PRECISION NC ELECTRICAL DISCHARGE MACHINE

EDGE 3*i*

Instruction Manual (Safety and Installation)

⚠ WARNING

- There are two instruction manuals: the instruction manual referenced on the NC Screen, and this instruction manual (EDM assist) which is printed out.
- This instruction manual describes the information necessary up to when turning on the power.
- Please carefully read through this instruction manual and do not turn on the power until fully understanding the instructions.
- After the power is turned on, please reference the instruction manual (EDM assist) on the NC Screen.
- Please carefully read the instruction manual (EDM assist), and do not operate the machine until fully understanding the instructions.

MAKINO

24ED1MX02-1804E

NOTE

It will be subjected to control by fire defense law or fire prevention ordinance in the case of install electrical discharge machine in JAPAN.

In the case of electric discharge fluid, cutting oil etc dangerous goods with firing point 70 ~ 200°C (class 4 Petroleum No. 3) in one building is used, please do a procedure at fire department as following in accordance with combined usage amount.

1. When the volume of dangerous goods is more than 2000L
   - Permission of general use place is required as dangerous facility, so file an application for permission.
   - Report it as "Use of Fire Equipment" in accordance with fire prevention ordinance.

2. When the volume of dangerous goods is more than 400L and less than 2000L.
   - Report the little dangerous goods storage place as dangerous facility.
   - Report it as "Use of Fire Equipment" in accordance with fire prevention ordinance.
3. When the volume of dangerous goods is less than 400L.
   - Please report it as "Use of Fire Equipment" in accordance with fire prevention ordinance.

INTRODUCTION

This is the Instruction Manual for the Precision NC Electrical Discharge Machine EDGE3.

(1) Types of instruction manual

There are two types of instruction manual (EDM assist), namely, manual referred on the NC screen and printed manual.

Do not turn on the power and operate the machine before you have thoroughly read and understood the instruction manual.

(2) Important Notice

- Do not learn the operation by operating the machine on trial without reading the manual.
- Wrong handling of the machine could cause a danger. Handling of the machine after knowing the machine structure and motion does not cause a danger.
- Before operation, read intensively the manual to understand the meaning of operation and machine motions (moving direction, maximum speed and maximum travel, resultant danger if a part or whole of your body exists in motion), so that you will be able to foresee the next motion of the machine.
- Nevertheless, you may move accidentally or involuntarily. To avoid this, you should be always aware of the safety. Moreover, you should get in good health when operating the machine.
- It is also important to arrange the machine environment. Clear all unnecessary goods off the machine and its periphery, and wipe completely the water and oil off the floor surface.
- Important safety information is listed in “Safety” chapter. Read it with care.
- When reselling the machine, attach this Instruction Manual to the machine.
- Store this manual in a place near the machine and keep it clean so that the operator can consult as necessary.
- It is recommended to designate a safety management representative to ensure safety work.

GUARANTEE

(1) GUARANTEE ITEMS

1) Terms of Guarantee

The term of a guarantee shall be one year from the date of completion of the acceptance test of the machine.

2) Range of Guarantee

This guarantee shall cover costs associated with repair or replacement during the term of a guarantee, i.e. one year from the date of purchase, if a failure should occur under such conditions that the machine has received the inspection and maintenance set forth by our company and also the machine has been handled correctly. However, the following conditions are not covered by the guarantee.

3) Scope of Exceptions Not Covered by the Guarantee

- Failures caused because the operator operated the machine without following the instructions explained in this instruction manual.
- Failures caused by intentional or careless use of the machine.
- Failures caused by some outside influence, including, but not limited to, the user environment.
- Failures caused by a lack of maintenance.
- Failures recognized to have occurred due to modifications to a part or whole of the machine set that influence the machine functions.
- All faults caused by changes in machine leveling attributable to the foundation and peripheral environment.
- Defective parts replaced free of charge were not returned to the place specified by our company within 30 days.

(2) ESCAPE CLAUSE

- Failure, damage or loss was caused by a reason listed in the Scope of Exceptions Not Covered by the Guarantee.
- A part or whole of the machine set was transferred to another party.
- Parts other than those specified by our company were used.
- Failure, damage or loss was caused during transportation of the machine by a party other than our company.
- Failure, damage, or loss occurred due to an accuracy error caused by a machining that exceeded the specifications of a part or whole of the machine set.
- Damage or loss occurred due to neglect of considerations or cautions that it is understood must be attended to during inspection, adjustment, operation, or maintenance of a part or whole of the machine set.
- An injury or damage caused by incompatibility of functions, and specifications of a part or whole of the machine set, and the contents of instruction manual with your applications, or by a difference from the expected marketability of the workpieces finished by the machine set.
- When any part or whole of the machine set was added or modified without the approval of our company, and a damage or loss occurred as a result.
- Damage or loss occurred due to acts of God such as fires, earthquakes, flooding and/or any other such natural disaster.

AFTER-SALES SERVICE

The after-sales services including machine installation and maintenance are provided by Makino Engineering Service Co., Ltd and contact the Service Centers in your region.
Also, this manual is available from the Service Centers when it is missing or defaced.

SAFETY

CONTENTS

2 WARNING LABELS

WARNING

Operating the machine carelessly or without reading carefully or understanding the operating instructions give in this manual could cause a critical accident.

1. SAFETY INFORMATION

1.1 Important Information

- What are important points to avoid hazards are the attention to foresee the possibility of hazard and prudential actions, and knowledge about entire machine that backs up such actions. Read intensively this Instruction Manual so as to know well about possible hazardous places and what hazards are hidden. Further, make sure the machine movements and utilize safety functions built in the machine so that you can protect yourself and the machine.
- Thus, inhibit a such method that you learn the operation by operating the machine on trial.
- Designate the operators. Unaccustomed operation leads to a careless operation, causing a danger.
- Keep this Instruction Manual at hand (in a place near the machine) so that the operator can consult whenever doubtful or uncertain.
- Immediately get the Instruction Manual or equivalent one, if it is missing.
- Do not use or go near the machine if you are using a pacemaker or other implants which may be affected by electromagnetic waves.
- Prevent slippage near the equipment, such as by placing non-slip mats on the floor around the machine.
- Prevent slippage by completely clearing away any unnecessary items from above or around the machine, and completely wipe away any moisture or oil on the floor.
- Gloves must be worn when actually or possibly coming into contact with any oils or acids.
- •• Gloves must not be worn near winding or rotating parts.

- Protective glasses and safety shoes must be worn when using the machine.
- Before attaching or removing any heavy parts be sure to first secure safety by implementing measures to prevent falling, such as when using a crane for hoisting.

1.1.1 Utilizing safety functions

- Routine checking is important. Repair immediately if any faults are found. Do not operate the machine before repair.
- Before operation, confirm the location of EMERGENCY STOP button, and make preparation so that you can press the button immediately in case of emergency.
  For instance, where you cannot reach the EMERGENCY STOP button with your left hand if right hand got caught by the machine, operate with the left hand so as to press the button with your right hand. Thus, take care and make preparation at all times for accidental causes that will occur abruptly.

1.2 Precaution to Prevent a Fire

To prevent a fire caused by electrical discharge machining and to ensure operator's safety, this section describes the requirements to be satisfied.

1.2.1 Dielectric fluid

(1) Kind of dielectric fluid

The flash point of dielectric fluid used for an electrical discharge machine must be above 70°C (refer to Installation, Table 1).

(2) Fluid level height

The fluid level must be as high as possible in the range, at least 50mm above the top surface of workpiece.

1.2.2 Safety devices

The machine is equipped with the fluid temperature sensor, fluid level sensor, abnormal machining detector, and automatic fire extinguisher. Inspect and maintain these devices periodically (refer to "Maintenance"). However, never modify these devices.

The function and handling precautions of safety devices are as follows.

(1) Fluid temperature sensor

This device stops machining immediately when the dielectric fluid temperature exceeds the set temperature. The set temperature is 45±3°C.

(2) Fluid level sensor

This device stops machining immediately when the fluid level drops below the set level. The set level must be at least 50mm above the top surface of workpiece.

(3) Abnormal machining detector

This device stops machining if a carbide is built up in the gap.

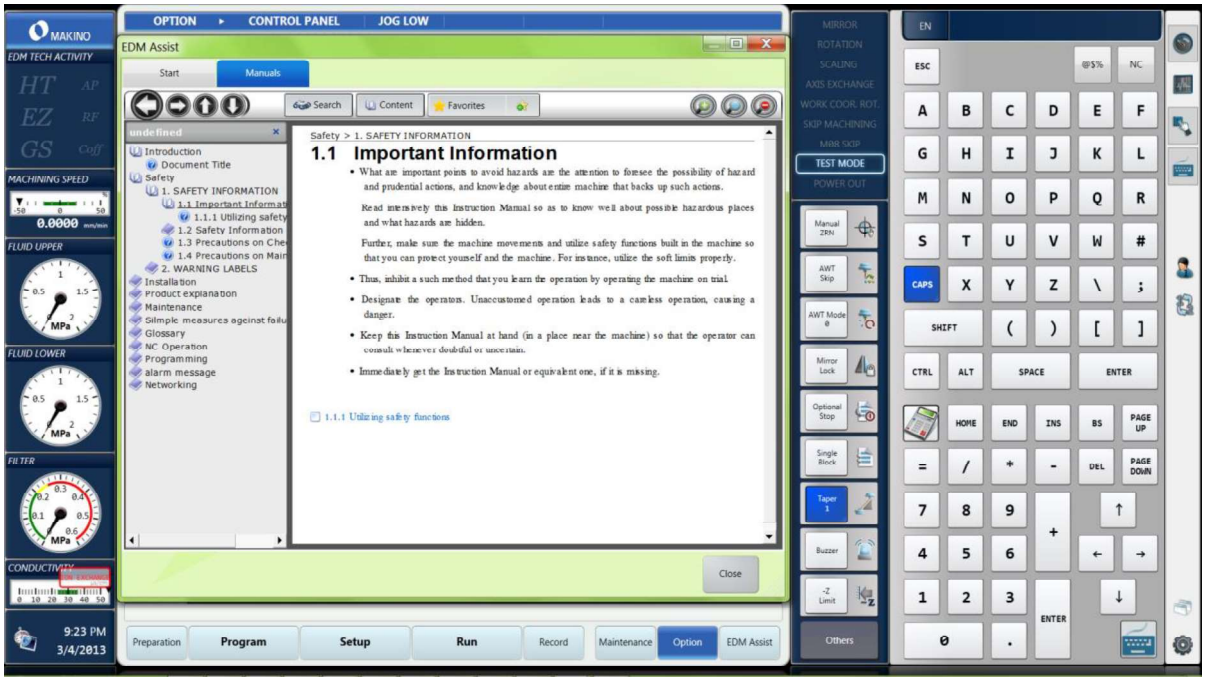
(4) Automatic fire extinguisher

This device senses the temperature if the dielectric fluid catches a fire, and it injects the extinguishing agent automatically to the work tank. Do not change position and direction of the injection nozzle.

SAFETY

1.3 Safety information on operation

It is important to learn operating methods correctly. Learning the operation by operating the machine through a try and error way without reading the Instruction Manual is wrong. This way of operation is very dangerous and strictly inhibited.
The manual is with built-in NC.
Please read through the manual with the EDM Assist screen opened after power supply ON.



EDM Assist Screen

1.3.1 Safety devices and warning labels

To protect the operator and machine, the safety functions are provided and the warning labels are affixed.
The main safety device is equipped with the emergency stop button, fluid temperature sensor, fluid level sensor, abnormal machining detector, and automatic fire extinguisher. There is an explanation for the warning label in subsequent pages to avoid the danger.

1.3.2 Handling the covers

Close the all covers and door when operating the machine.
These covers protect the operator from hazardous movable parts and an electric shock.

1.3.3 Precautions on operation

The precautions on operation are as listed below.

- Only the designated persons must operate the machine.
- Before turning on the main switch, pay attention to the following:
  * Check if there is a person at the rear of machine or in a blind spot.
  * Confirm the location of EMERGENCY STOP button so as to press it to avoid a danger in case of emergency.
  * Check if there is possibility of interference between movable parts and workpieces on the table, portable operation panel, or fixtures or tools on the machine, whichever directions respective axes move in.
  * Check if any parts have been still removed, or the machine has been restored to normal condition after maintenance or inspection.
  * Check if a trouble has been repaired correctly, and it is already confirmed.
- When the operator is doing a job far away from the main switch, take proper measure so that the third person cannot turn it on, or tag a signboard, indicating “UNDER JOB. DO NOT TURN THE POWER ON”.
- Check that no obstacle exists, or the power supply cable does not interfere with the workpiece or fixture, when moving the axes manually.
- Do not touch the wire during machining, as high voltage is applied.
- Take care of your fingers not to get caught between workpiece and lower head when loading/unloading the workpiece.
- During work inside or outside the work tank where portable operation panel is placed on the workpiece or work tank, you may accidentally press the axis move keys on the portable operation panel by your elbow. Take always care of the location of portable operation panel.
- Placing the tools such as a workpiece clamp or hex. Wrench on the elevating work tank causes a danger. Do not place them at all times.
- Except for the designated area, DO NOT place any objects near the work tank.

- Note the danger of getting your hand between the top surface and workpiece of the work tank, when moving the work tank up and down.
- You could be pinched your foot during work on the steps installed near the work tank, when the work tank moves up or down.
- Never put your hand into the X, Y, Z axis stroke during automatic operation. When putting your hand into the stroke unavoidably during automatic wire threading, make preparation so that you can press the EMERGENCY STOP button with other hand to avoid unexpected hazardous machine motion.
- The illumination must be bright sufficiently.
- Do not clean the machine by air blow.
- Do not move or alter the stroke limiting switch, dog, interlock limit switch or interlock circuit that are for limiting strokes.
- Dress yourself properly. Arrange your hair and clothes so that you are not caught by the machine. Do not wear a ring or other accessories or gloves.
- Wear protection glasses and safety shoes to ensure safety.
- Clean the touch monitor regularly with a soft cloth.
  The position of the touch point might not shift and the touch monitor react when there are a drop of water and dirt in the touch monitor.

1.4 Precautions on Machining

To prevent a fire caused by electric discharge machining and also to ensure operator's safety, observe the following precautions.

1.4.1 Inhibition of blow machining

Machining while blowing the dielectric fluid to the workpiece as shown in (1) could catch a fire. Blow machining must be avoided.
Also, do not use dielectric fluid having the flash point below 70°C. (For the kind of dielectric fluid, refer to INSTALLATION 4.2.5 "Supplying dielectric fluid".)

1.4.2 Machining near fluid level

Avoid electric discharge near the fluid level as shown in (2), (3) and (8). Take care of the installation method of workpiece and electrode, and also the position of mounting attachment; the fluid level should be at least 50mm above the top surface of workpiece.

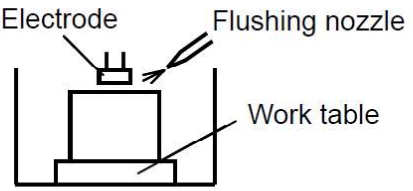
1.4.3 Supervising during automatic operation

A supervisor who can take proper action in case a fire breaks out should be posted even during automatic operation with various safety devices in active status. Also, do not perform machining with safety devices removed or interlock functions disabled.

1.4.4 Fire accident cases by electric discharge machines

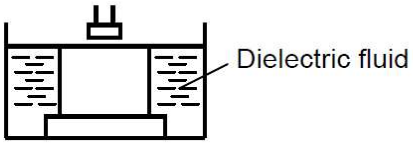
Next item shows the fire accident cases caused by electric discharge machines. Machining under such conditions must be avoided.

(1)



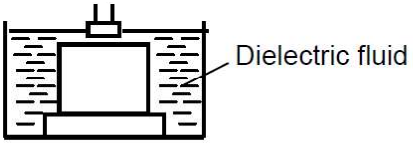
Catching of a fire during machining while the dielectric fluid is being injected.

(2)



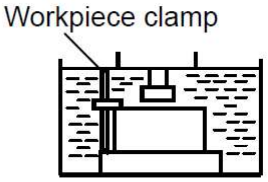
The workpiece height to the work tank is too high.
At least 50 mm is necessary between fluid level and workpiece top surface.

(3)



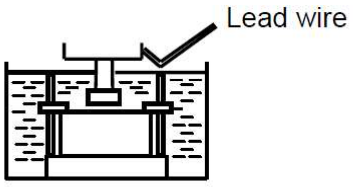
The fluid level is too low nevertheless the work tank has room for the fluid.

(4)



Discharge between electrode and workpiece clamp occurred near fluid surface.

(5)



Discharge between workpiece clamp and lead wire whose cover is broken.

1.5 Precautions on checking

During a checking, pay attention to the following:

- Checking, repair, and maintenance of the machine or equipment must be performed after thorough examination by only the personnel who knows well about the structure, operation, and possible hazards.
- Follow traditional practices executed in your shops.
- Dress yourself properly. Arrange your hair and clothes so that you are not caught by the machine. Do not wear a ring or other accessories or gloves. Wear protection glasses and safety shoes to ensure safety.
- During a checking or maintenance, the personnel may not be seen from the third person. Tag or stick a warning sign indicating “UNDER INSPECTION” to the main switch or a proper place necessary for hazard prevention.
- During work with the power turned on, stick a warning sign to a visible place such as operation panel to notify the third person that the work is under way.
- Before turning on the power switch, clear unnecessary workpieces or goods off the machine and its periphery, and also make sure the location of EMERGENCY STOP button.
- In checking the operating status the covers left open and pay attention to the following:
  * Do not touch rotating or moving parts.
  * Do not touch moving axes.
  * Be careful about the parts which are going to start.
- Do not move the work tank up and down when working on the step ladder. Or separate the step ladder from the machine.

1.6 Precautions on maintenance

During the maintenance, pay attention to the following:

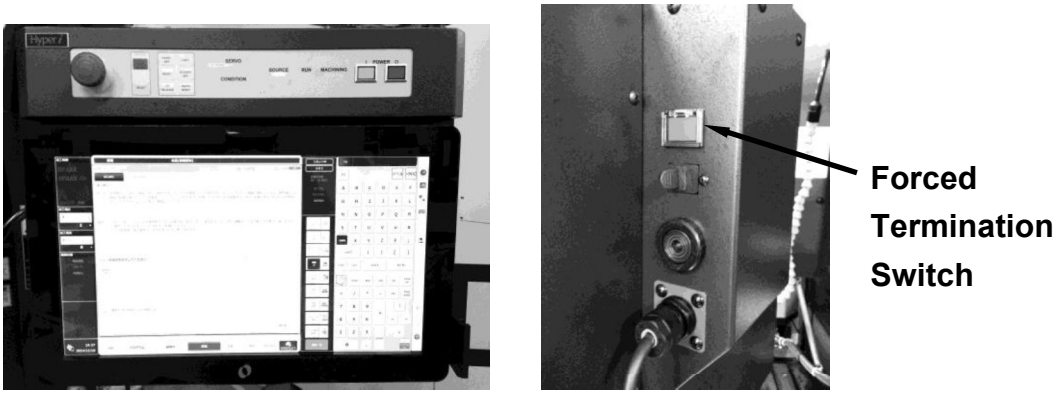
- The maintenance of the machine or equipment must be performed after thorough examination by only the personnel who knows well about the structure, operation, and possible hazards.
- Do not perform maintenance (repair) other than those mentioned in the instruction manual.
- The machine installation, relocation, or repair must be performed by the qualified personnel only.
- Upon connection with AC power supply, the source voltage is applied to the machine and equipment. Hazardous voltage is present in the equipment even if the breaker of the equipment is opened.
- The voltage remains in many places for about 10 seconds after the main power switch is turned off.
- In performing maintenance or adjustment, press the EMERGENCY STOP button with a lock to shut off the power supply, so that the third person cannot start the machine accidentally from other place.
  In the power off status where the maintenance and adjustment are not performed, first tag a signboard to a visible place such as operation panel, indicating that maintenance is under way and the machine operation is inhibited, so that the third person does not operate the machine accidentally.
- Attach a breaker or circuit breaker with a fuse for overcurrent protection regulated by the law, if not attached to the equipment.

NOTE

Please contact the nearest service centers, when you have uncertain points in the instruction manual, and you don’t know how to perform maintenance or adjustment.

1.7 Forced termination of NC display

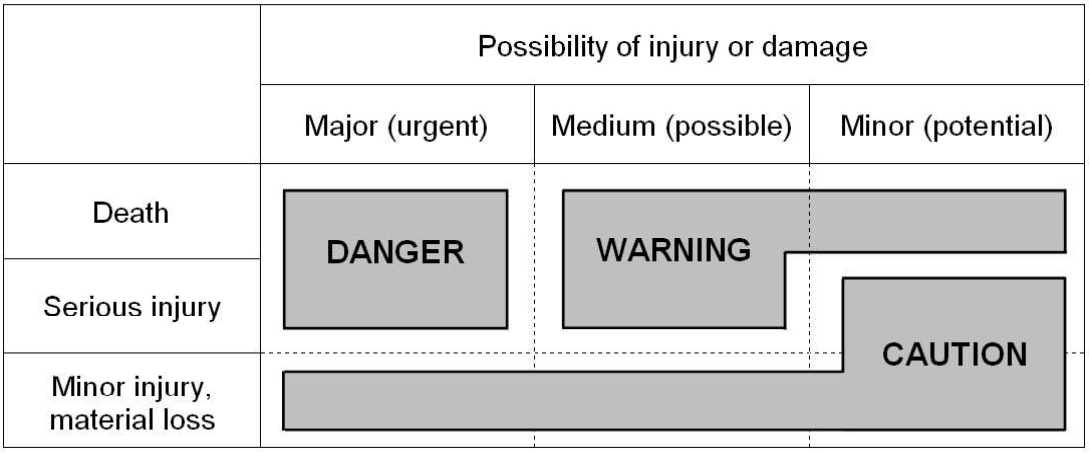
Please cancel the NC screen keeping pushing the forced termination switch for five seconds or more when the NC screen display does not disappear even if power supply OFF switch is pushed.



Forced Termination Switch (Side of Operation Panel)

2. WARNING LABELS

2.1 Kinds and meaning of warning



The Instruction Manual lists precautions concerning the operation and maintenance.

The precautions are classified into four categories according to the degree of danger:

DANGER

Failure to follow the instructions will cause an urgent danger which leads to the death or a serious injury.

WARNING

Failure to follow the instructions can cause a condition where there is a possibility of death or a serious injury.

CAUTION

Failure to follow the instructions can cause a condition where there is a possibility of medium or minor injury. This may also be used to alert the operator of unsafe traditional practices.

NOTE

Useful information on the machine operation

2.2 Location of warning labels

Possible hazardous places are indicated with the illustration and text on the warning labels. The warning labels give the following information:

- Contents and nature of danger (danger, warning, caution)
- Degree of damage cause by danger
- How to avoid danger

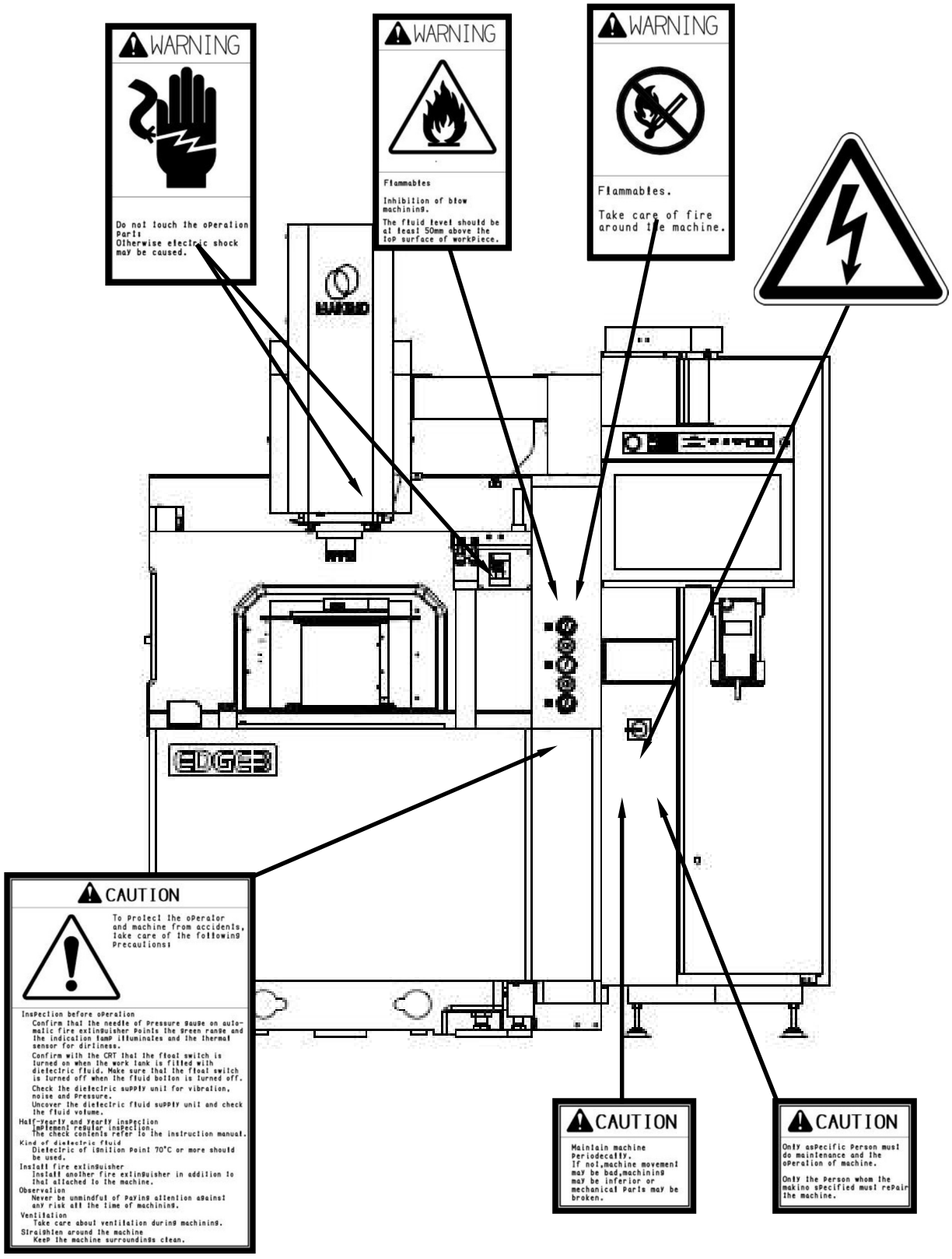
NOTE

The labels with thick leader lines and illustrations enclosed with thick frames are stuck to the machine.

WARNING

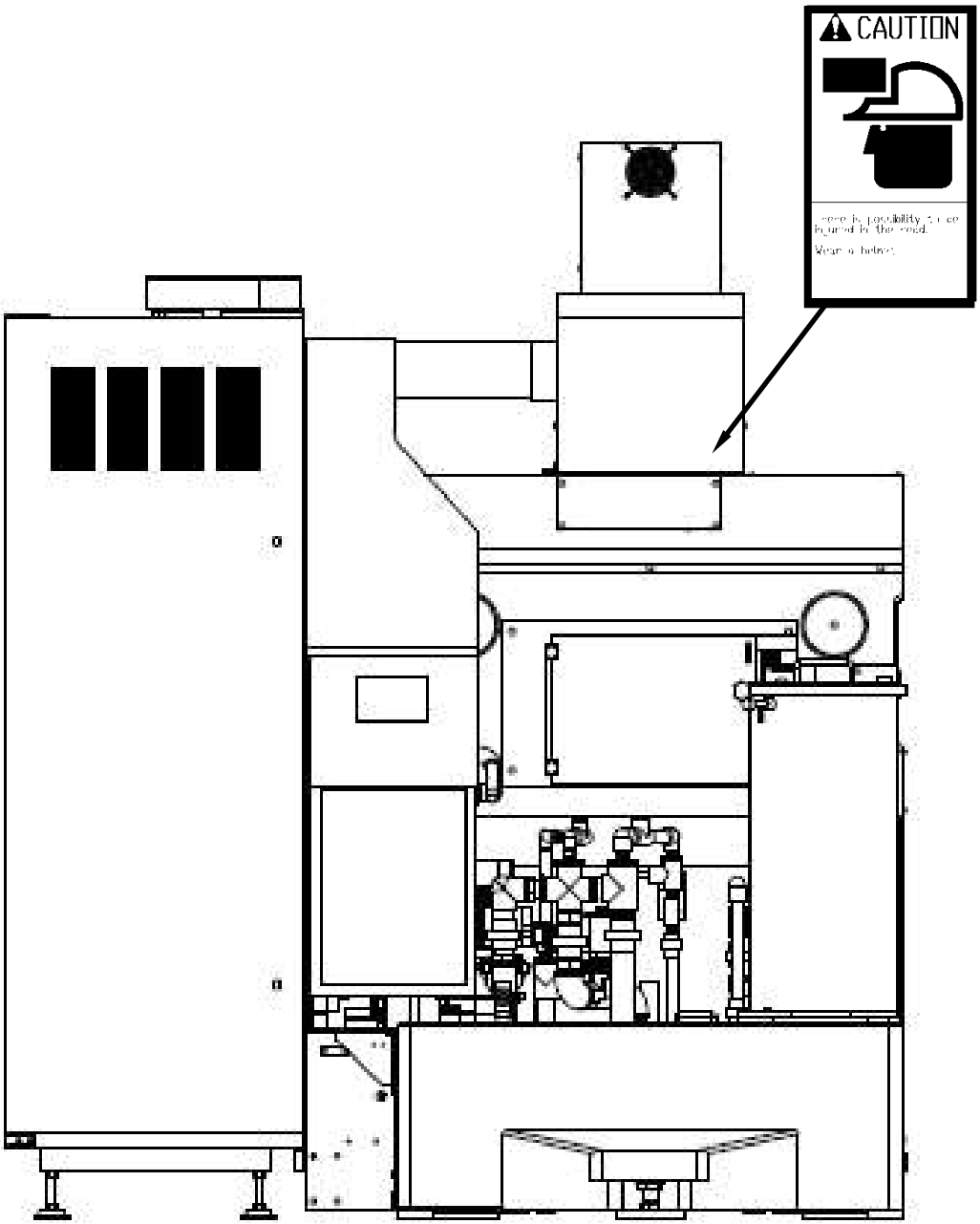
When a warning label peeled off or has become illegible, please get it from us or our agents, and stick to the original position. When a part where a warning label is stuck was replaced, stick a new warning label to the same position as before.

2.2.1 Machine front view

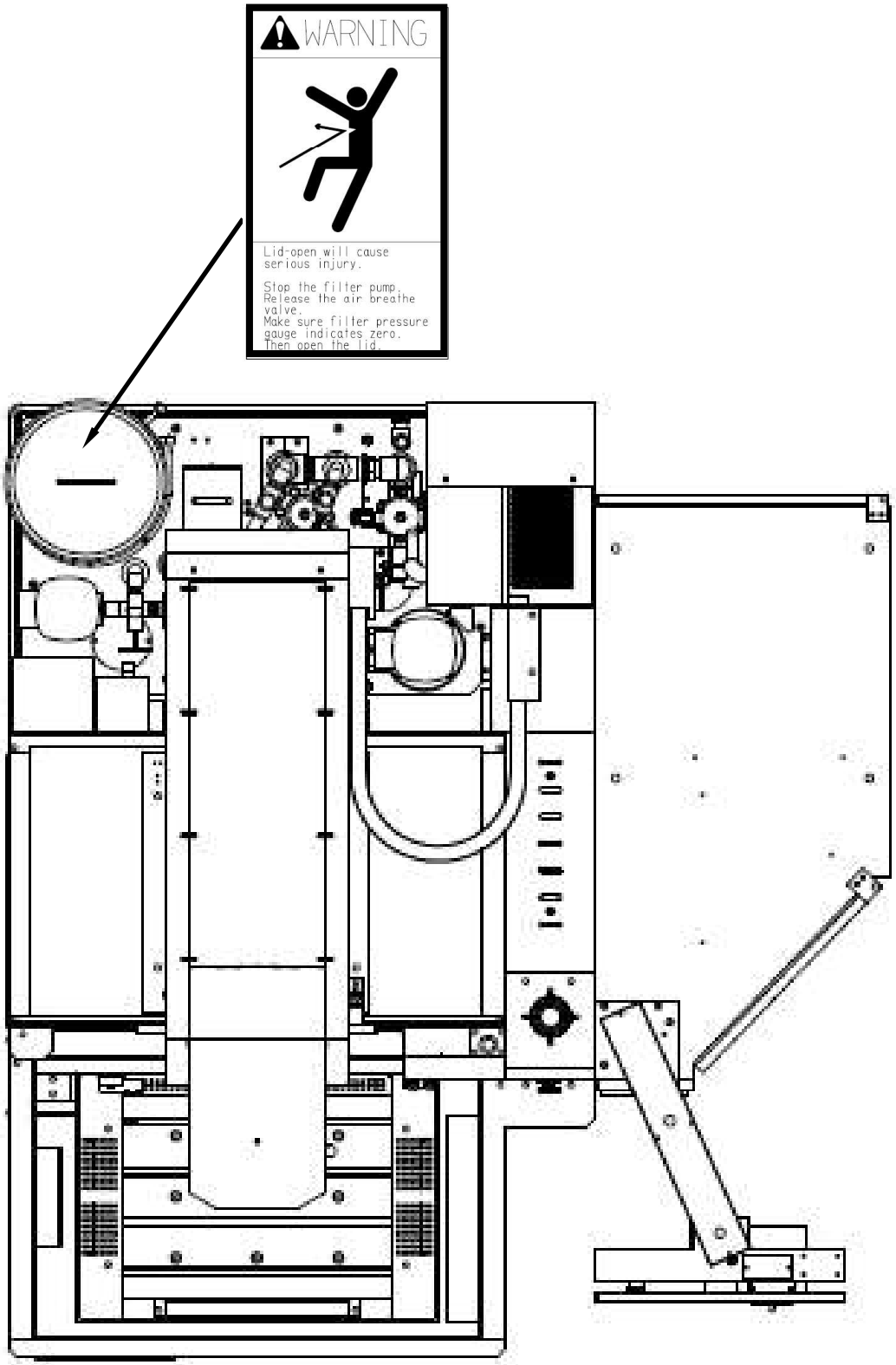


2.2-2

2.2.2 Machine rear view



2.2.3 Machine plane view



2.3 List of Safety Precautions

2.3.1 Automatic Operation

• During operation in dry run mode ----	Getting pinched your hand or body, resulting in cut or fracture of a bone.
• During machining----------	Feeling an electric shock, or getting pinched your hand or body. Dielectric fluid splashes.
• Work tank up and down ----------	Getting pinched your hand or body, resulting in fracture of a bone.
• During C axis rotation and during ATC arm turning ----------	Getting pinched or caught your hand in, or burned.

2.3.2 Manual operation

• Portable operation panel ----------	Leaving carelessly this panel on the workpiece or work tank allows you to press the axis move button by your elbow, causing a serious accident. Not knowing that you are operating portable operation panel at the rear of machine, the third person may operate the main operation panel, causing an accident.
• Work tank up and down ----------	Getting pinched your foot or body, resulting in fracture of a bone.
• Setup of workpiece Loading/unloading ----------	Workpiece, if falling, breaks your bone, cuts or pinches your leg.
Centering----------	Getting pinched your hand or body, resulting in fracture of a bone.
• Axis movement----------	Getting pinched your hand or body, resulting in fracture of a bone. Getting pinched your body by the rear of machine, resulting in death.

• MDI operation	Be careful with possible danger in both automatic and manual operations. Electric shock, fracture of a bone, bruise, etc.

2.3.3 Routine checking and maintenance

• Replacing fluid filter	Unless you wait until oil pressure drops, the dielectric fluid blows out and wets the floor, causing you to be slipped and stumbled. Do not drop the filter to avoid foot injury.
• Replenishing fluid	Fluid, if spilling, wets the floor, causing you to be slipped and stumbled.
• Cleaning fluid	Getting pinched your hand or body.
• Cleaning fluid tank	Cutting hands with machining chip. Pinch hands between piping inside the tank and the tank wall, the fluid getting into the eyes.
• Cleaning filter in dielectric fluid cooler	Dust enters your eyes or the fan cuts your fingers.
• Maintaining electrical parts	Electric shock, burn, fire.
• Maintaining power supply cable	Electric shock, burn, fire.
• Chemicals (antirust agent, antiseptic agent, cleaner, acid)	Attach your skin or enter your eyes.

2.3.4 Others

• Use of steps	Getting pinched your foot by work tank, resulting in bruise or fracture of a bone.
• Full protection covers	Getting pinched your hand.
• Tools	Getting hart due to falling, pinching, or slipping tools.

2.3.5 Warning labels

The warning labels give information on the degree of danger, kind of danger, and how to avoid danger about the very hazardous places.

Among them, the warning labels enclosed with thick frames are stuck to the machine.

Understand well the contents of information given with these labels.

INSTALLATION

CONTENTS

1 PREPARATION

1.1 Installation Location

1.1.1 Installation Location Condition

Select an installation on place while taking care of following points:

[1] A place that machine weight could be sustained enough **(Note)**

[2] A place free from vibration and shock

[3] A bright place free from dust

[4] A place that has less temperature change

[5] A place where air can flow freely

[6] An easy accessible plate to carry in and out the machine

[7] Ensure sufficient service area by referring to the floor plan

[8] Depending on the environment, a shied room may be required in order to avoid radio wave interference

Note: Install the machine on the concrete floor of the thickness over 200mm.

1.1.2 Foundation

In order to ensure high accuracy and performance of the machine for a long period of time, the machine foundation should be:

[9] Free from settlement

[10] Stable

[11] Free from floating or sliding

[12] Free from vibration transmitted from other machines

The concrete thickness and the floor area will vary depending on the bearing capacity of soil, and therefore select the foundation so as to attain adequate withstanding area and rigidity. For the fundation requiring piling, after piling, cut off the piles at the height of rubbles.

1.2 Machine Floor Plan

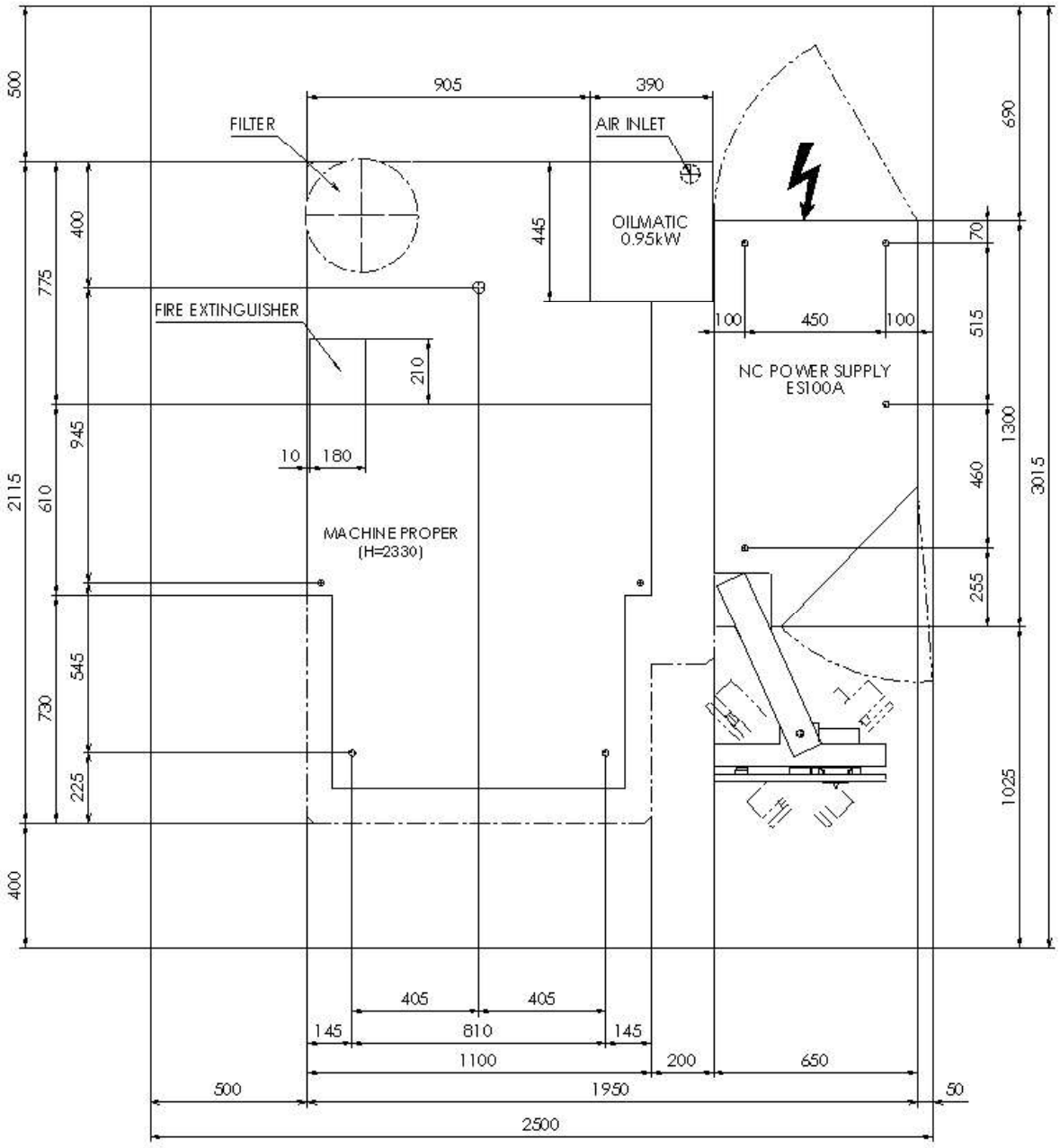


Fig1.2-1 EDGE3 layout

1.3 Required Equipment

1.3.1 Required Pneumatic Power Source

Required Air Source 0.6MPa ~ 1.0MPa			
Qty	Connection Unit	Specification	(Flow Rate) [L/min]
1	Machine	Standard Head	No air pressure source required
		ATC, MA, MR, Automatic Chuck	200 (Atmospheric Pressure)

Note 1: Connection port: hi-coupler outer dia ø9 mm (Standard Accessory) (Connect inner dia. ø8 mm hose or ¼")

Note 2: Prepare the clean air specified on below.

Dew point temperature: –20°C or less

Equivalent to class 2.5.2 specified by JIS B 8392-1(ISO 8573-1)

Max particles number 0.001 < × ≤ 0.005 mm per 1m^3 is less than 100 pieces

Max particles number 0.0005 < × ≤ 0.001 mm per 1m^3 is less than 6,000 pieces

Max particles number 0.00001 < × ≤ 0.0005 mm per 1m^3 is less than 400,000 pieces

Pressure dew-point below +7°C (value at absolute pressure 0.8MPa)

Total oil concentration 0.1 mg/m^3 or less

Negligence of maintenance of air filter element installed on the machine causes a trouble, thus requiring a periodical checking and maintenance.

1.3.2 Power Supply Required

Power Supply Required				
Generator	Q'ty	Connection Unit	Specification	[kVA]
Standard	1	Machine	Standard Head	7.0
			ATC Unit	+0.3
			MA Head	+0.5
			Mi Head	+0.2
60A	1	Machine	Standard Head	9.0
			ATC Unit	+0.3
			MA Head	+0.5
			Mi Head	+0.2
			Constant Temperature Chamber	+4.2

Prepare the following power supply facility.

Power supply specifications : Three-phase voltage AC200 V ±10%, 50/60Hz ±1%

Earth-leakage breaker : For inverter circuit, working current 30 mA (If a shield room is not available)

Connection terminals : Direct to wire or rod terminal

Grounding work : Special Class-3 grounding is recommended. (Grounding resistance 10 Ω or less)

Power cable size : 14 mm^2

2 INSTALLATION WORK

2.1 Machine Installation

2.1.1 Lifting the Machine

The procedure of lifting and transportation are described as below:

(1) Drain dielectric fluid from the dielectric fluid tank, work tank, and filter case. In draining the fluid from the work tank, raise the work tank up to the top position and open the dielectric fluid return valve. (See 2.2.5 “Dielectric Fluid Supply”)

(2) Move each axis to the following position for clamping.

X axis → 225 mm (Center)
Y axis → 150 mm (Center)
Z axis → Reference point (Top position)
ATC (option) → Reference point

(3) Loosen two truss head screws on the X axis winding covers (both sides) and winding up the covers (Fig.2.1-1).

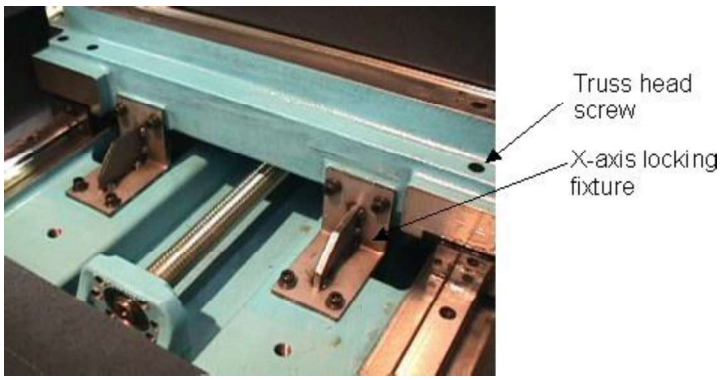


Fig. 2.1-1 X-axis clamping fixture

(4) Clamp the X and Y axes with exclusive clamp devices. (Fig. 2.2-1, 2)

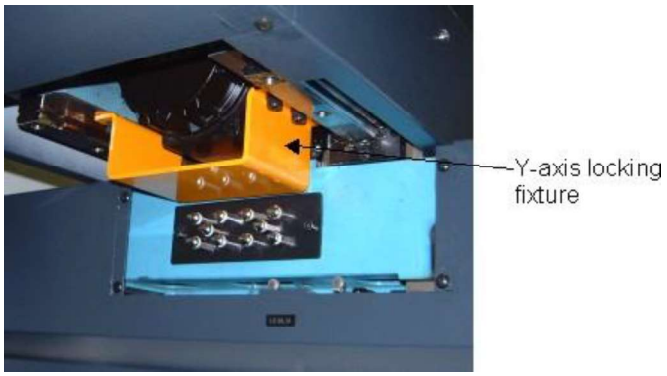


Fig.2.1-2 Y-axis clamping fixture

(5) For the machine with optional ATC, clamp as shown in **Fig.2.1-3.**

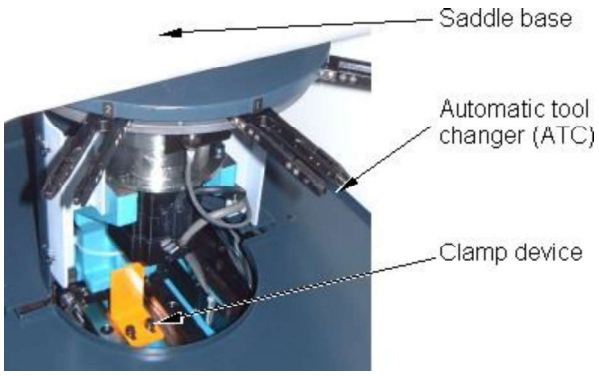


Fig. 2.1-3 ATC clamp

(6) Remove the Lifting Bar Cover from the rear side of the saddle base (See Fig. 2.2-1, 2.2-2). Mount the Lifting bar on to the bed and the rear side of the saddle base as shown in Fig. 2.1-4.

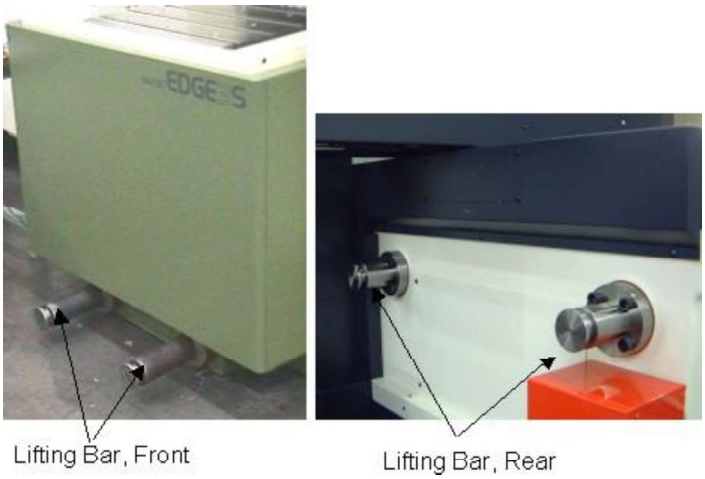


Fig. 2.1-4. Lifting bar mounting

(7) Clamp the generator so that it rides on the chin of the bracket mounted to the machine bed. Open the doors on the generator and tighten four socket head bolts. (Fig.2.1-5)

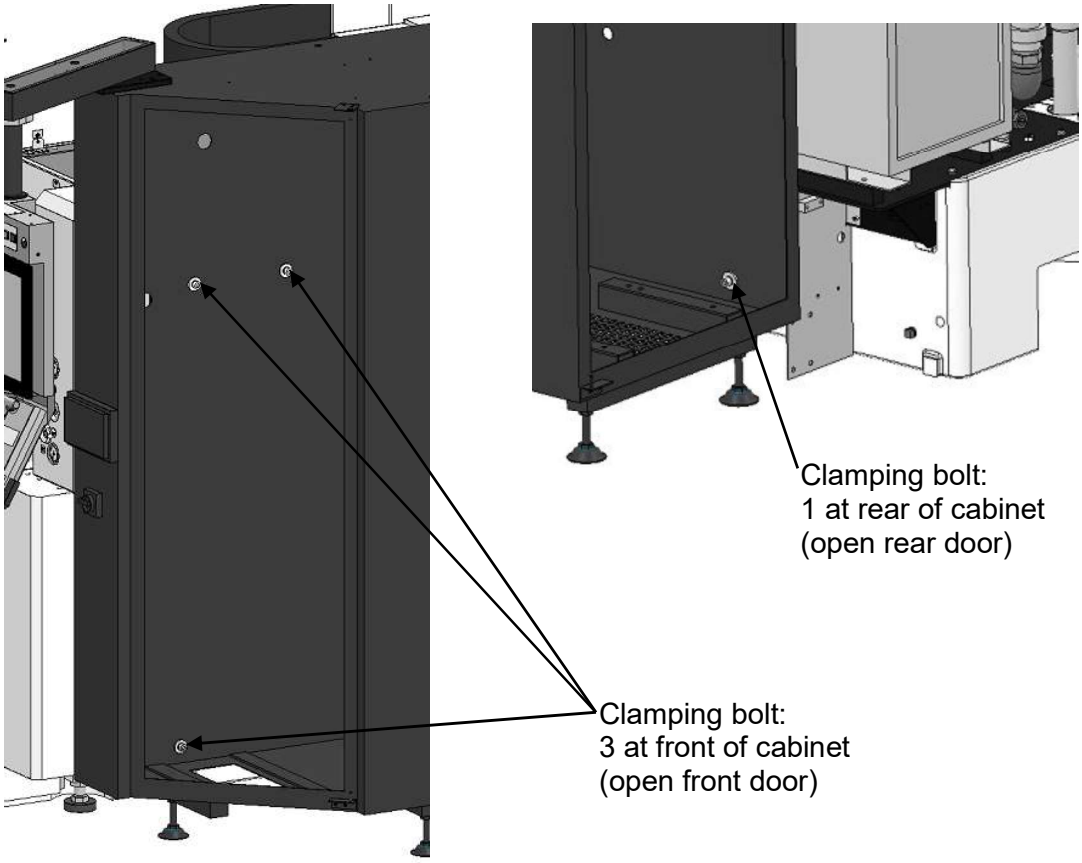


Fig. 2.1-5 Clamping bolts in generator cabinet

(8) Make leveling bolts (4 pcs) on the generator floating. (Fig.2.1-6)

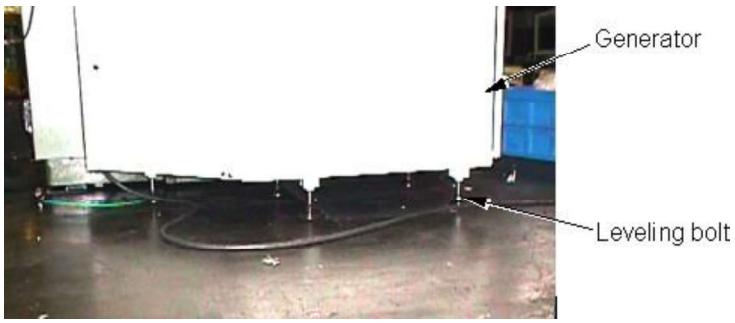


Fig. 2.1-6 Leveling bolts on generator

(9) Assemble the 4 lifting bars

(10) Hook wire ropes on to the lifting bars on the machine and connect the other end of the wire ropes to the lifting frame as shown in the figure.

(11) Lift the machine as show in Figure 2.1-7.

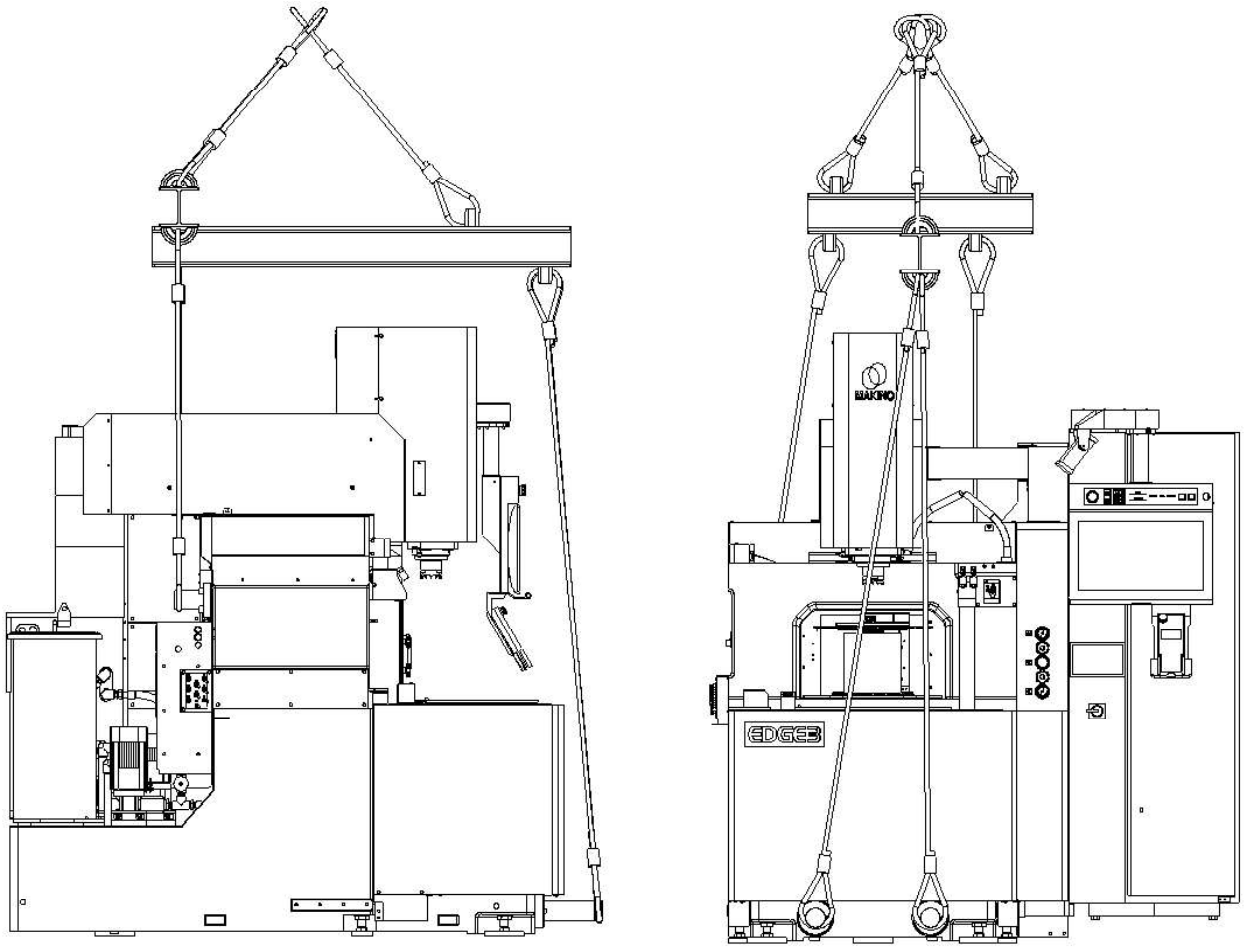


Fig. 2.1-7 Machine lifting positions

2.1.2 Machine Installation

Install the machine as follows:

(1) Install the machine on the place that satisfies the requirements in 1.1 Installation Location, and insert the leveling plates. (Fig.2.1-6, 2.1-8, 2.1-9)

(2) Adjust the leveling bolts (4 pcs) on the generator properly. (Fig.2.1-6).

(3) Open the doors on the generator, and loosen four locking bolts that lock the machine and generator. (Fig.2.1-5)

(4) Rotate additionally the leveling bolts on the generator, so that the generator floats up about 5 mm from the chin of bed. (Fig.2.1-6)

(5) Adjust the machine leveling. In leveling the machine, the chin of bed may interfere with the generator. In such a case, rotate further the leveling bolts on the generator to raise the generator above the chin of bed.

(6) Confirm that the clamping bolts in the generator are loose. (Fig.2.1-5)

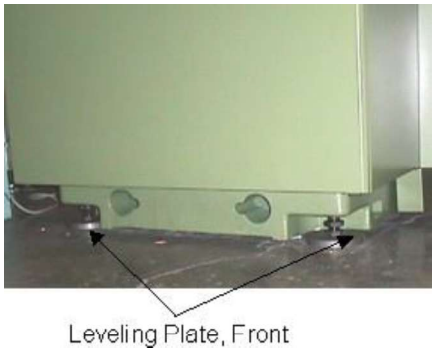


Fig. 2.1-8 Leveling plate (front)

Fig. 2.1-9 Leveling plate (rear left)

2.1.3 Power Supply Connection

After the installation of machine and the assembly of accessories were completed, connect the power supply to the main breaker in the generator cabinet. (refer to 1.3.2 " Power Supply Facility ").Use a hole at the bottom of cabinet when leading a power cord into the cabinet.

⚠ CAUTION

Before connecting the power supply, make sure that the breakers on the factory side and on the machine side are in “OFF” position. Take precautions and make indications to prevent a third party from turning it on during the work.

1) Connection of three-phase power supply

Connect the power cord to the main switch inside the cabinet by passing the cable through the sponge hole at the bottom of the cabinet.

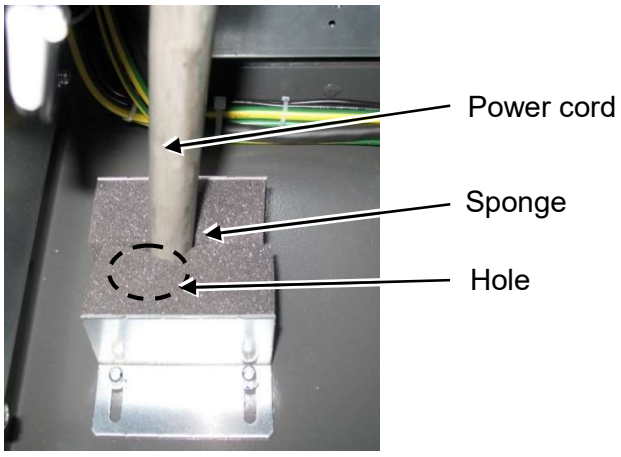
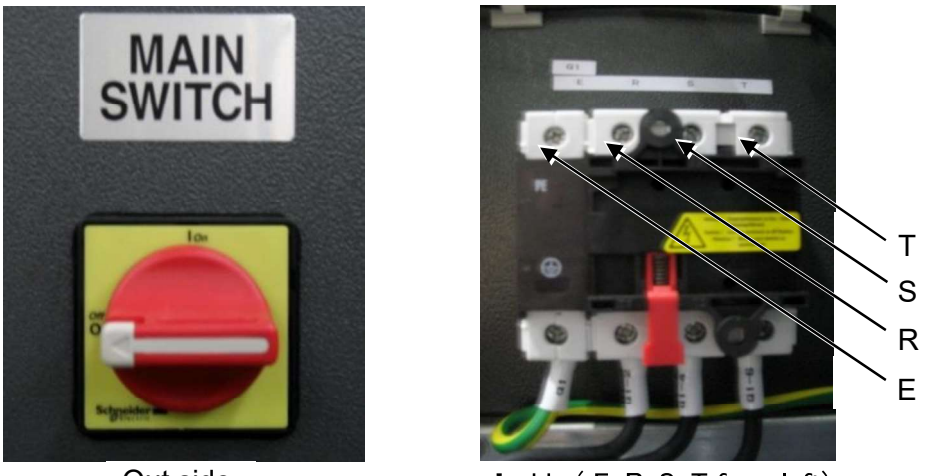


Fig 2.1-10 Bottom of power cabinet



Out side　　Inside (E, R, S, T from left)

Fig 2.1-11 Main switch

- Processing of cable
  Use a Stick terminal with insulation sleeve.

- Size of cable

Generator [kVA]	Cable [mm^2]
~ 6	5.5
6 ~ 8	8.0
8 ~ 14	14.0

CAUTION

Do not turn on the power when there is no discharge fluid in the dielectric fluid supply unit. That may cause damage by the pump running idle.

2.1.4 Air connection

Connect air hoses respectively and adjust the regulator to the specified pressured. For a regulator adjusting method, see 2.2.4 Setting air pressure.

2.2 Operation Preparation

2.2.1 Wipe off Rust-Preventive Oil

Rust-preventive oil would be applied on the machine table and electrode mounting plate depending on transportation distance. Wipe off rust- preventive oil with a cloth etc before operation.

2.2.2 Remove Lifting Bars

The procedure to remove the lifting bars is as follows:

(1) During the transporting of the machine, the machine is lifted with four wire ropes. Remove the wire ropes and the lifting bar from the saddle base and the bed. (Fig.2.1-4, 2.1-7).

2.2.3 Removing Clamping Devices

The X, Y axes have been locked with clamp devices during transportation. Before operation, they must be removed.

For the Z-axis, its brake is automatically released when the power is turned on.

Removing X-Axis Clamp:

Remove the clamp device that locks the saddle and the saddle base on the left side by loosening the socket head bolts. See Fig.2.1-1

Remove Y Axis Clamp:

1. Remove the clamp device that locks the ram and the saddle by loosening the socked head bolts. See Fig.2.1-2
2. Assemble the rear Saddle cover to cover the opening.

Removing ATC (Option) Clamp Device

Remove the clamp device by loosening the socket head bolts. See Fig.2.1- 3.

2.2.4 Air Pressure Setting

(1) Without air booster

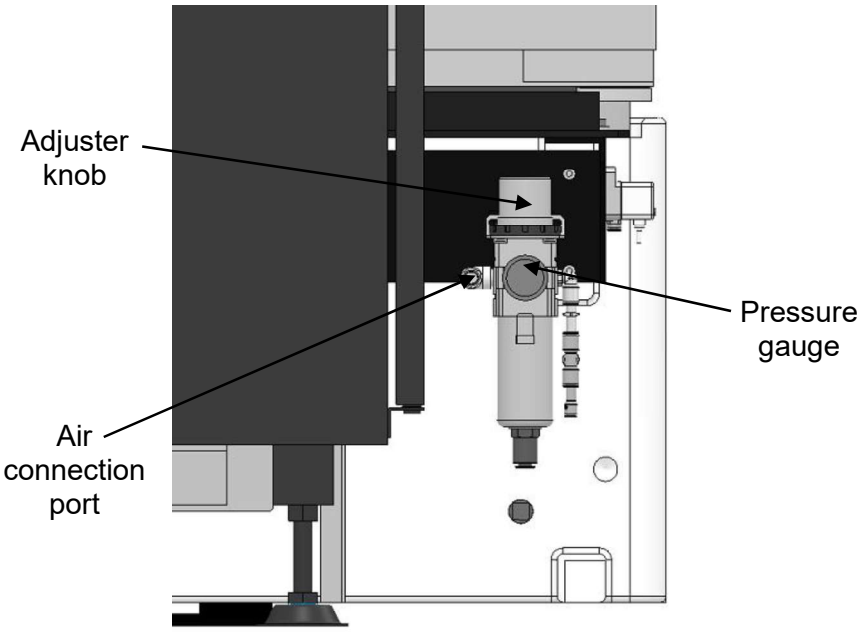


Fig. 2.2-3 Setting air pressure

(a) Supply the air to the air connection port as follows:
EDGE3 Standard machine:-
0.6MPa or more, 100L/min (atmospheric pressure), dry air
EDGE3 Machine with MA/MR head or ATC:-
0.6MPa or more, 200L/min (atmospheric pressure), dry air

(b) Unlock the adjuster knob (by pulling up the knob lightly).

(c) Adjust so that the pressure gauge indicates 0.6 MPa. To increase the pressure, turn the knob clockwise as viewed from top.

(d) Lock the adjuster knob (by pushing down the knob lightly).

(2) With air booster (optional)

Use the air booster if the air pressure of air pressure source is below 0.6 MPa, or if the air pressure is not stable.

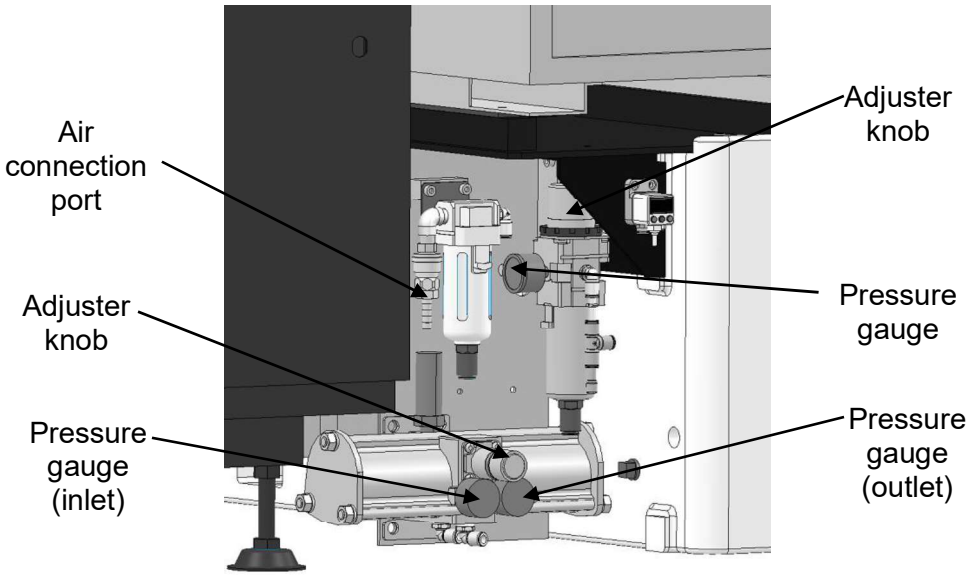


Fig. 2.2-4 Setting air pressure

(a) Supply the air to the air connection port as follows:
EDGE3 standard machine:- below 0.6MPa, 100L/min (atmospheric pressure), dry air
EDGE3 Machine with MA/MR head or ATC:- below 0.6MPa, 200L/min (atmospheric pressure), dry air to the air connection port.

(b) Unlock the air booster and regulator adjuster knobs by pulling them up.

(c) Turn knob so that the pressure gauge on outlet side indicates 0.7 MPa.
To increase the pressure, turn the knob clockwise as viewed from top.

Note: If the air pressure of air pressure source exceeds 0.7 MPa and it is not stable, increase the pressure by 0.1 MPa from the air pressure of air pressure source.

(d) Turn the knob 2 so that the pressure gauge 2 indicates 0.6 MPa.

(e) Lock the adjuster knobs (by pushing down each knob lightly).

2.2.5 Dielectric Fluid Supply

Supply proper dielectric fluid selected based on table 2.2-1 from oiling port of dielectric fluid supply unit. Be sure to turn OFF the main circuit breaker of power supply when replacing dielectric fluid.
Total volume of dielectric fluid is 380L.

Table 2.2-1 Dielectric Fluid

Japanese Manufacturer	Product Name
SHOWA SHELL OIL	PARAOL-250
IDEMITSU KOSAN	DAPHNEY HL25
COSMO OIL	EDM OIL D, SP
JXTG NIPPON OIL & ENERGY	METAL WORK S, HS

Attention

Classification of Hazardous articles by Japan Fire Service Law: Group-4, Class 3 Petroleum

International Manufacturer	Product Name
Oelheld（USA）	IonoPlus 3000
Oelheld（Europe）	IonoPlus IME82
Castrol	Ilocut EDM180
Steel Fluid	EDM fluid 108MPS

Attention

Please consult Makino if EDM oil other than those listed in the table is used

2.3 Turn ON Power

2.3.1 Confirm Position and Function of Emergency Stop Button

The EMERGENCY STOP button is used to stop the machine immediately. At this time, all operations of the machine stop. The EMERGENCY STOP button is provided at two places: (Refer to Fig. 2.3-1)

- **Main operation panel**
- **Portable operation FPB2**

Once the button has been pressed, it is pushed in and locked there.
To reset the button, rotate the button in the arrow direction (clockwise).

If the EMERGNECY STOP button is pressed, the following results:

- **Each axis feed stops immediately.**
- **All pumps of dielectric fluid supply unit stop.**
- **Machining power turned off.**
- **ATC (optional) stops in midway of operation, when it is operating.**

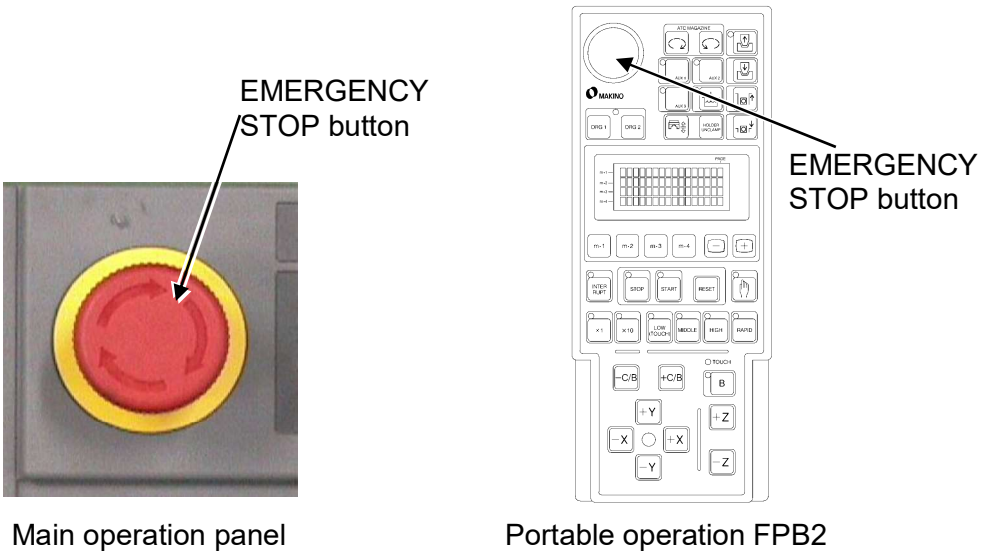


Fig 2.3-1 EMERGENCY STOP button

2.3.2 Power ON procedure

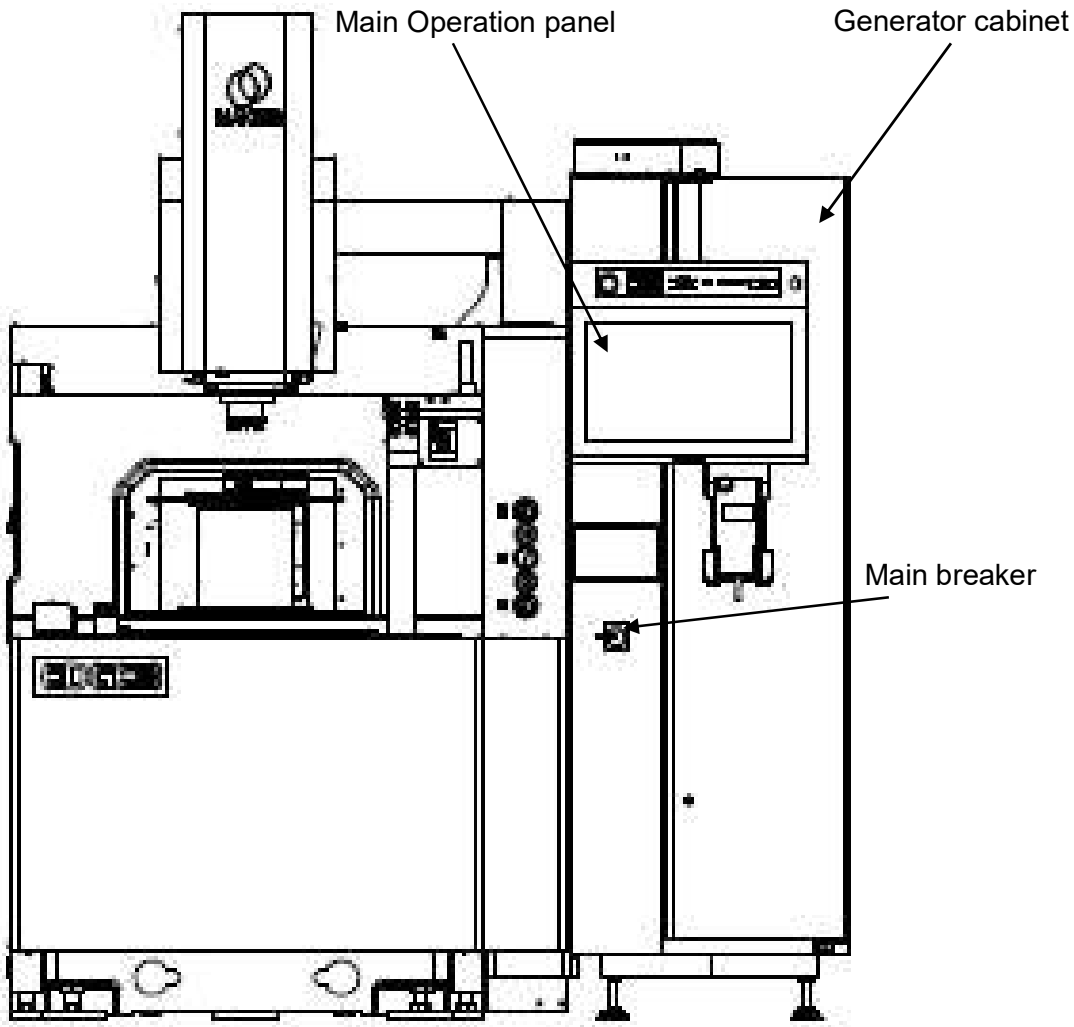
After all wiring and dielectric fluid filling completed, turn on the power in the sequence given below. For the location of main breaker, refer to Fig 2.3-2. For the location of power button, refer to Fig 2.3-3.

(a) Turn on the main breaker.

(b) Press the POWER ON button on the Main operation panel.

In several seconds, the machine will start up. The Z axis break is released, and the filter pump and the Oilmatic operate. Make sure that the filter pump is running in the arrow direction indicated on the top of pump motor.

To turn the power off, press POWER OFF button and then turn off the Main breaker on the generator.



2.4 Level Adjustment

Level the machine as follows:

Place level gauges in the X and Y direction on table center (Fig 2.4-1). Respective leveling bolts should be equally loaded. Concentrated load on one bolt or no load will cause the bed to be distorted.

Fig 2.4-1 Level Gauges