2003-11

disco

INSTALLATION MANUAL

Automatic Dicing Saw

DAD3350

SOFTWARE VERSION 1.2 SERIES

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UKBSNE*012A

READ CAREFULLY BEFORE USING THIS MANUAL

Introduction

This machine is a dicing saw to cut materials such as silicon wafers, glass substrates and ceramic substrates (referred collectively as "workpiece" hereafter).
The machine contains rotary sections with parts that operate at high speed; high-voltage sections with danger of causing electric shock and drive sections where the workers' physical parts and/or clothing may get caught.
Failure to handle this machine properly may lead to serious injury or death.

Read before using the machine

Before using the machine, read this manual thoroughly and follow strictly all the instructions set forth in this manual.

To assure safety during work associated to operation and maintenance of this machine, it is important for every worker to know where the potential safety hazards lie in this machine. Although it is difficult for Disco to foresee each and every potential safety hazard, various precautionary notes and warnings have been included in this manual and the separate Safety Manual to identify and provide preventive knowledge against all foreseeable hazards. Strict observance of all these precautions and other relevant instructions set forth in this manual and the separate Safety Manual is thus essential for increased safety assurance.

The safety features of the machine may be seriously affected, in case this machine is modified without gaining the prior consent from Disco or repaired in a manner not stated in this manual.

Therefore, never attempt to modify or repair this machine in a manner not approved by Disco.

Extent of responsibility

- Disco is not responsible for any accident due to any of the following events.
  - When equipment of another manufacturer is added to the machine
  - When the machine or part of the machine is transported, reused, resold or modified
  - When supplied parts or parts designed by users are mounted on the machine
- It is possible that we are not able to carry out repair or maintenance work for reasons of safety and health care of our service or repair personnel, if the machine user refuses to disclose the names and contents of processing materials being used and/or processing piping, for reasons of confidentiality or trade secret protection.

Hazard level

The safety precautions set forth in this document are classified into DANGER, WARNING and CAUTION categories which represent three degree of hazards latent in the machine. These categories are defined as detailed below in accordance with the seriousness and probability level of the hazard. 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.

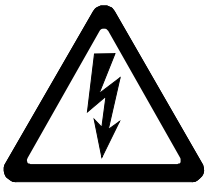
Before using the machine, be sure to read and understand all the associated safety precautions set forth in the manual.

Hazard levels are classified as follows:

⚠ DANGER	If you cannot avoid the incident in question, a critical situation in which either critical injury or death is very likely to result. This symbol is used for the incident in which the injury is critical and there is high probability of occurrence.
⚠ WARNING	If you cannot avoid the incident in question, a serious situation in which either critical injury or death may result. This symbol is used for the incident in which the injury is serious but there is not high probability of occurrence.
⚠ 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 there is not high probability of occurrence.
CAUTION	If you cannot avoid the incident in question, an accident of property damage may occur.
NOTICE	Indicates the safe way of using the machine as well as precautions to avoid accidents resulting in damage to property.

Safety label

Safety labels are affixed to the potentially hazardous sections of this machine. Before using this machine, verify the label positions and thoroughly understand the precautions and warning indicated by the safety labels.

Label	Hazard Level	Meaning of Label
Rotary Blade Label 		It is possible that your hands and fingers may be cut by the rotating blade. Observe the following precautions for at least 15 seconds until the spindle comes to a complete stop: - Do not place your hands or fingers near the blade or flange. - Ensure that the cover is kept closed.
Driving Section Label 		It is possible that yours hands and fingers may be caught and injured by the driving section. While the power is ON, ensure that the cover is kept closed.
Electrical Shock Hazard Label 		Use care to avoid possible electrical shock hazard.

INTRODUCTION

About this manual

This Installation Manual describes the installation procedures for the Disco Automatic Dicing Saw 3000 Series Models DAD3350.

To ensure safety

In order to ensure safety, be sure to thoroughly read and fully understand the important safety information set forth in the separate Safety Manual, before performing any operation.
The contents of this manual is based on software version 1.2 series.

In installation or maintenance operation, be sure to follow the procedures set forth in this manual.
Be sure that the machine should be installed and adjusted by a qualified person who has completed DISCO's education curriculum (hereinafter referred to as the maintenance personnel).

Definition of a manager and an operator

This manual defines a manager and an operator as follows:

Category	Applicable Personnel	Job Description
Manager	Management representative	The person who is responsible for overall management of the machine and the personnel.
Personnel	Maintenance personnel	The qualified person who received machine maintenance training offered by Disco.
	Data maintenance personnel	The qualified person who is responsible for the management of software data used for the machine.
	Operator	The person who operates the machine to process workpieces.

Documentation for this machine

The following six manuals are provided for this machine.
This manual is the Installation Manual indicated by the arrow.

Manual	Who should read	Contents
Safety Manual	- Management representative - Data maintenance personnel - Maintenance personnel	Information to ensure safety in the operation, installation and maintenance of the machine.
Installation Manual	**Maintenance personnel**	**Procedures for machine installation and adjustment**
Operation Manual	Operator	Operational procedures to be performed by operators
Data Maintenance Manual	Data maintenance personnel	Screen contents for data entry and data setting procedures
Maintenance Manual	Maintenance personnel	Servicing, inspection and adjustment procedures to be performed by customers
Technical Reference	Maintenance personnel	Machine specifications/circuit diagrams Illustrations 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.

CONTENTS

CONTENTS

A. INSTALLATION SPECIFICATIONS AND ENVIRONMENT

Contents of this chapter

This chapter describes the machine specifications and environment requirements including the installation space and piping connection positions.

Section No.	Title	Contents
1	Specifications	- Utilities requirements of the machine
2	Standard Packing Style on Delivery	- Standard dimensions and mass on delivery
3	Installation Environment	- Installation requirements
4	Piping and Wiring Connection	- Connection positions for piping and wiring

1. Specifications

Specifications

1	Power requirements (Standard)	Voltage	3-phase 200 - 240V AC ± 10 %
		Power frequency	50-60Hz
		Noise	Do not use the machine in electrically noisy environments. The tests listed below are conducted for this machine. Standards IEC: 61000-4-4 Electrical fast transient/burst immunity test (JIS: C1000-4-4 Electrical fast transient/burst immunity test) Outline of test ± 2.0kV (Charge voltage)
		Grounding	A ground connection must be made. Grounding must be carried out according to your local regulations.
		Maximum power	4.9kVA (1.8 kW spindle installed)
		Leakage current	15mA or less (If the earth leakage breaker is used for the plant facilities for protection purpose, use a breaker whose sensed current is 30mA or more.)
	Power requirements (Transformer specification)	Voltage	3-phase 380 - 415V AC ± 10 %
		Power frequency	50-60Hz
		Noise	Less than 2,000V at a pulse width of 500ns (square wave)
		Grounding	A ground connection must be made. Grounding must be carried out according to your local regulations.
		Maximum power	4.9kVA (1.8 kW spindle installed)
		Leakage current	15mA or less (If the earth leakage breaker is used for the plant facilities for protection purpose, use a higher harmonic-measured breaker whose sensed current is 30mA or more.)

2	Air	Supply pressure	Range: 0.5-0.8MPa (5.0-8.0kgf/cm^2)
			Variation: ± 0.01MPa (± 0.1kgf/cm^2)
		Degree of filtration	0.00001mm/99.5% or higher
		Residual oil content	0.1ppm
		Atmospheric dew point	-15 °C or lower
		Connection port	Rc (PT) 1/4" female
		Maximum consumption	200L/min (ANR) (185NL/min) (except for the use of air gun) The values shown above are for reference and will differ depending on the actual conditions applied.
3	Water		
	Wheel coolant water	Pressure	0.2 - 0.4 MPa (2.0 - 4.0 kgf/cm^2) Variation: ± 0.01MPa (± 0.1kgf/cm^2) If wheel coolant pressure is low due to your utility situation, please consult your DISCO sales representative.
		Water temperature	Room temperature +2 °C Variation: within ± 1 °C
		Water quality	If deionized water is not available, consult your nearest DISCO office.
		Connection port	Rc (PT) 1/4" female
		Flow rate setting range	0.2-4.0L/min The maximum flow rate fluctuates depending on the wheel cover to be used or Optional Accessories to be attached.
	Spindle coolant water	Pressure	0.2 - 0.4 MPa (2.0 - 4.0 kgf/cm^2) Variation: ± 0.02MPa (± 0.2kgf/cm^2)
		Water temperature	Equal to room temperature Variation: within ± 1 °C Fluctuation in water temperature may adversely affect cutting accuracy due to expansion or shrinkage of spindle.
		Water quality	If the chlorine (Cl), iron (Fe), copper (Cu) or sodium (Na) content or electrical conductivity is high, mechanical parts corrosion or piping clogging may be caused.
		Connection port	Rc (PT) 1/4" female
		Consumption	1.5L/min at 0.3MPa

4	Water drainage	Connection port	Duct hose 50.6mm ID
5	Duct	Exhaust capacity	5.0m^3/min If the employed duct capacity is less than 5.0m^3/min, consult your nearest DISCO office.
		Connection port	Duct hose 76.4mm ID
6	Outside dimensions	Main body dimensions	900 W × 1,050 D × 1,800 H mm Without protrusion and status indicator (336 mm)
7	Dry mass		1200kg - If you select the transformer unit for use outside Japan (68 kg) or uninterruptible power supply (55 kg), the mass of these equipment would be added to the machine's mass.
8	Paint color		Munsell No. 2.5GY 8.0/0.5

2. Standard Packing Style on Delivery

Standard packing style on delivery

The table below shows the standard packing style and mass of the machine on delivery.

Main Body Dimensions (mm)	Mass (kg)
900 W × 1,050 D × 1,800 H	Approx. 1,200

- In transferring, secure enough space so that the machine will pass safely through the selected route. (Information: At least a space of approximately 610mm wide is necessary for a person to work sitting.)

- The status indicator (336mm) and other protrusions are not included in the above dimensions.

- If you select the transformer unit for use outside Japan or uninterruptible power supply, the mass of these equipment would be added to the machine's mass.

Optional Accessory	Mass (kg)
Transformer unit for use outside Japan	Approx. 68
Uninterruptible power supply	Approx. 55

3. Installation Environment

Summary of this section

This section describes the space required to install the machine and other environment requirements.

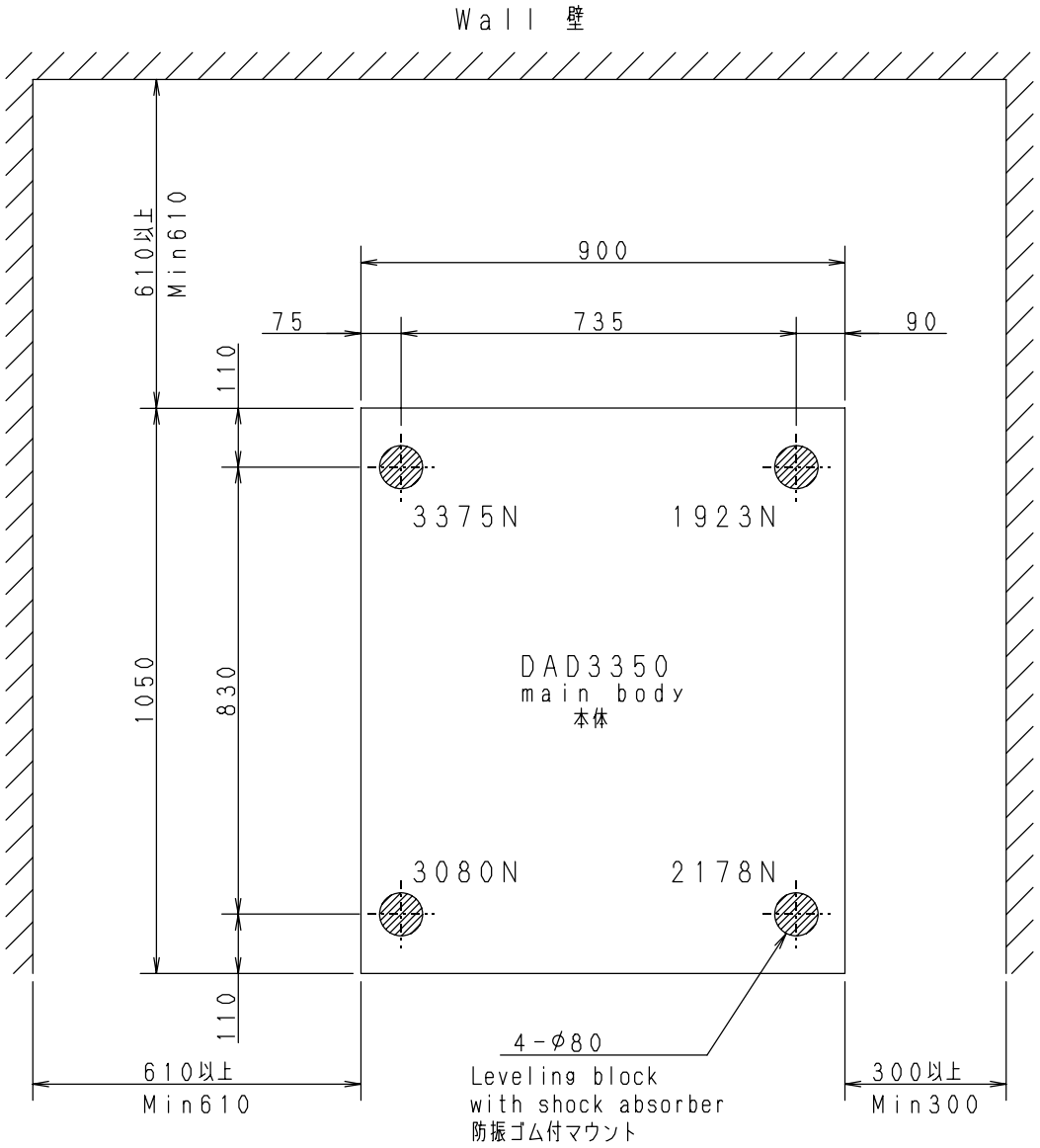
Section No.	Title	Contents
3-1	Installation Site	- Illustration of the installation site
3-2	Environment Requirements	- Environment requirements to install the machine
3-3	Environment for Storage and Transport	- Storage environment - Transport environment

3-1. Installation Site

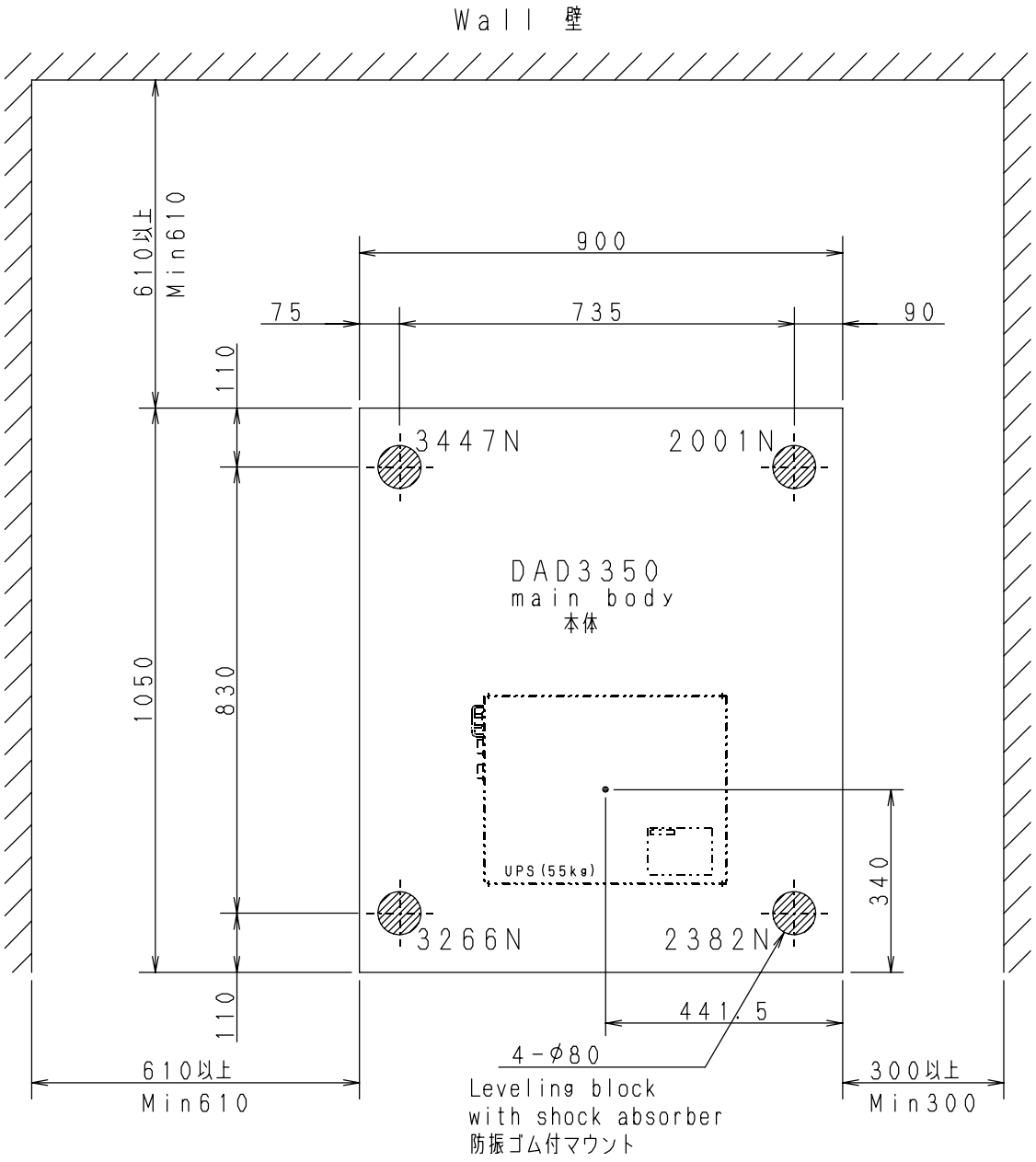
Installation precautions

- In installation site selection, ease of operation and maintenance must be taken into consideration.
- Avoid the place where temperature variations are great.
- In installation, secure 380mm of maintenance space between the top face of the machine and the ceiling of the room (2,180mm high from the floor).

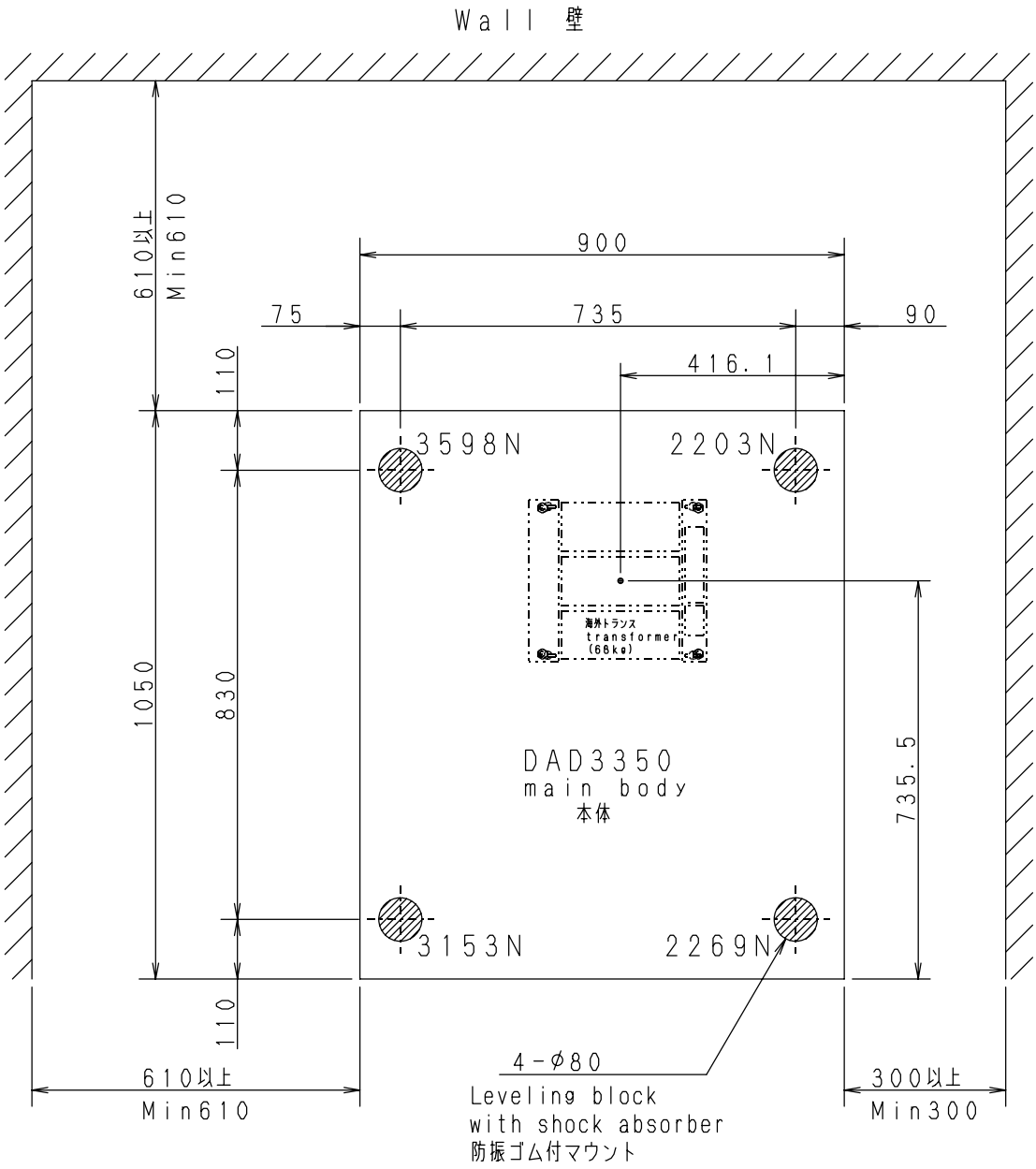
Installation drawing [Standard]



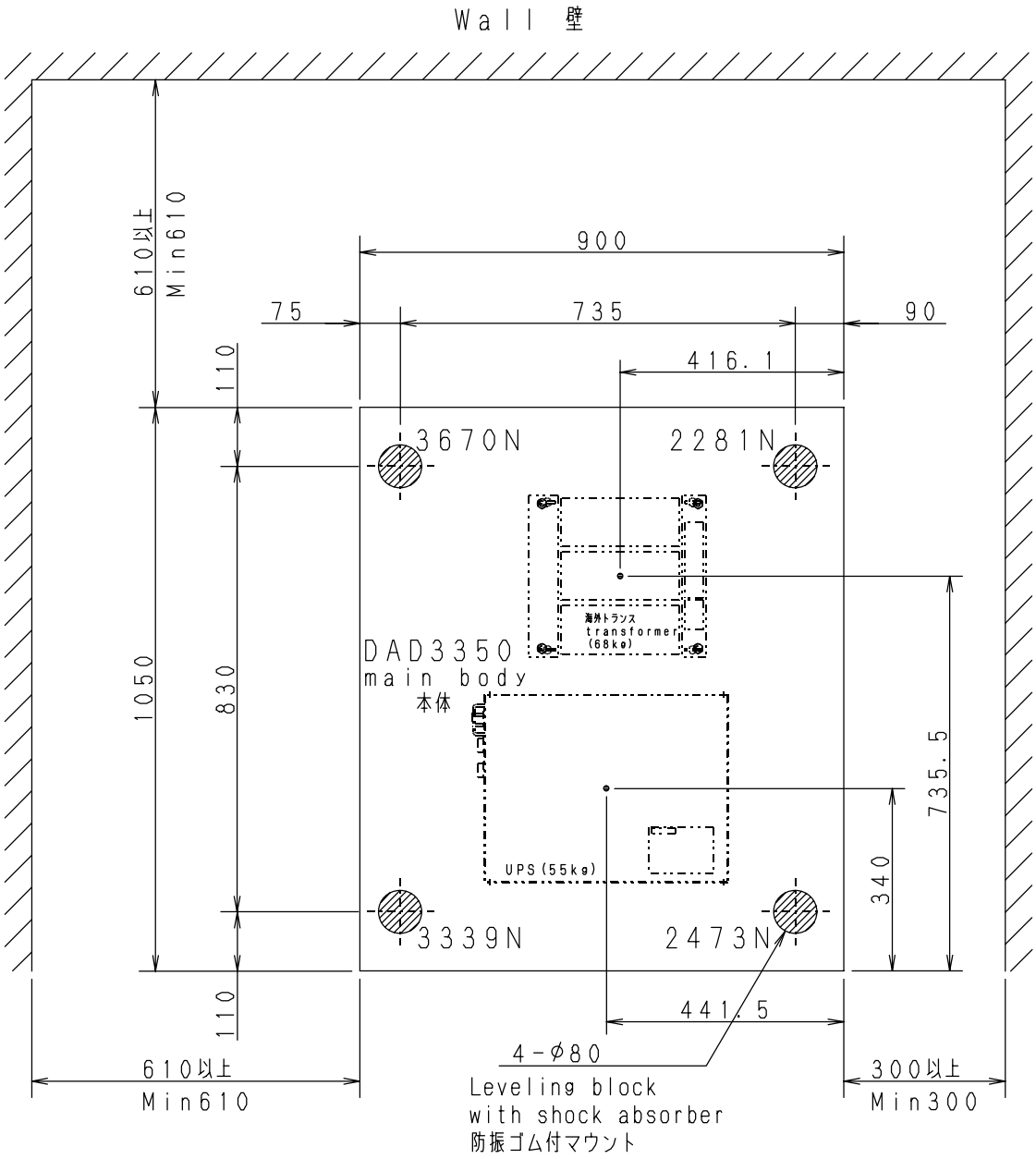
Installation drawing [Machine with a UPS]



Installation drawing [Machine with a transformer for use outside Japan]



Installation drawing [Machine with a UPS and a transformer for use outside Japan]



3-2. Environment Requirements

Environment requirements

This machine realizes highly accurate applications by employing highly precision axis units.
The installation environment, therefore, gives a great effect on the machine accuracy.

Ambient temperature (room temperature)	20 to 25 °C (variation: within ± 1 °C)
Ambient relative humidity	55 % ± 15 % (no condensation)
Wheel coolant water temperature	Room temperature +2 °C (variation: within ± 1 °C)
Spindle coolant water temperature	Equal to room temperature (variation: within ± 1 °C) Fluctuation in water temperature may adversely affect cutting accuracy due to expansion or shrinkage of spindle.
Power requirements	Standard spec: 3-phase 200 - 240 V AC ± 10 % - The leakage current is 15mA or less. If the earth leakage breaker is used for the plant facilities for protection purpose, use a higher harmonic-measured breaker whose sensed current is 30mA or more. - Significant voltage fluctuation must be avoided. - A momentary power failure must not occur with the employed power source. - Do not use the machine in electrically noisy environments. The tests listed below are conducted for this machine. Standards IEC: 61000-4-4 Electrical fast transient/burst immunity test (JIS: C1000-4-4 Electrical fast transient/burst immunity test) Outline of test ± 2.0kV (Charge voltage)
Duct	Rated displacement: 5.0 m^3/min
Grounding	A ground connection must be made. Grounding must be carried out according to your local regulations.
Altitude	Altitude of 1000m or lower * When the altitude of the site is 1000m or higher, consult your nearest DISCO.

Ensure that an air source, a water source, drain pipes and a power source are located near the machine.
The insides of the employed piping hoses must be free of dirt.
Be sure to install the machine on the floor that has adequate strength. And when the installation site uses the raised floor, please consult your nearest DISCO about its strength. (For the load capacity of the installation floor, see the section 3-1 of this chapter, [Installation Site].)
In installation avoid the place where noises, vibrations, heat or oil mist occurs or near a fan, a ventilating opening or oil mist source.
Machine anchors are optionally available. They are designed to provide human/equipment protection in the event of an earthquake or other disaster. It is recommended that the machine be secured with these anchors.

3-3. Environment for Storage and Transport

Environment for storage and transport

The environmental conditions for storage and transport would wield a profound influence on the machine's accuracy when it is operated.

Ambient temperature (room temperature)	5 to 40 °C
Ambient relative humidity	35 to 70 % (no condensation)
Machine anchors are optionally available. They are designed to provide human/equipment protection in the event of an earthquake or other disaster. It is recommended that the machine be secured with these anchors.	
In installation avoid the place where noises, vibrations, heat or oil mist occurs or near a fan, a ventilating opening or oil mist source.	
Drain water from the machine before storage and transport.	
Before starting operation of the machine after storage or transport, make sure to grease its driving axes.	

4. Piping and Wiring Connection

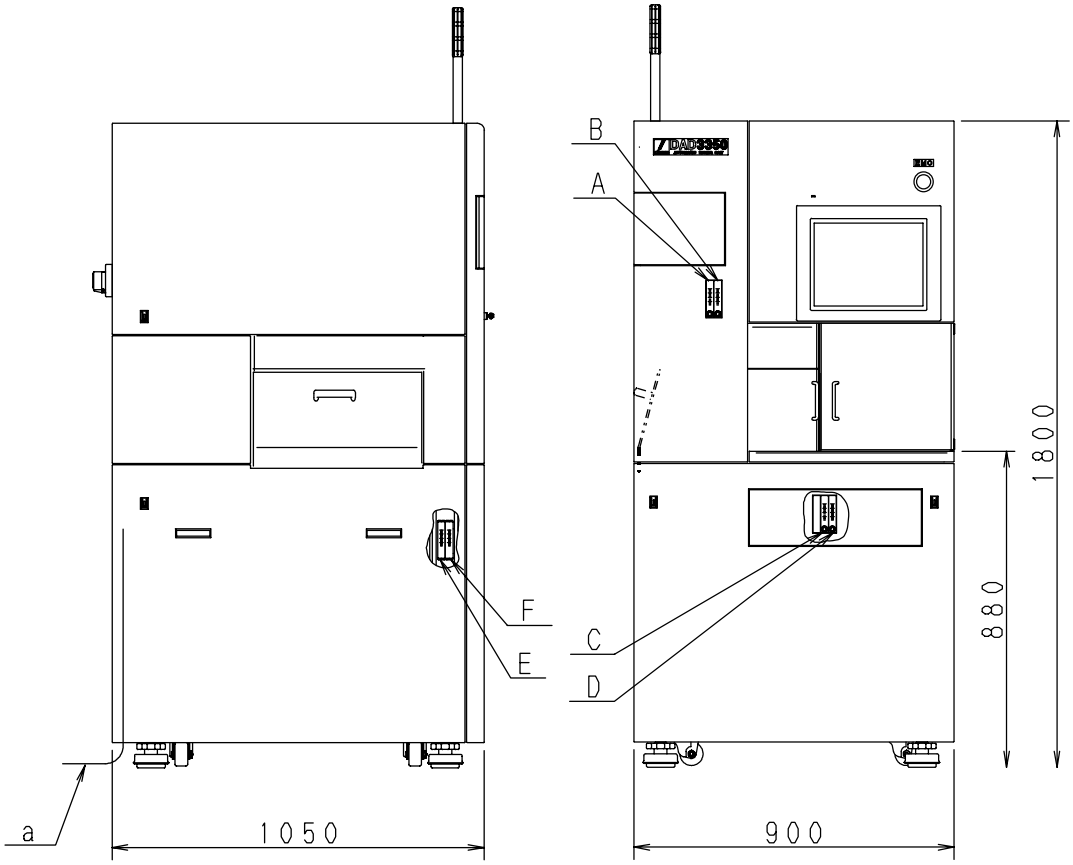
Summary of this section

In this section, the connection of piping and wiring are illustrated.

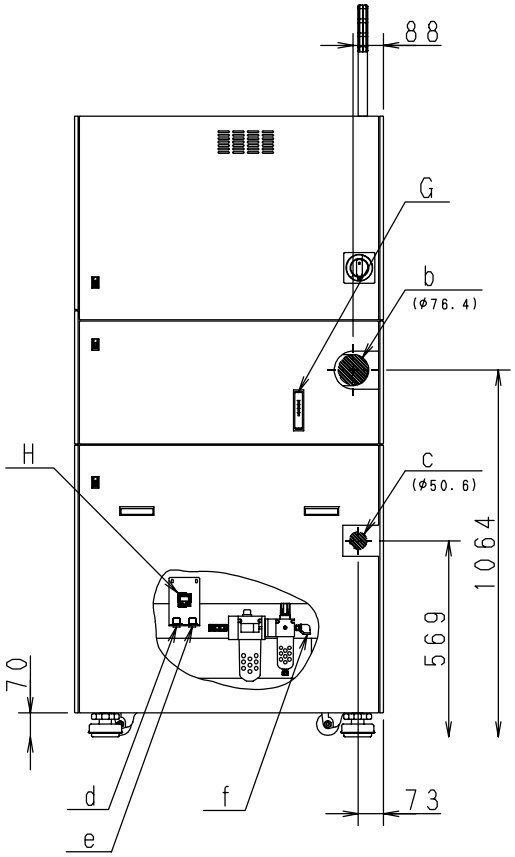
Section No.	Title	Contents
4-1	Positions of Piping Connection	- Piping connection diagram of the machine
4-2	Piping and Wiring Connection	- Piping and wiring connection

4-1. Positions of Piping Connection

Positions of Piping Connection



No.	Name	Remarks
A	Flowmeter of wheel coolant water (blade cooler)	Wheel cover section
B	Flowmeter of wheel coolant water (shower)	Wheel cover section
C	Spray nozzle flowmeter	Wheel cover section [Optional accessory]
D	Water curtain flowmeter	[Optional accessory]
E	Flow rate sensor of wheel coolant water (blade cooler)	Wheel cover section [Optional accessory]
F	Flow rate sensor of wheel coolant water (shower)	Wheel cover section [Optional accessory]
a	Power supply	



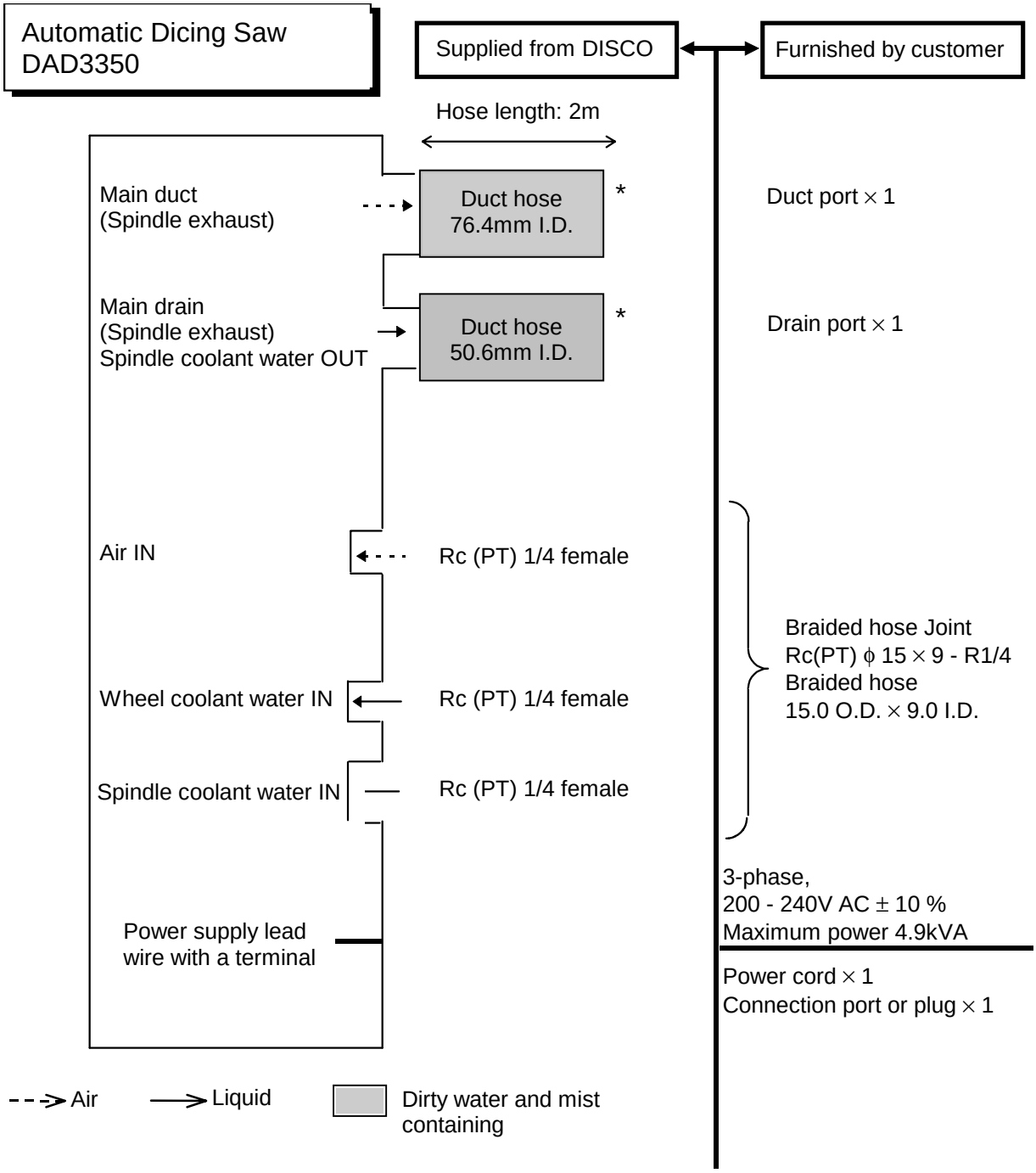
Back (Unit: mm)

No.	Name	Remarks
G	Flow rate sensor of spindle coolant water	
H	Air pressure sensor	
b	Main duct *	76.4 I.D. Duct hose
c	Main drain *	50.6 I.D. Duct hose
d	Wheel coolant water IN	Rc (PT) 1/4
e	Spindle coolant water IN	Rc (PT) 1/4
f	Main air IN	Rc (PT) 1/4

* Discharges dirty water and mist containing cutting material particles.

4-2. Piping and Wiring Connection

Piping and wiring connection



Note: 1) The optional piping is not included in the above diagram.
2) Pipe bands are provided with the parts marked with an asterisk (*).
3) The connecting parts to be furnished by the customer may vary depending on the installation site and connection method. For details, please consult your DISCO sales representative.
4) All the hoses and joints required for installation are available as optional accessories. It is recommended to use swage lock type joints if you prepare joints by yourself.

B. INSTALLATION AND TRANSFERRING OPERATION

Summary of this chapter

This chapter describes the installation operation, necessary adjustments for installation and the transferring operation.

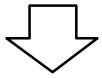
Section No.	Title	Contents
1	Installation Operation	- Procedures of installation - Necessary adjustments for installation
2	Transferring Operation	- Procedures of machine transfer

1. Installation Operation

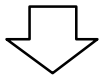
Operation flow

The procedure of installation operation consists of the following steps.

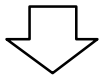
1-1 Hoisting and Lowering the Machine by a Crane



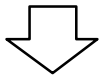
1-2 Transferring the Machine



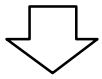
1-3 Installing the Machine with the Leveling Mount



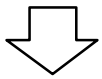
1-4 Removing the Drive Axis Metal Fixtures



1-5 Piping and Wiring Connection

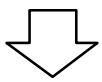


1-6 Mounting the Machine Outer Cover



1-7 Leveling the Machine with the Leveling Mount

1-8 Mounting the Machine Anchors [Optional Accessory]



1-9 Completion of Installation Operation

WARNING

- Control of exhaust air/drain water/contaminants
  Depending on the type of workpiece that is processed, hazardous substance may be produced as a result of cutting operation. Exhaust air, drainage and contamination produced by this machine must be controlled and disposed of, in accordance with local environmental regulations.
- Anchoring the machine
  Machine anchors designed to provide human/equipment protection in the event of an earthquake or other forms of disaster are prepared by Disco as optional accessories.
  Disco recommends its customers to use these anchors to secure their machines firmly at their respective sites at the time of installation.

NOTICE

Neither safety goggles, protective gloves, stepstools, flashlights nor alcohol, all of which are necessary for maintenance work, are not supplied. Use what are furnished in your factory or what comply with your factory's standards.

1-1. Hoisting and Lowering the Machine by a Crane

Before operation

Have on hand the following jigs to hoist or lower the machine with a crane.

> **WARNING**
>
> If the machine is hoisted or lowered using hoisting gear other than the dedicated jigs, hoisting gear may be broken due to insufficient strength or center-of-gravity displacement and the machine may fall down. This may result in severe injury or death of any person underneath the machine.
> In a hoisting operation, ensure to use the specified hoisting jigs.

[Hoisting jigs]

Part No.	Name	Qty
MGSSM10025U	Hexagonal socket head bolt	4
MG6N-M10-1U	Hexagonal nut	4
MOCAJ006--A	Shackle	4
MOENJ003	Lifting bracket (Suspension jig)	1
MOENJ035	Shackle	4
MOJTJ016--A	Lifting plate	2
MOJKJA20--A	Rope	4
MOJEJ004--A	Rope	2

[Others]

Safety shoes and protective gloves

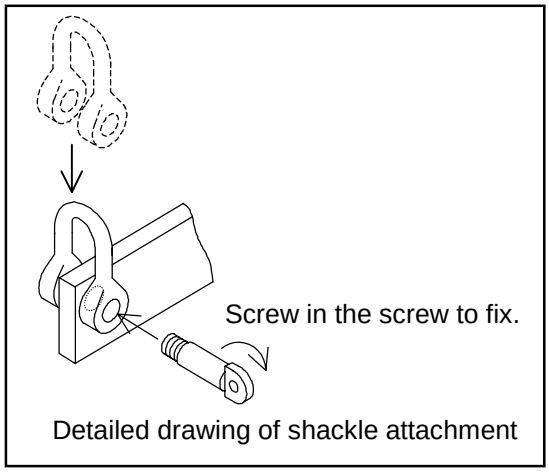
DANGER

If the machine should fall while it is hoisted, any person under the machine could be crushed to death or seriously injured.
During hoisting, stay away from the area under and/or near the machine.
The mass of the machine including the hoisting jigs is approximately 1,500 kg.
Ensure that the maximum load rating for the employed lifting crane is adequate for the machine weight, boom length and hoisting angle.

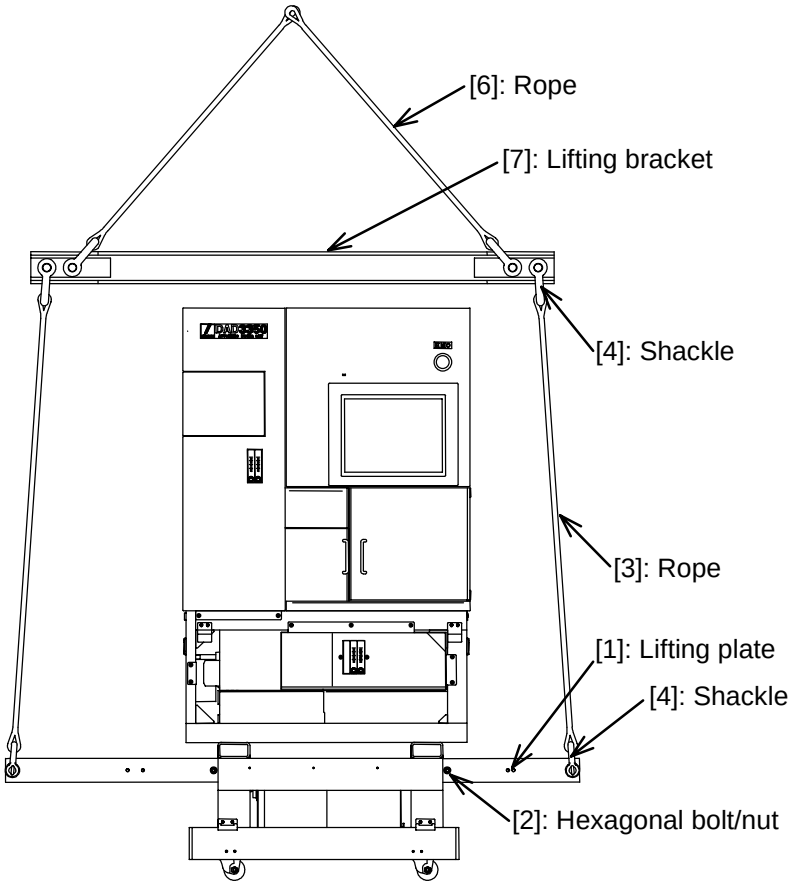
WARNING

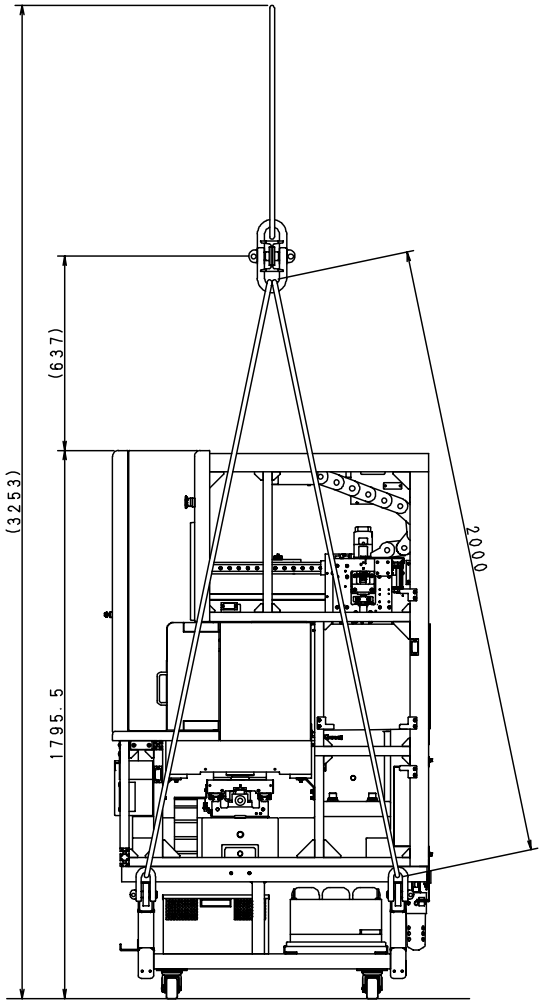
- If the machine should fall due to insufficient strength of hoisting jig or center-of-gravity displacement, you could be crushed to death or seriously injured.
  In a hoisting operation, use the specified dedicated hoisting jigs.
  If the machine is hoisted using hoisting jigs other than the dedicated one, hoisting accessory breakage may occur due to strength insufficiency or center-of-gravity displacement, thereby allowing the machine to fall.
- If the displacement-prevention bolts come off from the hoisting jigs during hoisting, the hoisted machine may lose balance and fall. If the machine fall, you could be crushed to death or seriously injured. Be sure to firmly secure the displacement-prevention bolts to the hoisting jigs.
- If the shackles are disengaged from the jigs during machine hoisting, the hoisted machine may lose balance and drop. Be sure to firmly secure the shackles.
- While you hoist or lower the machine, your feet and hands could be caught or cut off by the machine.
  Wear safety shoes and protective gloves.

Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Insert the lifting plate [1] into the machine frame.
3	Attach the hexagonal bolt and nut [2] for displacement-prevention to the front and rear of the inserted lifting plate [1].
4	Thread the rope [3] through the shackle [4]. Engage the shackle with the inserted lifting plate [1] and lifting bracket [5].
5	Engage the hoisting ropes [6] with a crane.



Detailed drawing of shackle attachment



Step No.	Do This
5 (Continued)	
6	Make sure that the ropes do not come into contact with any part of the machine, and then start hoisting. The mass of the machine including the hoisting jigs is approximately 1,500 kg. Ensure that the employed crane rating is adequate for the machine weight. Also, be sure that the employed wires and other hoisting accessories are appropriate for the machine weight. - Hoist the machine without shocking the machine. - Do not tilt the machine. - Do not apply any undue force to the covers.
7	Lower the machine. - While lowering, exercise care not to shock the machine.

1-2. Transferring the Machine

Summary of this section

You can move the machine by either hand push or using a pallet truck.
Each procedure is described in the sub-sections respectively.

Section No.	Title	Contents
1-2-1	Transferring the machine by hand push	- Procedures for transferring the machine by hand push
1-2-2	Transferring the machine by pallet truck	- Procedures for transferring the machine by pallet truck

1-2-1. Transferring the machine by hand push

Before operation

Have on hand the following equipment for transferring operation.

- Safety shoes, protective gloves

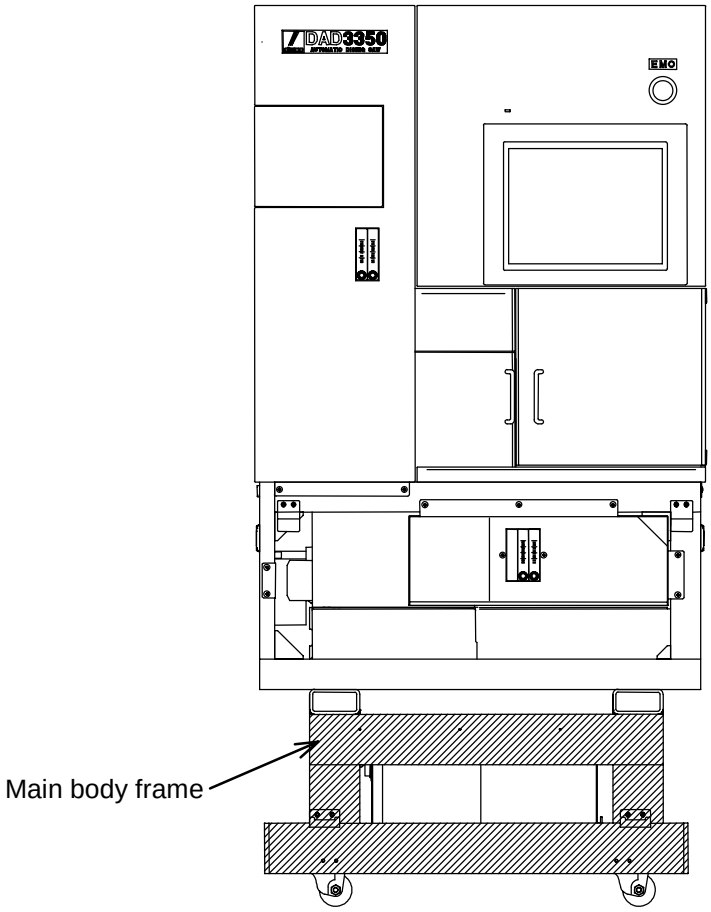
Procedures for transferring the machine by hand push

WARNING

- If the machine should topple down while it is transferred, you may be caught under the machine, or if the leveling mount should come off, your feet or hands may be caught or cut off by the machine. During transferring operation, do not place your feet or hands under the machine.
- During transferring operation, your feet and hands could be caught or cut off by the machine.
  Wear safety shoes and protective gloves.

CAUTION

- When the machine passes a floor that is bumpy or with varying surface levels, the impact applied to the machine while it moves on such irregular floor may have an adverse effect on its cutting precision.
  Therefore, whenever there is a need to move the machine elsewhere, be sure to choose a flat route.
- In machine transferring operation, resin cover might be broken or sub-frame might be bent.
  Do not push or pull the covers or sub-frame, but push the main body frame to move the machine.

Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Secure enough space so that the machine will pass safely through the selected route. (Information: At least a space of approximately 610mm wide is necessary for a person to work sitting.)
3	Push the main body frame to move the machine. * To move the machine, push only the main body frame. 

1-2-2. Transferring the machine by pallet truck

Before operation

Have on hand the following equipment for transferring operation by pallet truck.

Safety shoes and protective gloves
Pallet truck

Procedures for transferring the machine by pallet truck

DANGER

- Transferring the machine by pallet truck
  When a pallet truck is used to transfer the machine, make sure that the center of gravity of the machine matches with the center of the pallet truck. In case the machine is transferred while it is off-balanced (for not placing its weighted center right in the center of the pallet truck), it may fall from the truck during the transfer and cause anyone nearby to be crushed to death or seriously injured. The mass of the machine including the hoisting jigs is approximately 1,500 kg. The pallet truck used for the transfer of this machine must be a type that is designed to be capable of lifting, lowering and transporting a load of 1,500 kg, and with a fork having a length of at least 1,100 mm.
- If the fork is not inserted into the correct position, the machine may fall down or topple, which may result in a person underneath being severely injured or crushed to death. Check the associated drawings in advance to confirm the appropriate fork insertion position.
- If the machine should topple or fall, a person on the machine transfer route may be severely injured or crushed to death. Ensure that there is no person on the machine transfer route.

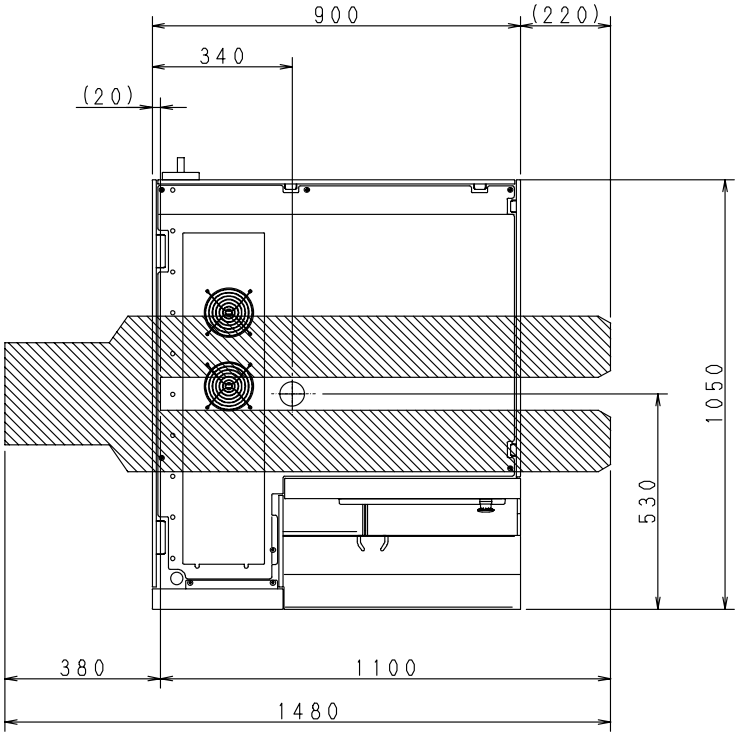
WARNING

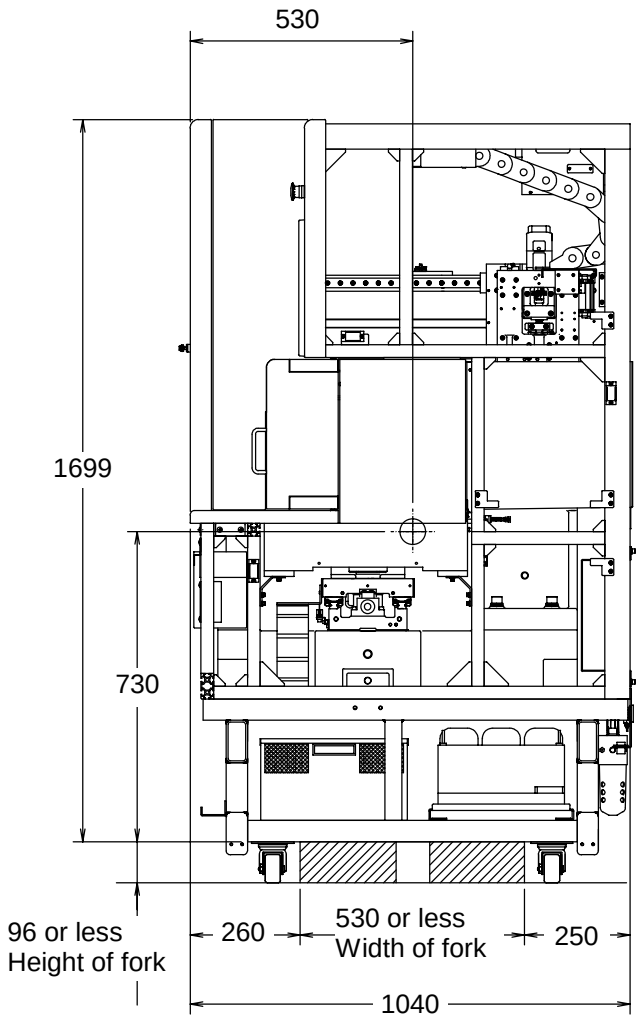
- If the machine should topple down while it is transferred, you may be caught under the machine, or if the leveling mount should come off, your feet or hands may be caught or cut off by the machine. During transferring operation, do not place your feet or hands under the machine.
- During transferring operation, your feet or hands could be caught or cut off by the machine.
  Wear safety shoes and protective gloves.

CAUTION

- Before transferring the machine, make sure that the supplied metal fixtures have been attached to the specified axes. If the machine is transferred without securing the metal fixtures, it may take a great deal of time later to readjust the machine's accuracy. For details of securing the metal fixtures, refer to the section 2-3, [Securing Drive Axes] in this chapter.
- When the machine passes a floor that is bumpy or with varying surface levels, the impact applied to the machine while it moves on such irregular floor may have an adverse effect on its cutting precision.
  Therefore, whenever there is a need to move the machine elsewhere, be sure to choose a flat route.
- In machine transferring operation, resin cover could be broken or sub-frame may be bent.
  Do not push or pull the covers or sub-frame, but push the main body frame to move the machine.

Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Secure enough space so that the machine will pass safely through the selected route. (Information: At least a space of approximately 610mm wide is necessary for a person to work sitting.)

Step No.	Do This
3	From the left side of the machine, insert the fork of the pallet truck under the machine as shown below, and lift the machine. 

Step No.	Do This
3 (Continued)	
4	Transfer the machine to the installation site. - For details of installation site; See the section A-3-1, [Installation Site].
5	Lower the fork and then pull it out of the machine.

1-3. Installing the Machine with the Leveling Mount

Before operation

Have on hand the following equipment for installing operation.

22 mm wrench
Safety shoes and protective gloves

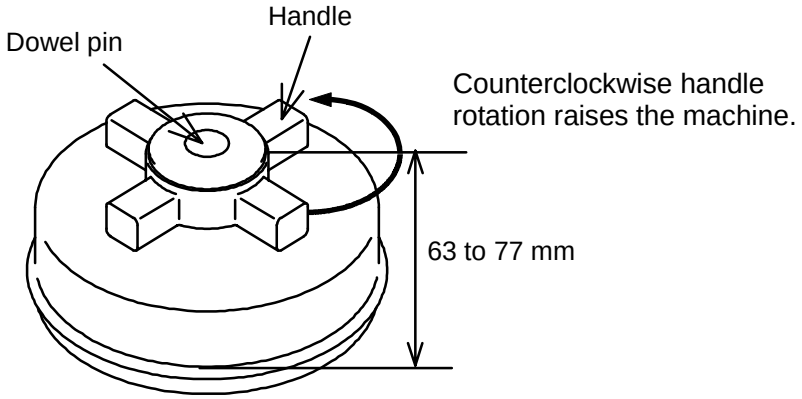
Procedures for installing the machine with the leveling mount

The casters attached underneath the machine make the machine transferring easier.
When the machine arrives at the intended installation site, however, you have to secure the machine there and take some measure to prevent the machine from moving easily. For this purpose, attach the leveling mounts and jack the machine up in order to disable the casters.

WARNING

- If the machine should topple down during jacking operation, you may be caught under the machine, or if the leveling mount should come off, your feet or hands may be caught or cut off by the machine. Do not place your feet or hands under the machine during jacking operation.
- If the leveling mount comes off during jacking operation, your feet or hands may be caught or cut off by the machine.
  The leveling mount must be adjusted so that the distance between the machine bottom surface and floor surface becomes between 63 and 77 mm. If the machine is jacked up higher than this, the leveling mount may come off.
- In the installation operation, your feet and hands could be caught or cut off by the machine.
  Before starting installation, wear safety shoes and protective gloves.

Procedures for installing the machine with the leveling mount (Continued)

Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Place the dowel pin of the leveling mount just under the positioning hole located underneath the main body frame. Then rotate the leveling mount handle lightly counterclockwise. - For the positioning hole; - See the section A-3-1, [Installation Site].
3	Verify that the dowel pin fits into the positioning hole and the leveling mount does not move to-and-fro or side-to-side.
4	With a wrench, rotate the leveling mount handle counterclockwise until all the casters are lifted above the floor surface. Make necessary adjustments in the front-rear and left-right directions so that the machine is roughly parallel to the floor surface. * In jacking-up operation, ensure that the distance between the machine bottom end and the floor surface becomes between 63 and 77 mm. 
5	Visually make sure that all the casters mounted on the bottom of the machine are lifted above the floor.

1-4. Removing the Drive Axis Metal Fixtures

About removing the drive axis metal fixtures

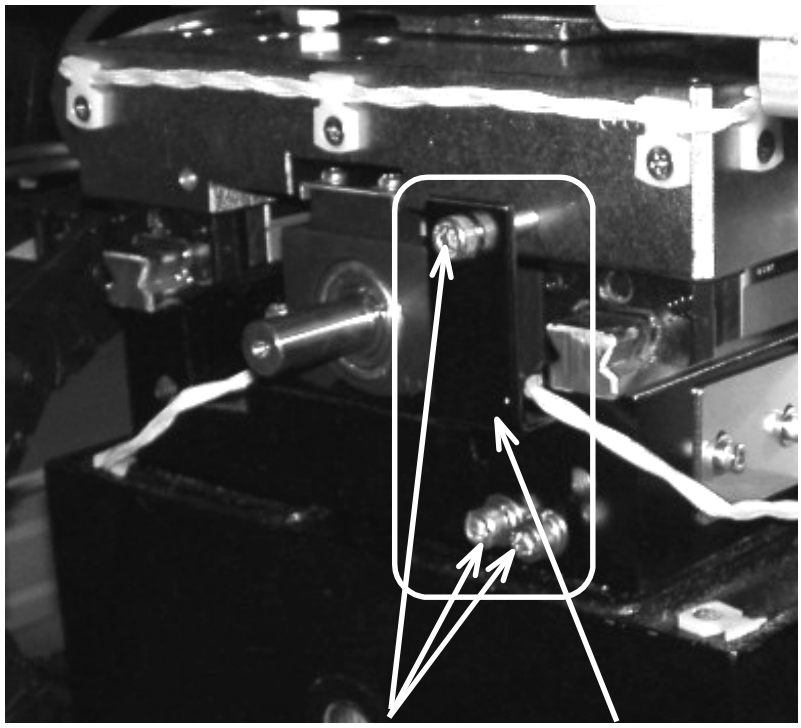
Prior to machine shipment, the drive axes of the machine are secured with the dedicated metal fixtures to prevent the axes from being displaced due to vibration or the like during transit. Before installing the machine, therefore, it is necessary to remove the metal fixture retaining screws as well as metal fixtures of the X-, Y- and θ -axes.

Before operation

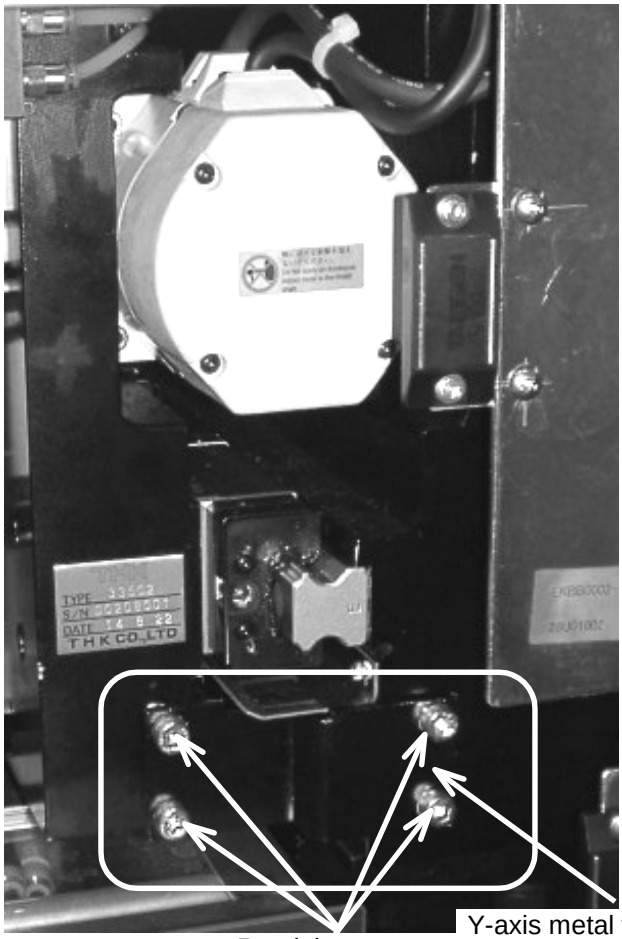
Have on hand the following tools for removing the drive axis metal fixtures.

3 mm Allen wrench
4 mm Allen wrench
6 mm Allen wrench
Phillips screwdriver

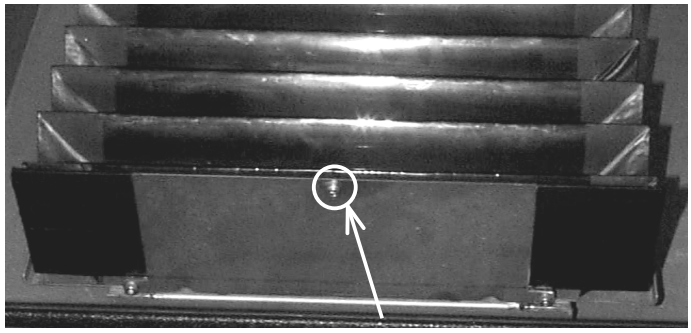
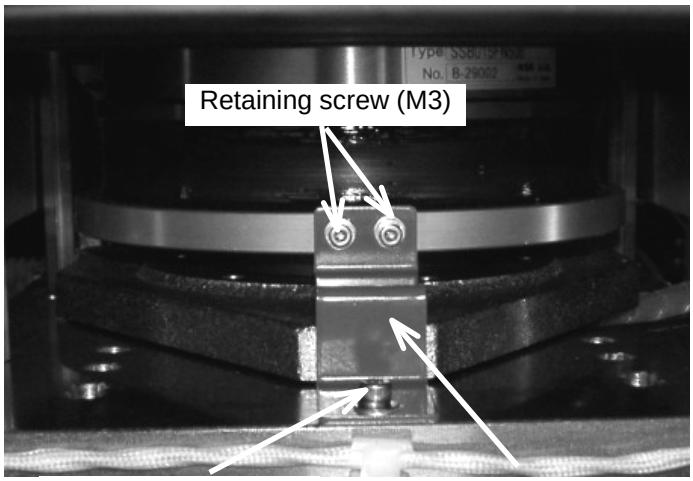
Procedures for removing the axis metal fixture

Step No.	Do This
1	From the right side of the machine, loosen the retaining screws (M6) of the X-axis metal fixture, and then remove the metal fixture.  Retaining screw X-axis metal fixture

Step No.	Do This
2	From the backside of the machine, loosen the retaining screws (M6) of the Y-axis metal fixture, and then remove the metal fixture.



Procedures for removing the axis metal fixture (Continued)

Step No.	Do This
3	From the left side of the machine, remove the retaining screws (M4) of the metal fixture of the bellows (left).  Retaining screw of bellows (left)
4	While holding up the bellows, unscrew the retaining screws (M3 and M4) of the θ -axis metal fixture, and then remove the metal fixture. 
5	Screw down the retaining screw of the bellows (left).

1-5. Piping and Wiring Connection

Operation flow

The procedure for mounting the status indicator and connecting piping and wiring consists of the following steps.

1-5-1	Mounting the status indicator

⇩

1-5-2	Connecting piping

⇩

1-5-3	Connecting power supply wiring

Before operation

Have on hand the following tools for piping and wiring connection.

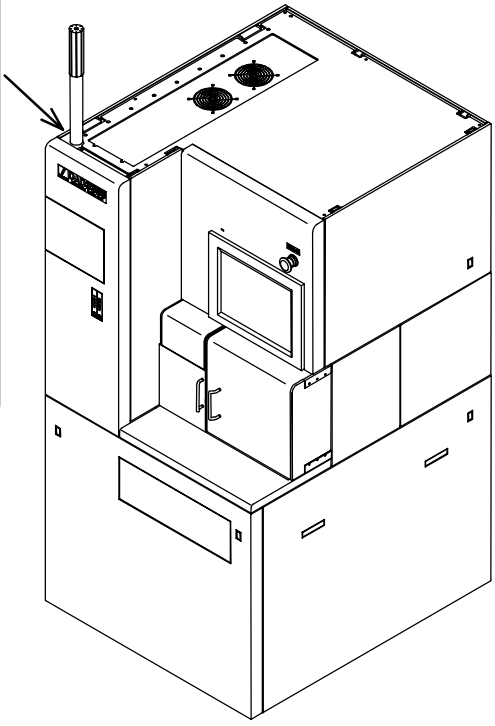
3 mm Allen wrench
24 mm wrench
27 mm wrench
Swage lock type joint [Rc(PT) ϕ 15 × 9-R1/4 (Qty: 3)]
Braided hose [O.D. 15.0 × I.D. 9.0 (Qty: 3)]
Flatblade screwdriver (For wire clamp)
Phillips screwdriver (For power connection)

1-5-1. Mounting the status indicator

Procedures for mounting the status indicator

CAUTION

If any equipment other than the specified ancillary equipment is connected to a convenience power outlet within the machine, the power supply to the machine may become insufficient or the machine may malfunction to incur accidents.
Use the internal convenience power outlet for the specified ancillary equipment only.

Step No.	Do This
1	Run the connector cable of the status indicator into the machine via a hole of the main body frame. Then secure the status indicator with the lock nut.  
2	Connect the connector cable (JSTC) of the status indicator to the mating machine-side connector.

Continued in the next section.

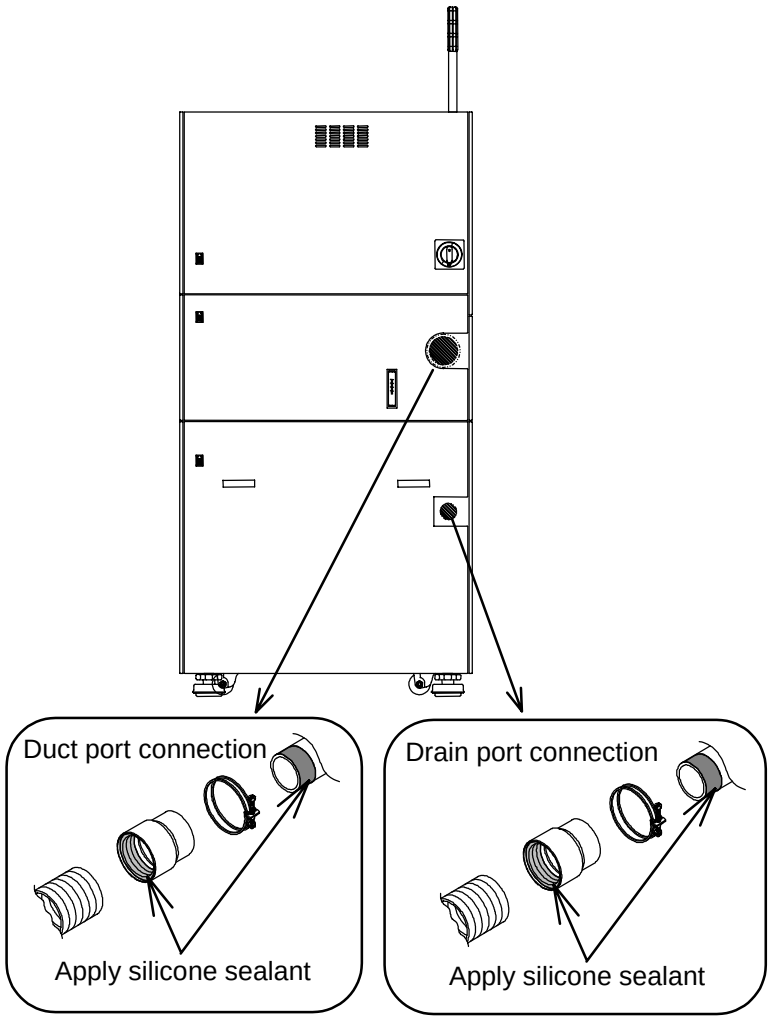
1-5-2. Connecting piping

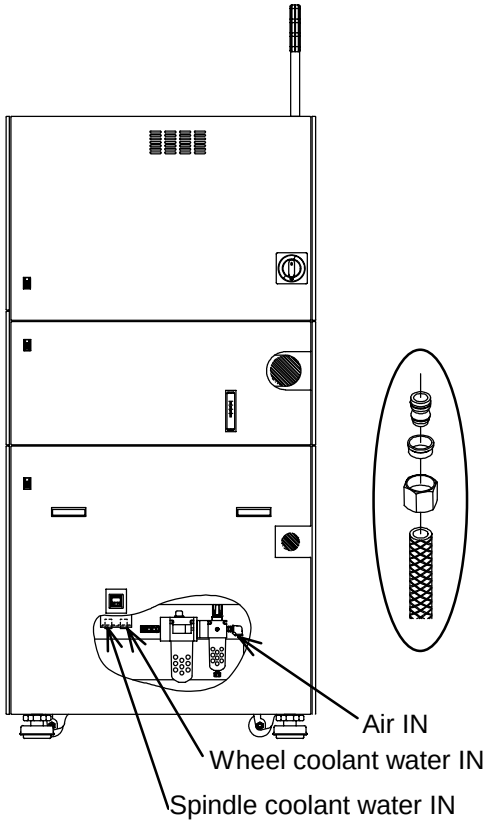
Procedures for connecting piping

CAUTION

- If the air pipe is disconnected during spindle rotation, the spindle may be broken and inadequate connections will result in pipe disconnection.
  Ensure that air supply connection coupling is properly completed.
- If the facility water drain is not positioned lower than the machine drain port, water remains in the duct, which may cause water leakage from the duct joint.
  The hose and hard pipe line between the machine drain port and facility water drain must be inclined.
- When the quality of wheel and spindle coolant water is different each other, improper piping of them could lead to workpiece breakage or deterioration of cutting accuracy.
  Take care not to install the hoses of wheel and spindle coolant water to the opposite side.

Step No.	Do This (Continued from the previous section)
1	As shown below, connect the hoses to the drain and duct exhaust ports at the back of the machine. - Apply silicone sealant to the hose and cuff joints.



Step No.	Do This
2	Using joints, connect the braided hoses to the supply ports of the individual utility manifold, as indicated below. * It is recommended that the customer use a swage lock type joint as indicated in the figure. The swage lock type joint is available as an optional accessory. 

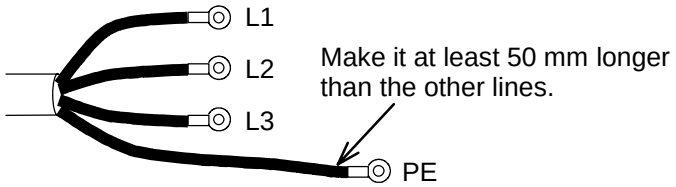
Continued in the next section.

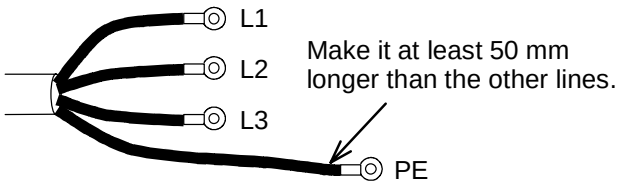
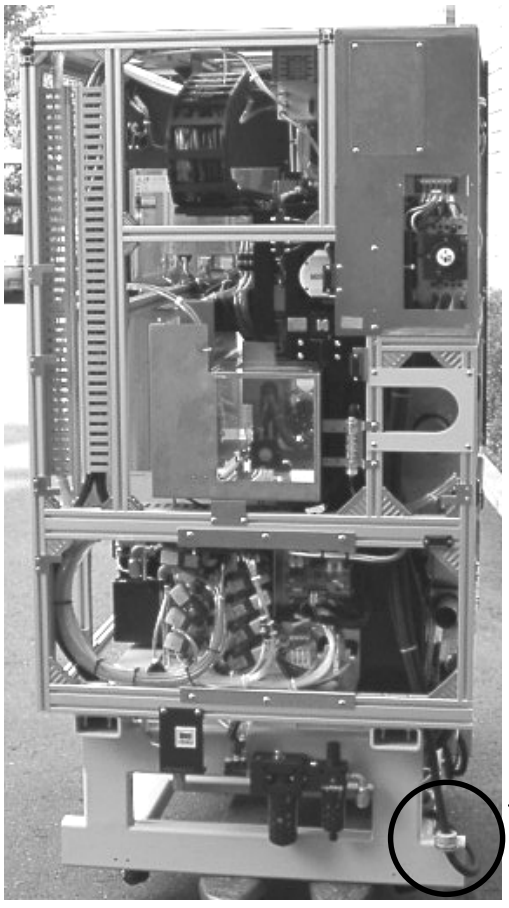
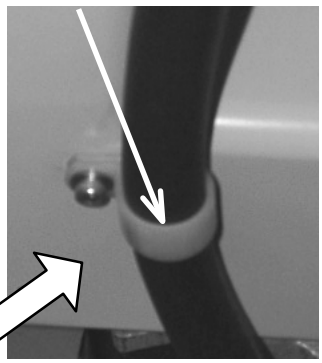
1-5-3. Connecting power supply wiring

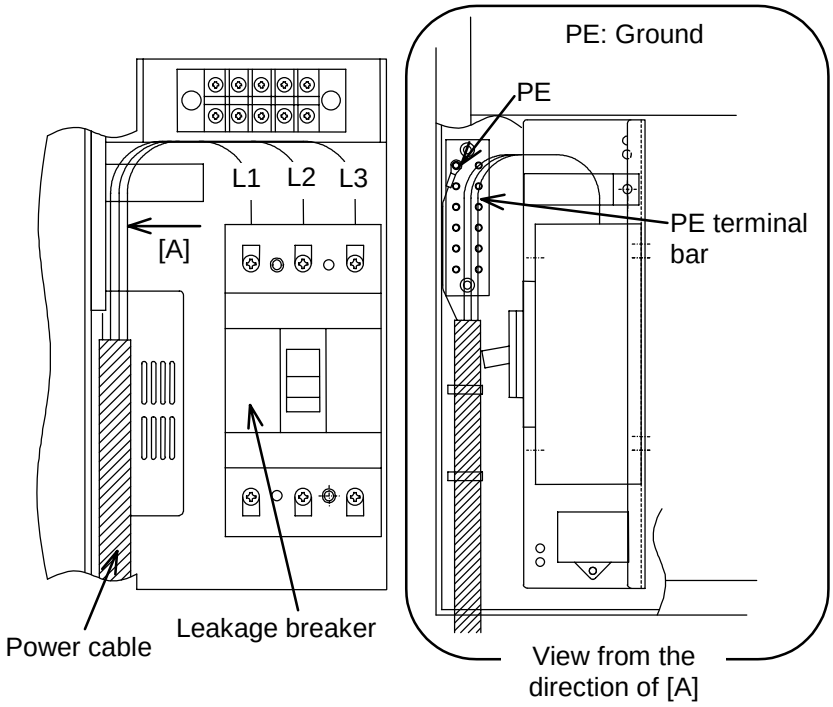
Procedures for connecting the power supply wiring

WARNING

- If you touch the machine that is not grounded, you may receive an electric shock that could result in serious injury or death.
  Be sure to connect the PE line first before making power supply connection and verify its connection.
- If you operate the machine while its interior or floor gets wet with water, you may receive electric shock that could result in serious injury or death.
  If the machine is wet, do not turn ON the facility power supply until the machine dries.
  If the floor gets wet, turn OFF the facility power supply and then wipe the floor dry.
- If you make any power supply wiring connections with power supplied to the machine, you may receive an electric shock which results in serious injury or death.
  The wiring connections must be made with the facility power supply turned OFF.
- If the PE line is loosened or disconnected, you may receive an electric shock from the leaked current. To prevent the PE line from disconnecting under the strain, make sure that the PE line of the power cable is at least 50 mm longer than the L1/L2/L3 lines.

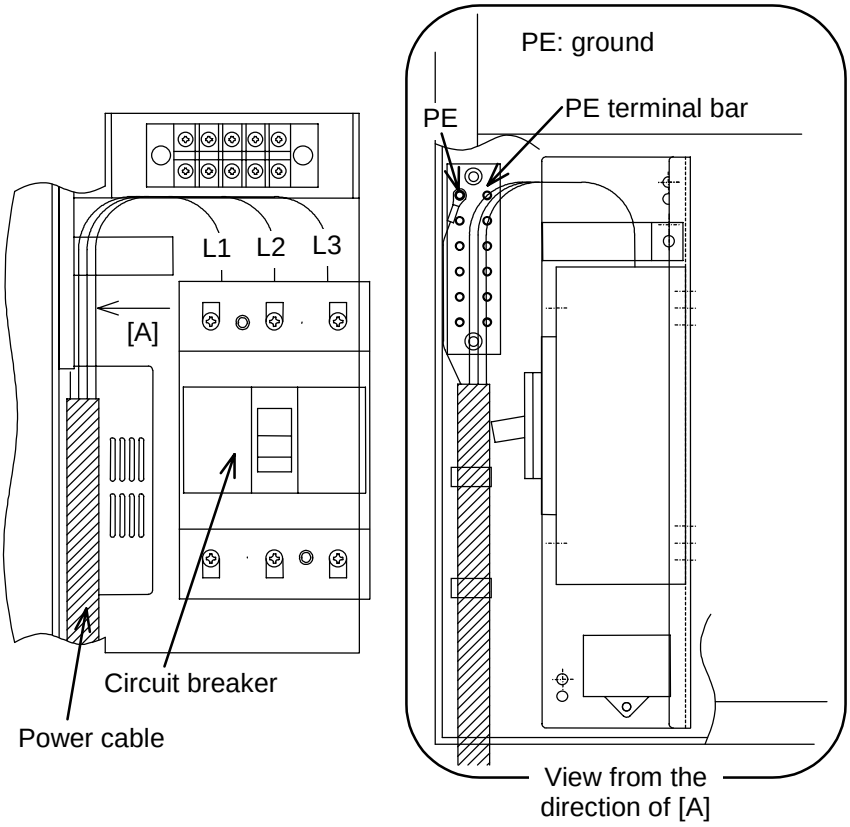


Step No.	Do This (Continued from the previous section)
1	Have on hand the cable, terminals and other items required for power cable connection. - Make sure that the PE line of the power cable is at least 50 mm longer than the L1/L2/L3 lines. 
2	Route the power cable to the inner side of the machine, as shown below. - Screw down the retaining screw (M3) of the nylon clip to firmly secure the power cable so that it does not move.  Nylon clip - Firmly secure it. 

Step No.	Do This
3	As indicated below, connect and fasten the power cable to the machine wiring terminal. * In power cable connecting, be sure to connect the PE line first. * Before connecting the machine to the facility power source, connect the cables of optional accessories such as a transformer and UPS (Uninterruptible Power Supply). [Standard specification]  [Power cable specifications]

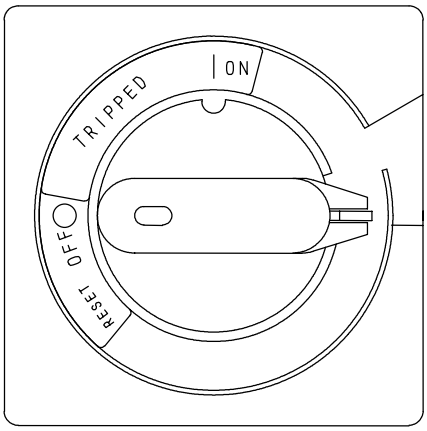
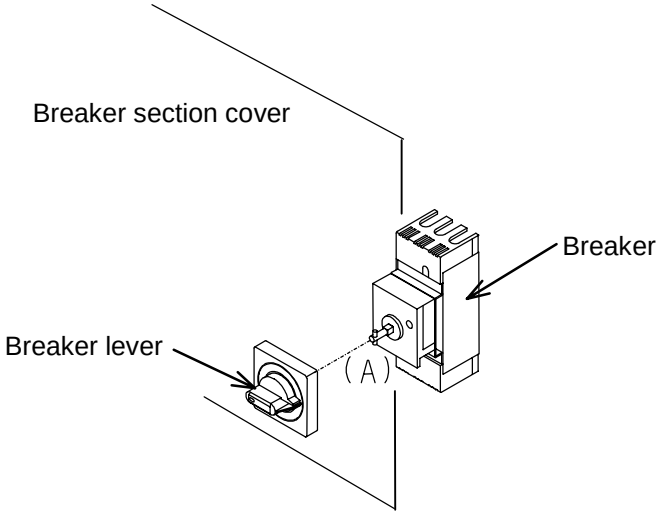
Part number	XBEU04C3.50A
Part name	Cable (vinyl cabtyre)
Nominal cross - sectional area	12AWG (Equivalent to 3.5SQ)
conductors	4

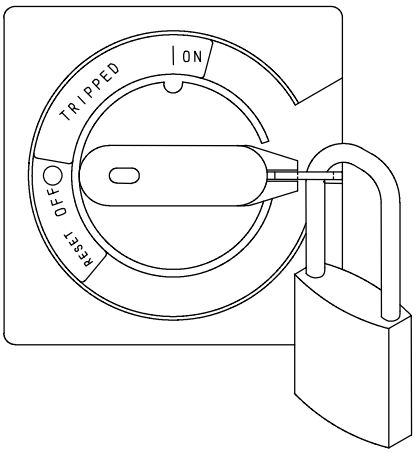
Step No.	Do This
3 (Continued)	[Transformer specification (AC380V)] - If a transformer is selected as an optional accessory, the earth leakage breaker is mounted on the transformer section. On the electrical system section, the circuit breaker is mounted.



[Power cable specifications]

Part number	XBEU04C3.50A
Part name	Cable (vinyl cabtyre)
Nominal cross - sectional area	12AWG (Equivalent to 3.5SQ)
Number of conductors	4

Step No.	Do This
4	Check to make sure that the PE line terminal is not strained when you lightly pull down the power cable by hand. - If the PE line terminal is strained, it means that the PE line is not long enough. Use a PE line with enough length.
5	Mount the circuit breaker lever. * The circuit breaker lever must be placed in the "OFF" position. Then install them it the notch of section [A] together with the circuit breaker section cover.  

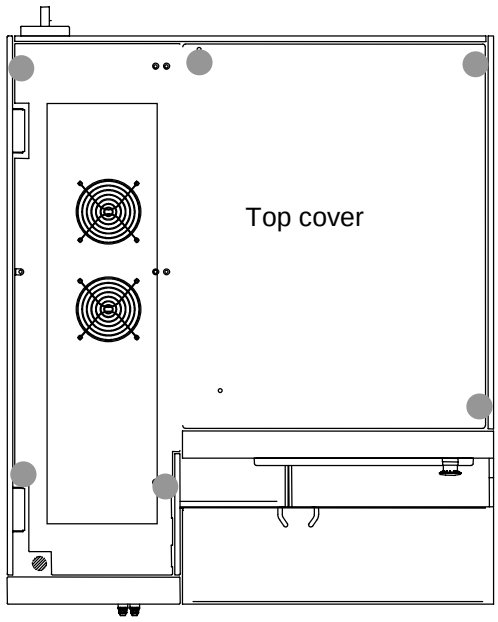
Step No.	Do This
6	Lock up the circuit breaker lever with a padlock or the like. 
7	Connect the power cable to the facility power source. * When you make cable connection to the facility power source, be sure to connect the PE wire first using a adequately long PE wire. * Before connecting the machine to the facility power source, connect the cables of optional accessories such as a transformer and UPS (Uninterruptible Power Supply).

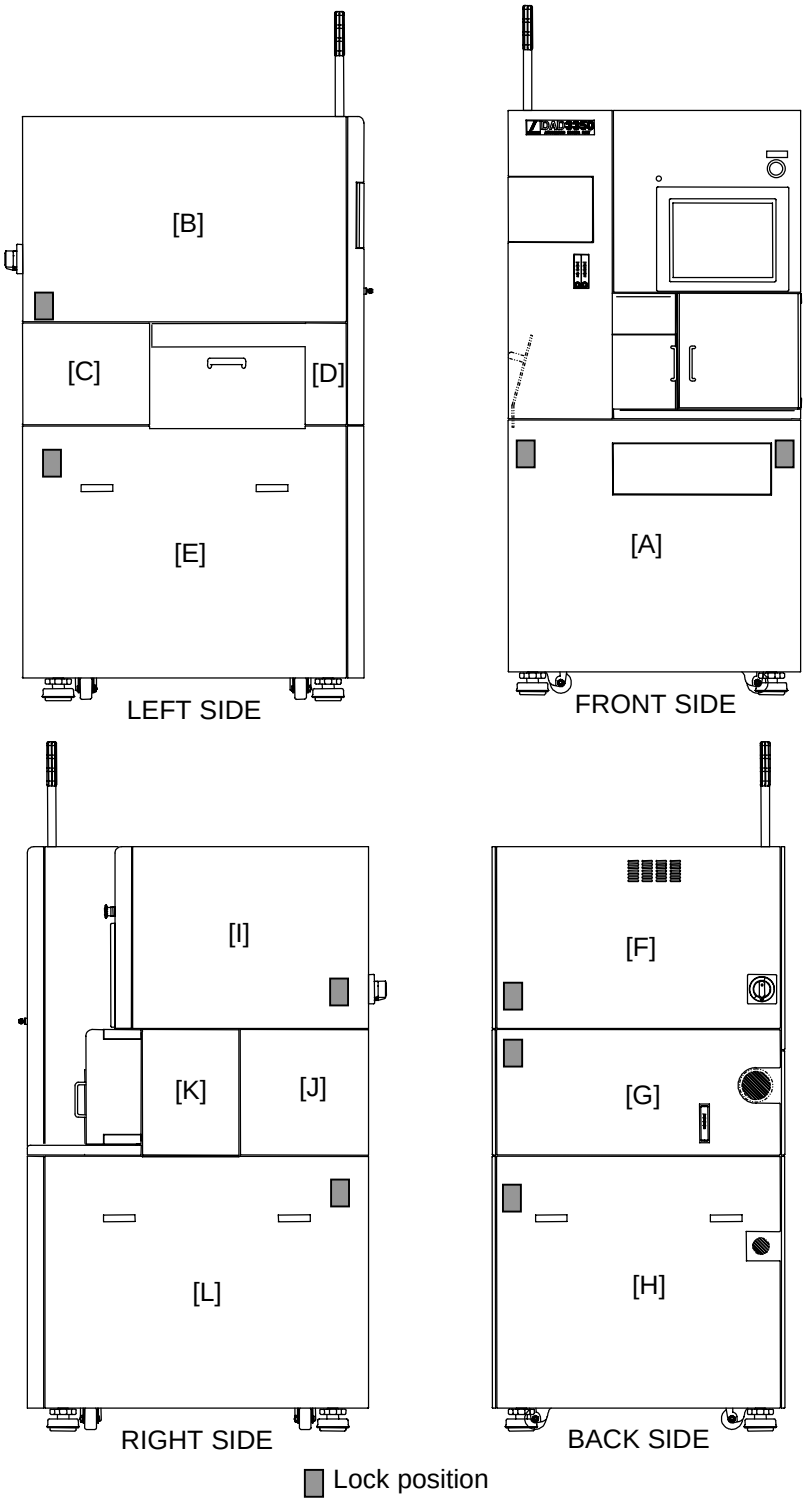
1-6. Mounting the Machine Outer Cover

Machine outer cover configuration

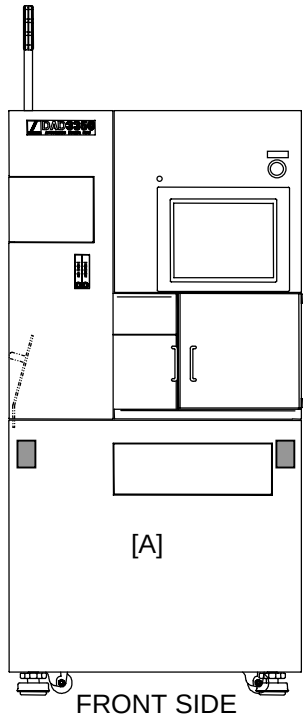
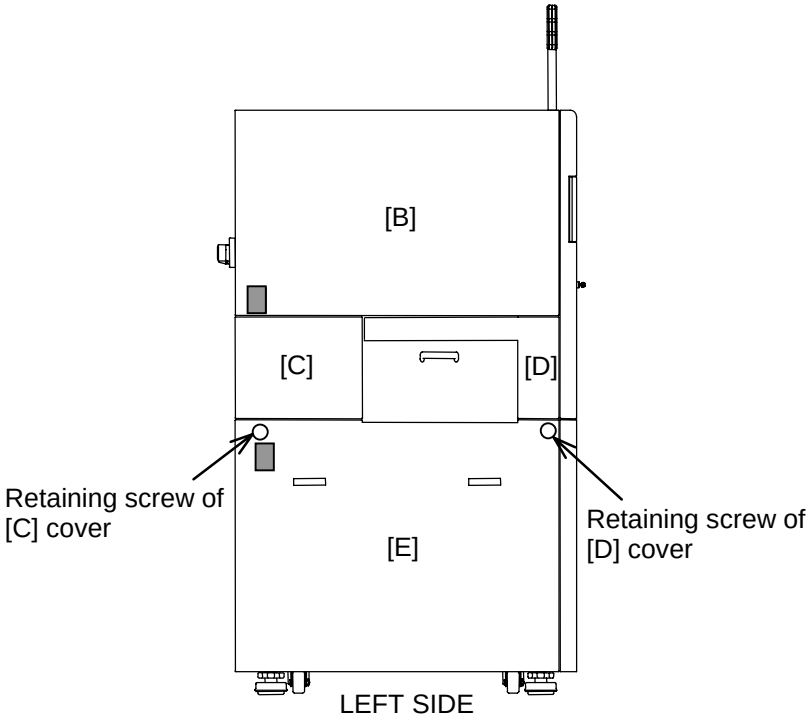
The machine outer cover is configured as shown below.

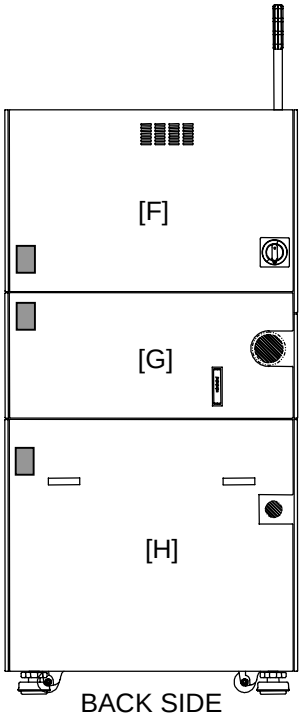
- The top cover and the covers [C], [D] and [K] are to be secured with screws.
- The covers [C] and [D] are to be installed before the cover [E].
- The cover [J] is to be installed before the cover [I].

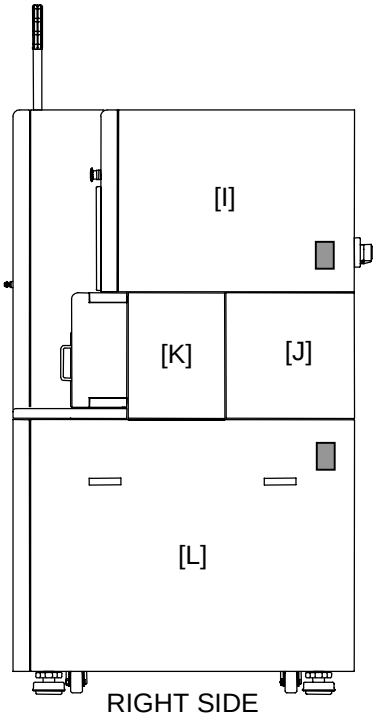



[B]
[C]
[D]
[E]
LEFT SIDE
[A]
FRONT SIDE
[I]
[K]
[J]
[L]
RIGHT SIDE
[F]
[G]
[H]
BACK SIDE
Lock position

Procedures for mounting the machine outer cover

Step No.	Do This
1	Install the cover [A]. 
2	First mount the covers [C] and [D], and then [B] and [E]. - To install the covers [C] and [D], hook their upper parts on the sub-frame and then secure the lower parts with screws. 

Step No.	Do This
3	Install the covers [F], [G] and [H]. - The cover [F] is to be mounted together with the breaker lever. - For the procedures to install the cover [F]; See the section 1-5-3 of this chapter, [Connecting power supply wiring]. 

Step No.	Do This
4	First install the cover [J], and then [I] and [L]. - To install the cover [J], hook its lower part on the sub-frame and then fix the upper part to the magnet of the sub-frame. - It is unnecessary to remove the cover [K] in installation/transfer operation.  RIGHT SIDE

1-7. Leveling the Machine with the Leveling Mount

Operation flow

The procedure for leveling the machine with the leveling mount consists of the following steps.

1-7-1	Mounting the spirit level

⇩

1-7-2	Removing the machine outer cover

⇩

1-7-3	Leveling the machine

Before operation

Have on hand the following equipment for machine leveling with the leveling mount.

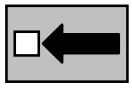
Spirit level (Minimum tick: 20 μ m/m)
22 mm wrench
Safety shoes and protective gloves

1-7-1. Mounting the spirit level

Mounting the spirit level

WARNING

In the leveling operation, your feet and hands could be caught or cut off by the machine.
Wear safety shoes and protective gloves.

Step No.	Do This
1	Wear the safety shoes and protective gloves.
2	Turn ON the facility power supply.
3	Unlock the lever of the circuit breaker, and then turn ON the circuit breaker.
4	Insert the key into the main switch.
5	Rotate the key to "START" position to turn ON the machine.
6	Press the <System Initial> button. - System initialization will be effected.
7	With the  button on the software keyboard, move the chuck table to a location under the spindle section.
8	Open the splash cover F.
9	Make sure that there is no dirt or other foreign matters on the upper surface of the table base. Place a spirit level on the table base.

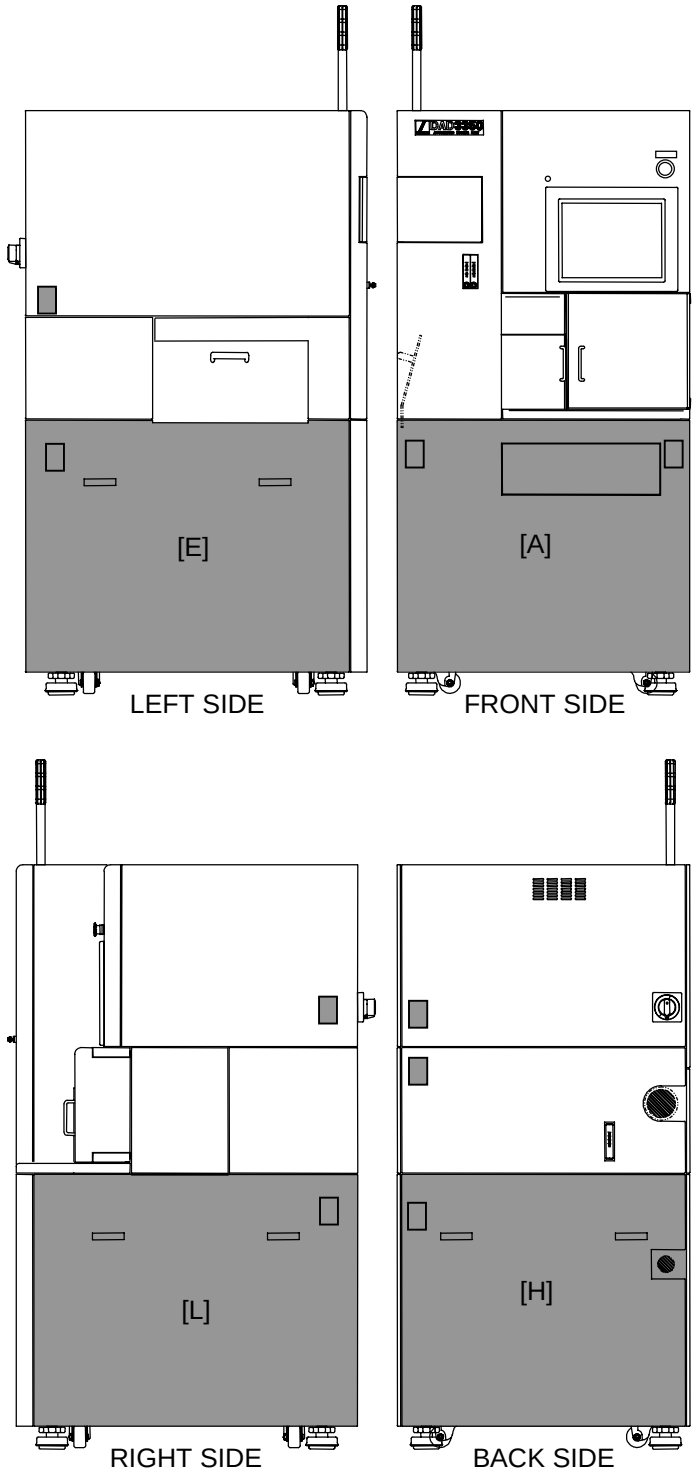
Continued in the next section.

1-7-2. Removing the machine outer cover

Procedures for removing the machine outer cover

Step No.	Do This (Continued from the previous section)
1	Turn OFF the main switch and then remove it.
2	Turn OFF the circuit breaker at the back of the machine and lock out the breaker lever with a padlock or the like.
3	Shut OFF the facility power supply.

Step No.	Do This
4	Remove the covers [A], [E], [H] and [L].



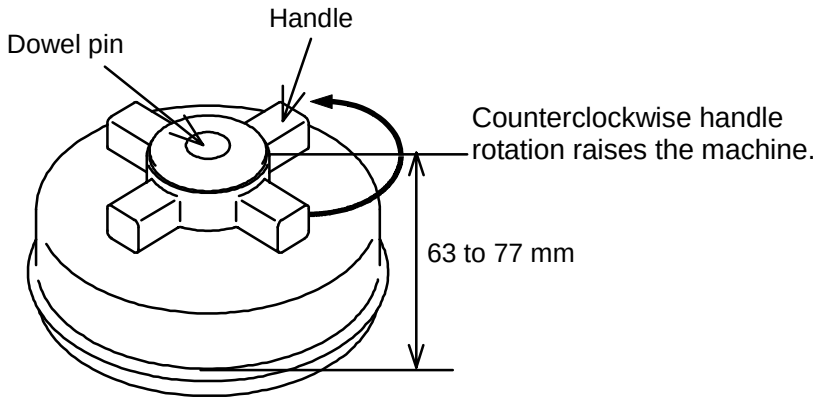
Continued in the next section.

1-7-3. Leveling the machine

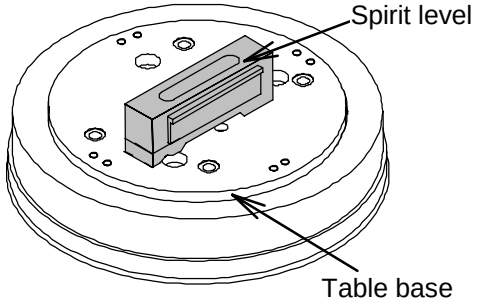
Procedures for leveling the machine

WARNING

- If the machine should topple down, you may be caught under the machine, or if the leveling mount should come off, your feet or hands may be caught or cut off by the machine.
  During jacking-up operation, do not place your feet or hands under the machine.
- If the leveling mount comes off during jacking-up operation, your feet or hands may be caught or cut off by the machine.
  The leveling mount must be adjusted so that the distance between the machine bottom surface and floor surface becomes between 63 and 77 mm. If the machine is jacked up higher than this, the leveling mount may come off.

Step No.	Do This (Continued from the previous section)
1	Adjust the level of the machine by alternately turning the handle of the leveling mount (front, rear, left and right). - In jacking-up operation, ensure that the distance between the machine bottom end and the floor surface becomes between 63 and 77 mm. (When the machine is jacked up by 70 mm, the chuck table surface is positioned at a height of 900 mm from the floor.) 

Procedures for leveling the machine (Continued)

Step No.	Do This
2	With a spirit level, level the machine until the spirit level reads 0.02 mm/1 m or lower for both the X- and Y-direction. 
3	Remove the spirit level from the table base surface.
4	Secure the machine to the floor with the machine anchors. - For the anchoring procedure, see the section 1-8 of this chapter, [Mounting the Machine Anchors].

1-8. Mounting the Machine Anchors [Optional Accessory]

Before operation

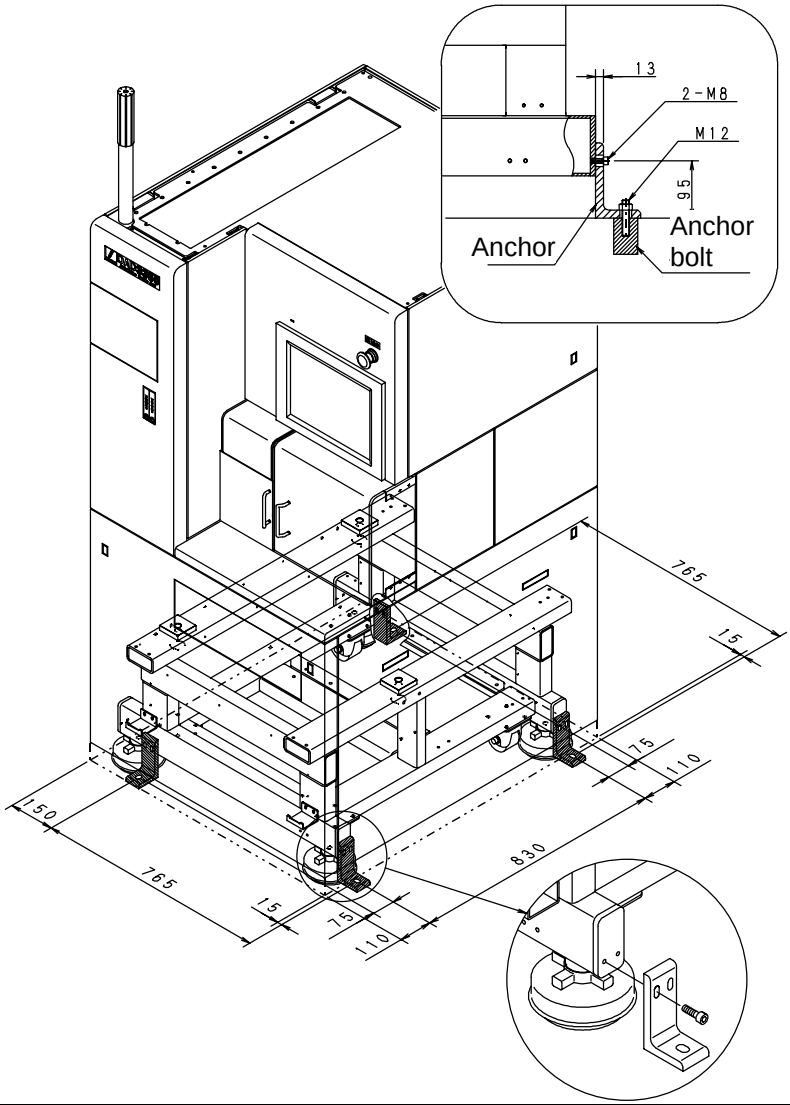
Have on hand the following equipment for mounting the machine anchors.

13 mm wrench
18 mm wrench
Safety shoes and protective gloves

WARNING

In machine anchoring operation, your feet and hands could be caught or cut off by the machine.
Wear safety shoes and protective gloves.

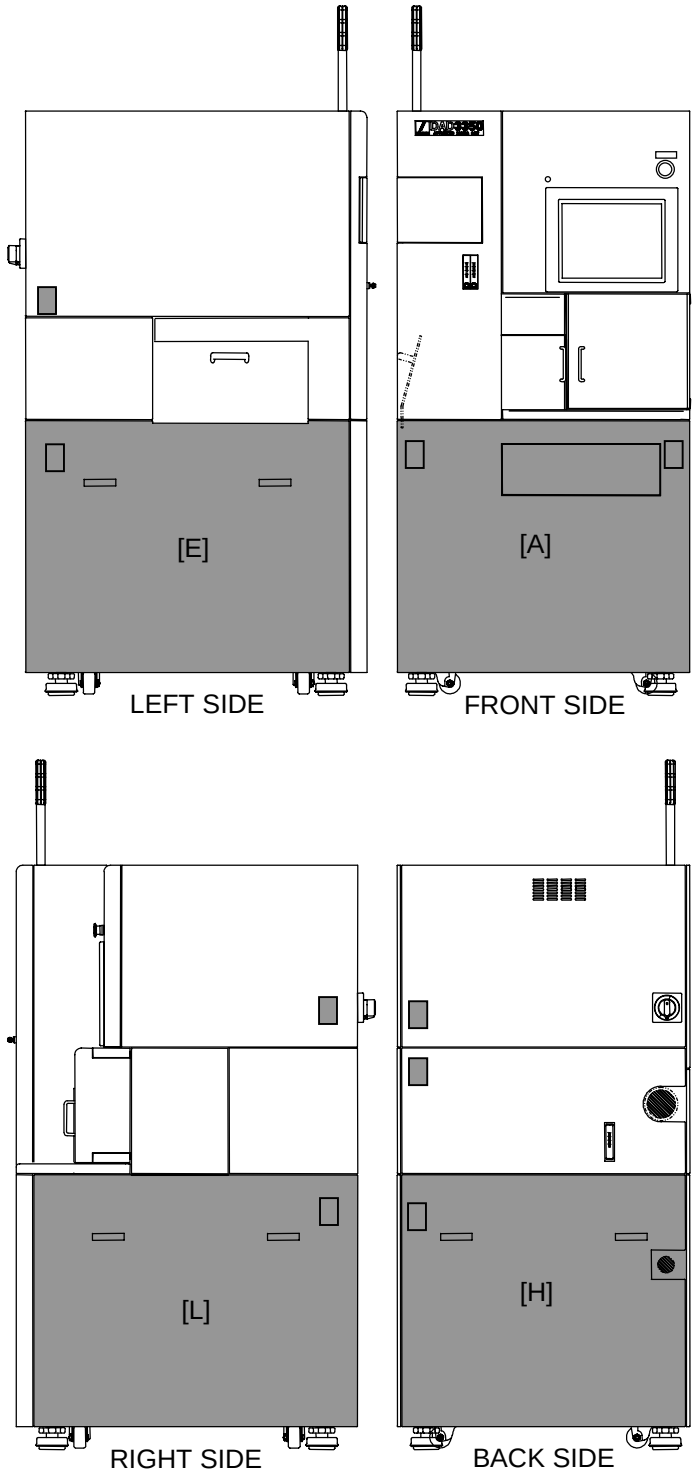
Step No.	Do This
1	Wear safety shoes and protective gloves.
2	As shown below, secure the machine to the floor surface using the machine anchors. - The installing positions of the machine anchors are indicated with arrows on the main frame.

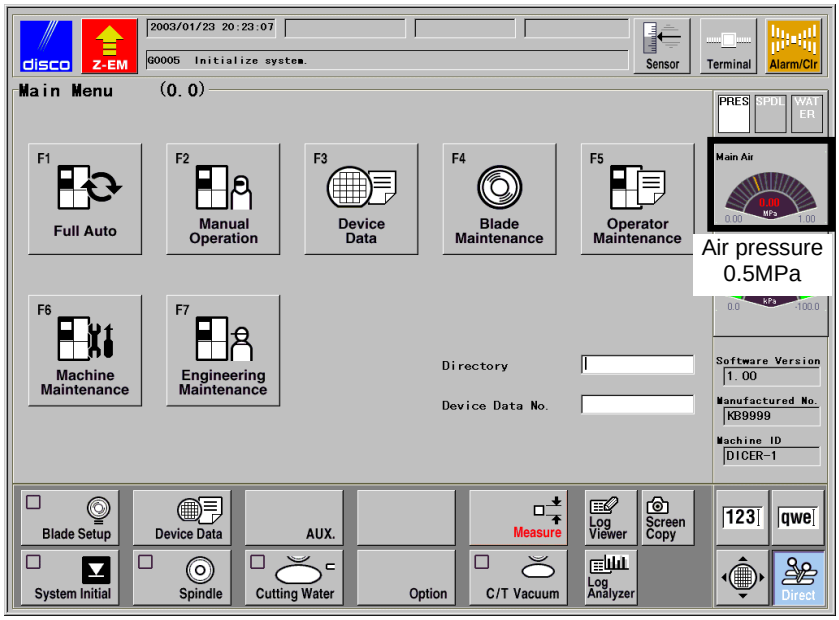


1-9. Completion of Installation Operation

Procedures for completion of installation operation

Step No.	Do This
1	Mount the covers [A], [E], [H] and [L].

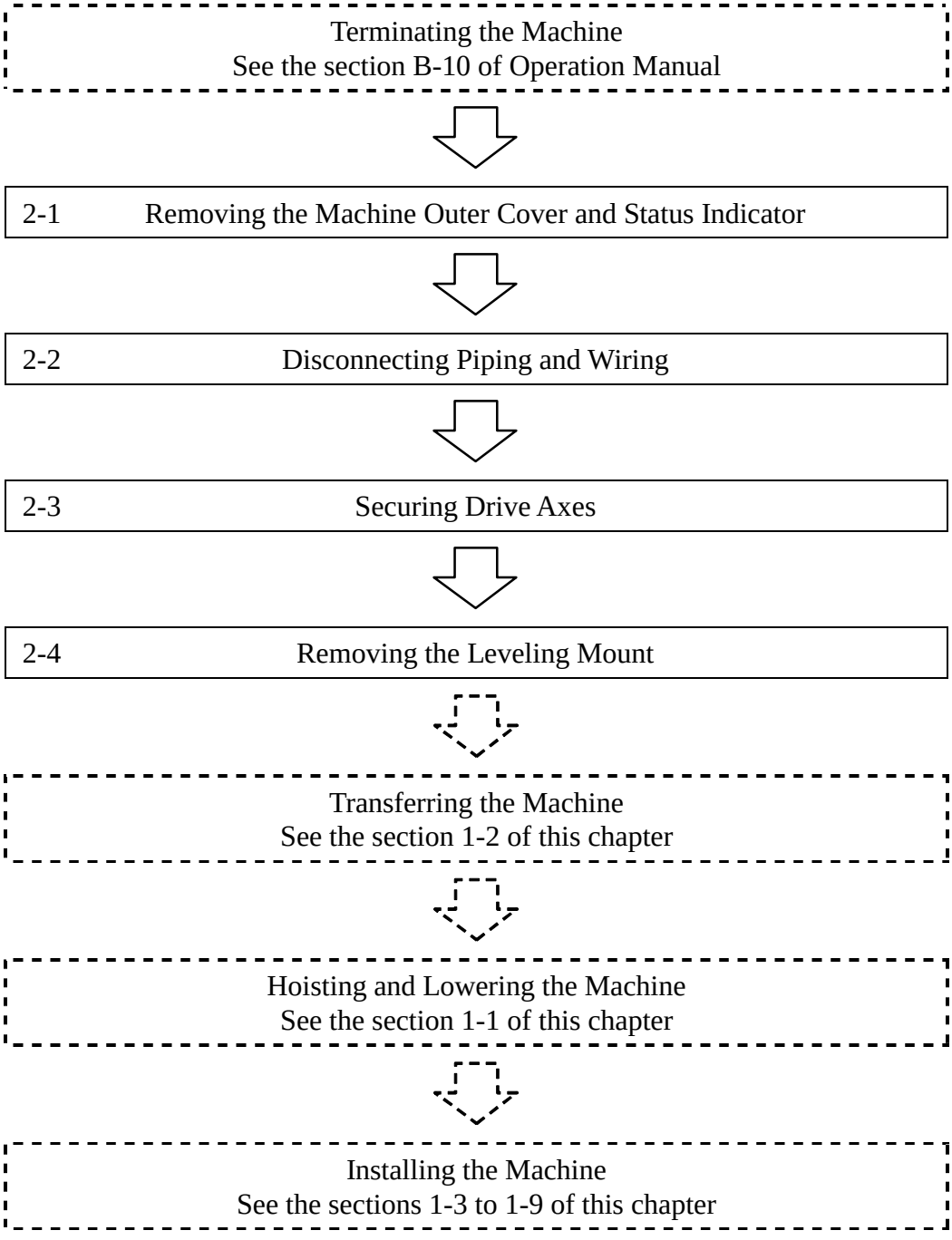


Step No.	Do This
2	Turn ON the facility power supply.
3	Open the lock of the breaker at the back of the machine, and then turn ON the circuit breaker.
4	Insert the key into the main switch.
5	Turn ON the machine by rotating the key to the "START" position.
6	Press the <System Initial> button. - System initialization will be effected.
7	Make sure that the air pressure displayed on the right side of the screen indicates 0.50MPa or higher. - For the air adjustment procedures; See the section B-3 of Maintenance Manual, [Sensor Adjustment]. 
8	Mount the chuck table. - For the procedures to mount the chuck table; See the section B-1, [Chuck Table Replacement] of the Maintenance Manual.

2. Transferring Operation

Operation flow

The procedure for transferring operation of the machine consists of the following steps.



NOTICE

- When you intend to relocate or disuse the machine, contact your nearest DISCO office or DISCO Service Office because the presentation of detailed precautionary notes and the management of new installation site data are essential.
- Neither safety goggles, protective gloves, stepstools, flashlights nor alcohol, all of which are necessary for maintenance work, are not supplied. Use what are furnished in your factory or what comply with your factory's standards.

2-1. Removing the Machine Outer Cover and Status Indicator

Safety items for operation with the machine outer cover removed

CAUTION

When you carry out maintenance with the outer cover removed, observe the following precaution. If you stand the removed outer cover against the machine, you may receive injury by the cover if it is toppled by the earthquake or like that.
When you take off the outer cover for maintenance, keep it sufficiently away from the maintenance area.

Operation flow

The procedure for removing the machine outer cover and status indicator consists of the following steps.

2-1-1 Turning OFF the power

⇩

2-1-2 Removing the machine outer cover

⇩

2-1-3 Removing the status indicator

Before operation

Have on hand the following key to remove the machine outer cover.

Part No.	Name
MOHRN001	Cover unlock key

2-1-1. Turning OFF the power

Procedures for turning OFF the power

Step No.	Do This
1	Press the <System Initial> button to effect system initialization.
2	Turn OFF the main switch. - If you use a water temperature control unit; Turn OFF the power of the unit.
3	Turn OFF the circuit breaker at the back of the machine.
4	Shut off the facility power supply.

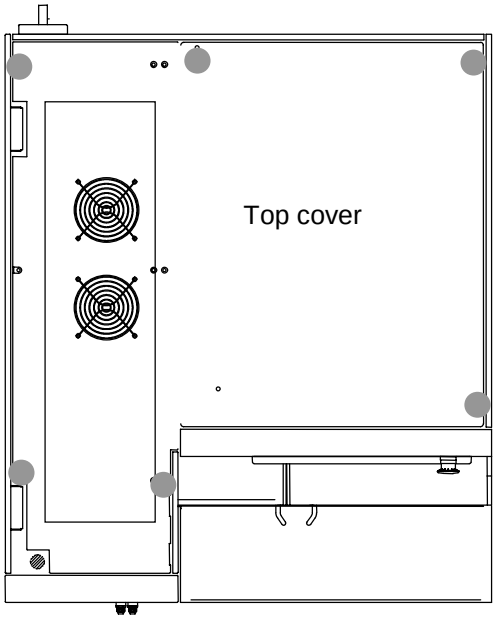
Continued in the next section.

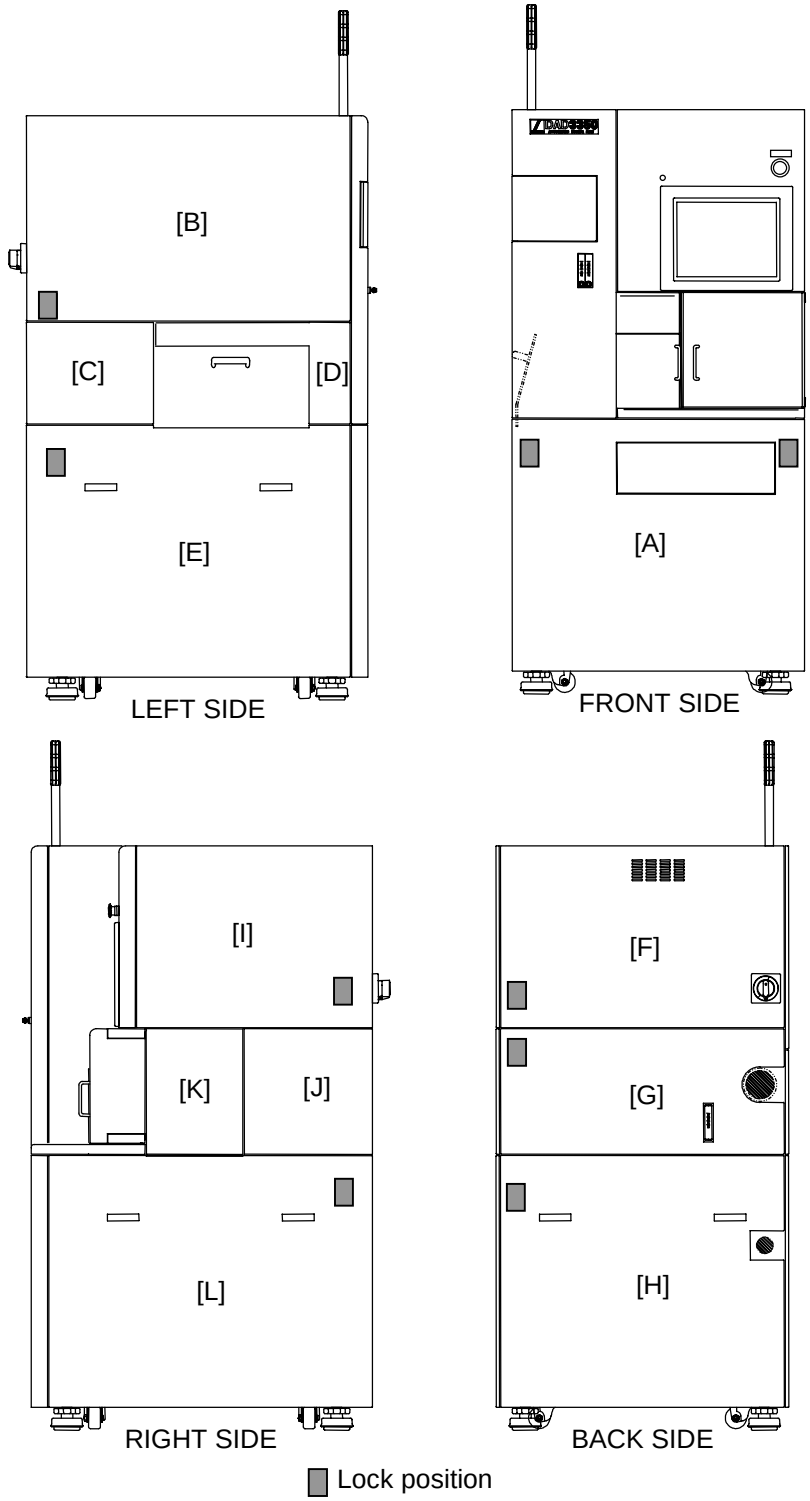
2-1-2. Removing the machine outer cover

Machine outer cover configuration

The machine outer cover is configured as shown below.

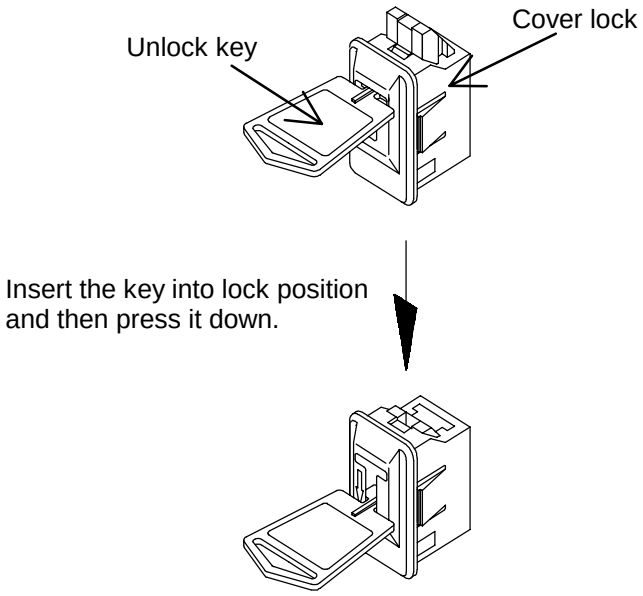
- The covers [C] and [D] are secured with screws.
- The covers [C] and [D] are to be removed after the cover [E].
- The cover [J] is to be removed after the cover [I].
- It is unnecessary to remove the top cover or the cover [K] in transfer operation.



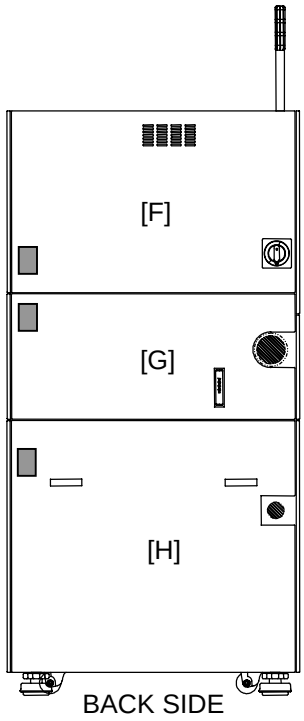
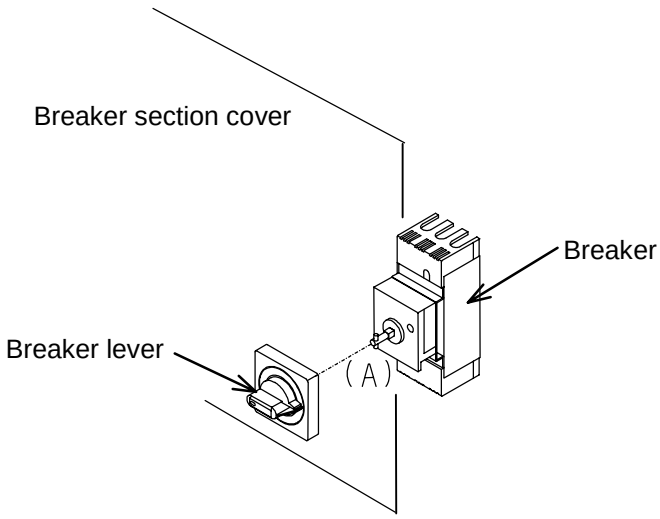

[B]
[C]
[D]
[E]
LEFT SIDE
[A]
FRONT SIDE
[I]
[K]
[J]
[L]
RIGHT SIDE
[F]
[G]
[H]
BACK SIDE
Lock position

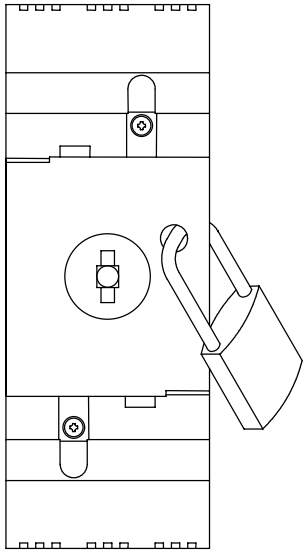
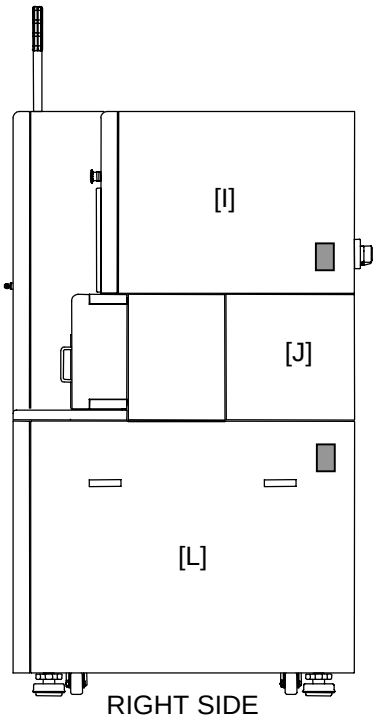
How to unlock the outer cover

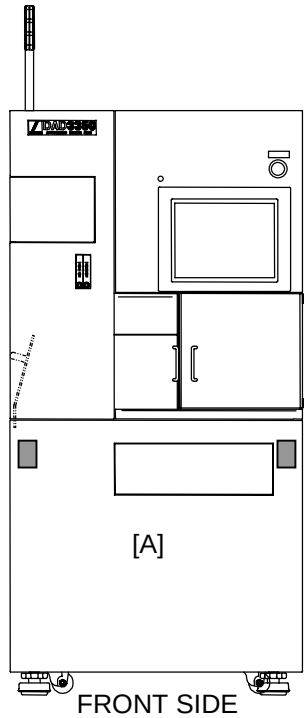
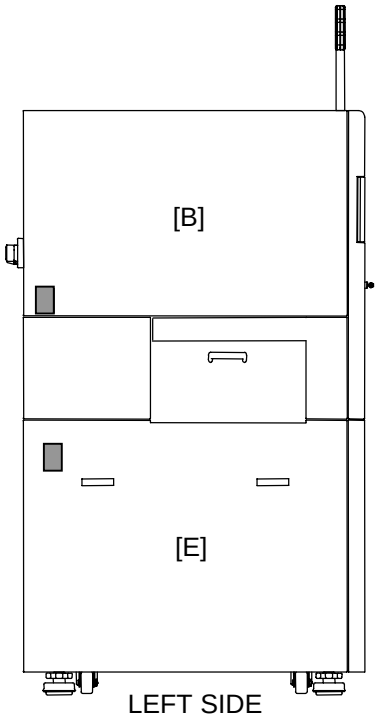
As shown below, insert the unlock key into the cover lock position in order to release the cover lock and remove the cover.

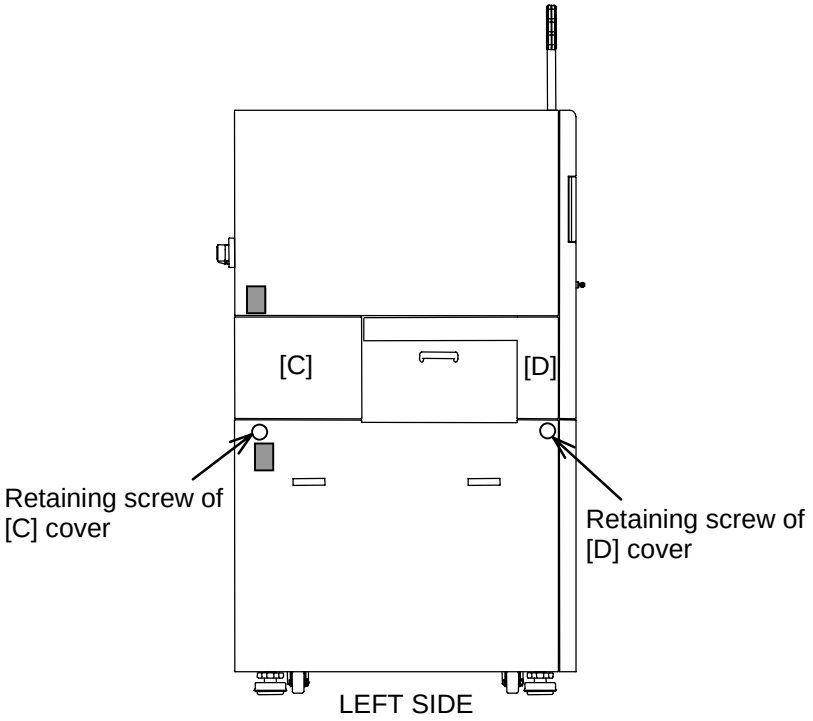
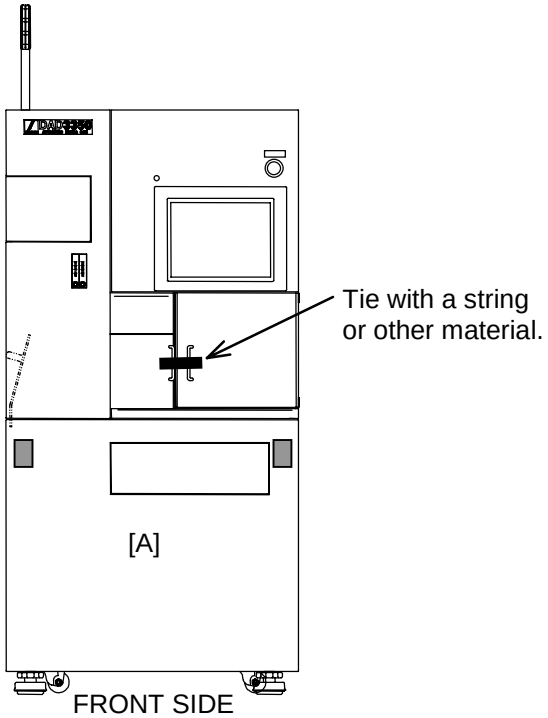


Procedures for removing the machine outer cover

Step No.	Do This (Continued from the previous section)
1	Turn the breaker lever to "RESET" position from "OFF". - The lock of the breaker lever is canceled.
2	Insert the lock release key to the cover [F] lock position, and then remove the cover. - The cover [F] comes off with the breaker lever.  

Step No.	Do This
3	Lock up the circuit breaker with a padlock or other equipment. 
4	Remove the covers [G] and [H].
5	Remove the covers [I] and [L].  RIGHT SIDE
6	Remove the cover [J]. - The lower part of the cover [J] is hooked on the sub-frame.

Step No.	Do This
7	Remove the cover [A]. 
8	Remove the covers [B] and [E]. 

Step No.	Do This
9	Remove the covers [C] and [D]. - The lower parts of the covers [C] and [D] are secured with screws while the upper parts are hooked on the sub-frame. 
10	Tie the handle of the splash cover F and microscope section cover together with a string or other material. 

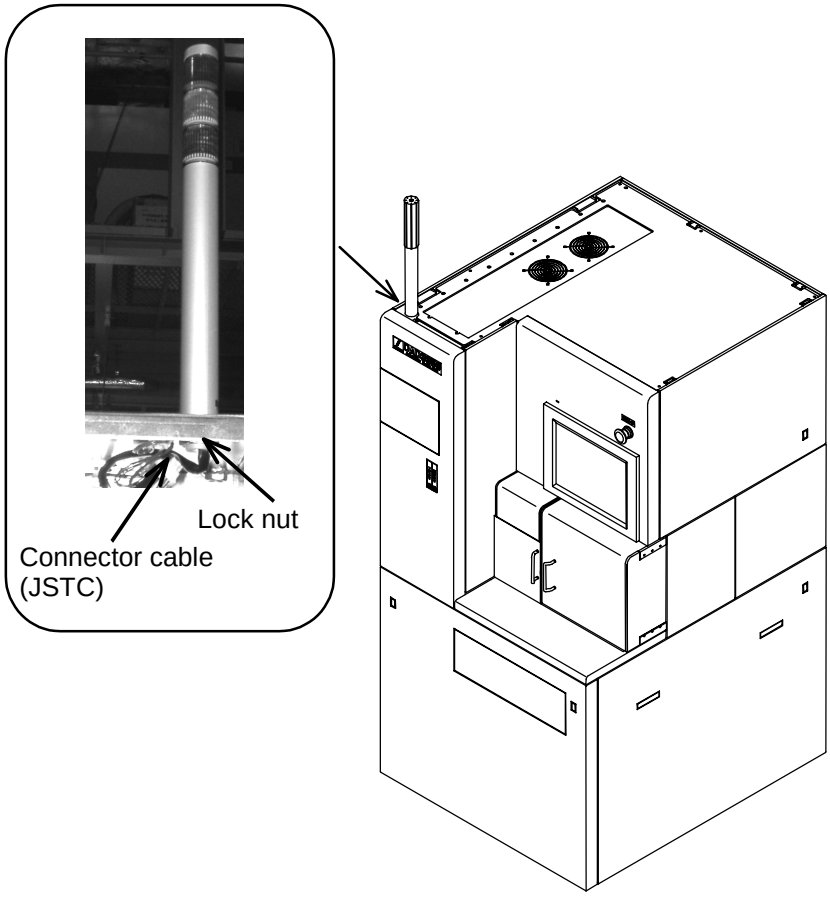
Procedures for removing the machine outer cover (Continued)

Step No.	Do This
11	Store the removed covers sufficiently away from the working area.

Continued in the next section.

2-1-3. Removing the status indicator

Procedures for removing the status indicator

Step No.	Do This (Continued from the previous section)
1	Disconnect the connector cable of the status indicator (JSTC). 
2	Unfasten the lock nut of the status indicator, and then remove the status indicator.
3	Wrap the status indicator with packing material.

2-2. Disconnecting Piping and Wiring

Before operation

Have on hand the following tools for disconnecting piping and wiring.

30 mm wrench
Safety shoes and protective gloves

Procedures for disconnecting piping and wiring

WARNING

- If you operate the machine while its interior or floor gets wet with water, you may receive electric shock that could result in serious injury or death.
  If the machine is wet with water, do not turn ON the facility power supply until it dries.
  If the floor is wet with water, turn OFF the facility power supply and wipe the floor dry.
- If you touch the machine that is not grounded, you may receive an electric shock which results in serious injury or death.
  Be sure to disconnect the PE line last after disconnecting power supply cables.
- When you make any wiring disconnection, you may receive an electric shock which results in serious injury or death.
  The wiring disconnection must be made with the facility power supply shut off.
- In the water draining procedure, if you attempt to remove a broken workpiece or clean the workpiece area with bare hands, your fingers may be cut or stabbed by broken workpieces.
  Use tweezers when you remove any broken workpiece. And wear protective gloves before cleaning.
  Before removing a broken workpiece, make sure that all axes come to a stop.

Procedures for disconnecting piping and wiring (Continued)

Step No.	Do This
1	Disconnect the power cable from the facility power source. - Be sure to disconnect the PE wire last.
2	Shut OFF the facility-side master valve completely and disconnect pipes.
3	Wear the safety shoes and protective gloves.
4	Drain water from the machine. - When the floor or machine gets wet, wipe it dry with a cloth or the like.
5	Remove the machine anchors. - See the section 1-8 of this chapter, [Mounting the Machine Anchors]

2-3. Securing Drive Axes

Safety items for securing drive axes

WARNING

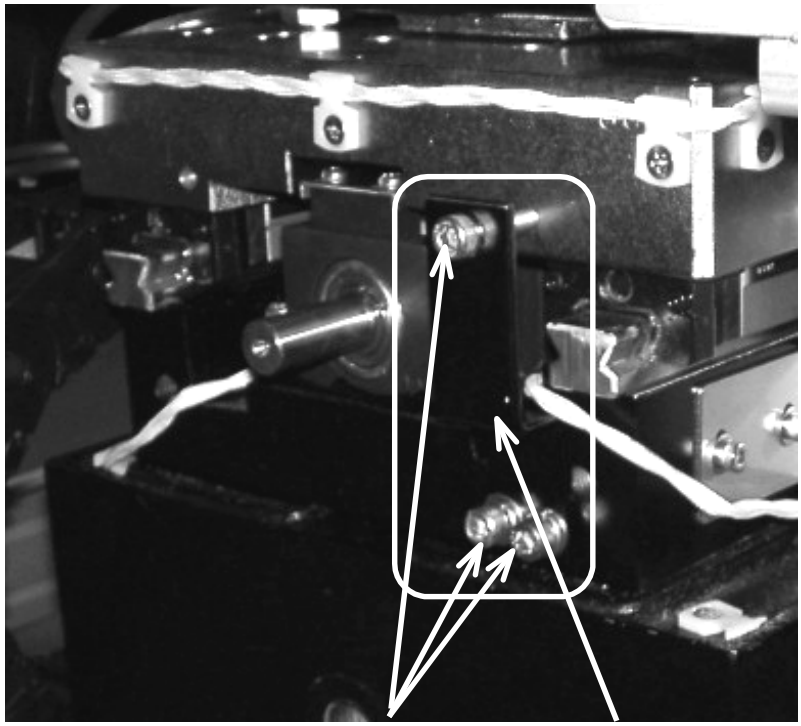
- If your hands or fingers are placed in a motor-driven section for axis locking metal fixture installation purposes while the axes are operative, they may be caught or cut off.
  Axis locking fixture installation must be conducted while the facility power supply is shut OFF.
- If your hands or fingers are positioned in an air cylinder driven or other movable section, they may be caught or cut off.
  Axis metal fixture installation must be conducted while the air supply is shut off.

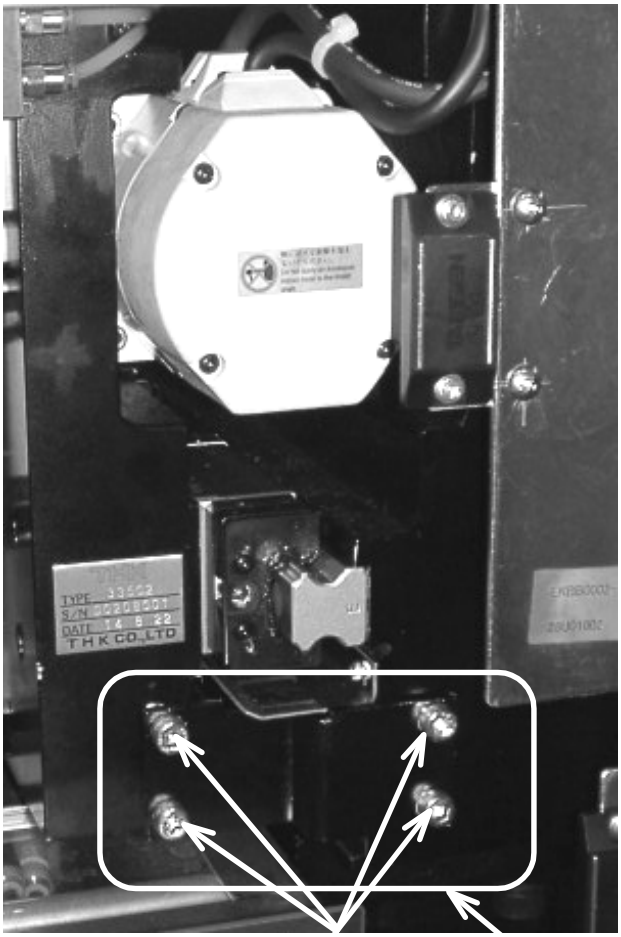
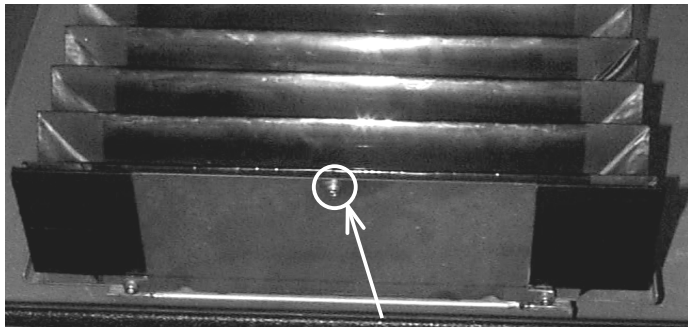
Before operation

Have on hand the following tools for securing drive axes.

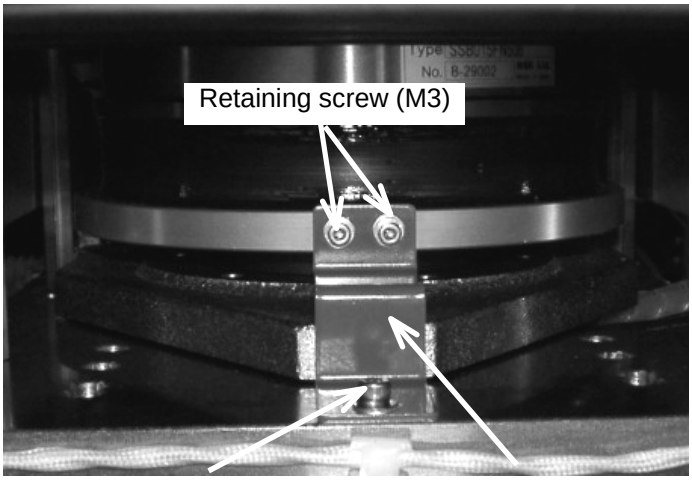
3 mm Allen wrench
4 mm Allen wrench
6 mm Allen wrench
Phillips screwdriver

Procedures for securing drive axes

Step No.	Do This
1	From the right side of the machine, secure the X-axis metal fixture with retaining screws (M6).  Retaining screw X-axis metal fixture

Step No.	Do This
2	From the backside of the machine, secure the Y-axis metal fixture with retaining screws (M6).  Retaining screw Y-axis metal fixture
3	From the left side of the machine, remove the retaining screws (M4) of the bellows (left).  Retaining screw of the bellows (left)

Procedures for securing drive axes (Continued)

Step No.	Do This
4	While holding up the bellows, secure the θ -axis metal fixture with retaining screws (M3/M4). 
5	Screw down the retaining screw of the bellows (left).

2-4. Removing the Leveling Mount

Before operation

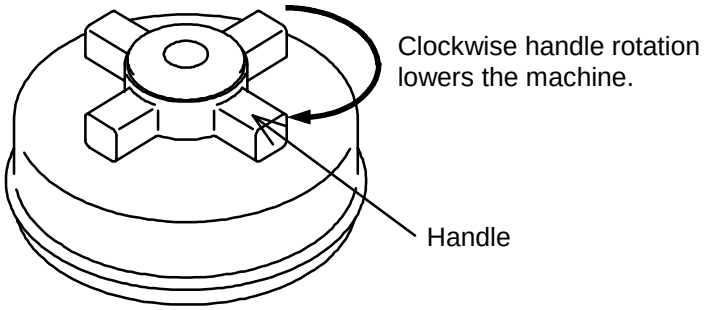
Have on hand the following equipment for removing the leveling mount.

22 mm wrench
Safety shoes and protective gloves

Procedures for removing the leveling mount

WARNING

- If the machine should topple down while it is jacked up, you may be caught under the machine, or if the leveling mount should come off, your feet or hands may be caught or cut off by the machine. During jacking-up operation, do not place your feet or hands under the machine.
- In machine transferring operation, your feet and hands could be caught or cut off by the machine. Before moving the machine, wear safety shoes and protective gloves.

Step No.	Do This
1	Wear safety shoes and protective gloves.
2	With a wrench, rotate the handle of the four leveling mounts. Loosen them equally until all the casters come into contact with the floor. 
3	Rotate the leveling mount handle clockwise until it does not move. Then remove all the leveling mounts.
4	Store the removed leveling mounts.
5	Transfer the machine. See the section 1-2 of this chapter, [Transferring the Machine].
6	To hoist or lower the machine, see the section 1-1 of this chapter, [Hoisting and Lowering the Machine by a Crane].
7	For the machine installation after transfer, see the sections 1-3 to 1-9 of this chapter.

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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/