ENGLISH

Original Version: V1.0

PS900SB13090CKZ
PS900SB13090CKW
Laser knife type
INSTRUCTION MANUAL

CAUTION :
This Instruction Manual describes the laser knife type. When you want to use your sewing machine with this product attached, refer to the "Safety precautions" in the Instruction Manual for your sewing machine carefully until you fully understand the included precautions in prior.

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CONTENTS

If any control device or program other than those specified in this Instruction Manual is used, or if the adjustment method and usage specified in this Instruction Manual are not followed, the maintenance person or user of this product can be exposed to hazardous irradiation from the laser. If the human body or cornea is exposed to direct laser-irradiation, health hazard such as burn of cornea, burn of retina, conjunctivitis, visual loss, burn of skin, etc. and the fire can be caused.

1. SAFETY PRECAUTIONS

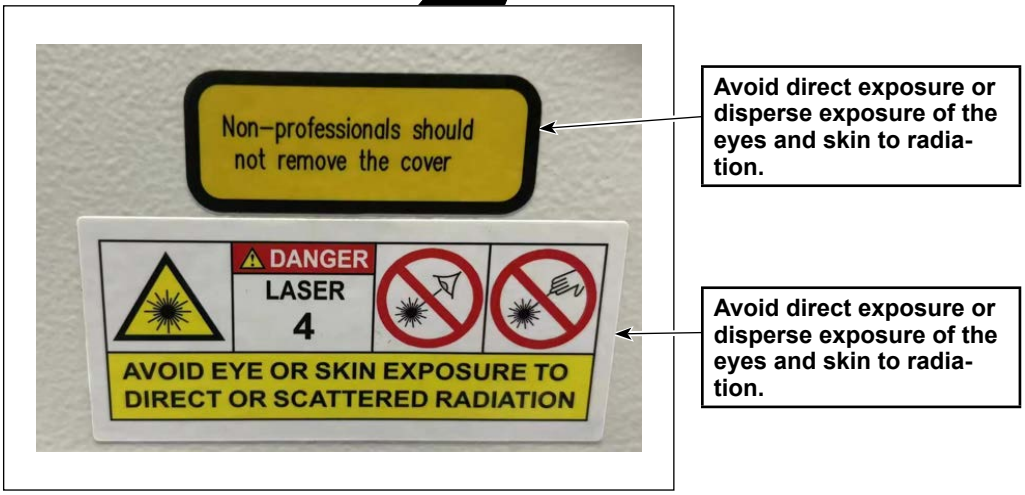
1. **This product cuts the material using the Level 4 no observation light continuous wave laser. Wave length is 10.6 µm, maximum output is 100 W and the angle is 3.1 mrad. Only the persons who have received professional training are allowed to use and handle this product. Be sure to contact our After-Sale Service staff if you want to carry out maintenance and / or repair of this product. Professional staff who has received professional training in JUKI to gain experience of the relevant work will carry out maintenance / repair of your product.**

2. **Whenever you use of this product or carry out maintenance / repair of it, be sure to wear safety goggles. Use the safety goggles that satisfy the following criteria or that are provided by the manufacturer.**

   Safety goggles selection criteria :

   1. CE Marking is obtained
   2. Visible light transmittance VLT>60%
   3. Applicable wave length : 10.6µm
   4. Protective characteristics : Light absorption type CO2 laser safety goggles or light reflection type CO2 laser safety goggles
   5. Protection level : OD5+

3. Safety-mark attachment positions and meaning of icons and expressions

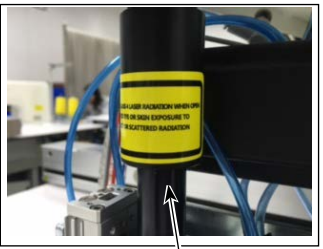


DANGER label

Avoid direct exposure or disperse exposure of the eyes and skin to radiation. This product is a Class 4 laser product.

Warning label against pinching

This label indicates that there is a risk of pinching hands between the sewing machine and the laser device mechanism.



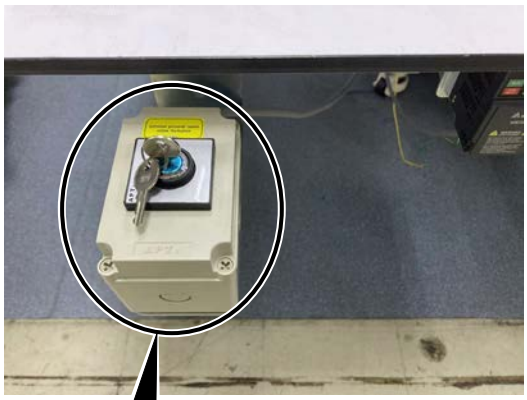
DANGER label

This product causes Class 4 laser beam exposure. When you have detached the cover, be sure to avoid direct exposure or disperse exposure of the eyes and skin to radiation.

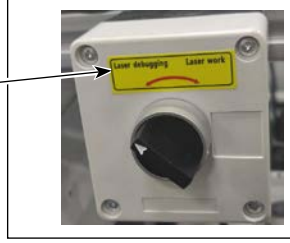
CAUTION label

This is the laser exit port.

Any person other than the professional engineer is allowed to carry out adjustment. Do not remove the cover while the laser is in operation.



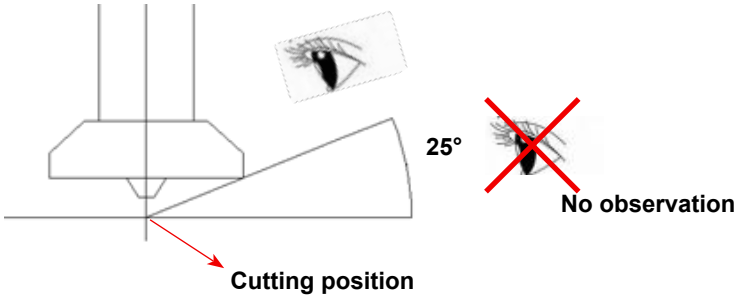
Twist counterclockwise:
Laser maintenance mode
Twist clockwise:
Laser operation mode



Any person who has not received professional training is not allowed to touch the keys.

1-1. Precautions to be taken when installing or adjusting the laser

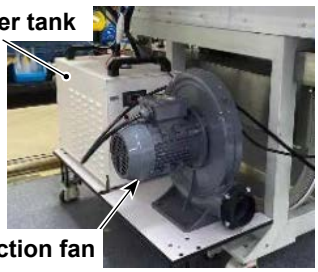
1) If the laser intensity is excessively high, take care not to directly look into the laser in order to protect your eyes. Be sure to wear safety goggles during work.
2) Take care not to irradiate the mirror surface with laser light in order to prevent reflection.
3) Laser current during the adjustment: Adjustment of the laser current during adjustment is prohibited. The factory-set value at the time of shipment must be used as the standard value.
4) Be sure to use the adjustment mode when you adjust this product. (Refer to **"5-5. Adjusting the laser" p.22**.)
5) Visible angle during work or adjustment (See the figure given below)

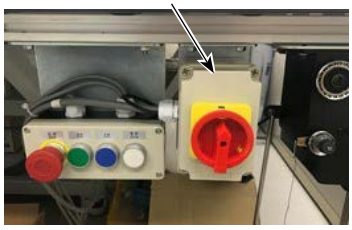


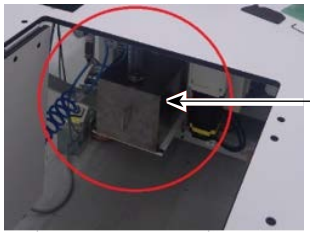
1-2. Precautions to be taken when using the laser

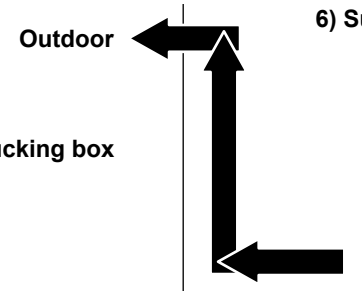
1) Be sure to check the head section of the laser to clean it up to remove the accumulated combustion impurity every working day before commencing the work.
2) Check atmospheric pressure and adjust it to 0.5 - 0.55 MPa every working day before commending the work.
3) Be sure to check whether the cooling water tank and suction fan of the equipment normally operate and also check the suction fan for abnormal noise and the cooling water tank for errors every working day before starting the work.
4) Be sure to check the cooling water tank of the laser contains an adequate amount of commercially available pure water.
5) Turn OFF the power switch every working day at the end of the work.
6) Be sure to place the exhaust pipe of the suction fan in an outdoor location and attach a combustion deodorizing filter to its outer connector.
7) This product is a Level-4 no observation light laser product. Anybody who has not received the professional training must remain away from this product to protect against injury.
8) Whenever you want to carry out maintenance / repair of the laser equipment of this product, be sure to contact our After-Sale Service Department. The professional staff who has received professional training in JUKI to gain experience of the relevant work will carry out maintenance / repair of your product.
9) Be sure to remove any dust from the dust sucking box before operation and be sure to put a little water into the box to prevent fire.

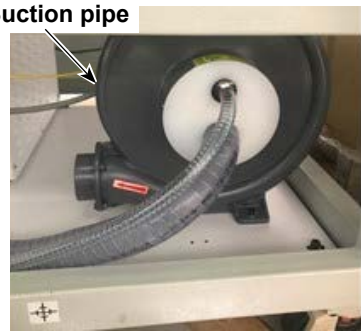
Supplementary materials



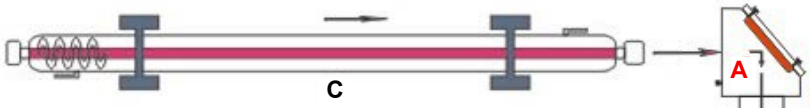


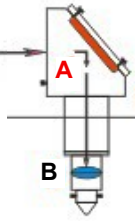






Caution **9) There is a risk of fire if 9) is not properly handled.**



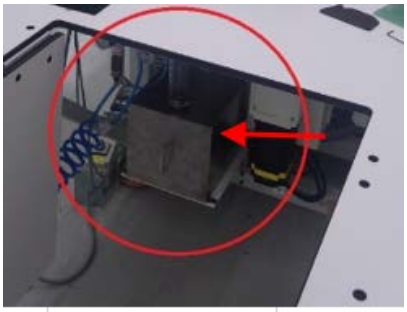


Important **It is prohibited to observe the laser tube with an optical telescope or directly look at the optical path while the laser is in operation, from the locations as shown in the figure.**

A: Reflecting mirror of the laser
B: Focusing lens of the laser
C: Laser tube

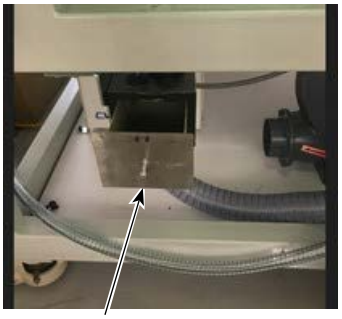
2. MAINTENANCE

1) Observe the cooling water tank of the laser to check whether the water normally circulates in the tank to ensure that the laser tube is not clogged inside.
2) Wipe the reflecting mirror surface with alcohol once every half month to keep it clean and to improve its reflecting effect. Wipe the focusing lens inside the irradiation cylinder with alcohol from time to time to keep it clean. (Refer to **"2-1. Care for the lens" p.6** for details.)
3) Replace the laser tube based on the frequency of use. If the laser tube fails to satisfy the requirements for cutting the material, change the laser tube with an appropriate one.
4) For the cooling water tank of the laser tube, change the pure water (approximately 5L - 6L) in the tank periodically once every three month.
5) The water in the cooling water tank of the laser tube should be changed every time the laser tube is changed together. The tank uses approximately five to six liters of commercially available pure water.
6) Check the hose of the tank and laser tube periodically once every three months and change it with a new one if necessary in order to prevent a broken tube from negatively affecting smoking and cooling.
7) Adjust / calibrate the laser path once every six months to ensure that the laser beam is focused without distortion.
8) After 4 hours of use, unscrew the arrow shown in the photo, pull out the dust sucking box drawer to clean it (to remove dust), and be sure to put a little water into the box to prevent a fire.



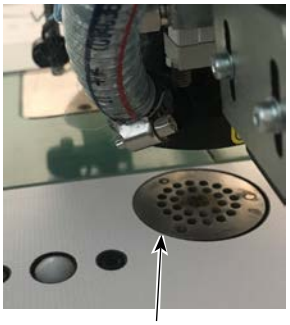
9) Thoroughly inspect and carry out cleaning of the following parts every time you have used the laser for eight hours to prevent accumulation of dust and deterioration of the tube, thereby preventing a fire from occurring. In some cases, blow the relevant parts with an air blower or disconnect the hose to remove dust.
   ① Clean up litter in the upper smoking tube.
   ② Clean up litter in the lower smoking tube (Loosen the screw in the cover on the table. Clean up litter at the tube opening and in the tube with a tool or small wooden stick).
   ③ Clean up litter accumulated in the dust suction opening, outlet and exhaust pipe of the suction fan.
10) Immediately carry out inspection and maintenance according to the instructions displayed on the operation panel.
    Service life of the laser tube: Approximately six months. Service life of the focusing lens and reflecting mirror: Approximately one year. Periodical cleaning is required to prevent foreign matters from attaching them.

Supplementary materials



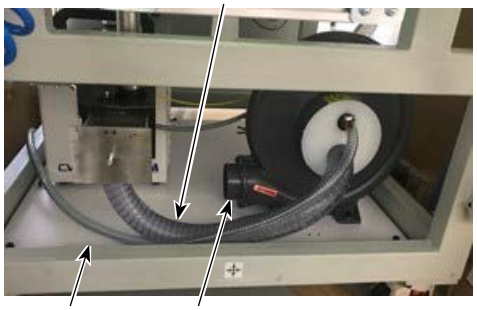
8) Dust sucking box

9) Upper suction tube



9) Lower suction (Cover)

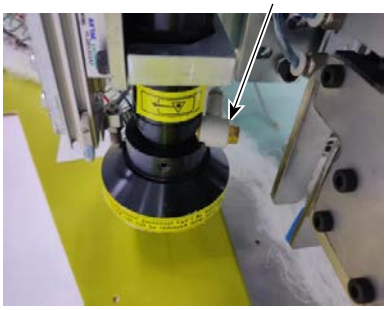
9) Lower suction tube



Upper suction tube

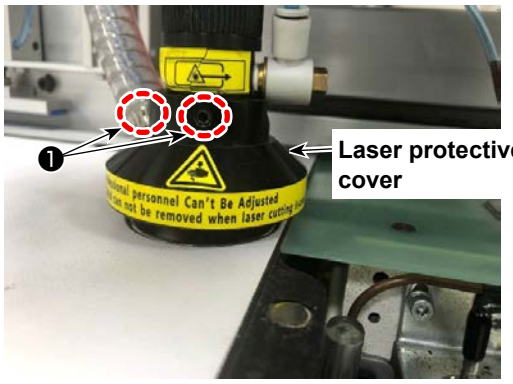
Outlet

Air outlet

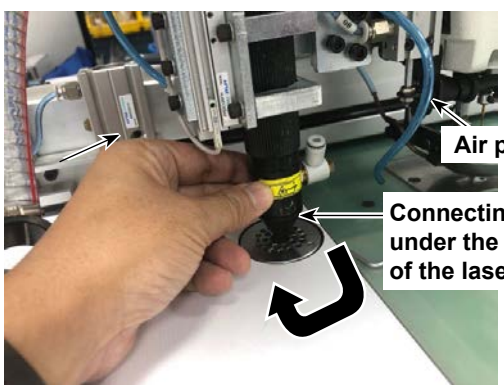


2-1. Care for the lens

WARNING :
Be sure to always turn OFF the power to the sewing machine and laser before disassembly and assembly.

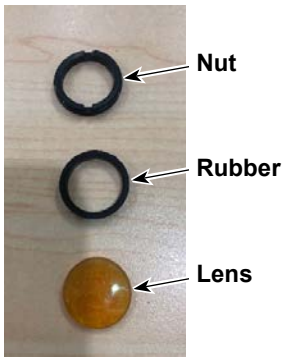


1) Loosen two setscrews ❶ of the laser protective cover to remove the cover.



Disassembled state

2) Turn OFF the air and disconnect the air pipe. Then, turn the connecting tube under the neck of the laser to remove it.

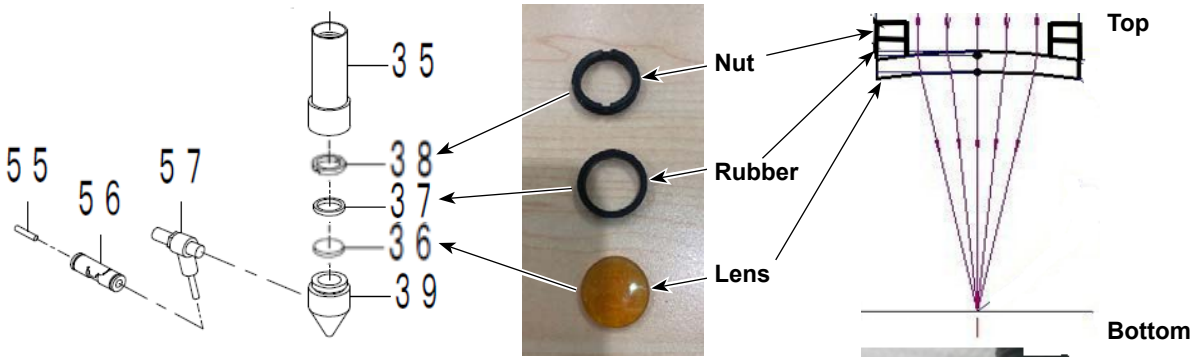


Disassembled state

3) Loosen the nut to remove the lens.

Be sure to loosen the nut with a jig that is suitable for the nut slot shape.
Never use a coin to disassemble or assemble the lens components since the coin will damage the lens.

4) Wipe the lens you have removed with alcohol using a piece of clean waste cloth.
Check to make sure that there is no abnormality such as dirt or flaws on the surface of the lens.

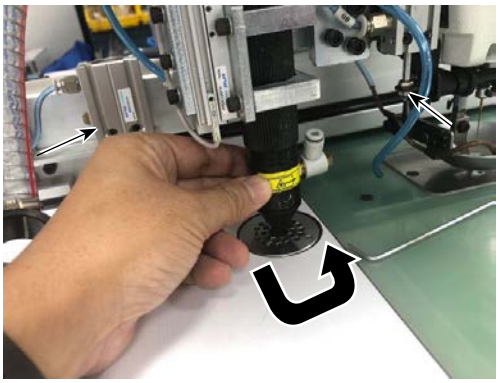


5) Reassemble the lens components.

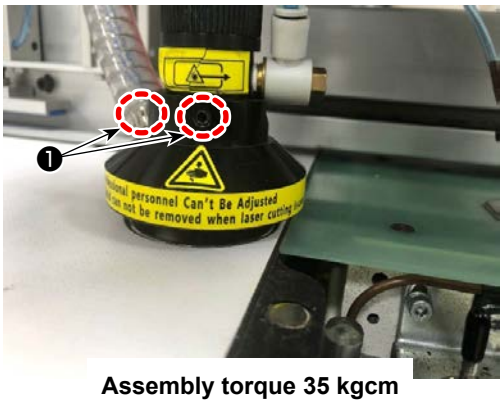
Reassemble the lens components paying attention to the mounting order and orientation of the lens components.

*** Convex surface of the lens should be on the top.**

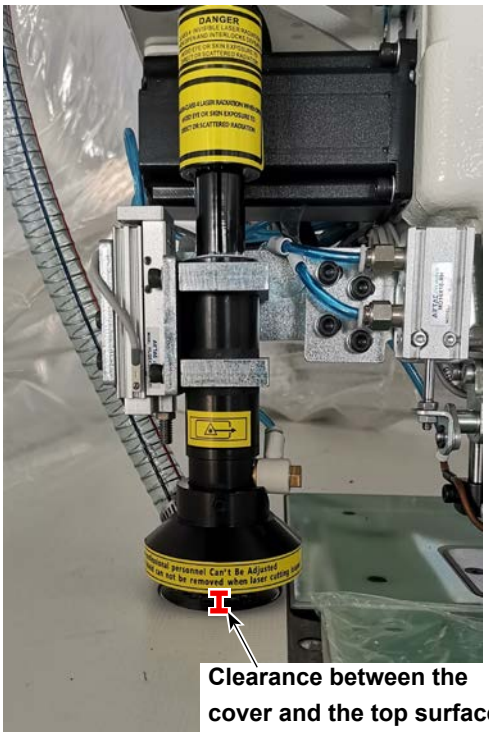
Nut tightening torque 5 to 10 kgcm



6) Turn the connecting tube under the neck of the laser to install it.
Then, perform air piping.



Assembly torque 35 kgcm



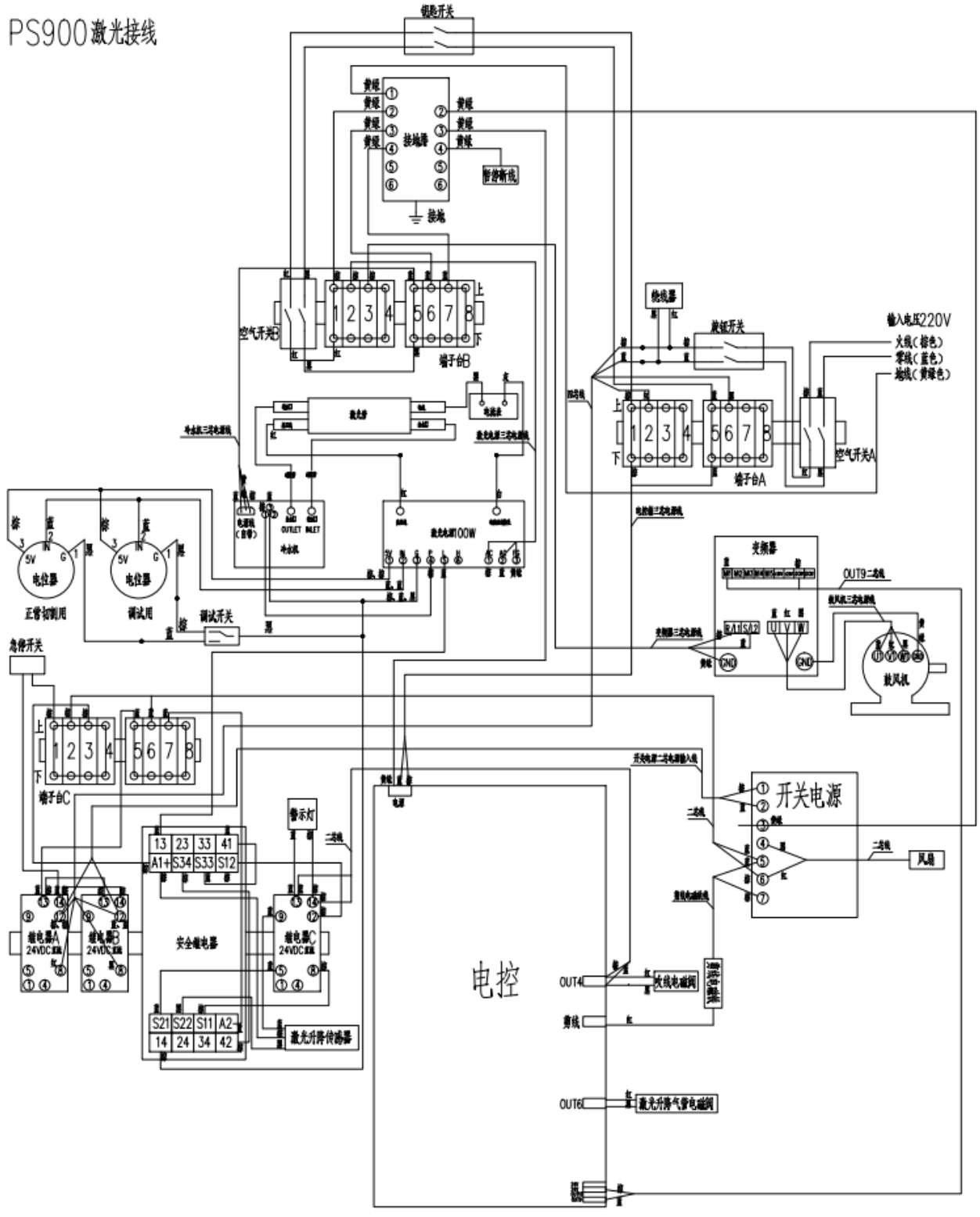
Clearance between the cover and the top surface of the table 5 to 8 mm

7) Attach two setscrews ❶ to the laser protective cover to secure the cover.

8) Lastly, carry out cutting test on the laser and adjust the laser if necessary.

3. ELECTRICAL SAFETY

3-1. Circuit diagrams



Note: ┼ **Intersection of lead wires is not yet connected**

┼ **Intersection of lead wires is connected**

㊡ **All of the base lines are connected on the same base.**

4. INSTALLATION

4-1. Installing the laser power supply

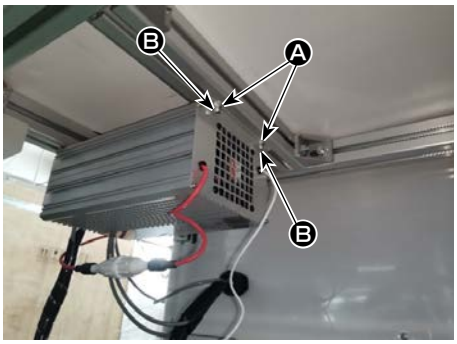
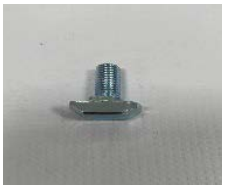
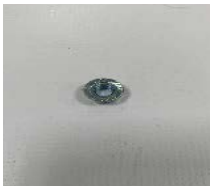


Fig. 1

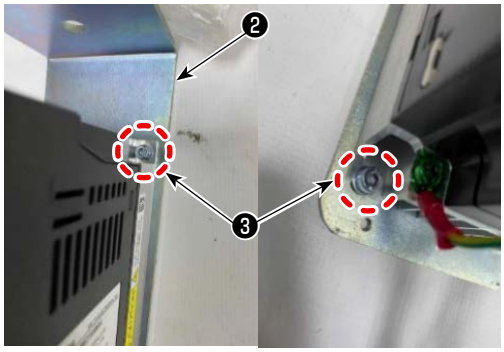
1) Securing the laser power supply

To secure the laser power supply, align screws Ⓐ (Fig. 1) with the tapped holes of the slider nuts Ⓑ (Fig. 1) and tighten the two screws on the right and left of the laser power supply.

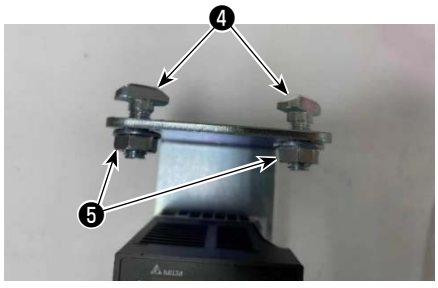
2) Installing the converter

❶	❷	❸	❹	❺
				

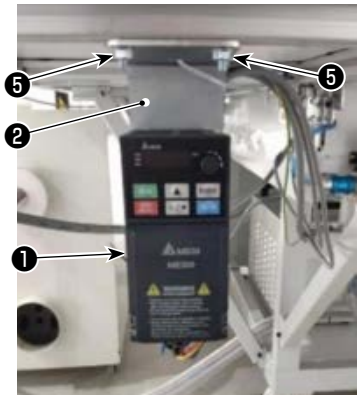
No.	Part name	Qty	Remarks
❶	Converter	1	ME300
❷	Mounting plate	1	
❸	Hexagon socket head cap screw	2	
❹	T-type bolt	2	
❺	Nut M8	2	



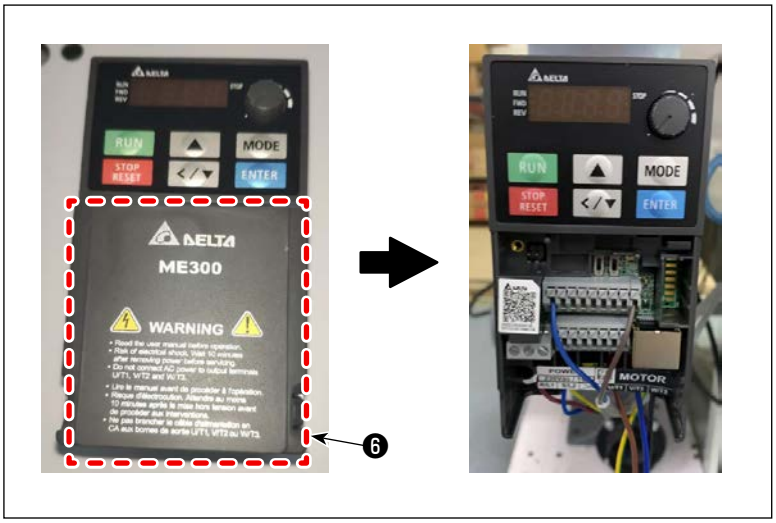
Secure converter ❶ to mounting plate ❷ with hexagon socket head cap screws ❸ .



Attach T-type bolts ❹ and nuts ❺ to mounting plate ❷ as shown in the figure.

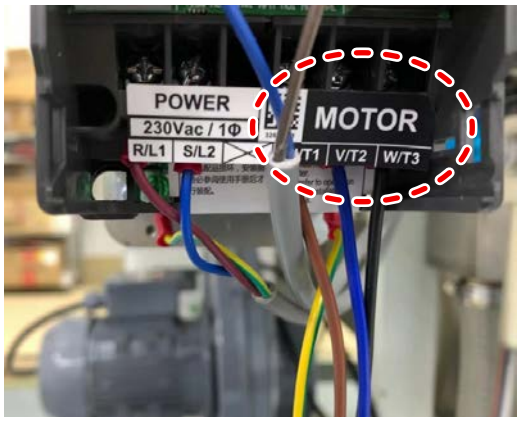


Install converter ❶ to the sewing machine frame. Install it to the position as shown in the figure and tighten nuts ❺ to secure it.

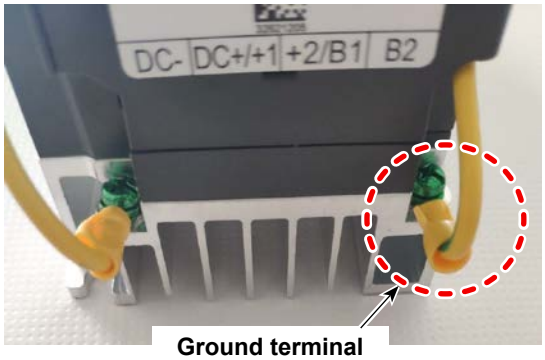


3) Wiring the cable between the air blower and the converter
Open cover ❻ of the converter.

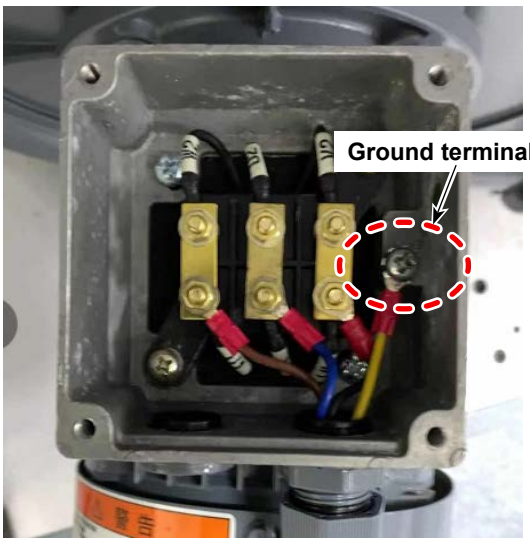
Connect air blower ❼ and converter ❶ with air blower connection cables ❽ (4-core cable: Black, blue, red, green/yellow).



[Connection on the converter side]
Connect the black core wire of cable ❽ to the "W/T3" terminal.
Connect the blue core wire of cable ❽ to the "U/T1" terminal.
Connect the red core wire of cable ❽ to the "V/T2" terminal.



Connect the green/yellow core wire of cable ❽ to the ground terminal located at the lower right part of the converter.



[Connection on the air blower side]

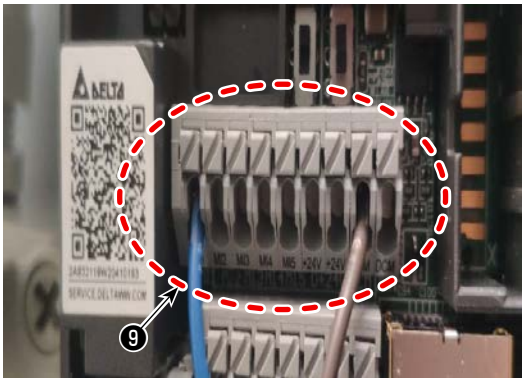
Connect the black core wire of cable ❽ to the W terminal.

Connect the blue core wire of cable ❽ to the V terminal.

Connect the red core wire of cable ❽ to the U terminal.

Cable color	Air blower	Converter
Blue	V	U/T1
Black	W	W/T3
Red	U	V/T2
Green / Yellow	Ground terminal	Ground terminal

Table 1. Connection between the air blower and the converter



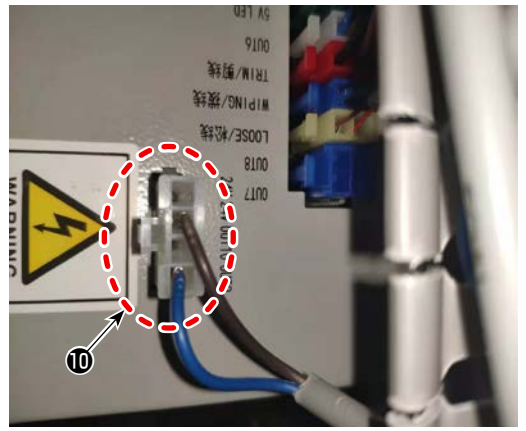
4) Wiring the cable between the electrical control box and the converter

Connect the electrical control box and the converter with the electrical cable ❾ (2-core: Blue, brown).

[Connection on the converter side]

Connect the blue core wire of cable ❾ to the "MT1" terminal of the terminal block.

Connect the brown core wire of cable ❾ to the "DCM" terminal of the terminal block.

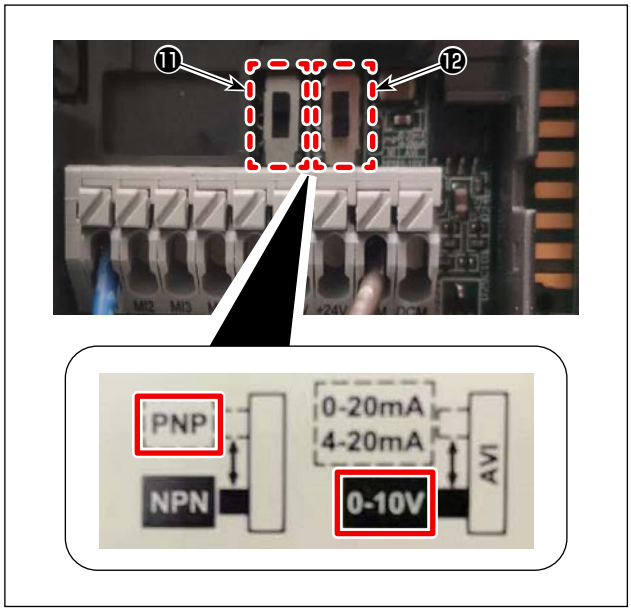


[Connection on the electrical control box side]

Connect cable ❾ to the connector ❿ of the electrical control box.

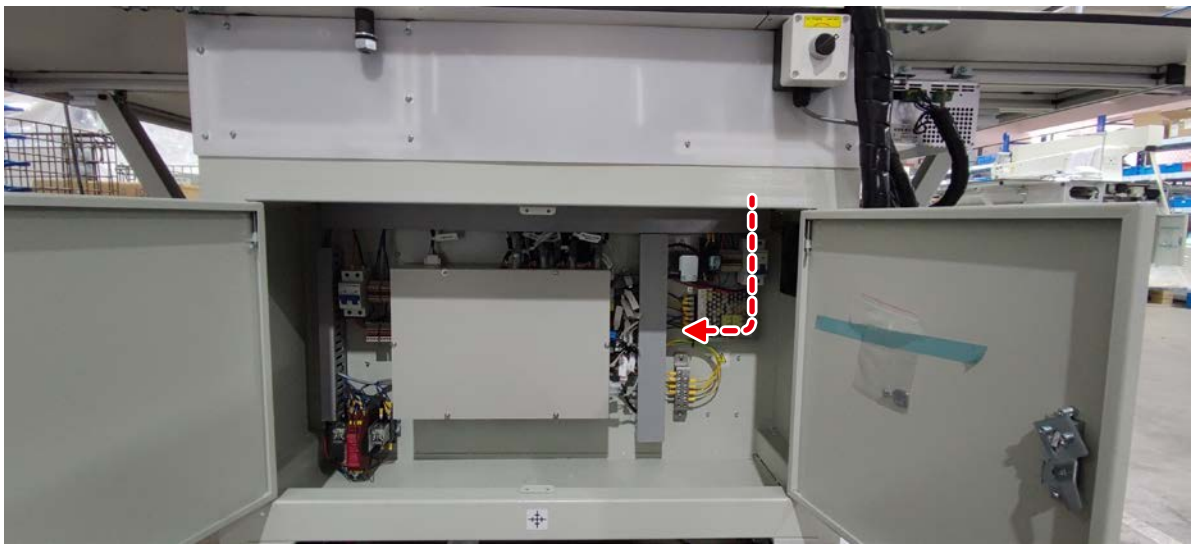
Cable color	Converter	Electrical control box
Blue	MT1	OUT9
Brown	DCM	24V

Table 2. Connection between the electrical control box and the converter



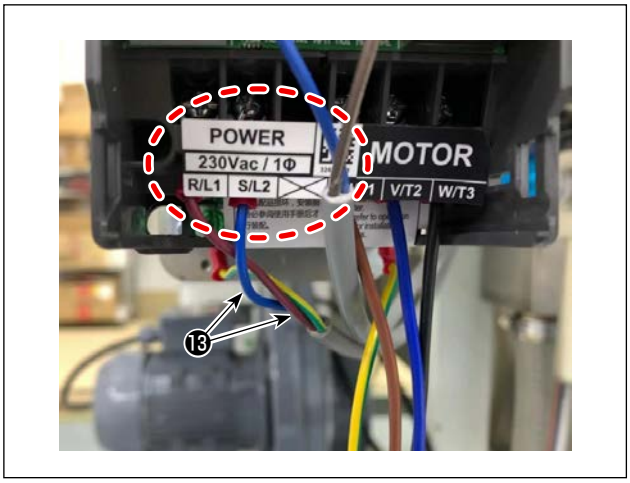
[Switch setting]

Change over the setting of the switches located inside the converter; i.e., switch ⓫ to "Upper: PNP" and switch ⓬ to "Lower: 0 - 10 V".



[Wiring route]

Pass the cables from the side face to the back of the sewing machine and pull them into the electrical rack.



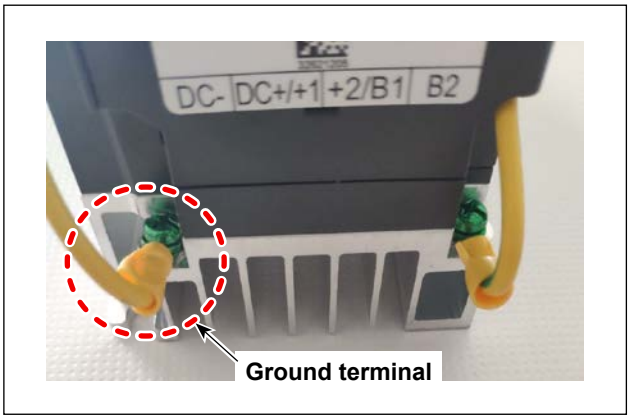
5) Wiring the cable between the power supply terminal block and the converter

Connect power supply terminal block ⓮ located inside the electrical rack and the converter with power supply connection cable ⓭ (3-core: Blue, brown, green/yellow).

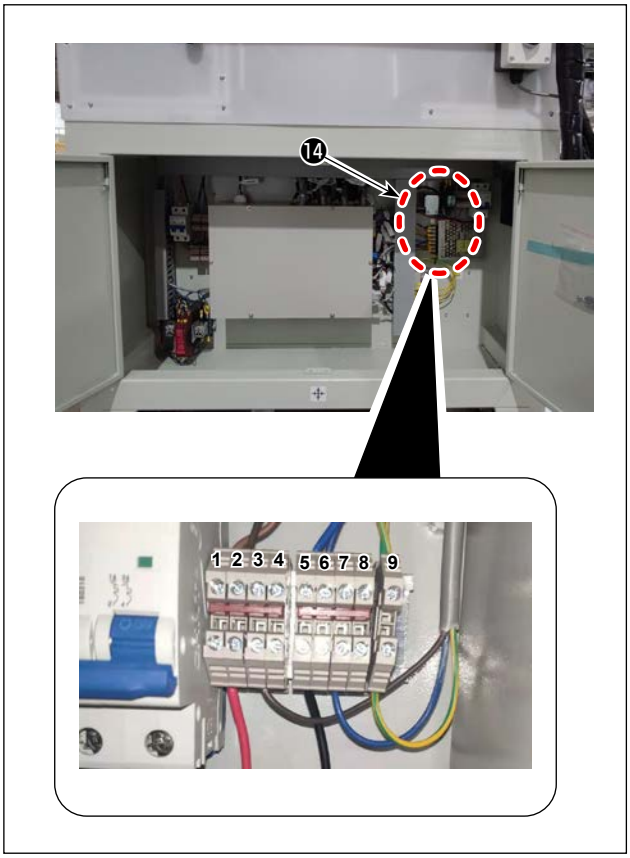
[Connection on the converter side]

Connect the brown core wire of cable ⓭ to the "R/L1" terminal of the terminal block.

Connect the blue core wire of cable ⓭ to the "S/L2" terminal of the terminal block.



Connect the green/yellow core wire of cable ⓭ to the ground terminal.



[Connection on the power supply terminal block side]

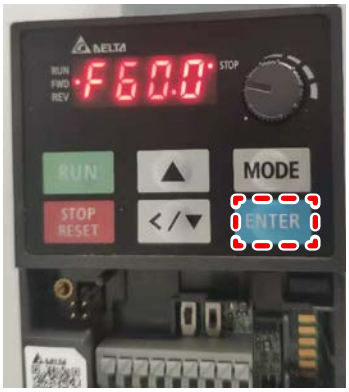
Connect the blue core wire of cable ⓭ to "7" of power supply terminal block ⓮ .

Connect the brown core wire of cable ⓭ to "3" of power supply terminal block ⓮ .

Connect the green/yellow core wire of cable ⓭ to "9" of power supply terminal block ⓮ .

Cable color	Converter	Power supply terminal block
Blue	S/L2	7
Brown	R/L1	3
Green / Yellow	Grounding	9

Table 3. Connection between the power supply terminal block and the converter



6) Setting the converter

In this paragraph, setting of the parameter setting No. "0.20" is described. Set the parameters in Table 1 in the same way as described above.

Setting No.	Value
0.17	14
0.20	7
0.21	1
1.12	4

Setting No.	Value
1.13	5
1.35	60
1.52	60

When you turn ON the power to the sewing machine, the power to the converter is turned ON.
While the power to the converter is in the ON state, press the "ENTER" button.

Press the "▲" button to adjust the numeric value on the LED to "00.20".

Press the "ENTER" button.

Press the "▲" button to adjust the numeric value on the LED to "7".

Press the "ENTER" button.

Press the "MODE" button twice.
Then, the LED display is changed over as illustrated in the figure on the left. Now, setting of the converter is completed.

5. OPERATION

5-1. Tune ON the power

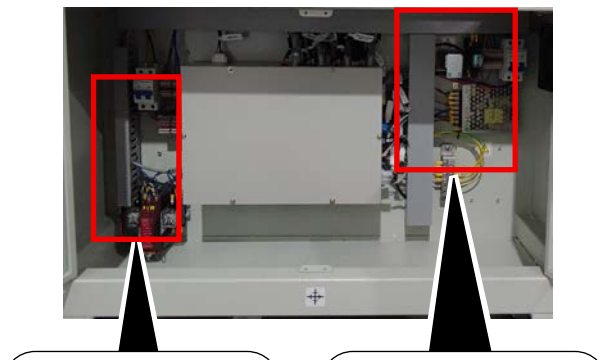


Fig. 1

Fig. 2

1) Insert the power cord plug into the socket (supply voltage: 220 V ± 20 %, 50 Hz). Be sure to ground the power cord for the sake of safety.
2) Among the power switches (air switches) in the control panel cabinet, the switch that is located at the left side of the control panel and has the identical-color upper and lower cords (red and red, and black and black) is the laser power supply switch ❶ . (See Fig. 1.) Another air switch that is located at the upper right corner in the control panel and has different-color upper and lower cords (red and brown, and blue and black) is the sewing machine power supply air switch ❷ . (See Fig. 2.)

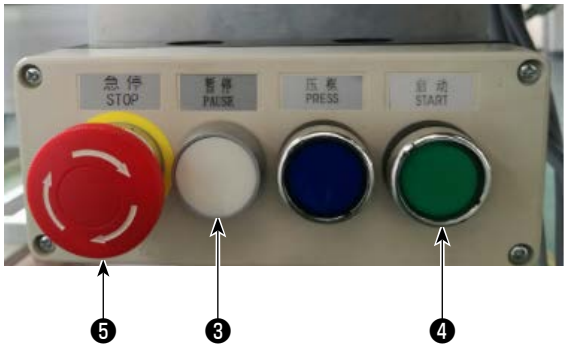
5-2. Starting the air supply

Put the compressed air from the air source (air pressure: 0.5 - 0.55 MPa) to the air supply suction inlet 64 by means of the air tube (specification: 8 × 5 mm).

5-3. Temporary measures

Fig. 1

Fig. 2



5-3-1. Emergency stop

In the case an accident occurs, press the white pause button on the operation panel (Fig. 1 and Fig. 2) to stop the current operation state (the laser operation is stopped, but the power to the laser is not turned OFF). Or, all of the power supply to the equipment excluding the bobbin winder and the control panel cabinet fan can be turned OFF by pressing the red emergency stop button on the five-button control panel (Fig. 2).

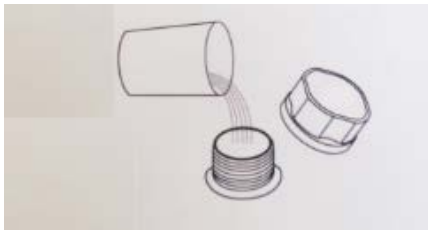
5-3-2. Re-start

Method 1: While the sewing machine is in the temporary stop state, the background LED lamp of "PAUSE" button ❶ (Fig. 1) located at the lower portion of the screen lights up in red.
When the accident is eliminated, press "PAUSE" button ❶ (Fig. 1). Then, the background LED lamp of the pause button changes its color to blue to indicate that the laser is released from the temporary stop state. Then, when you press "START" button ❷ (Fig. 1) located at the lower portion of the screen, the sewing machine re-starts automatic sewing.

Method 2: Press white "PAUSE" button ❸ (Fig. 2) on the five-button control panel to release the laser from the temporary stop state. When you press "START" button ❹ (Fig. 2) on the five-button control panel, the sewing machine continues automatic sewing.

Method 3: When the laser is placed in the temporary stop state with emergency stop button ❺ (Fig. 2) pressed, turn the emergency stop button ❺ (Fig. 2) clockwise to release the laser from the emergency stop state, before re-starting the sewing machine. After the aforementioned re-setting, press "START" button ❹ (Fig. 1) located at the lower portion of the screen or green "START" button ❹ (Fig. 1) on the five-button control panel to continue / re-start sewing.

5-4. Use of the cooling system



Open the water inlet of the cooling system of the equipment. Put cooling water in the cooling system (take care not to allow water to overflow).

Fig. 1

5-4-1. Using the cooling system

1) Check to make sure that the drain pipe and water supplying pipe are securely connected to the equipment.
2) At least 5 to 6L water should be put in the cooling system. If the water in the cooling system runs short, an alarm will sound from the cooling system. (Be sure to use pure water or distilled water. Avoid the use of tap water or mineral water.)
3) After starting the cooling system for the first time after the purchase, immediately check the tubes for leakage of water.
4) Plug in the power cord and turn ON the power switch. (Starting the cooling system without supplying water is strictly prohibited.)

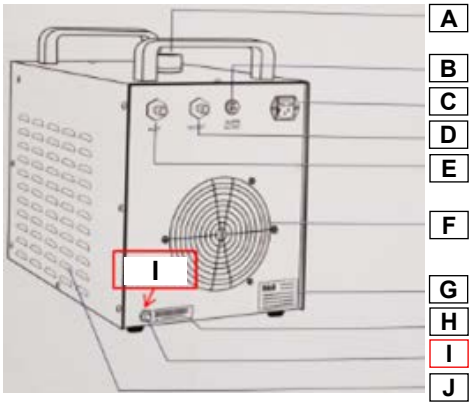


Fig. 2

5-4-2. How to feed water to the cooling system, and water changing cycle

1) How to feed water : See Fig. 1. Be sure to wait until the water temperature becomes equal to the room temperature before putting it in the cooling system.
2) Water changing cycle : It is recommended to change the water once every three months. When you want to change the water in the cooling system, turn the power OFF, turn the drain outlet (Fig. 2) to open it to allow the water to be discharged from inside of the system for cleaning. Then, tighten the drain output and put new water according to the instructions.

A	Water inlet	**F**	Radiating fan
B	Alarm signal output port	**G**	Equipment parameter
C	Power supply connector (provided with a fuse tube)	**H**	Serial number of the machine
D	Water outlet	**I**	Discharge outlet
E	Condensate inlet	**J**	Air inlet

5-4-3.Cooling system error display

If there is a problem with the cooling device, an error code will be displayed on the display of the cooling device body.

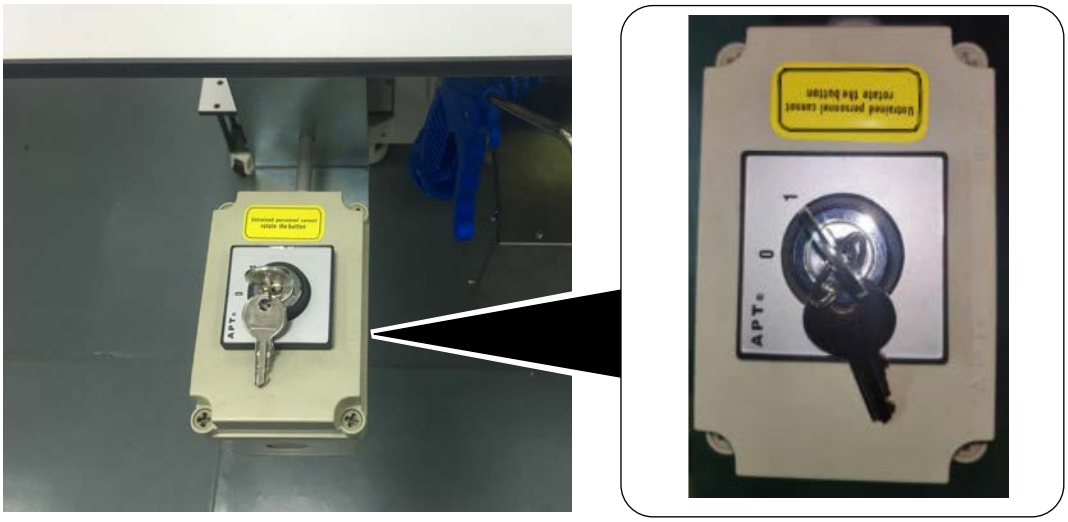
Error code	Error description
E0	Water flow alarm
E1	Excessive water temperature
HH	Water temperature sensor error (short circuit)
LL	Water temperature sensor malfunction (open)

5-4-4. Cause and action in case of cooling system failure

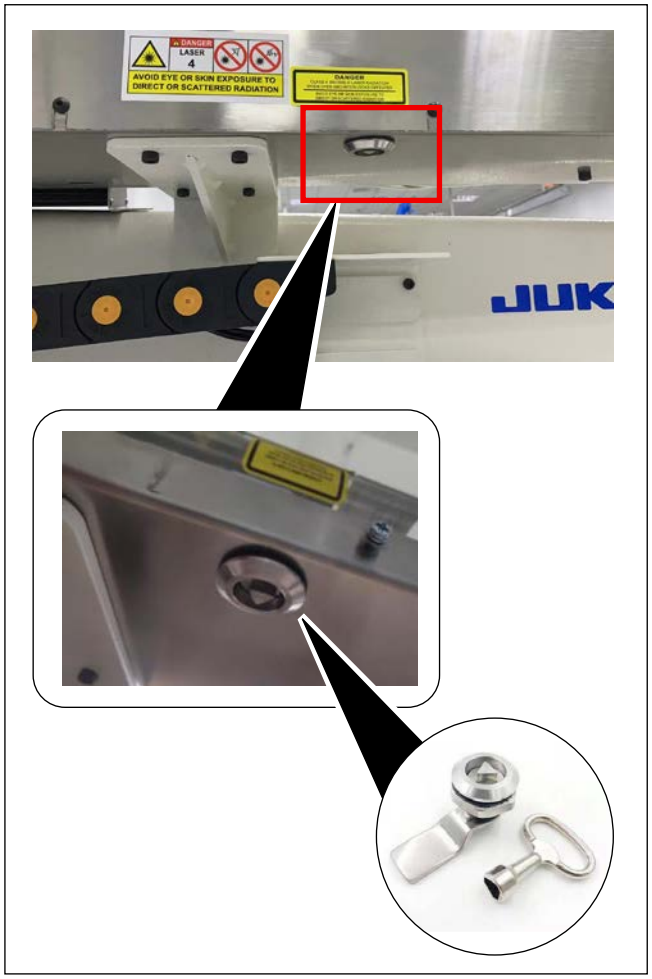
Symptom	Cause	Action
Power cannot be turned ON.	Power line is not connected.	Check the power line connection. If the problem cannot be solved, there may be a problem with cooling system.
Water flow error occurred and water is not flowing to the water outlet and condensate inlet.	Water level in tank is too low.	Add cooling water. Check for water leakage from the water distribution pipe.
Water flow error occurs when connecting the cooling system to the equipment. (No error in the cooling system alone)	Clogged water distribution pipe	Check for sudden bending or pinching of the water distribution pipe.
High water temperature	Poor ventilation of the cooling system	Ensure good ventilation around the cooling system.
	Excessive heat load	If there are heat sources around the cooling system, remove them.
Fan does not operate when cooling system is turned on.	Water temperature is lower than 20°C.	It is normal if the water temperature is below 20°C.
Error after adding and replacing cooling water.	Water splashed on the electrical circuit.	Let it dry naturally.
	Pump motor failure	There may be a problem with cooling system.

5-5. Adjusting the laser

If it is necessary to adjust the light path, be sure to contact our After-Sale Service staff before carrying out the adjustment. The professional staff who has received professional training in JUKI to gain experience of the relevant adjustment work will carry out the adjustment.

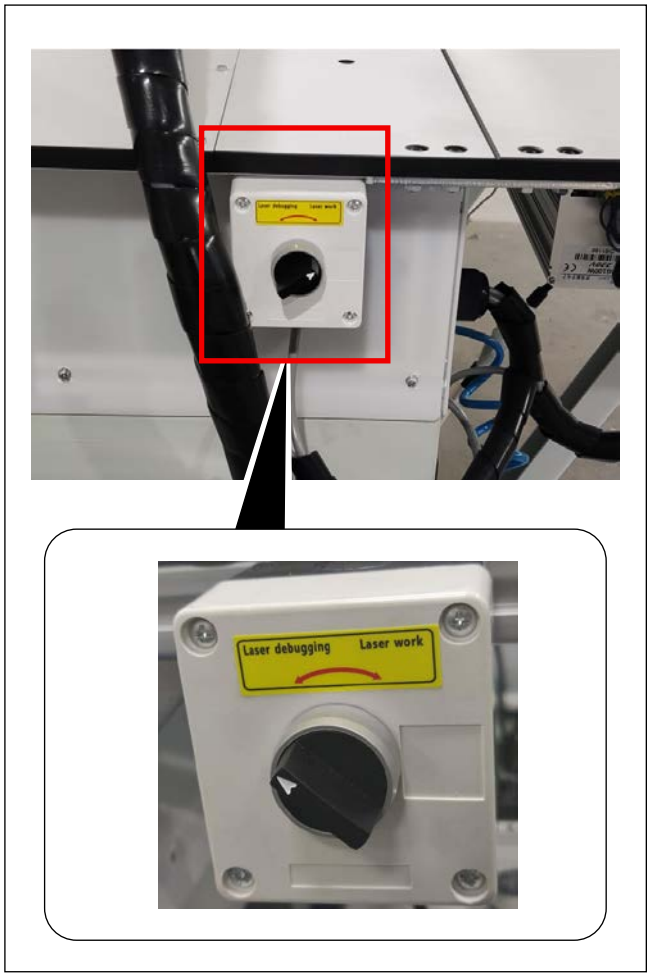


1) Laser switch key
Do not pull out the laser switch key.
When the switch is set to "1", the laser is energized and can be operated.
When the switch is set to "0", the power to the laser is disconnected and the laser cannot be operated. However, even in this case, the sewing machine is able to perform sewing.

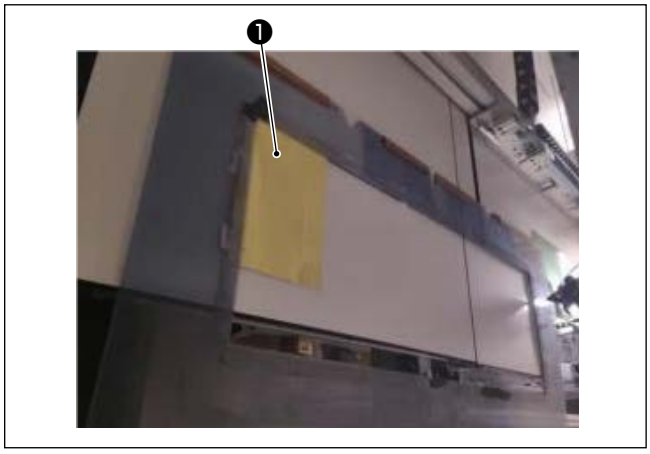


2) Laser tube cover key

If it is necessary to adjust the light path, be sure to contact our After-Sale Service staff before carrying out the adjustment. The professional staff who has received professional training in JUKI to gain experience of the relevant adjustment work will carry out the adjustment.



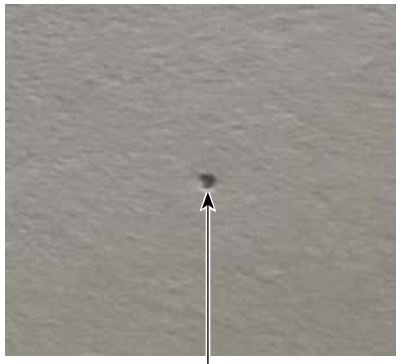
3) Opening the laser adjustment mode
Turn the laser operation mode knob located on the right side of the thyristor type electronic voltage regulator counterclockwise to proceed to the adjustment mode. (When the laser operation mode knob is turned counterclockwise, the laser enters the laser adjustment mode. When the knob is turned clockwise, the laser enters the laser operation mode.)



5-5-1. Adjusting the laser reference

1) Place paper ❶ on the upper left corner of the template.

2) Set the template in place and push it in the X direction. Then, click "CLAMP" ❷ located below the display.



3) Turn the pulley by hand to allow the needle to penetrate into the paper at one point ❸ .

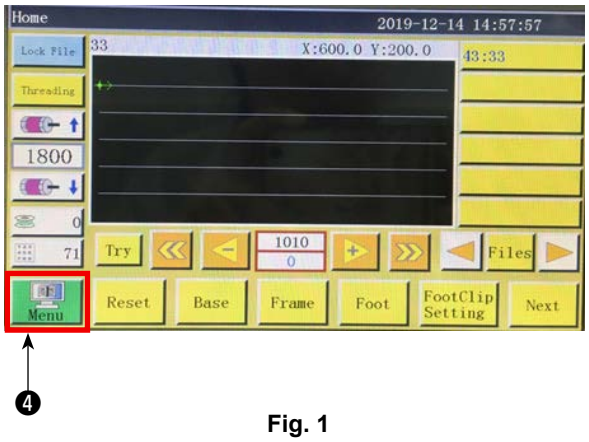


Fig. 1

4) Click on “Menu” ❹ on the electronic control main screen.

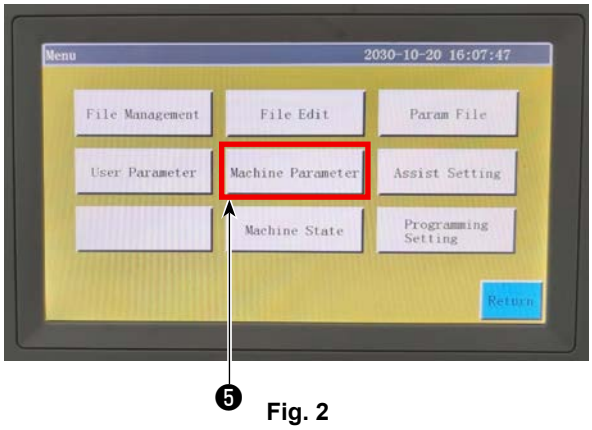


Fig. 2

5) Click on “Machine Parameter” ❺ .

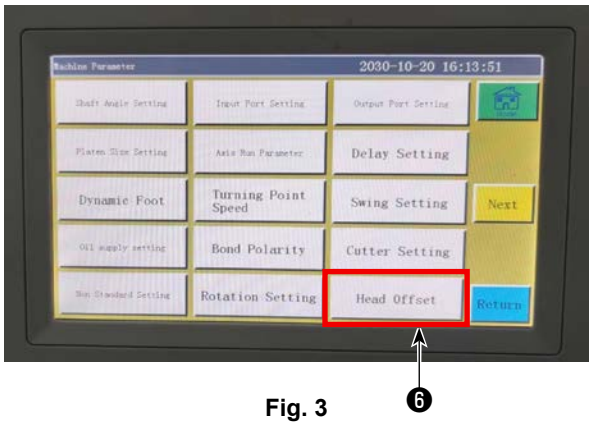


Fig. 3

6) Click "Head Offset" ❻ .

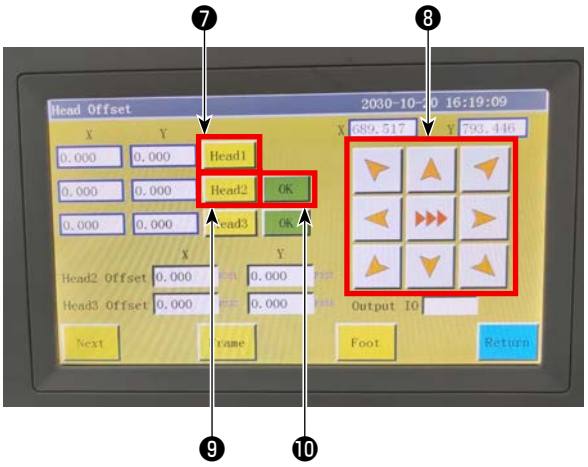


Fig. 4

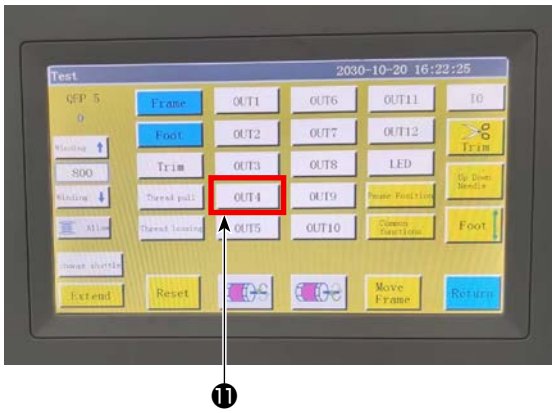
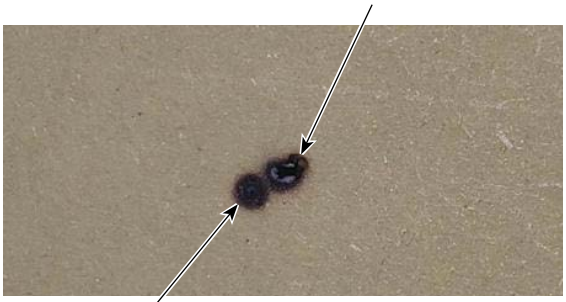


Fig. 5

Second time: Laser irradiation point is aligned with the needle-penetrated point of the paper



First time: Laser irradiation point is not aligned with the needle-penetrated point of the paper

Fig. 6

7) The values displayed beside the "Head 1" are changed by clicking "Head 1" ❼ .

8) Press the screen button ❽ , as shown in Fig. 4, and move it up/down/left/right to align the laser irradiation point with the needle-penetrated point on the pattern. Press “Next page” , as shown in Fig. 1, and “OUT4” ⓫ , as shown in Fig. 5, to check if the laser irradiation point is aligned with the needle-penetrated point.
If it is not aligned, adjust using the ❽ up/down/left/right button on screen in Fig. 4, so that the aforementioned points are overlapped. Press “Head 2” ❾ , then press “Confirm” ❿ . (Refer to Fig. 6 for an image.)

5-6. Using the laser

5-6-1. Electric control port for the laser for the regular use

1. Electric control port for the laser irradiation: OUT4
2. Electric control port for downward-direction operation of the laser head: OUT6

5-6-2. Reduction in the laser cutting range in comparison with the sewing range of the standard model of sewing machine

13090 : Reduction in the laser cutting range in the X direction : 210 mm
Reduction in the laser cutting range in the Y direction : 40 mm

5-6-3. Weight of the finished laser product

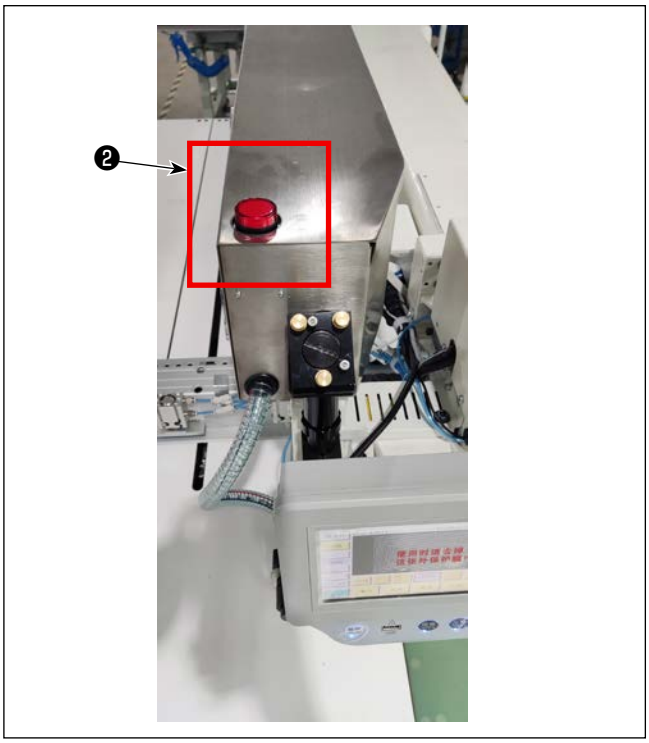
13090 : Weight of the finished laser product : 649 kg

5-6-4. Power consumption of the laser

13090 : Standard : 400 VA
Laser : 1250 VA

5-6-5. Operation pilot lamp

1) The laser irradiation is enabled only when sensor lamp ❶ lights up. When the sensor lamp goes out, the laser irradiation is disabled.



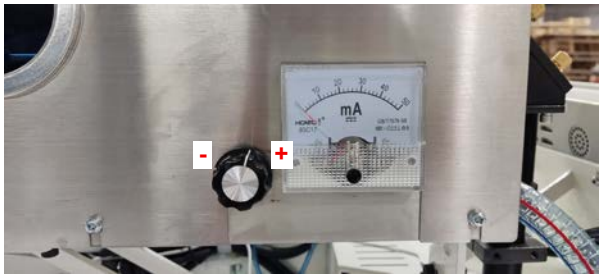
2) While laser operation pilot lamp ❷ located above the head is in the ON state, the laser receives the irradiation command. When it is in the OFF state, the laser does not receive the command. When the pilot lamp lights up, the laser equipment is in the operation state or in the stand-by state for irradiation.

The distance between the cover and the table becomes 8 mm or less when the pattern is pushed down while the laser is in operation.

5-6-6. Operation pilot lamp

1) When the laser tube is lifted to its upper position, there is a distance of 18 mm between the lowermost point of the laser head and the table surface. When the laser tube is pushed down to its lower position, the aforementioned distance is reduced to 5 to 8 mm. The highest position of the suction cover must be positioned 8 mm or lower than the pattern while the laser is in operation.

2) Loosen the connection at the upper part of the laser tube, and adjust the height of the laser tube according to the material thickness.



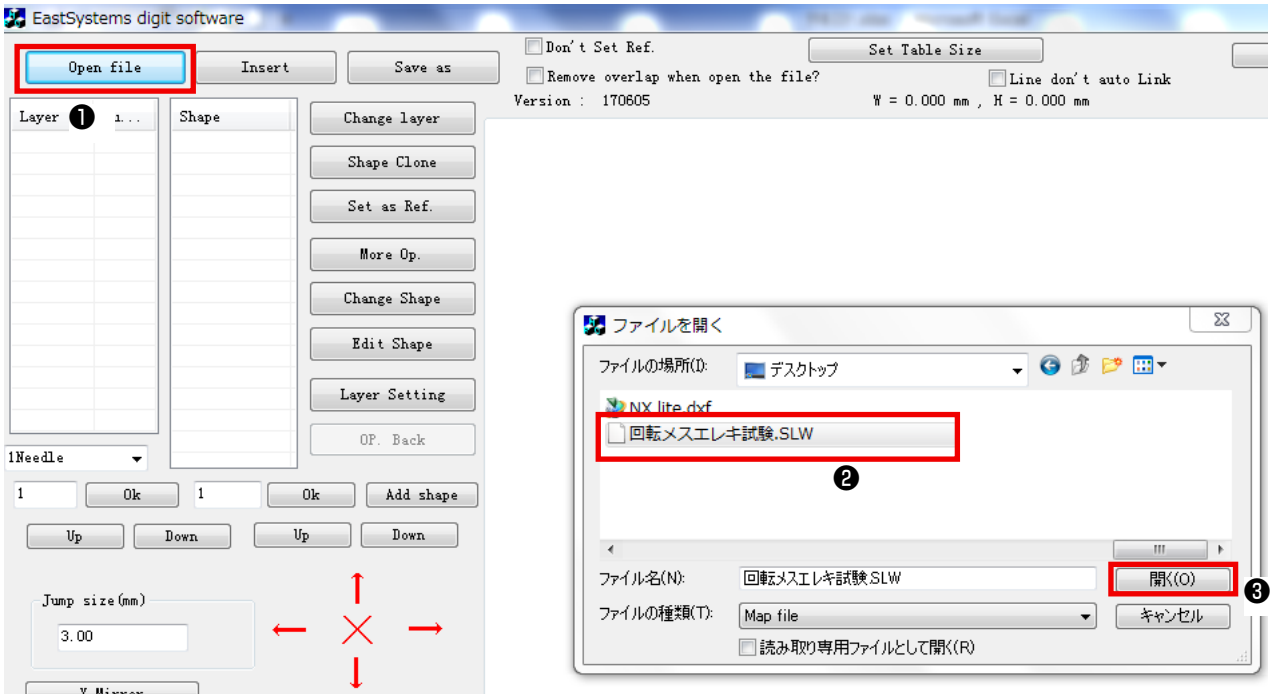
5-6-7. How to adjust the electric current according to the material thickness

The electric current is increased by turning the laser current adjustment knob, located on the left side of the laser tube, clockwise. The electric current is decreased by turning the aforementioned knob counterclockwise. The pointer of the current indication meter located on the right side of the knob vibrates to the right and left according to the increase / decrease of the electric current. In the case of normal cutting operation, the electric current is 100 mA ± 1 mA, while the maximum current value is 20 mA.

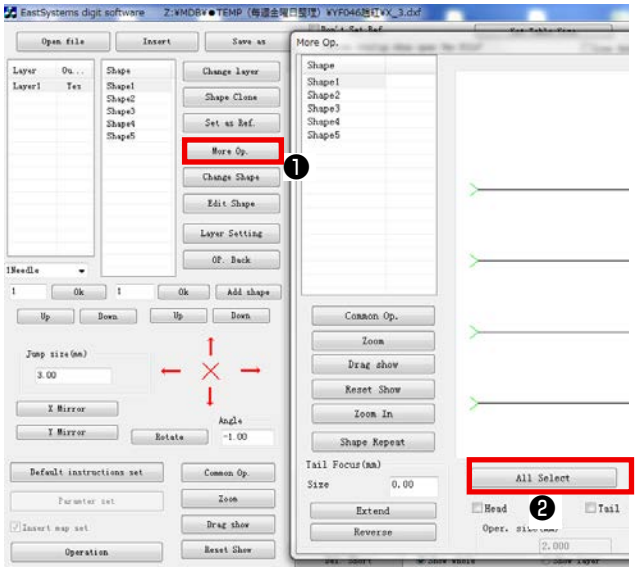
5-7. Adjusting the air volume of the fan

Adjust the air flow of the fan by turning the knob of the converter. Adjust the air volume of the fan until the material is not sucked by the fan.

5-8. Editing / setting the patterns, setting the layer, and setting the speed

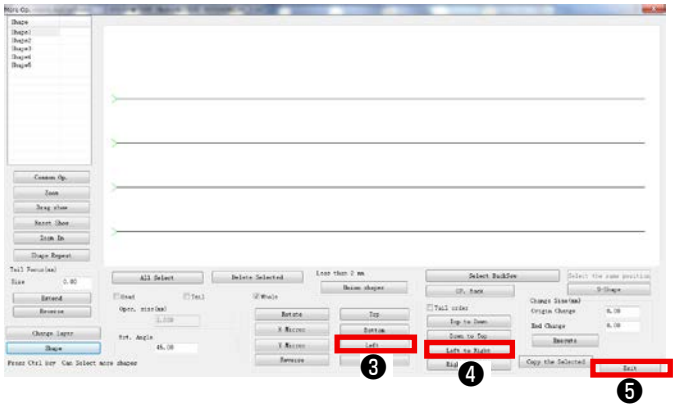


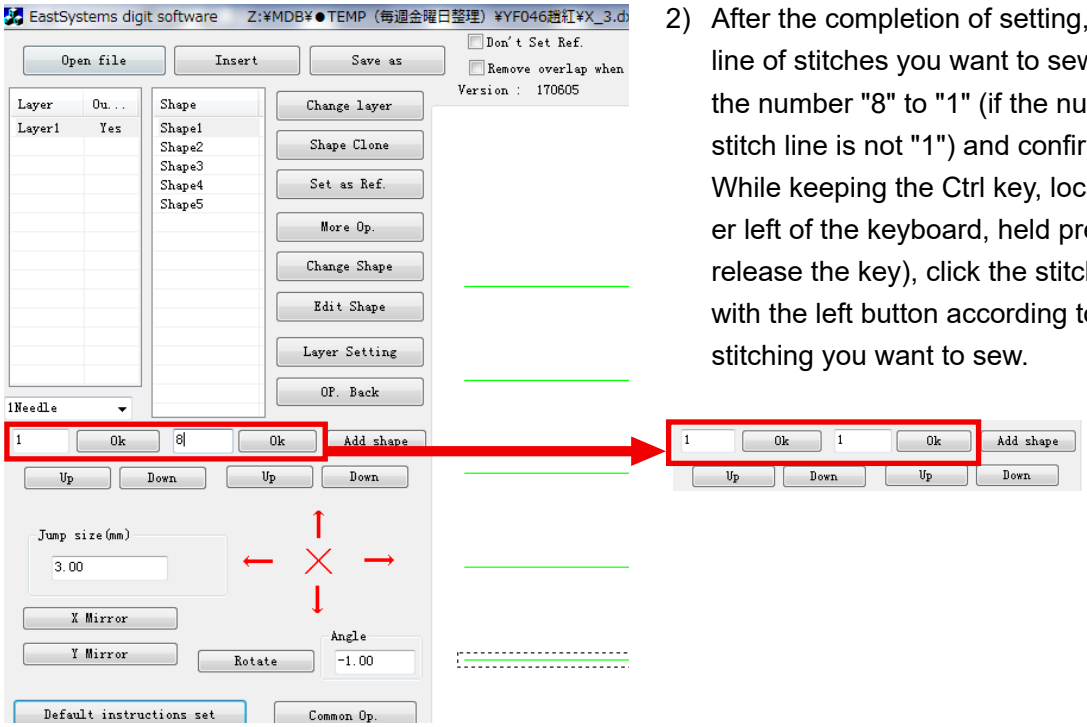
Start the NC software → click the upper left portion → Click ❶ "Open the file" → ❷ Find the file you want to edit → ❸ "Open"



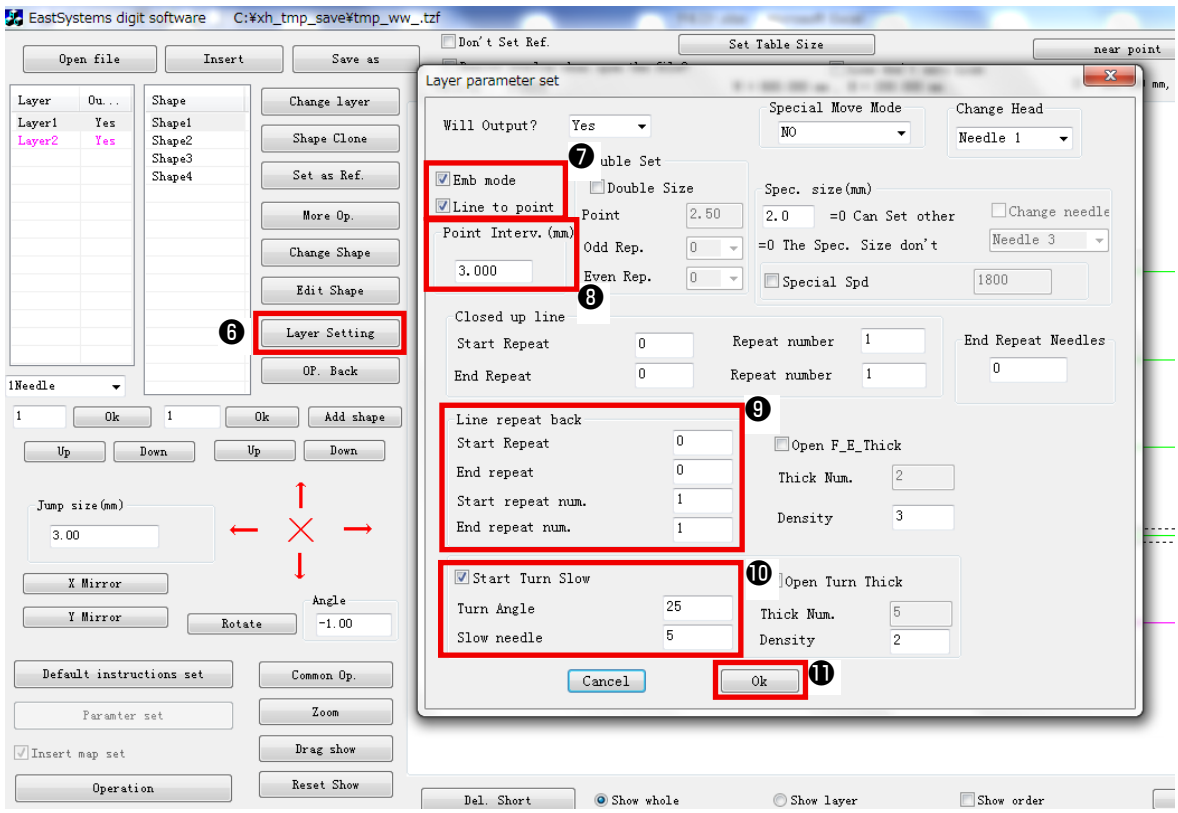
5-8-1. Setting the direction of sewing

1) Select ❶ "Batch processing". → Select ❷ "Select all". → Select ❸ "Start from the left" or "Start from the top". → Select ❹ "Arrange vertically" or "Arrange laterally". → Select ❺ "Close" to complete the procedure.

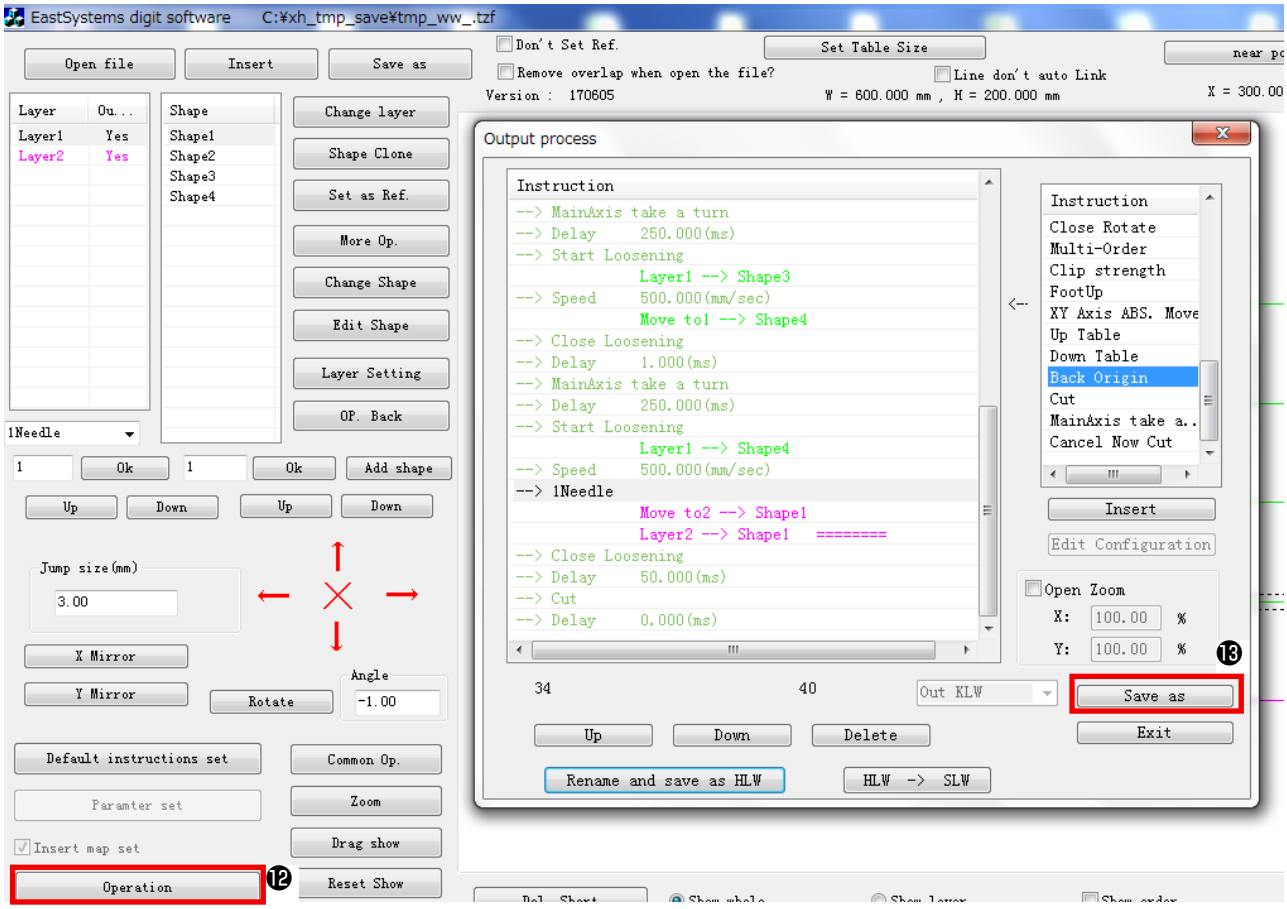




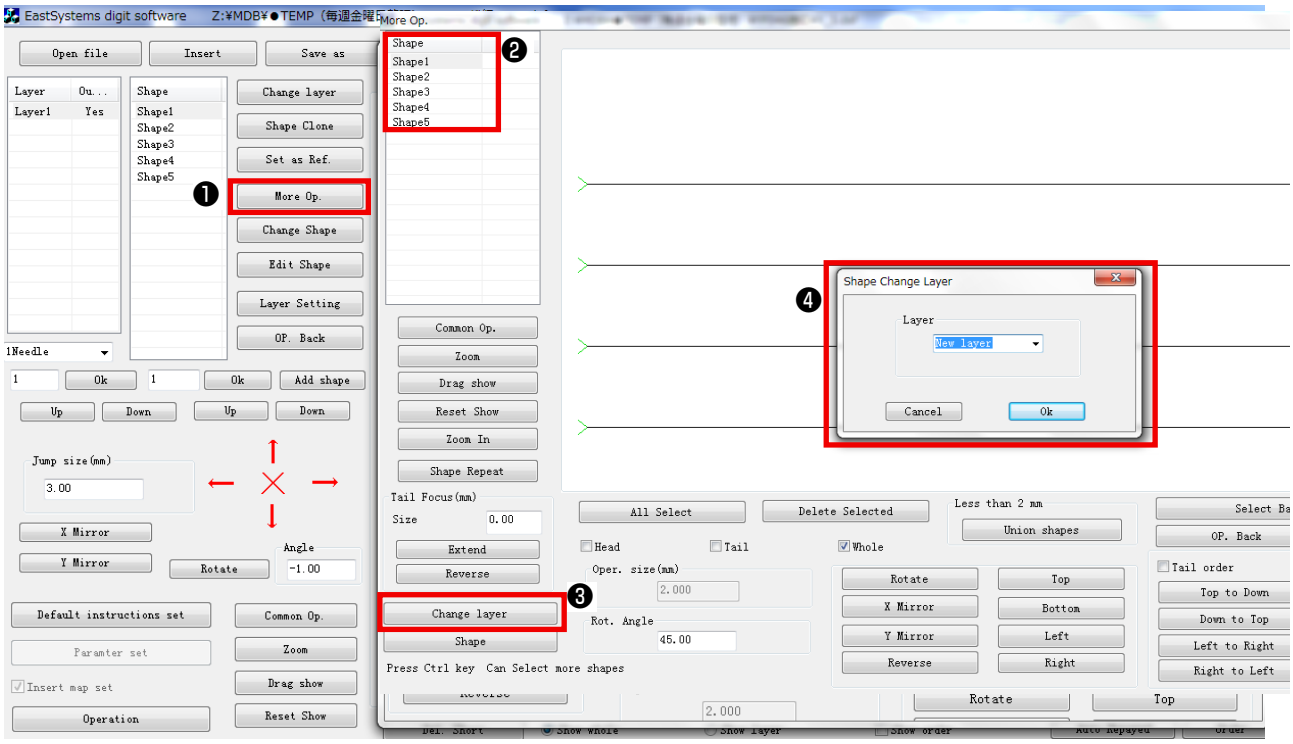
2) After the completion of setting, click the first line of stitches you want to sew, and change the number "8" to "1" (if the number of the first stitch line is not "1") and confirm.
While keeping the Ctrl key, located at the lower left of the keyboard, held pressed (do not release the key), click the stitch line numbers with the left button according to the order of stitching you want to sew.



3) After the completion of editing, click "Current layer setting" ❻ . → ❼ Put a checkmark to the "Sewing pattern" and "Bending point of line". → ❽ Set the stitch pitch (Enter the value obtained by "3 cm ÷ Number of stitches" or 1 "inch ÷ Number of stitches" in the input field of "3.000"). → ❾ Set the number of reverse feed stitches and the number of times of reverse feed stitching. → ❿ If it is necessary to reduce the sewing speed at the corner of the sewing pattern, put a checkmark to "Use the speed reduction at bending points" and change the angle of the bending point and the number of stitches". → Click ⓫ to confirm.

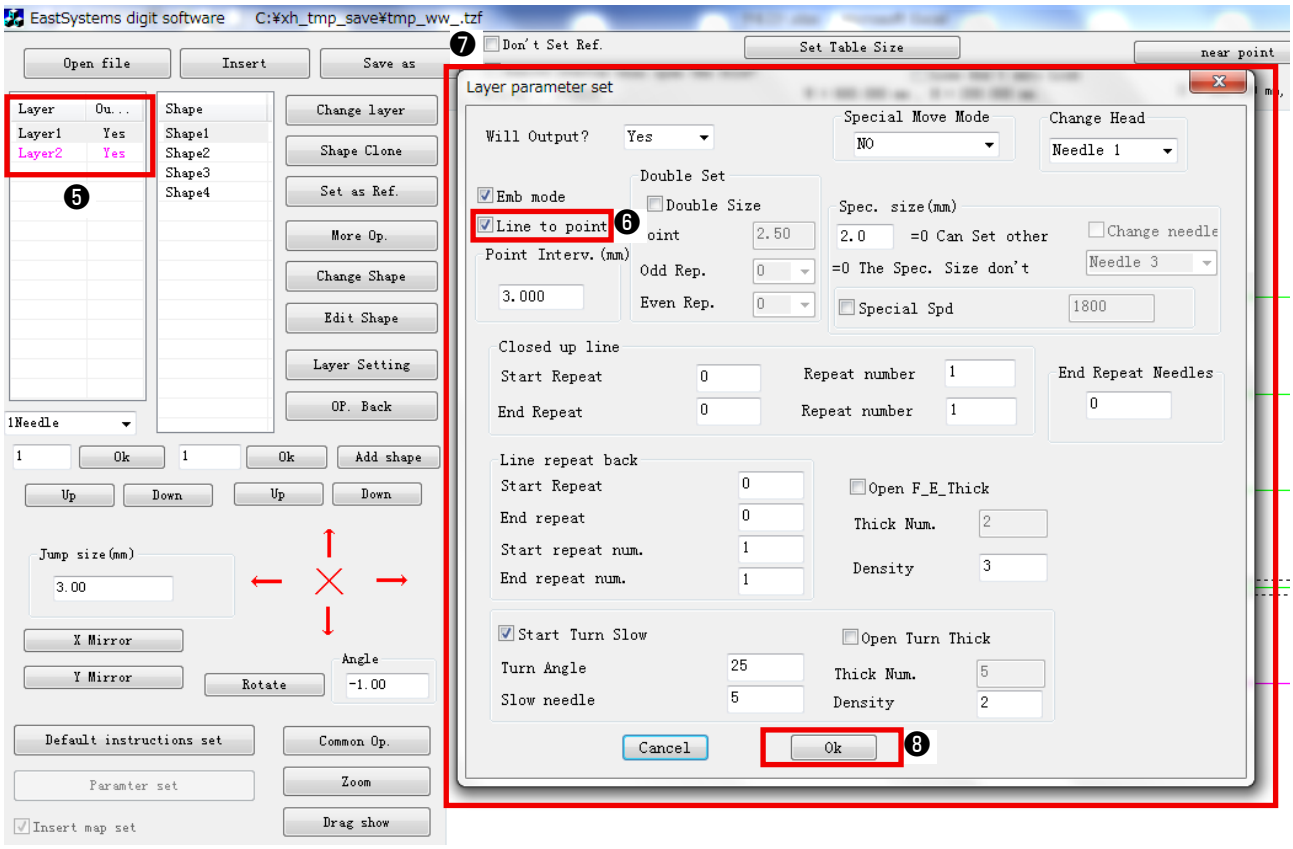


4) After the completion of setting, click the "Operation processing" ⓬ at the lower left of the screen. Click the "Output file" ⓭ to select the directory which you want to save the file. Enter the file name. (Only six characters can be entered as the name of file to be saved. The characters represent, as in the input order, "Model number" + Location" + "Size".) Then, click to save the file.

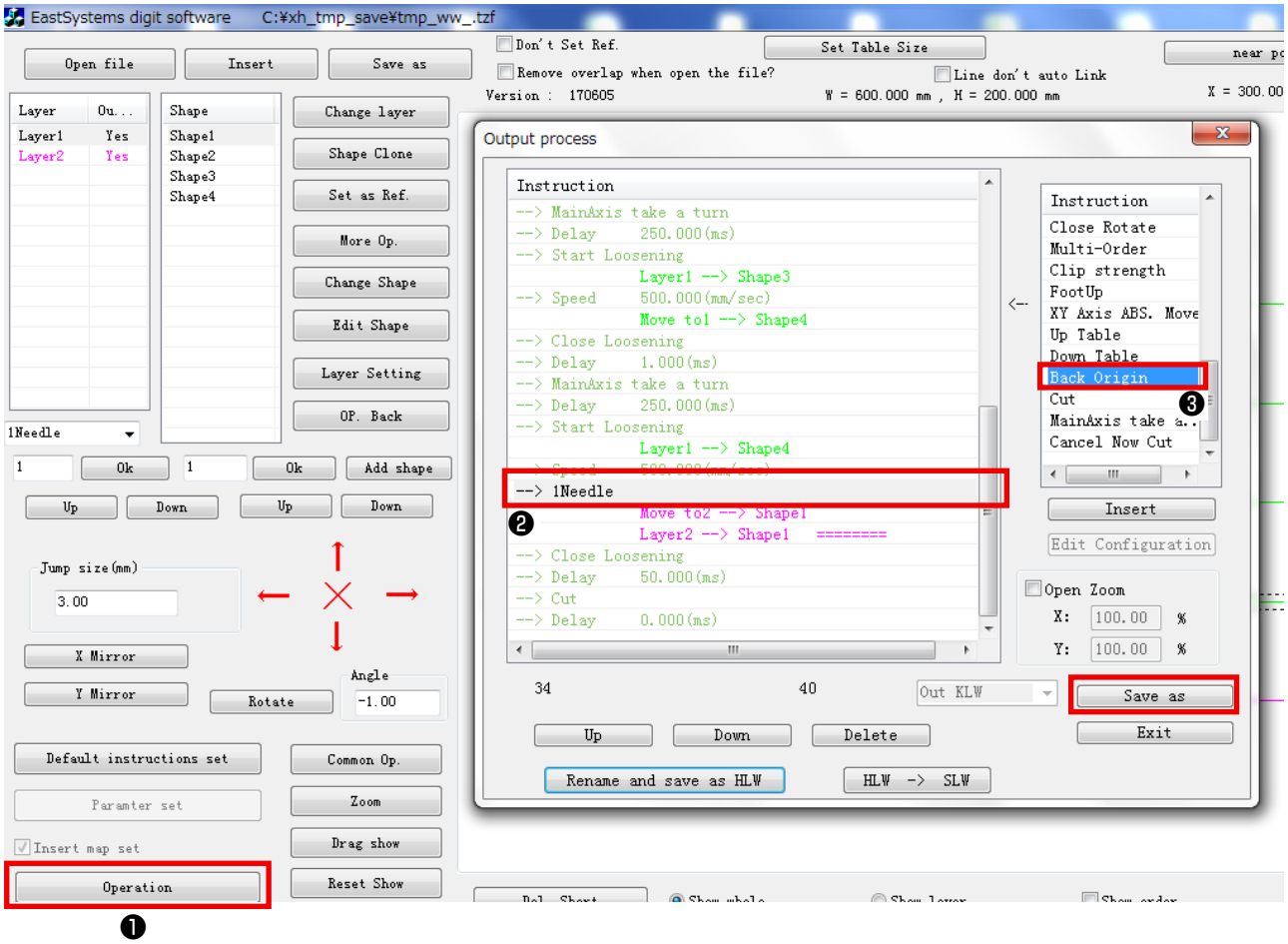


5-8-2. Setting the temporary-stop during sewing

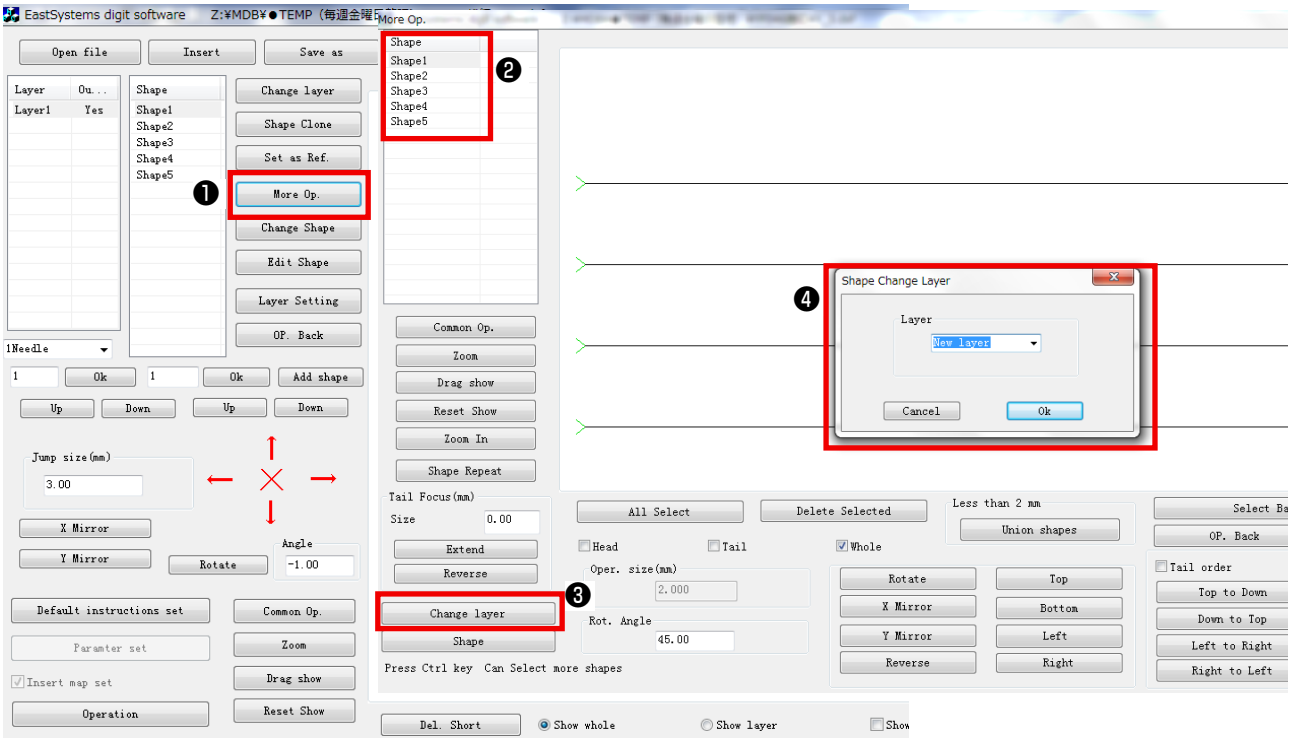
1) Open the software. Search for the target file. → Select "Batch processing" ❶ . → ❷ Select all the stitches you want to sew (it is possible to select two or more stitches while keeping the Ctrl key, located at the lower left of the keyboard, held pressed). After the completion of selection, → ❸ Click the layer you want to change. → ❹ Change the layer to a new one and click the "Confirm". (If it is necessary to temporarily stop sewing during sewing, repeat the aforementioned steps of procedure in sequence.)



2) After the completion of setting, one or more layers are displayed. → ❺ Then, double-click the target layer. → Put a checkmark to "Line bending point" ❻ . → ❼ Set the next option (parameter shown in the figure is a value for reference). → Click "Confirm" ❽ . (For all of the layers, set as described above.)

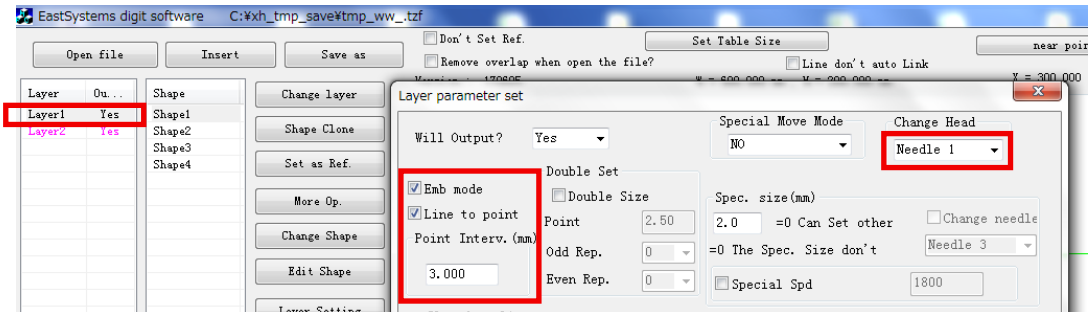


3) After the completion of setting, click "Operation processing" ❶ . → Click "Head 1" to display it in blue ❷ . → Then, double click the command field ❸ located at the right of the screen. Click the "Return to the initial position" to confirm. → Double click the command field located at the right of the screen. Click the "Pause at the upper position" to confirm. → Click the "Output the file". (Set all of the "Head 1" as described above.)



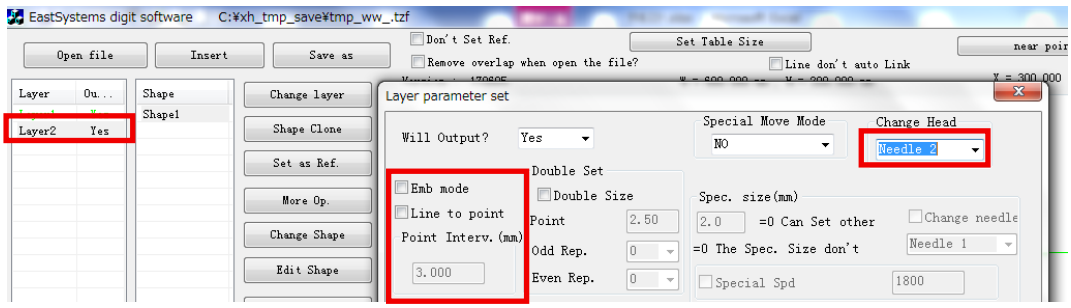
5-8-3. Setting the laser cutting

1) Open the software. Search for the target file. → Click "Batch processing" ❶ . → ❷ Select all stitches to be cut with the laser. (It is possible to select two or more stitches while keeping the Ctrl key, located at the lower left of the keyboard, held pressed). After the completion of selection, → Click "Layer to change" ❸ . → ❹ Select a new layer and click the "Confirm".



2) Double click the stitch line layer. → Put a checkmark to the "Line to point". → Set the next option. → Confirm.

※ The stitch line is "Head 1" in the aforementioned procedure.



3) Then, double click the layer 2 to be cut with the laser. Put no checkmark to any option. Change the "Head 1" to "Head 3" and confirm.

4) After the completion of setting, click the "Operation processing", located at the lower left of the screen to output the file. Then, save that file and terminate the procedure.

6. PRECAUTIONS TO BE TAKEN WHEN USING THE EQUIPMENT IN WINTER OR AT A COLD REGION

If the temperature drops suddenly, cold protection and heat retention for the equipment will be necessary. If no heating system is provided inside the plant, it will be necessary to maintain the circulation operation and immediately add antifreeze solution to the equipment without turning OFF the cooling system before stopping the equipment. (Industrial antifreeze solution, Anti-frozen N made by Clariant). If you do not start the equipment for a long time, expel water from the laser and the respective water tubes to keep them clean and to prevent suffering an unnecessary economic loss due to freezing. Composition ratio of the antifreeze is 3:7 (3: Antifreeze; 7: Water). It should be remembered, however, the antifreeze and water must be combined not only according to the aforementioned ratio but also taking the actual conditions of the site such as the temperature in consideration. From the results of inspection and measurement, we have reached the following conclusion. Refer the conclusion when you purchase the laser equipment.

6:4(6: Antifreeze solution; 4: Water) 45 degrees below zero
5:5(5: Antifreeze solution; 5: Water) -35 degrees below zero
4:6(4: Antifreeze solution; 6: Water) 25 degrees below zero
3:7(3: Antifreeze solution; 7: Water) 15 degrees below zero
2:8(2: Antifreeze solution; 8: Water) 5 degrees below zero

The laser equipment employs the latest laser technologies. The laser equipment has strict requirements for the working environment. When you use the laser equipment, take care of the installation environment of the laser equipment.
The CO2 laser cutter employs the water-cooled system for its cooling. This means that the liquid coagulates to form a solid substance if the liquid temperature drops below zero. In such a case, the connections of the tubes and seal portions of the cooling system will be likely to break, thereby inviting an extremely high risk of breaking the laser equipment, QBH output head and cooling system. During a cold winter, in particular, when the room temperature excessively drops, take additional care to take appropriate anti-freezing and maintenance measures for the laser equipment.

1 When you want to stop the laser equipment for a short time, do not turn OFF the cooling system but continuously run it to keep the equipment at a constant temperature. While the equipment is in use, carry out inspection at the fixed time to prevent the equipment from stopping unexpectedly.
2 When you want to stop the laser equipment for a long time, expel water from the cooling system. (If you do not have a preservative, the water may be stored in a clean tank.) In addition, blow out water from inside the tube, pump, filter and heat exchanger with nitrogen gas. It is also necessary, when the laser equipment made by ROFIN is used, to discharge deionized water from the laser tube.

7. IDENTIFICATION AND HANDLING OF FAILURES IN GENERAL

7-1. High-tension ignition and electric discharge

1) Check the area surrounding the high-pressure head of the laser equipment for dirt and moisture.
2) Check whether the high-pressure head is positioned too close to the metallic part of the equipment.
3) Check inside the high-pressure connecting device for breaking of wire or breakage.
4) In the case dew condensation (sweating) of condensed water is formed on the tube walls and water-cooled sleeves due to excessively low temperature of the water:
   Recommended measure : ① Wind insulating material on the high-pressure head of the laser equipment to separate it from the metallic part.
   ② Increase the cooling water temperature to 15 - 25 (°C).

7-2. Breakage / rupture of the laser tube

1) Water in the laser equipment freezes due to excessively low temperature
2) Water fails to pass inside the laser equipment
3) Water pressure is excessively low
4) Water flows according to the principle of flow of water for the laser equipment such as "water is put from a lower position and discharged from a higher position". However, the water cooling tube of the laser equipment is locally heated due to shortage of water.
   Recommended measure : ① Use the cooling system.
   ② See the figure for how to install the cooling system.

7-3. Cause of occurrence of high-pressure discharge and breakdown phenomenon

1) If the power supply of the laser equipment and the mains electricity differ in voltage or the power supply which has different specifications (such as in the case of energizing a low-output tube with a high-output power supply) is used, the rated voltage that the laser tube is able to withstand can be exceeded, resulting in breakage of the laser tube.
2) In the case the entire cooling tube is not filled with water due to poor water cooling conditions, air bubbles are formed. In such a case, the laser tube temperature will be increased excessively in the part that has no cooling system. As a result, the glass portion of the laser tube can be broken in part due to a change in glass property.

   Recommended measure : ① Use the power supply provided by the manufacturer.
   ② When you use the power supply provided by the manufacturer, check that the laser equipment is connected to the waterproofing function. Firstly, turn ON the cooling water system to circulate the water in the laser tube according to the requirement "water is put from a lower position and discharged from a higher position". Adjust the position of the drain pipe so as to ensure that the cooling water tube is filled with the cooling water with no air bubbles. Then, turn the power ON.

   Requirement : Use soft water (distilled water or pure water) as the cooling water. Keep the water temperature at 15 - 25 (°C) while carefully checking the temperature of the cooling water continuously to prevent the excessive increase / decrease in temperature.
   If the temperature excessively rises during the summer, in particular, immediately change the cooling water with an appropriate one or stop the laser equipment to put it at rest for a certain period of time. In a cold region, take care not to allow the cooling water to freeze. It is important, in particular, to thoroughly discharge the cooling water from the laser tube in order to prevent rupture of the laser tube due to freezing of the cooling water after the laser equipment is stopped.

   Special precaution : The user who uses the alternating current must ground the cooling water tank without exceptions.
   Limit the flow rate of the cooling water to 8 - 13 (L / min). If not, the cooling effect will be reduced to cause mode hopping. As a result, the spot will be deformed to reduce the laser tube output. The condensate outlet (water outlet) must be always immersed in water. If not, the cooling water tank water level will be dropped below the full water lever every time the laser equipment is turned ON and OFF.

7-4. Attenuation of output

1) Extremely high water temperature
2) If the water quality is poor, mucous membrane will adhere to the water cooling tube wall after the equipment has been used for an extended period of time to cause a reduction in the cooling effect.
3) If the laser equipment has been operated for a long time under the condition that the maximum operating current value of the laser tube is exceeded, the laser tube will be bleached.
4) Stains on the output lens
   Recommended measure : ① Refer to **"1-2. Precautions to be taken when using the laser" p.4** and **"2. MAINTENANCE" p.5**.

7-5. Power fault inspection while the laser is in use

Carry out the following inspection procedure after you have confirmed that the laser tube has no defect in appearance.

1) In the case the laser power supply is provided with the testing function, the lamp will light up and the laser tube will irradiate laser beam when the test switch is pressed when the laser power supply is in the standby state. If the lamp fails to light up, the laser power supply is damaged. If the laser fails to irradiate the laser beam even if the lamp lights up, the laser equipment is damaged.
2) In the case the laser power supply is not provided with the testing function, connect two lead wires of the laser power supply signal ports 5V and IN. Connect three ports L, P and G and turn ON the power to the laser equipment. If the laser equipment fails to output energy or the energy output is inadequate, the laser equipment has been damaged. If the current is 10 mA or less, the laser power supply has been damaged.

If any of the following troubles has occurred, contact our After-Sale Service department for appropriate handling.