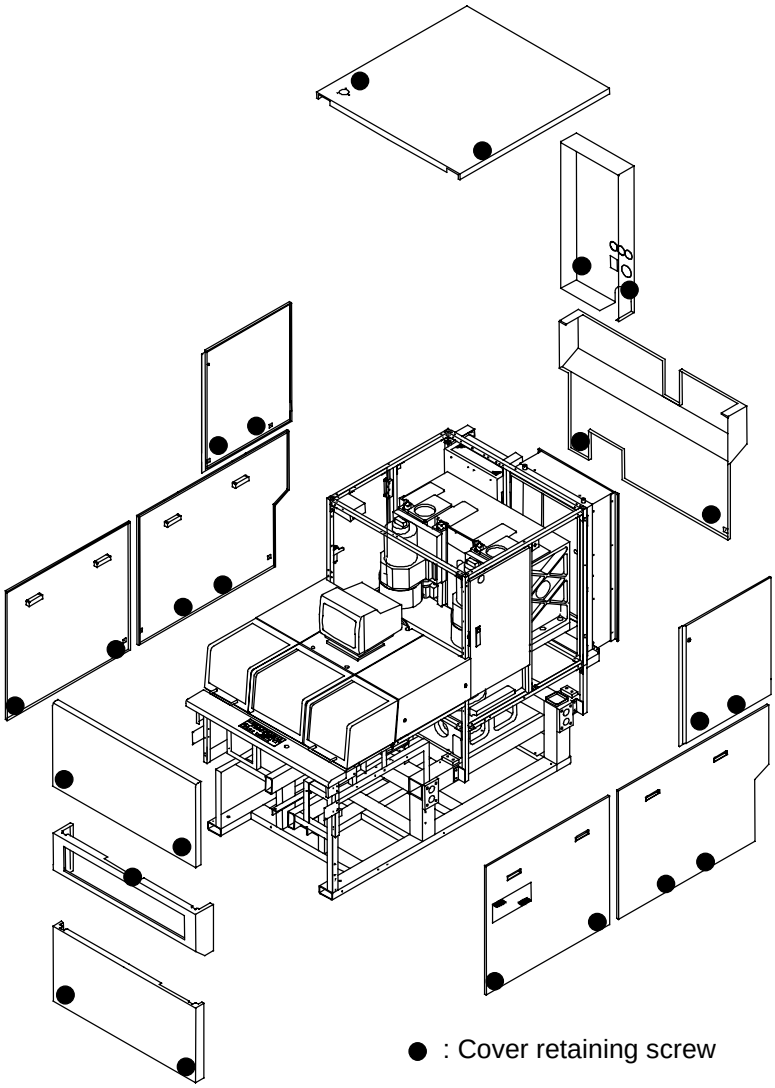
3-3-2. Removal of Machine Outer Covers

Prior to starting the work

The following tool should be readied to remove the machine outer covers.

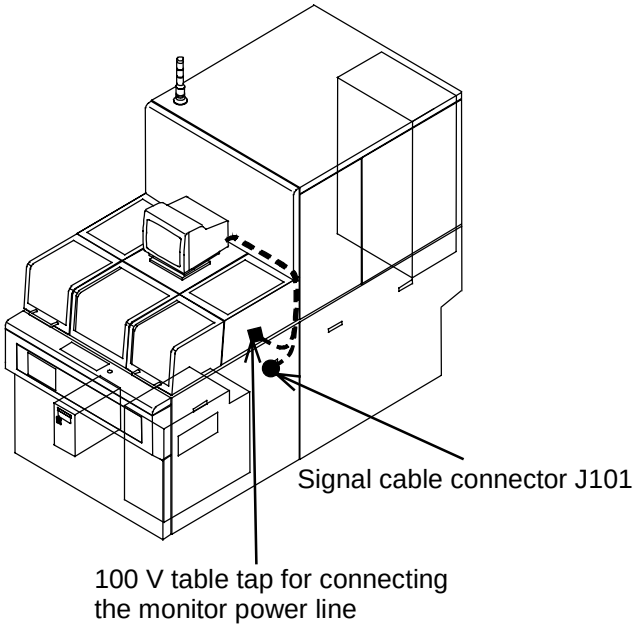
Allen wrench (2.5mm)

Procedure to remove the machine outer covers

Step No.	Do This
1	Check to make sure that the facility side power is shut OFF and the stopcocks of air and water are closed.
2	Remove all the machine outer covers.  ● : Cover retaining screw

3-3-3. Removal of Monitor

Procedure to remove the monitor

Step No.	Do This
1	Unplug the monitor power line from the 100V table tap in the lower right of the machine, and the signal line from the connector J101 as shown in the figure below. 

3-4. Installation of Retainer Jigs for Machine Transportation

Operation flow

This section describes about the procedures to install the retainer jigs for machine transportation in the flow of the operation steps as described below.

NOTICE

Before transferring the machine, make sure that the retainer jigs are respectively mounted to the Z1/Z2 axes and robot. If the machine is transferred without securing these movable components in their positions, it may take a great deal of time later to readjust and restore the machine's grinding accuracy.

3-4-1	Installation of Z-axis Retainer Jigs

⇩

3-4-2	Installation of Robot Retainer Jig

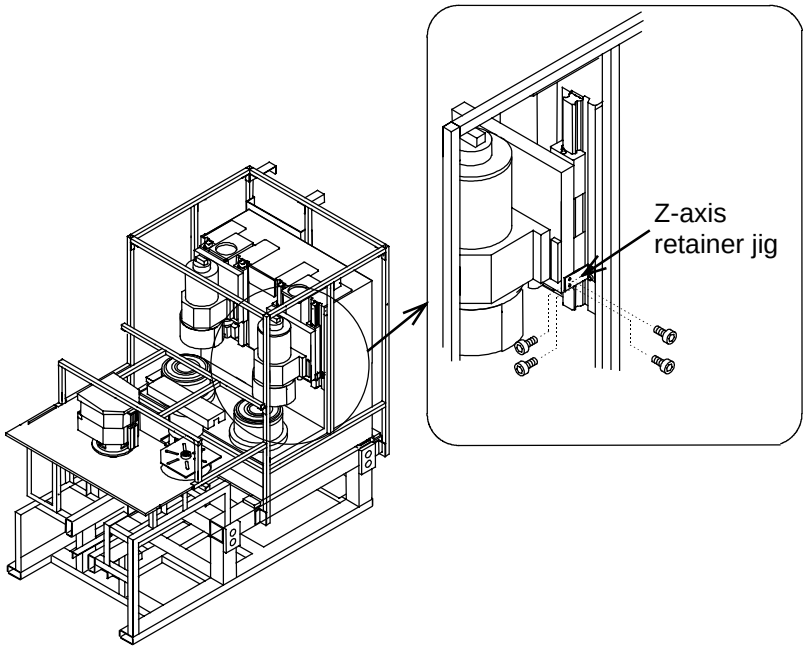
3-4-1. Installation of Z-axis Retainer Jigs

Prior to starting the work

The following tool should be readied to install the Z-axis retainer jigs to the machine.

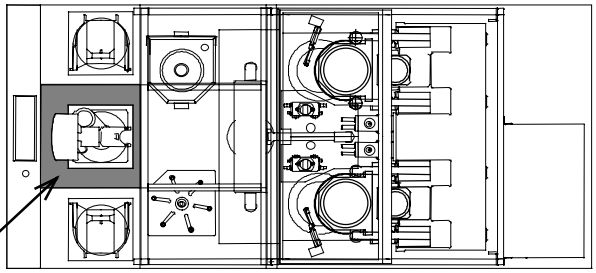
Allen wrench (5 mm)

Procedure to install the Z-axis retainer jigs

Step No.	Do This
1	Open the grinding section side cover at the Z1 and Z2 sides respectively.
2	Respectively install the Z1-axis and Z2-axis retainer jigs (red) with 4 hexagon socket-head screws (M6) referring to the figure shown below. 

3-4-2. Installation of Robot Retainer Jig

Procedure to install the robot retainer jig

Step No.	Do This
1	Lay out the robot retainer jig on the moving area of the robot as shown in the figure below and secure it to the machine with adhesive tape.  Robot retainer jig

3-5. Piping and Wiring Disconnection

Prior to starting the work

The following tools should be readied for piping and wiring disconnection.

Adjustable wrench
Wrench
Phillips screwdriver

Procedures to make piping and wiring disconnection

WARNING

If you come into contact with a live part of the machine while the facility-side power is turned ON, you may receive an electric shock that could result in severe injury or death. Before making piping or wiring disconnection, make sure to shut off power supply at the plant facility side.

Step No.	Do This
1	Check to make sure that power supply is shut OFF at the plant facility side.
2	Check to make sure that the stopcocks of air and water are closed at the plant facility side.
3	Disconnect the power cable of the machine at the plant facility side. - Make sure to disconnect the PE line of the power cable last.
4	Referring to Section 2-7, [Electric Wiring Connection] in this chapter, disconnect the electric lines from the machine, vacuum/coolant unit, and monitor.
5	Referring to Section 2-6, [Piping Connection] in this chapter, disconnect the piping lines from the machine and vacuum/coolant unit.
6	Purge water from the machine. - If the floor or the machine becomes wet with water, immediately wipe them dry with a lint-free cloth.

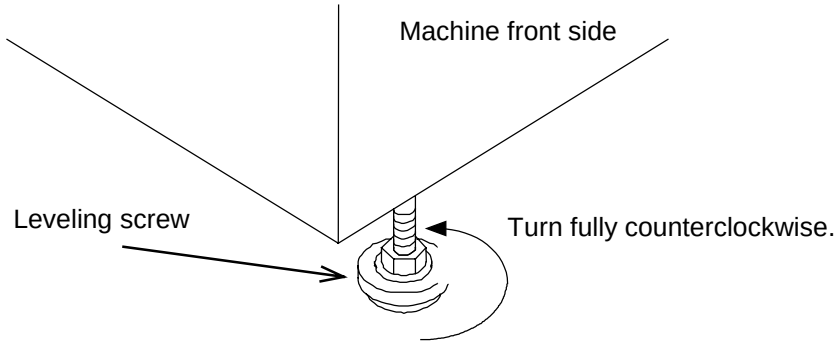
3-6. Screwing-In of Leveling Screws

Prior to starting the work

The following tools should be readied to screw-in the leveling screws at the bottom of the machine front corners.

Adjustable wrench
Wrench

Procedure to screw in the leveling screws

Step No.	Do This
1	Turn the leveling screws (2 in total) at each front corner of the machine bottom side fully counterclockwise to screw them in. 

3-7. Machine Relocation

Procedure to relocate the machine

Step No.	Do This
1	Transfer the machine by forklift. - Refer to Section 2-2, [Transferring the Machine] in this chapter for the procedure to transfer the machine.
2	Remove the leveling blocks (4) from the installation site and put them in safe custody.
3	To hoist/lower the machine, refer to Section 2-1, [Hoisting and Lowering the Machine] in this chapter.
4	Refer to sections 2-3 through 2-14 in this chapter for the procedures to install the machine at the new installation site.

INDEX

ADDRESS LIST

JAPAN OFFICE ADDRESS

JAPAN

DISCO CORPORATION

Japan Head Office	14-3, Higashi Kojiya 2-chome Ota-ku, Tokyo 144-8650 Phone 81-3-3743-0111 FAX 81-3-3743-5810
Overseas Sales / PS Company	Phone 81-3-3743-5813
Osaka Branch Office	3-12, Nishi Nakajima 6-chome Yodogawa-ku, Osaka 532-0011 Phone 81-6-6302-4501 FAX 81-6-6302-0258
Kyushu Branch Office	16-14, Kamisuizenji 2-chome Kumamoto-shi 862-0951 Phone 81-96-385-3411 FAX 81-96-384-1410
Sendai Regional Office	2nd. Floor, Sendai Bldg. Ekimae-kan 1-17, Itsutsubashi 1-chome Aoba-ku, Sendai-shi, Miyagi 980-0022 Phone 81-22-262-3345 FAX 81-22-262-3346
Suwa Regional Office	3rd. Floor, Center Bldg. 12, Okita-machi, 3-chome Suwa-shi, Nagano 392-0013 Phone 81-266-52-0814 FAX 81-266-52-0815
Nagoya Regional Office	1st. Floor, Kitamura No.4 Bldg. 80, Akegaoka, Meito-ku Nagoya-shi, Aichi 465-0033 Phone 81-52-776-6350 FAX 81-52-776-6380

ASIA OFFICE ADDRESS

SINGAPORE

DISCO HI-TEC (SINGAPORE) PTE., LTD.

Blk 2 Kaki Bukit Ave 1
#03-06/08 Kaki Bukit Industrial Estate
Singapore 417938
Singapore
Phone 65-7473737
FAX 65-7450266

THAILAND

DISCO HI-TEC (THAILAND) CO., LTD.

16th Floor, Lao Peng Nguan Tower 1
333 Viphavadi-Rangsit Road
Lard Yao, Cnatuchak
Bangkok 10900, Thailand
Phone 66-2-6188441
FAX 66-2-6188440

MALAYSIA

DISCO HI-TEC (MALAYSIA) SDN. BHD.

21A Tingkat 1
Jalan USJ 10/1D UEP
47620 Subang Jaya
Selangor, Darul Ehsan, Malaysia
Phone 60-3-563-72606
FAX 60-3-563-72439

Penang Regional Office

1-02-01 Persiaran Bukit Jambul Satu
Kompleks Sri Relau
11900 Penang, Malaysia
Phone 60-4-644-5502
FAX 60-4-645-2285

PHILIPPINES

AUROTECH SYSTEMS (PHIL'S), INC.

121 Buencamino Street
Alabang, Muntinglupa
Philippines
Phone 63-2-809-0155
FAX 63-2-807-7419

KOREA

D.I. CORPORATION

Disco Sales & Service Department

D.I Building
58-6, Nonhyun-Dong
Kangnam-ku, Seoul, Korea
Phone 82-2-546-5501
FAX 82-2-3446-8087

TAIWAN

HAPPY POLE, LTD.

8th Floor, 8-1, No.41
Section 2, Roosevelt Road
Taipei, Taiwan R. O. C.
Phone 886-22-3960651
886-22-3960652
886-22-3966717
FAX 886-22-3943943

HONG KONG (CHINA)

NEW TRONICS CO., LTD.

Flat F, 11th Floor, Valiant Ind. Bldg.
2-12 Au Pui Wan Street, Fotan
Shatin, N.T., Hong Kong
Phone 852-26871431
FAX 852-26874283

INDIA

H. FILLUNGER & CO., PVT. LTD.

Post Box No.2526
11/4, Pusa Road
New Delhi 110 005
India
Phone 91-11-5787428
91-11-5726052
FAX 91-11-5762961

CHINA

DISCO TECHNOLOGY (SHANGHAI) CO., LTD.

4th Floor, Block A, FaZhan Mansion
No. 51 RiJing Road
WaiGaoQiao Free Trade Zone
Shanghai, P. R. China 200131
Phone 86-21-58662516
FAX 86-21-58662517

U.S.A. OFFICE ADDRESS

U.S.A.

DISCO HI-TEC AMERICA, INC.

USA Head Office	3270 Scott Blvd. Santa Clara, CA 95054-3011 U. S. A. Phone 1-408-987-3776 FAX 1-408-987-3785
Eastern Regional Sales & Service Office	360 Harvey Road, Building B, Unit 202 Manchester, NH 03103 U. S. A. Phone 1-603-656-9019 FAX 1-603-656-9018
Southeastern Regional Sales & Service Office	4460 Brookfield Corporate Drive, Suite B Chantilly, VA 20151 U. S. A. Phone 1-703-815-2727 FAX 1-703-815-3573
Central Regional Sales & Service Office	4392 Sunbelt Drive Addison, TX 75001 U. S. A. Phone 1-972-267-9500 FAX 1-972-267-5612
Southwestern Regional Sales & Service Office	4411 South 40th Street, Suite D-5 Phoenix, AZ 85040-2950 U. S. A. Phone 1-602-431-1412 FAX 1-602-431-1437
Northwest Regional Sales & Service Office	7931 SW Cirrus Drive Beaverton, OR 97008-5971 U. S. A. Phone 1-503-644-0323 FAX 1-503-643-8108

LYONS & ASSOCIATES

832 Bellevue Avenue
Hulmeville, PA 19047
U. S. A.
Phone 1-215-750-6346
FAX 1-215-752-3216
Territory in charge: PA, DE, MD, VA, WV

MATRIX ASSOCIATES

303 Sweetwater Blvd. So.
Longwood, FL 32779
U. S. A.
Phone 1-407-862-1120
FAX 1-407-862-1123
Mobile phone 1-407-421-2341
Territory in charge: FL, GA, AL

LYONS & ASSOCIATES

620 Swamp Road
Doylestown, PA 18901
U. S. A.
Phone 1-215-345-7915
FAX 1-215-345-8089
Territory in charge: NY, NJ

LYONS & ASSOCIATES

c/o Resources for Electronics
24577 Green Valley Parkway
Elkhart, IN 46517
U. S. A.
Phone 1-219-875-1133
FAX 1-219-875-6873
Territory in charge: WI, IL, IN (Area Code 219 only)
MI (Area Codes 517, 616 only)

LYONS & ASSOCIATES

c/o Resources for Electronics
7800 John Elwood Drive
Centerville, OH 45459
U. S. A.
Phone 1-937-434-4941
FAX 1-937-434-9445
Territory in charge: OH, KY,
IN (Except Area Code 219)
MI (Except Area Codes 517, 616)

NET MERCURY

13438 Floyed Circle
Dallas, TX 75243
U. S. A.
Phone 1-972-783-1501
FAX 1-972-783-1574
Territory in charge: North half of TX, OK

NET MERCURY

2204 Forbes Drive, Suite 101
Austin, TX 78754
U. S. A.
Phone 1-512-835-2794
FAX 1-512-832-5274
Territory in charge: South half of TX, AR, LA, MO, KS

JOHN CRANE & ASSOCIATES

PMB 147
34522 No. Scottsdale Road, D-8
Scottsdale, AZ 85262
U. S. A.
Phone 1-480-488-9898
FAX 1-480-488-9848
Territory in charge: Mexico (Central & East)

SEMITORR MIDWEST

19175 Market Avenue
Belle Plain, MN 56011
U. S. A.
Phone 1-612-873-2873
FAX 1-612-873-2327
Territory in charge: MN, IA, NE, ND, SD

UKE ENTERPRISES

631 East Chapman Avenue
Orange, CA 92866
U. S. A.
Phone 1-714-633-0463
FAX 1-714-639-4359
Territory in charge: Southern CA (South of San Luis Obispo), Mexico (West)

U.S.A. (Continued)

UKE ENTERPRISES

4200 Beacon Place
Byron, CA 94514
U. S. A.
Phone 1-925-240-5483
FAX 1-925-513-3442
Mobile phone 1-408-209-9681
Territory in charge: Northern CA

SALES & SERVICE

17853 Santiago Blvd.
Bldg. 107, Suite 333
Villa Park, CA 92861
U. S. A.
Phone 1-714-532-6500
FAX 1-714-532-6131
Territory in charge: ID

CANADA

HEPAIRE PRODUCTS CORP.

P. O. Box 11026
Station "H"
Nepean, Ontario
Canada K2H7T8
Phone 1-613-831-3234
FAX 1-613-831-3235
Territory in charge: Eastern Canada

EUROPE OFFICE ADDRESS

GERMANY

DISCO HI-TEC EUROPE GmbH

Liebigstrasse 8
D-85551 Kirchheim b. Muenchen
Germany
Phone 49-89-90903-0
FAX 49-89-90903-199

FRANCE

DISCO HI-TEC FRANCE SARL

Provence Office

Espace Beauvalle-Bat. C
6, rue Mahatma Gandhi
F-13090 Aix-en-Provence
France
Phone 33-442910020
FAX 33-442910029

UNITED KINGDOM

DISCO HI-TEC UK LTD.

151 London Road
East Grinstead/West Sussex RH19 1ET
United Kingdom
Phone 44-1342-313165
FAX 44-1342-313177

ISRAEL

NEW TECHNOLOGY R.K. LTD.

3 Ben Gurion Street
P.O. Box 2227
Kfar-Azar 55000
Israel
Phone 972-3-6356650
FAX 972-3-6357750

IN AN EVENT OF AN ACCIDENT

Be sure to contact us

Immediately get in touch with the nearest DISCO or DISCO Service Office if a situation arises where an accident has occurred or might occur that involves injury or death during the operation of DISCO equipment.

Sales representative

Attach the business card of the DISCO sales representative you contact with, in the dotted lines below.

Attach the business card of your DISCO sales representative.

All addresses are subject to change without notice.
The latest addresses are available in the internet.

DISCO home page http://www.disco.co.jp/