Panasonic

Laser Welding Machine

Operation Manual

VL-W1 series

ME-VLW1N-OP-2

2024.4 | industry.panasonic.com/

Preface

Thank you for purchasing our product.
For full use of this product safely and properly, please read this document carefully.
This product has been strictly checked and tested prior to its delivery. However, please make sure that this product operates properly before using it. In case that the product becomes damaged or does not operate as specified in this document, contact the dealer you purchased from or our sales office.

The English version of this document is the original instruction. All other languages are translations that are based on the original documentation.

■ General terms and conditions of this document

1. Before using this product, or before every starting operation, please confirm the correct functioning and performance of this product.
2. Contents of this document could be changed without notice.
3. This document must not be partially or totally copied or revised.
4. All efforts have been made to ensure the accuracy of all information in this document. If there are any questions, mistakes, or comments in this document, please notify us.
5. Please remind that we assume no liability for any results arising out of operations regardless of the above clauses.

■ Disclaimer

The applications described in this document are all intended for examples only. The purchase of our products described in this document shall not be regarded as granting of a license to use our products in the described applications. We do NOT warrant that we have obtained some intellectual properties, such as patent rights, with respect to such applications, or that the described application may not infringe any intellectual property rights, such as patent rights, of a third party.

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Cautions in Handling

ALWAYS FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS!

To reduce the risk of injury, loss of life, electric shock, fire, malfunction, and damage to equipment or property, always observe the following safety precautions.

The following symbols are used to classify and describe the level of hazard, injury, and property damage caused when the denotation is disregarded and improper use is performed.

⚠ DANGER	Denotes a potential hazard that will result in serious injury or death.
⚠ WARNING	Denotes a potential hazard that could result in serious injury or death.
⚠ CAUTION	Denotes a hazard that could result in minor injury.

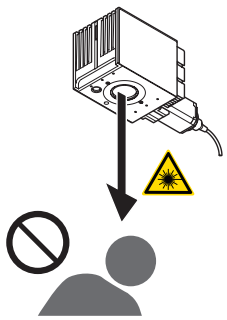
The following symbols are used to classify and describe the type of instructions to be observed.

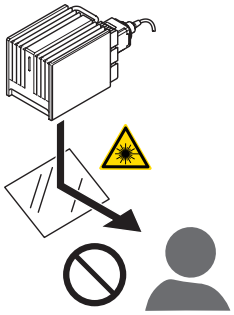
⃠	This symbol is used to alert users to a specific operating procedure that must not be performed.
❗	This symbols is used to alert users to a specific operating procedure that must be followed in order to operate the unit safely.
⚠	This symbols is used to alert users to a specific operating procedure that must be performed carefully.

⚠ DANGER

⃠

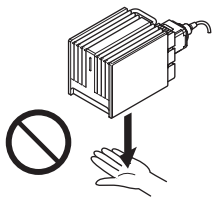
- Never look at laser beam directly, through lens or through any other optical components. Laser beam radiation into the eye causes blindness or serious damage to the eye.
  Not only the direct beam of laser, but also diffused reflected beam is harmful.





⃠

- Never touch laser beam and avoid human skin, clothing and any other flammable object from laser beam exposure directly.
  Burning into deep skin might result and there is a risk of fire.



❗

- Set protective enclosure with proper reflectance, durability and thermal resistance to enclose the laser radiation area without leakage. This laser is highly collimated and the laser energy density is high even at the distance.

⚠WARNING

- Do not use this product anywhere where fire is strictly prohibited, near inflammable gas, objects or organic solvents such as thinner or gasoline, or in dusty place. There is a risk of fire.
- Do not use this product except for water-resistant part in wet place. In addition, never conduct wiring or maintenance work with wet hands or when the product surface is wet. Otherwise, electric shock and/or malfunction may result.
- Never disassemble the product.
  Doing so may cause exposure to the laser beam or electric shock.
- Do not insert hands or objects between the gaps of the exhaust port or intake port. There is a risk of electrical shock or injury.
- Be careful neither to give strong power to the fiber cable nor to nip it for installation. Do not install the product to the systems that give excessive load acts on the fiber cable. If the fiber cable is damaged, laser beam comes out from the cable and it may cause laser exposures.
- Take laser protection measures required to use Class 4 laser products subject to the local laws and regulations of the country or region in which this laser product is used.
- To protect the operators' eyes, make it mandatory to wear goggles against laser beam within the laser controlled area. The protective goggles can momentarily protect the eyes against the scattered beam. Never look at the direct beam or reflected beam even when you are wearing the protective goggles.

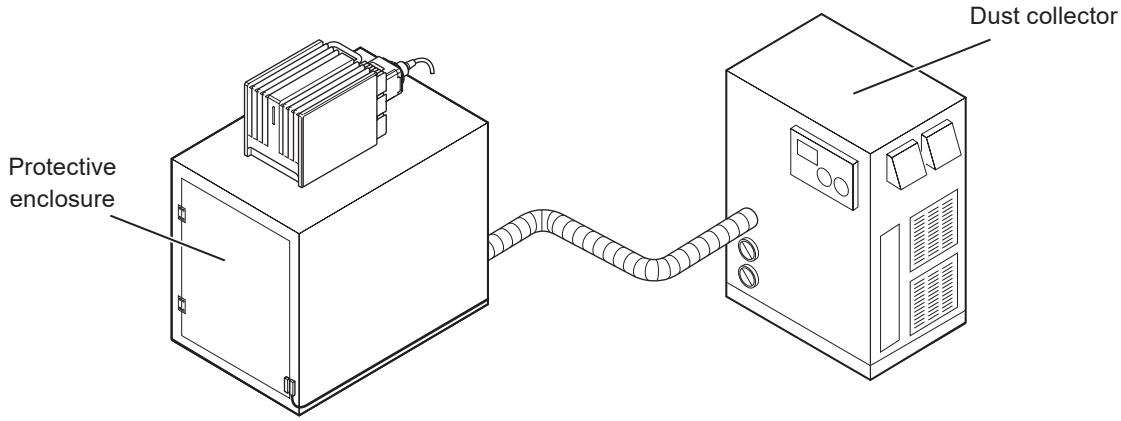


- Set a workpiece fixing jig and terminating object of the laser beam with a flame-resistant material which has low reflectivity, in case of the radiation of the direct laser beam. Do not use the resin or specular objects for a workpiece stand and terminating object.
- Construct an interlock systems such as a function to stop laser radiation for the maintenance door of the protective enclosure.
- After power supply of the laser system is turned off, laser safety manager must remove the key and keep it.
- Be sure to connect the head to the exclusive controller. It will cause exposure of laser beam and a failure if it connects with any equipment other than the exclusive controller.
- Read all guides and manuals thoroughly, and do not operate, install and connect the laser system with any other methods except the instructions provided in the manuals. If the product is used in a manner not specified by the instruction, the safety protection and functions provided by the device may be impaired and may cause injury, electrical shock or exposure of laser beam.
- Prior to wiring, cable connecting, and/or maintenance work, ensure that all the power switches are turned off. Otherwise, electrical shock may result.
- The wiring and maintenance must be conducted by the electrical engineers or under their supervision. Incorrect work may cause electrical shock.
- Connect ground wire before using. A failure or electrical leakage that occurs when the unit is not properly grounded may result in electric shock.

⚠WARNING

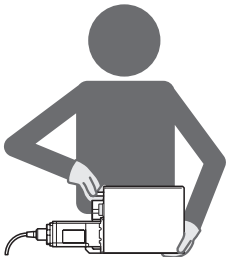
- Perform regular maintenance (cleaning, parts replacement) on this product. Using the product with dust or dirt may cause a fire or electric shock.

- Remove the dust and/or gas which may be generated during the laser radiation with dust collector or exhauster. Use an appropriate dust collector or exhauster for dust or gas generated.
  Depending on the material of the objects, harmful dust and/or gas to the human body and the laser system may be generated.
- For a nozzle of a dust collector or exhauster, use a flame-resistant material which has low reflectivity. Do not place a nozzle in the path of the laser beam.

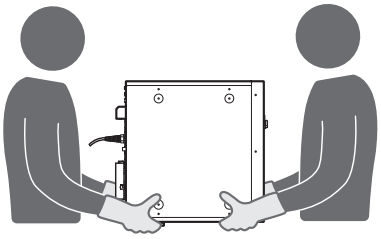


- When using the assist gas for laser processing, take safety precautions to protect operators from exposure, ignition, toxic effect, excess or lack of oxygen.

- To carry this product, wear the non-slip gloves and safety shoes. Hold the product with both hands. Do not hold the cables or connectors at carrying.
- To carry this product, do not hold the cut edges of metal parts, the protrusions or corners of the product body. It may cause injury.
- Carry the controller unit with two persons. Lifting or carrying without assistance may cause of injury.
- Install this product in the stable place without vibration and shock.
- In case it falls down, it may cause injury.



Head



Controller

The following are safety precautions when using the touch panel console.

⚠ WARNING

- Never conduct wiring or maintenance work with wet hands or when the product surface is wet. Otherwise, electric shock and/or malfunction may result.

⚠ CAUTION

- Do not dismantle or remodel the product. It could lead to excessive exothermic heat or smoke generation.
- Since the touch panel is made of glass, care should be taken so that a hard object may not hit it or an excessive force should not be applied. Do not fall the product from a high place because there is a danger of the glass breaking and causing an injury.
- Do not press more than one point on the touch panel at a time. A switch located in the middle of the plural points pressed (that was not meant to be pressed) will be activated. It could lead to a damage to the facility or an accident.

How to Read this Document

■ Symbol description

Notice	• “Notice” denotes any instructions or precautions for using this product. To prevent the damage or malfunction of the product, observe these precautions fully.
Reference	• “Reference” denotes any hints for operation, detail explanations, or references.

■ Target model

This document is subject to the following laser welding machine models.
In this document, this product is called “laser welding machine”.
If the setting contents or specifications vary by models, the target models are specified in the text.
In the text, multiple models may be described collectively, as shown in the table below.
Please remind that the illustration and the screen image may vary with the model.

Target model	Description in the text
VL-W1500-N	VL-W1 Series
VL-W1506-N	
VL-W1A00-N	
VL-W1A06-N	

■ Type of manuals

For this product, the following manuals are prepared. Read each manual and operate this product correctly and safely.
Save the manuals for future use.

Laser Safety Guide

This manual describes the items required for using the laser product correctly and safely. All users shall be required for reading this manual.

Setup/Maintenance Guide

This manual describes the items required for introduction and installation of this product as well as for the maintenance work.

- Product specifications, external dimensions
- Installation and connection method
- Signal details, I/O rating, and timing chart when I/O is used for control
- Maintenance details

Operation Manual

This manual describes the procedure and method to operate this product, and the screen operations to set the laser processing data and conditions.

Serial Communication Command Guide

This manual describes the communication commands to control this product externally using the serial communication (RS-232C). It describes the communication conditions, communication data formats, communication commands, and the control samples.
Mainly the machine builder and system integrator shall be required for reading this manual.

Reference

- The PDF data of each manual is included on an attached CD-ROM “Laser Processing Utility_VL-W1”.
- To read the PDF manual, Adobe Reader of Adobe Systems Incorporated is required.

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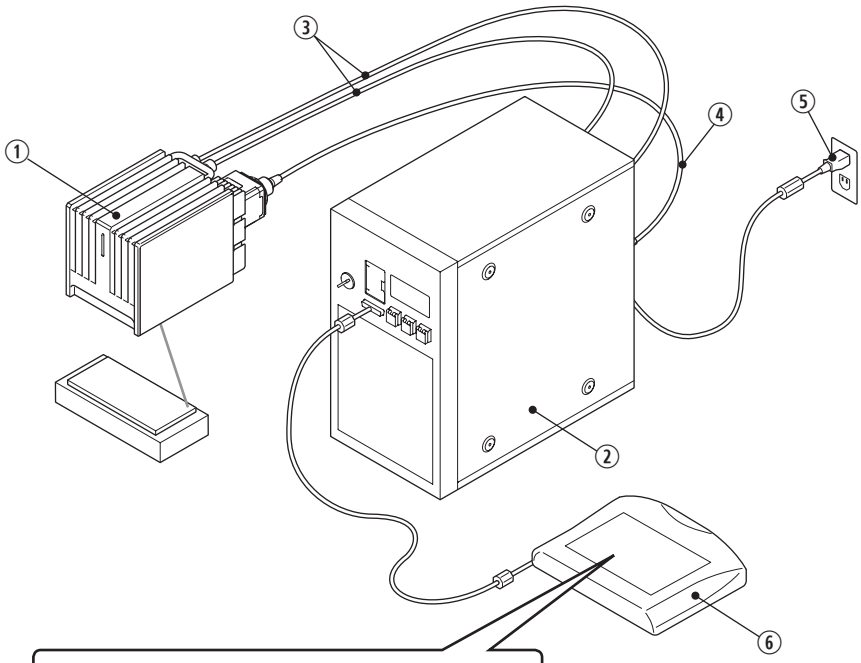
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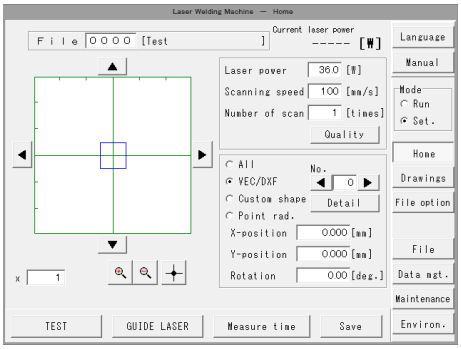
1 Operation Basics

1-1 Product Outline

This product is a laser welding machine which is used to process the materials by lasing.
The laser welding machine VL-W1 series consists mainly of the following units.



Setting screen image



No.	Name	Description
①	Head	It is the unit that radiates the laser beam. The optical components and the scanner are loaded inside.
②	Controller	It is the unit that stores the setting data and controls the operation. The main power supply, laser oscillator and connection interface with external devices are loaded.
③	Unit power cable (Attached accessory) Signal cable (Attached accessory)	Cables to connect the head and controller.
④	Fiber cable	Cable to deliver the laser beam from controller to head. This cable can be detached only from the head unit.
⑤	AC power cable (Optional item)	Cable to supply AC power to the controller. Use the specified optional cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used.
⑥	Touch panel console (Optional item) or Commercially available monitor and mouse (Not included in this product.)	Connect the touch panel console or monitor and mouse to the laser welding machine to set the drawing data and other lasing parameters. This display can be used also as a monitor during the operation.

1-2 Start-up & Termination

⚠WARNING	• It is obligated by IEC/FDA/JIS that laser products shall incorporate a key-actuated master control. Actuation of this product is basically controlled by the key switch located on the front of the controller. However, in considering situations when the laser welding machine is operating as a part of a larger system, the laser welding machine turns on if the key switch is already in ON position, and power is supplied. In this case, be sure that the external system controls the operation of the laser welding machine with a key-actuated master control.

■ Start-up

1. Set up the laser welding machine.

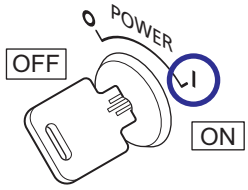
Connect the head and controller.

Connect the touch panel console or monitor and mouse to the controller.

Refer to Setup/Maintenance Guide.

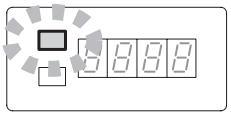
2. Turn ON the key switch of the controller.

The main indicator on the controller flashes in green.



3. After approx. 75 seconds, system starts up.

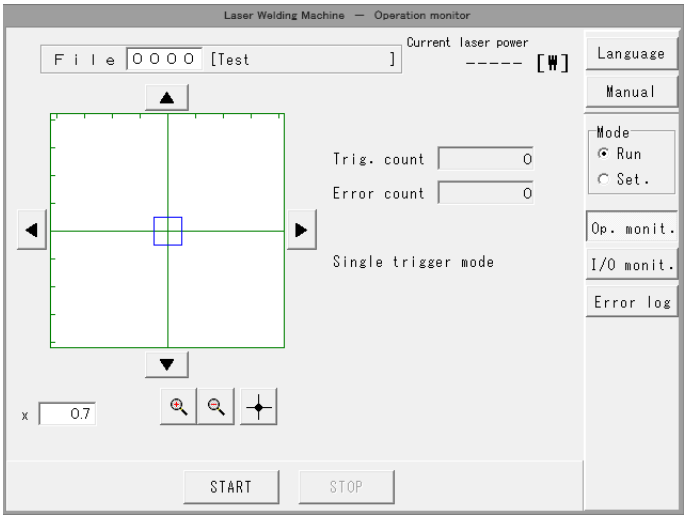
The main indicator changes into lighted-up status.



Notice

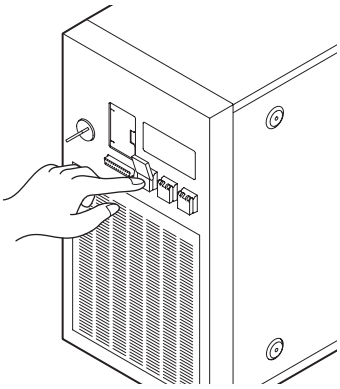
- Do not turn off the power supply until completing the system start.
- In case of turning ON the power supply after turning OFF, leave the interval at least 5 seconds between ON and OFF.

4. Operation monitor will appear.



■ Termination

1. Turn off the laser supply switch on the controller.

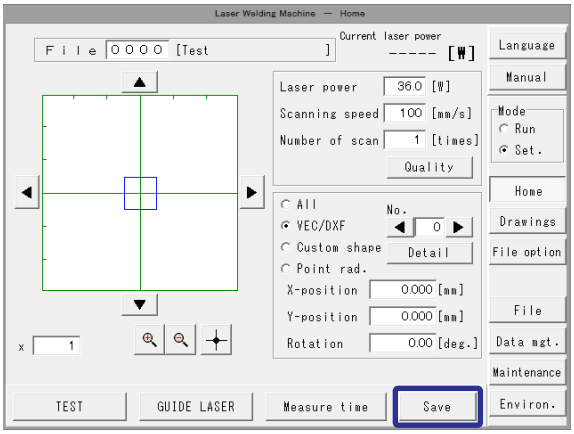


Reference

- Under the remote control mode, turn off the laser supply by using the input terminal or the serial communication command for the laser pumping.

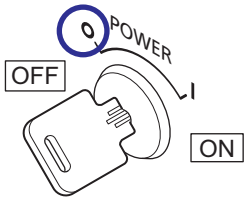
2. If you want to save the file, click “Save”.

Refer to “2-6-4 Save the file to laser welding machine” (P.83).



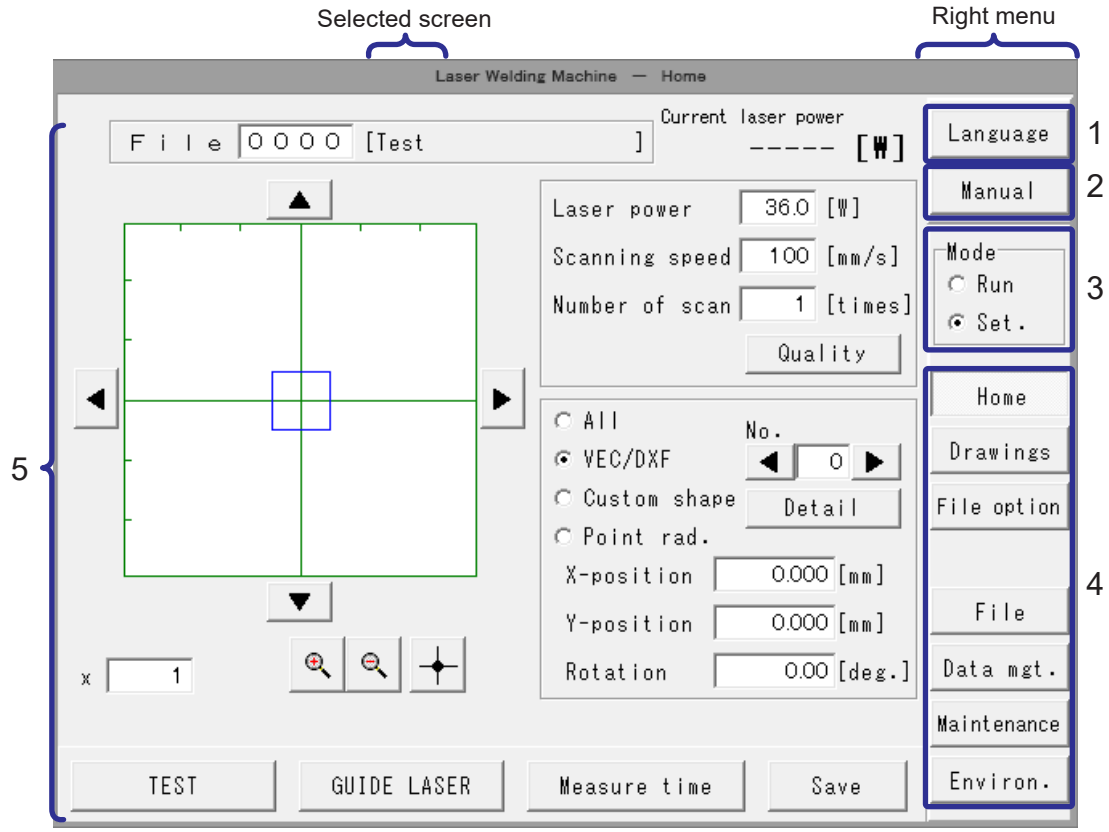
3. Turn off the key switch and pull it out from the controller.

The system key should be in safekeeping by a laser safety manager.



1-3 Screen Layout and Basic Operation

1-3-1 Screen layout

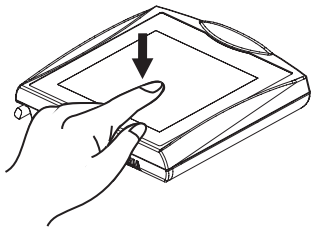
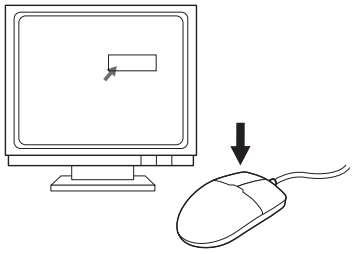


	Item	Description
1	Language	Changes the display language. Refer to “1-3-3 Language selection” (P.17).
2	Manual	Displays the related page of the operation manual (this manual).
3	Screen mode selection	Switches the screen mode between “Run” and “Setting”. Refer to “1-3-6 Screen selection” (P.23).
4	Screen selection button	Switches the screen. Depending on the selected mode, available screen type varies as follows.
5	Setting/display field	The display contents vary according to the selected screen.

Run mode	Setting mode
• Operation monitor • I/O monitor • Error log	• Home • Drawings • File option • File • Data management • Maintenance • Environment setting

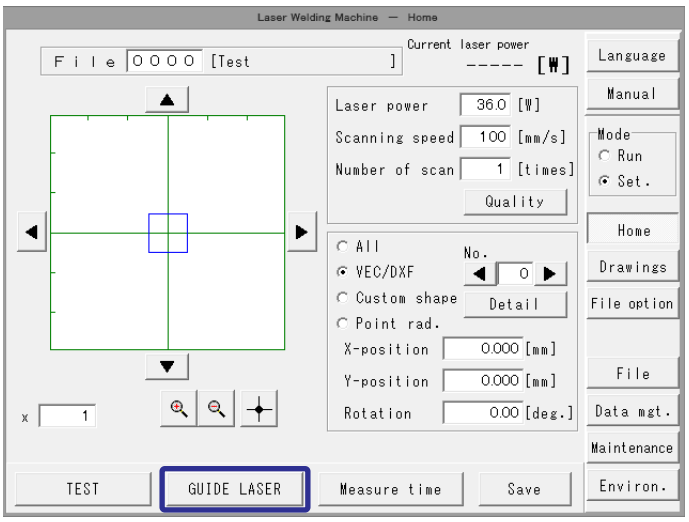
1-3-2 Basic operation of the screen

Here describes how to operate the screen of the touch panel or monitor.

For touch panel console:	For monitor and mouse:
Tap the items to be set with a finger or a rotundate object. In this manual, “click” means touch for the console users. 	Click on the items to be set with the left mouse button. 

■ General setting

Click the button to select or execute the item.

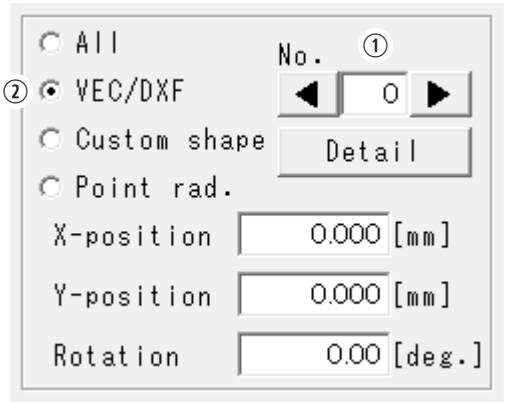


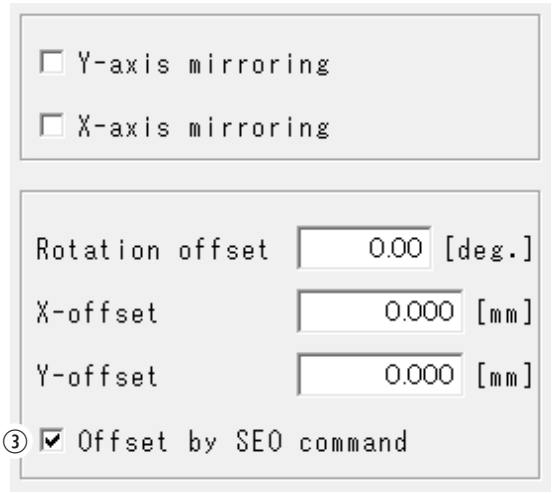
Reference

- If the touch panel console LP-ADP40 responds out of the pointed position, adjust it referring to “1-3-4 Touch panel calibration” (P.18).

■ Selection of setting items

Select the setting items with the following methods.





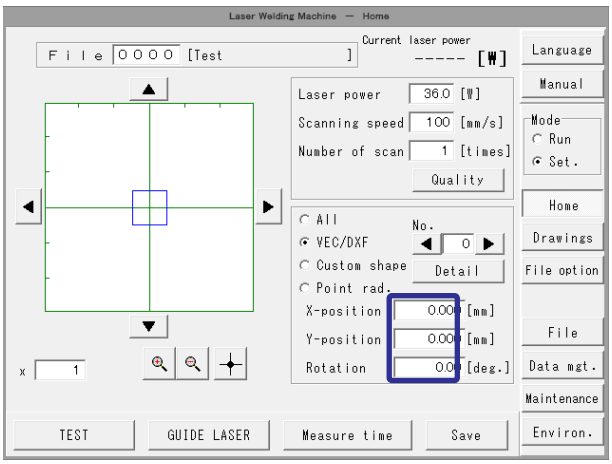
No.	Selecting method
①	Click ▲▼ or ◀▶ button to switch the items.
②	Click the item to be set from the list. The item displayed with “・” is selected.
③	To activate the setting, click the item and check the box.

■ How to input numerical value and characters

1. Click the text box for the item to set.

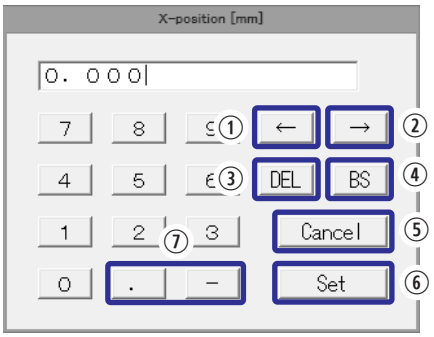
The settings in the white text box can be changed.

When the text box is indicated in gray, that item cannot be change.

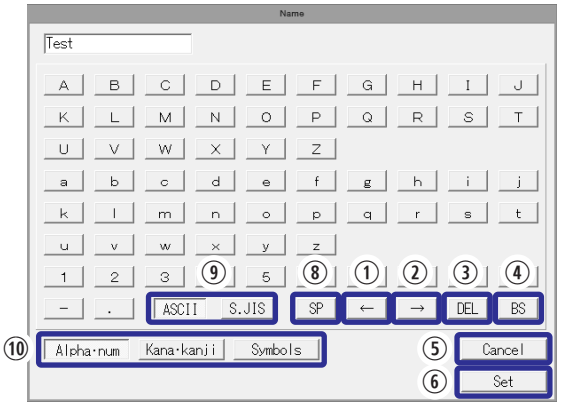


2. Input window appears. Input the numerical value or characters.

Click “Set” to complete the entry.



Numerical value input window



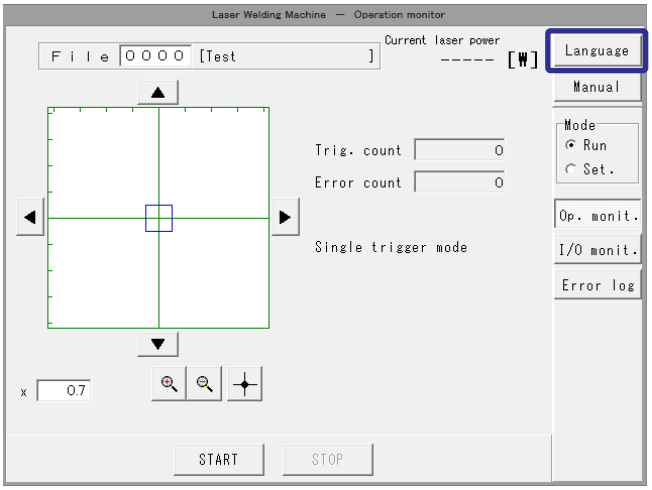
Character input window

No.	Description
①	Moves the cursor to the left.
②	Moves the cursor to the right.
③	Deletes a digit or a letter behind the cursor or the selected part.
④	Deletes a digit or a letter in front of the cursor or the selected part.
⑤	Closes the input window.
⑥	Applies the settings and closes the window.
⑦	Depending on the parameter type, minus and decimal point appear.
⑧	Inserts a space.
⑨	Switches the input mode of the alphanumeric between ASCII (1-byte) or Shift-JIS (2-byte).
⑩	Changes the character type.

1-3-3 Language selection

■ Change the display language

1. Click “Language” in the right menu.



2. Select the display language.

- German
- English
- Japanese
- Chinese (Simplified)

3. Click “Set”.

The screen display restarts with the selected language.



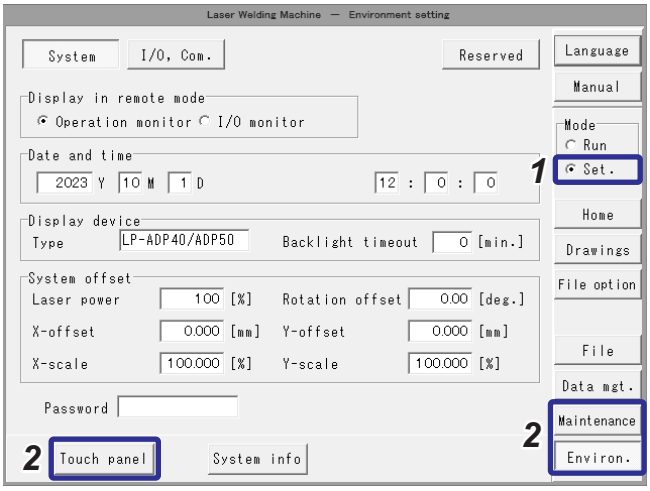
Reference

- When the display language is changed, the unsaved setting data under editing is cleared. Save the file before changing the language.
- From the next start-up, the screen will be displayed with the selected language.

1-3-4 Touch panel calibration

If the touch panel console LP-ADP40/LP-ADP50 responds out of the pointed position, adjust it with the following procedures.

1. Select the screen mode to “Set”.



2. Select “Environment” or “Maintenance” on the right menu and press “Touch panel”.

3. Touch the center of the cross at the lower left corner by using a pen.



4. Touch the center of the cross at the upper right corner by using a pen.

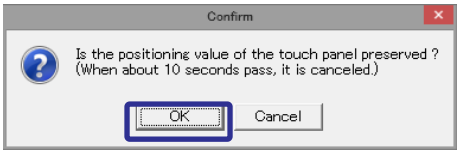


Notice

- Lightly touch the center of the cross with a pen whose tip radius is approx. 0.5. An excessive force applied to the touch panel may damage the panel.

5. Confirmation dialog box appears. Press “OK”.

Pressing “Cancel” or doing nothing for 10 seconds will cancel the calibration result.



Reference

- This function is available when the connected display is the touch panel console LP-ADP40/LP-ADP50.
- If the displacement of display position on the screen or bleeding occurs, synchronous error on touch panel console is considered. In such case, adjust the synchronous in accordance with the method described in the instruction manual of the touch panel console of LP-ADP40.

1-3-5 Screen variations

There are “Setting” mode and “Run” mode for the operation screen of the laser welding machine.
The applicable screen varies depending on this mode.

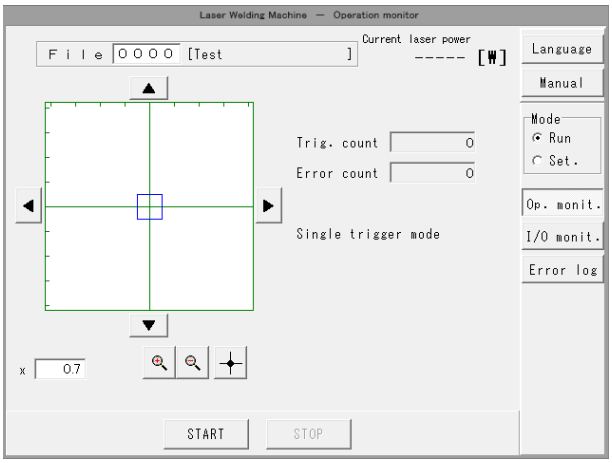
Screen mode		Screen name			
Run Mode	(P.111)	Operation monitor	(P.112)		
		I/O monitor	(P.116)		
		Error log	(P.117)		
Setting Mode	(P.27)	Home	(P.32)		
		Drawings	(P.45)	VEC/DXF	(P.47)
				Custom shape	(P.56)
				Point radiation	(P.63)
				Scanning order	(P.65)
		File Option	(P.66)	Position	(P.67)
				Quality	(P.69) (P.72) (P.73)
				Function	(P.76) (P.78)
		File	(P.79)		
		Data Management	(P.85)	Export	(P.87)
				Import	(P.88)
				Delete	(P.90)
				Delete media	(P.91)
				Backup	(P.92) (P.93)
				Text output	(P.94)
		Maintenance	(P.95)	Laser adjustment	(P.96) (P.99)
				Output simulation	(P.104)
		Environment Setting	(P.106)	System settings	(P.107)
				I/O and communication settings	(P.109)

■ Run mode

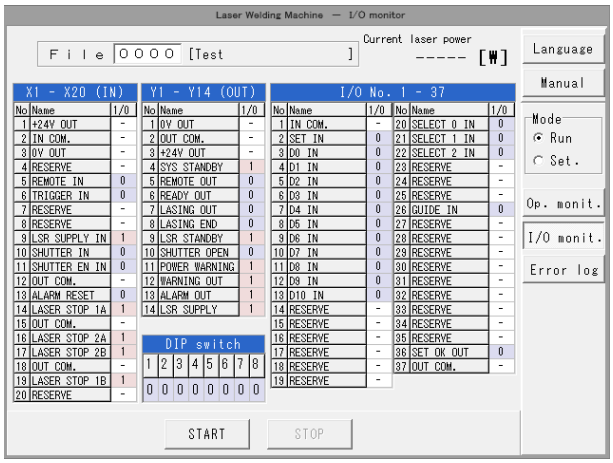
Run mode is the screen mode to confirm the operating status of laser welding machine during the remote control or running operation.

Reference

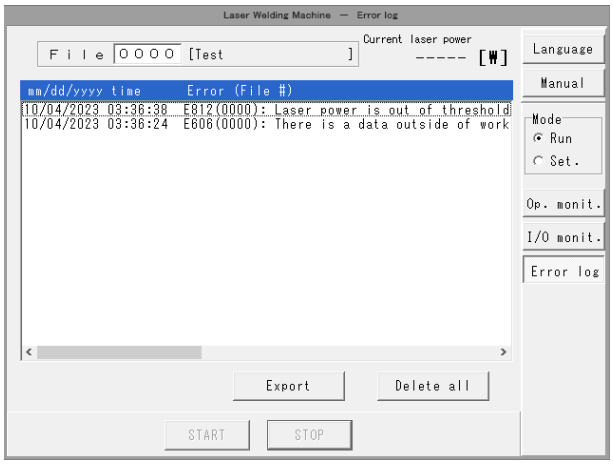
- Select the display shown during the remote control operation from Operation monitor or I/O monitor on Environment setting screen. Refer to “2-9-2 System settings” (P.107).



Operation monitor:
Displays the working image of the selected file.



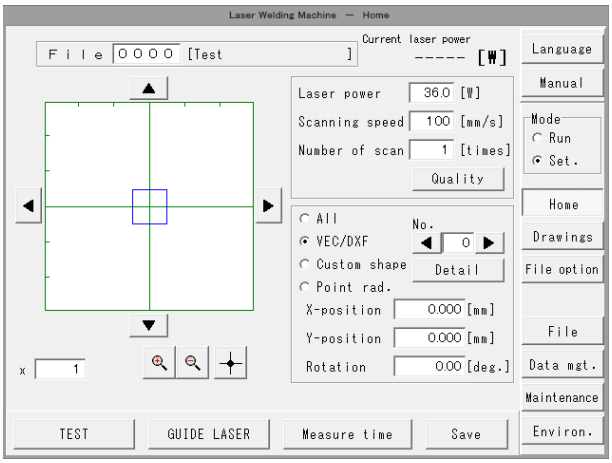
I/O monitor:
Displays the ON/OFF state of I/O.



Error log:
Displays the errors occurred in the laser welding machine.

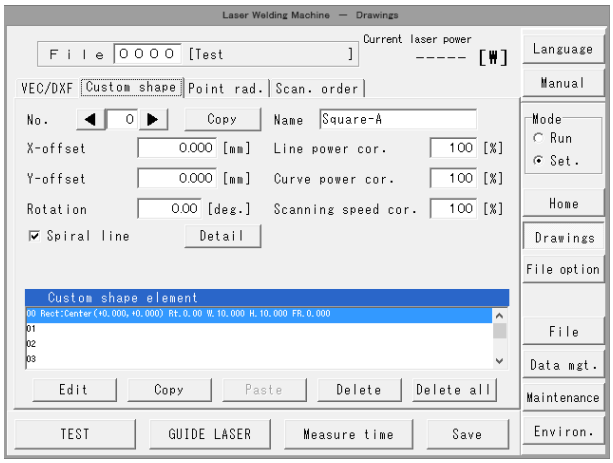
■ Setting mode

Setting mode is the screen mode to configure the drawing data and parameters. In this mode, environment setting and data management of the laser welding machine are also done.



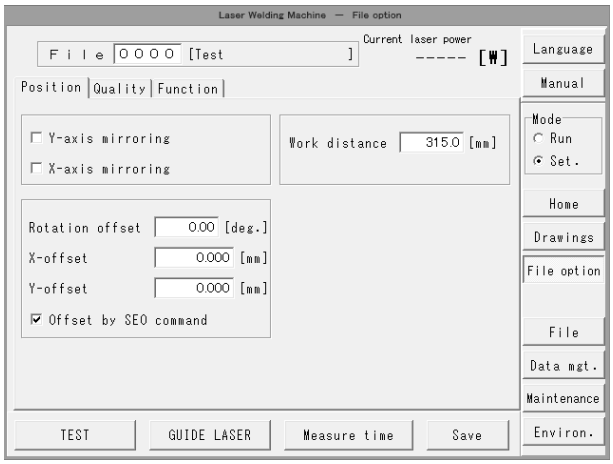
Home

- Shows drawing image.
- Sets laser power and scanning speed.
- Adjusts lasing position.
- Controls Test lasing.
- Controls Guide laser.



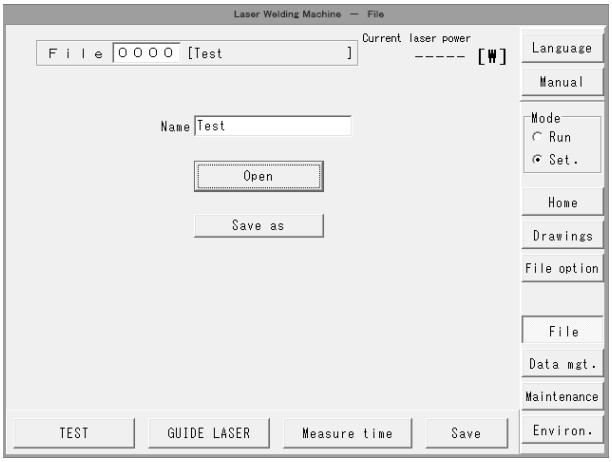
Drawings

- Sets drawing data.
- Modifies scanning order of drawings.



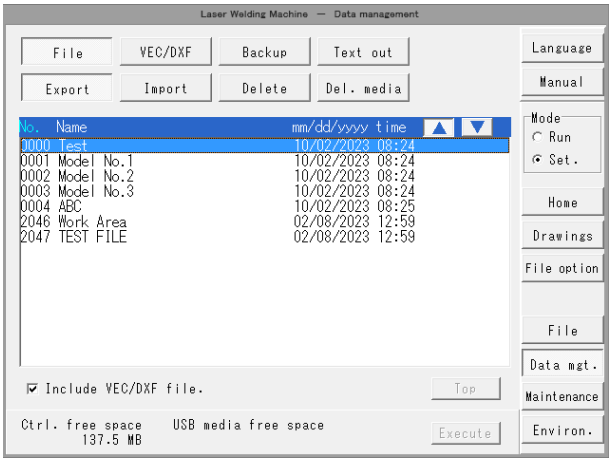
File option

- Adjusts the layout for all data in a file.
- Sets the monitoring condition of the laser power.



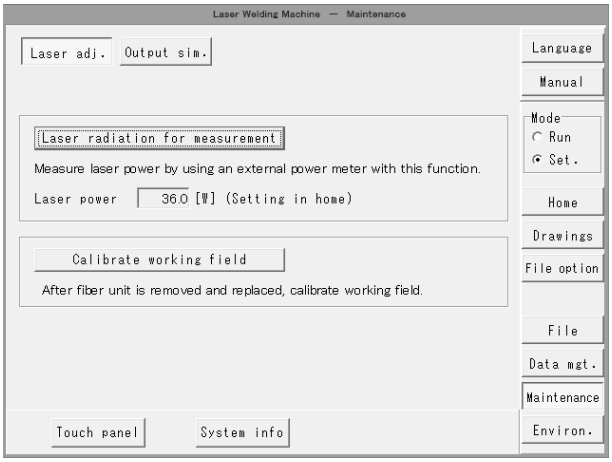
File

- Select a setting file
- Set a file name
- Copy a setting file to other file number.



Data management

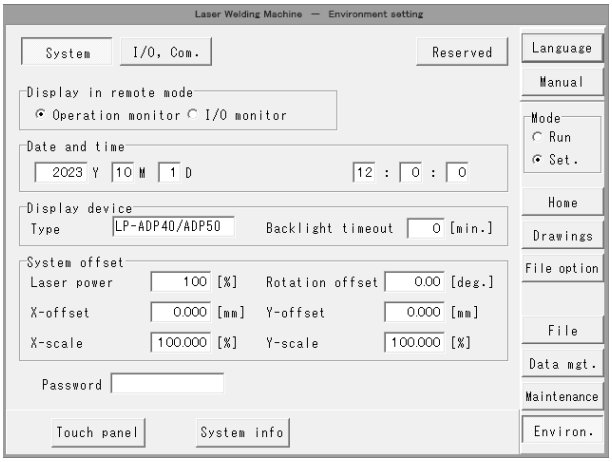
- Add/delete setting files and VEC/DXF files.
- Export the backup data from the laser welding machine.
- Import the externally saved backup data to the laser welding machine.



Maintenance

- Irradiate the laser for measurement. *
- Simulate ON/OFF operation of the output signals.

* To measure the laser output, you need a power meter available in stores.

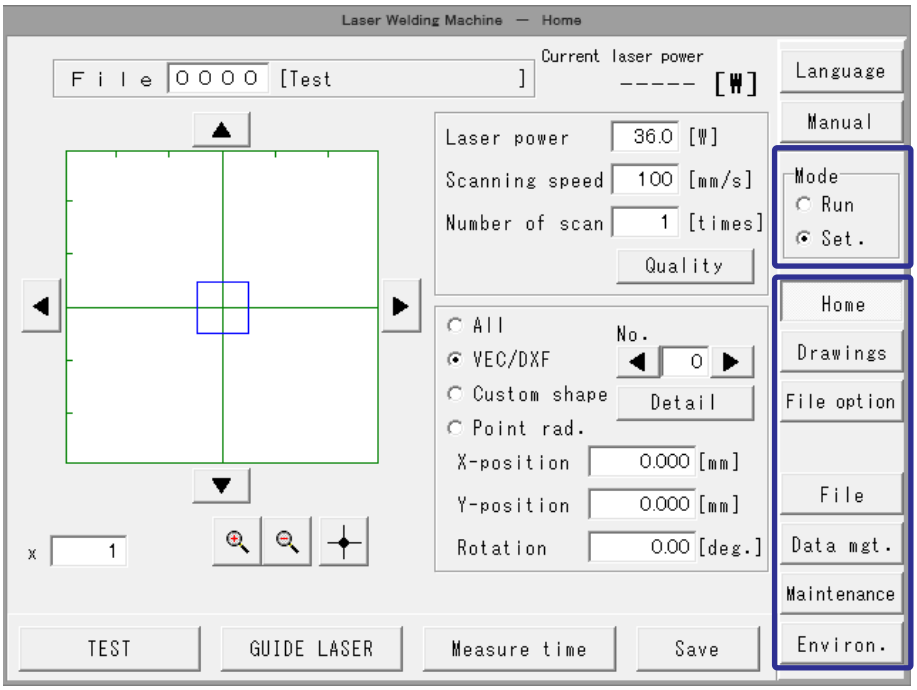


Environment setting

- Configure the I/O and communication conditions for the external control.
- Set the password to restrict access to the setting screen.
- Configure the laser power and offset value of the lasing position for all the data in the laser welding machine.
- Check the system information.

1-3-6 Screen selection

The display screen is switched by clicking screen names on the right menu.
Select the screen mode between Run or Setting. Depending on the selected mode, available screen buttons appear on the right menu.



Reference

- With a password set in the environment setting screen, the password is required to change the screen mode from “Run” to “Setting”.
- Under the remote control mode, only Operation monitor is available.

Notice

- The password function is designed for the purpose to prevent a wrong configuration or unintended operation. You cannot use this password for security purpose.

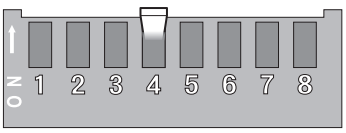
■ When password is forgotten

If you have configured the password on the environment setting screen, the password is required to change the screen mode from “Run” to “Setting”.
If you have forgotten this password, confirm the password according to the following procedures:

1. Turn OFF the power of laser welding machine.

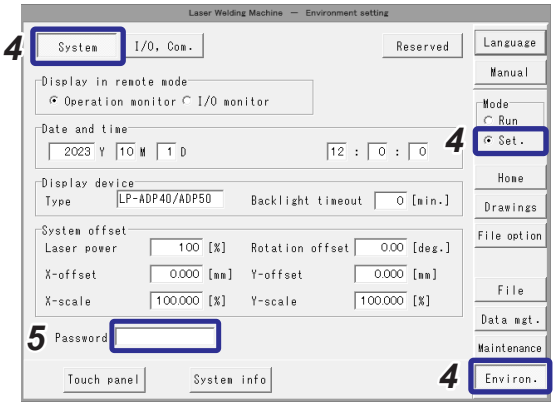
2. Turn ON the DIP switch No. 4 on the rear of the controller.

The access to the setting mode is unlocked.



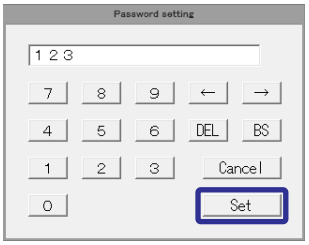
3. Turn ON the power of laser welding machine.

4. Select the screen mode to “Set” and click “Environment” - “System”.



5. Click input field of the password.

6. The currently set password is displayed.



7. To change the password, input the new one and click “Set”.

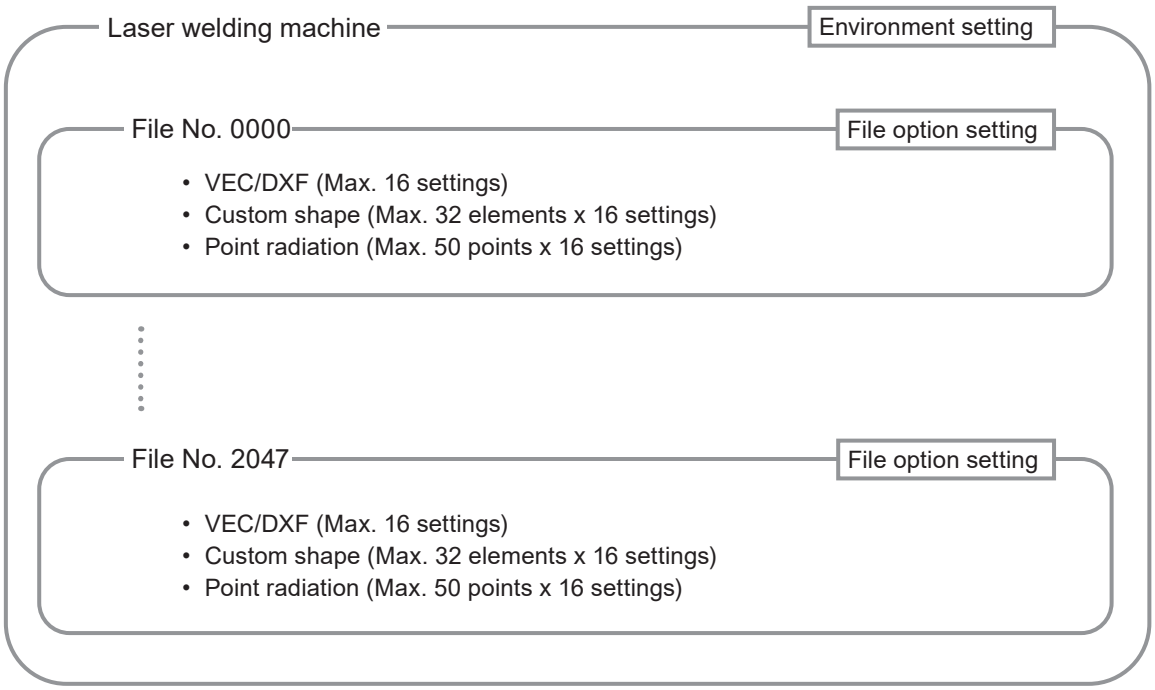
- To keep the current password, click “Cancel”.
- If you don't use the password protection, input nothing and click “Set”.

8. To use the password protection, turn OFF the power of laser welding machine and then turn OFF the DIP switch No. 4.

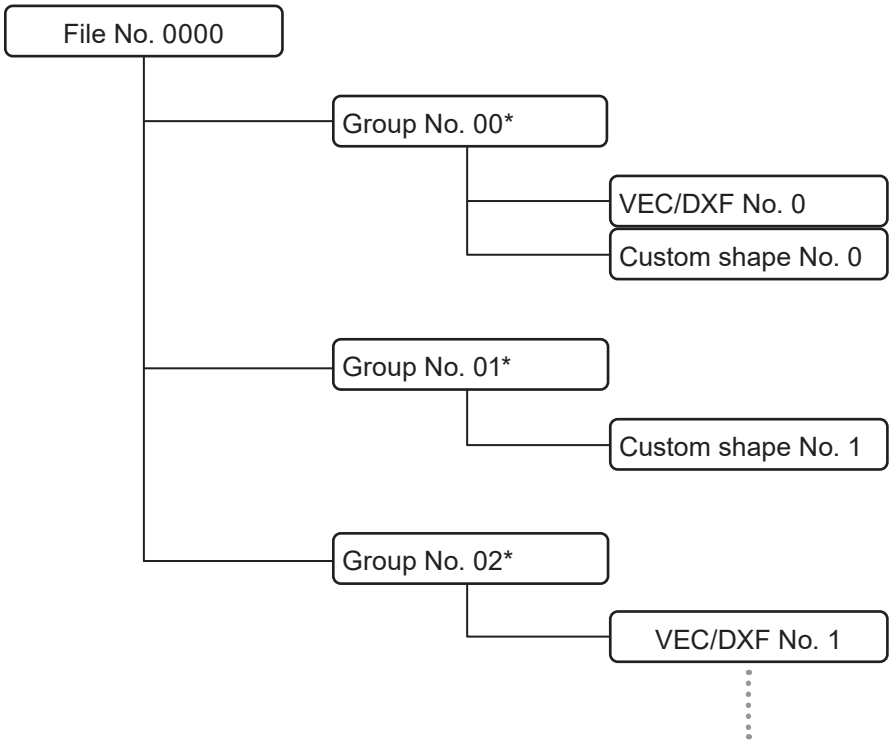
1-4 Data Component

In the laser welding machine the drawing data is set and saved in a “file” format.
A file is composed of one or more drawing data and the all data in one file is drawn by laser with one trigger.
Up to 2048 files are stored in one laser welding machine.
The drawing data in a setting file is consists of a combination of “VEC/DXF”, “Custom shape” and “Point radiation”.

■ Data composition image



■ Image of the file data configuration



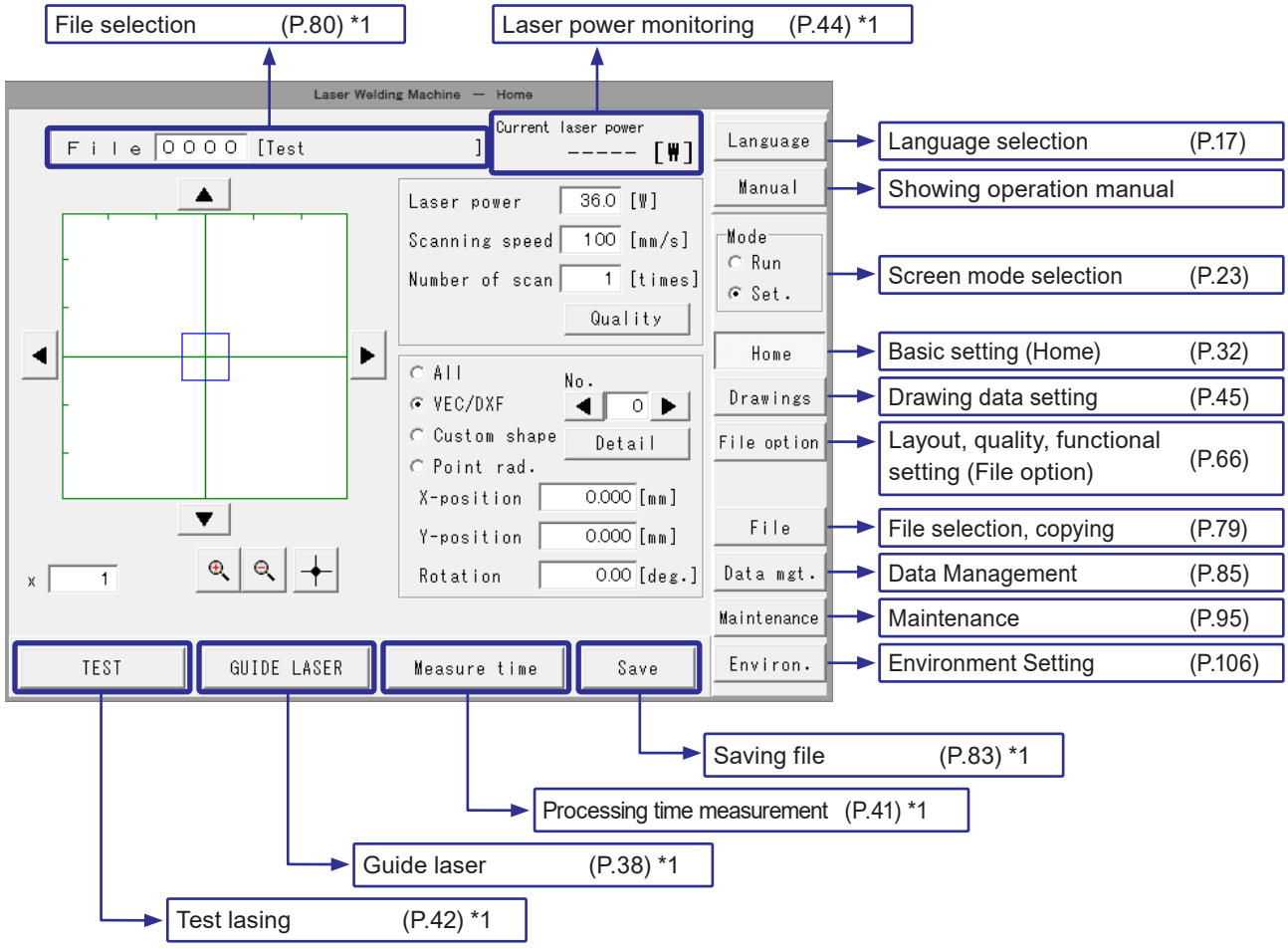
* Group No. specifies the scanning order at lasing.

2 Setting Mode

2-1 Setting Mode

Setting mode is the screen mode to configure the drawing data and parameters. In this mode, environment setting and data management of the laser welding machine are also done.

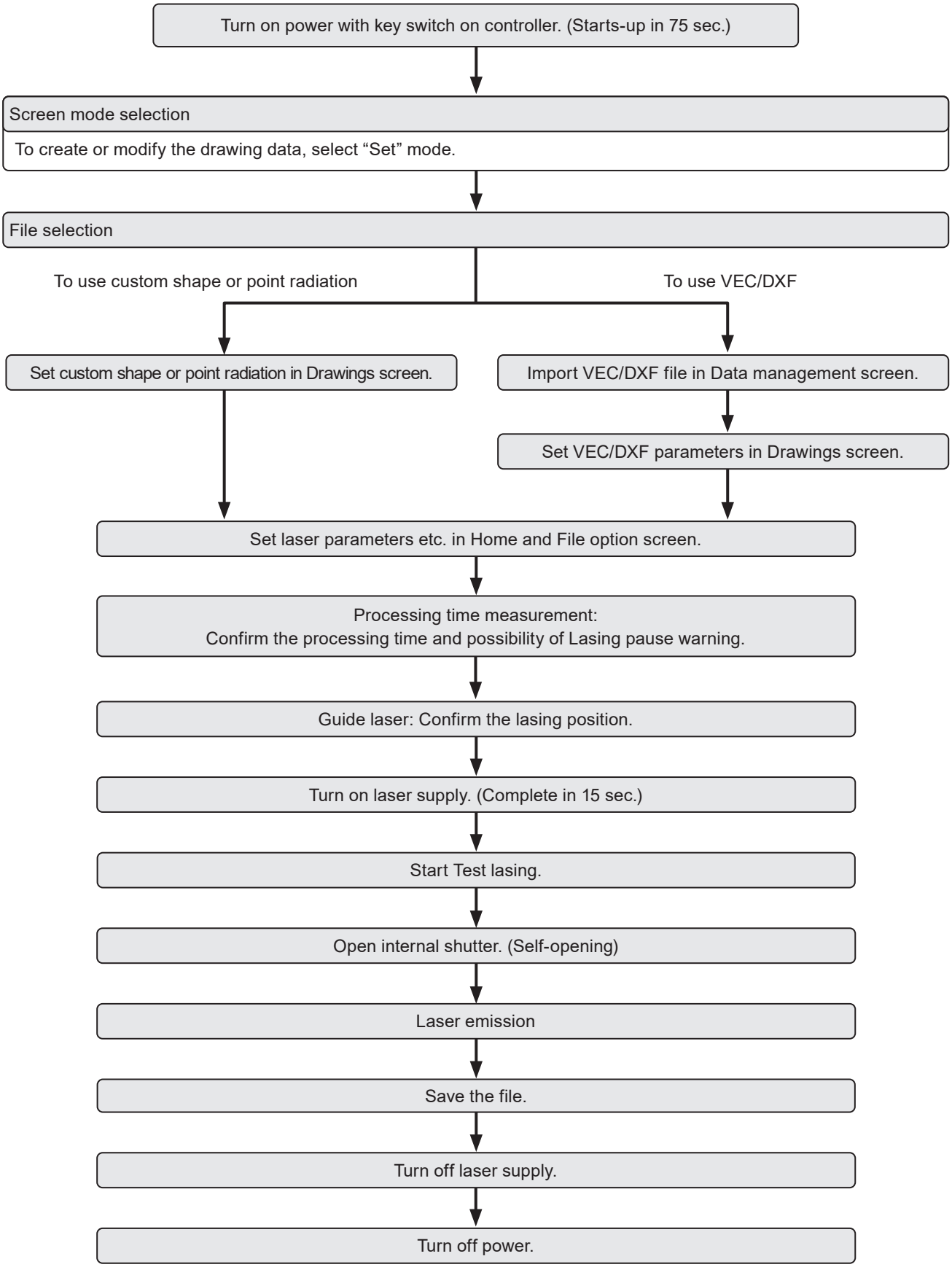
■ Function of setting mode



*1 : Available in “Home”, “Drawings”, “File option” or “File” screen.

2-2 Setting Flow

■ From file editing to laser radiation (test lasing)



■ Basic setting procedures

1. Install the laser welding machine.

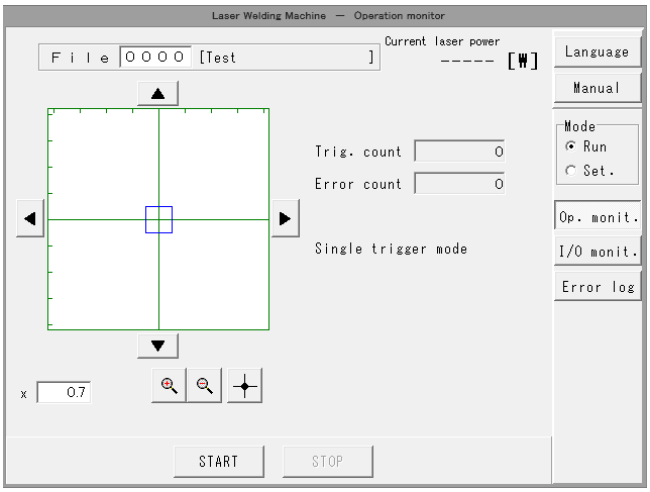
- Adjust distance between bottom surface of laser welding machine head and target surface of object as specified.
- Set the control dial of output beam diameter in head unit to the target line width at lasing.

Refer to Setup/Maintenance Guide.

2. Start up the laser welding machine.

Operation monitor appears.

- “1-2 Start-up & Termination” (P.12)
- To change the display language: “1-3-3 Language selection” (P.17)



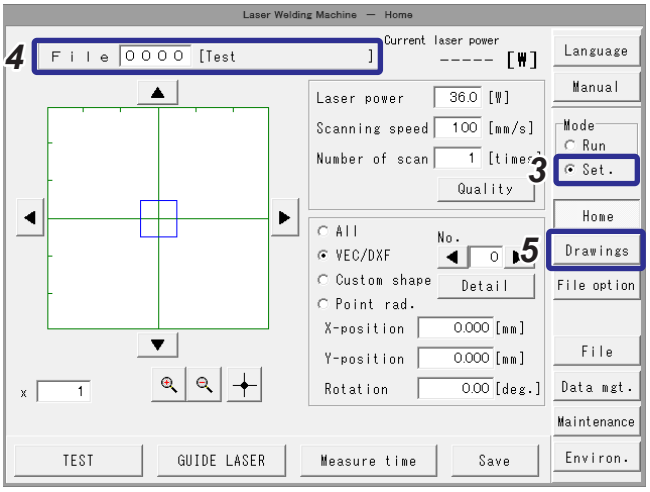
3. Select the screen mode to “Set”.

Details for the password protection: “1-3-6 Screen selection” (P.23)

4. Click the file number field on the left upper of the screen and select the file to use.

- “2-6-2 File selection” (P.80)
- “2-6-3 File name setting” (P.82)
- To copy existed file and modify it: “2-6-5 Save the file to other file No.” (P.84)

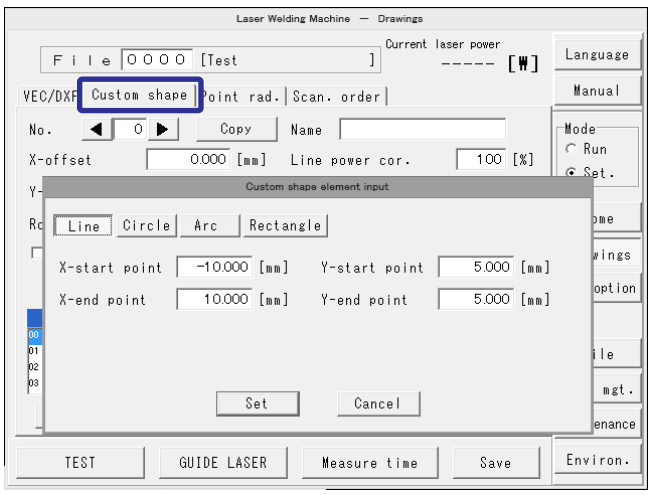
5. Click “Drawings” on the right menu.



6. Click “Custom shape” and set the custom shape elements.

Example: Input straight line of 20 mm length.

- “2-4-4 Custom shape” (P.56)
- To use VEC/DXF file: “VEC/DXF setting procedures” (P.51)
- Lasing at a point: “2-4-5 Point radiation” (P.63)



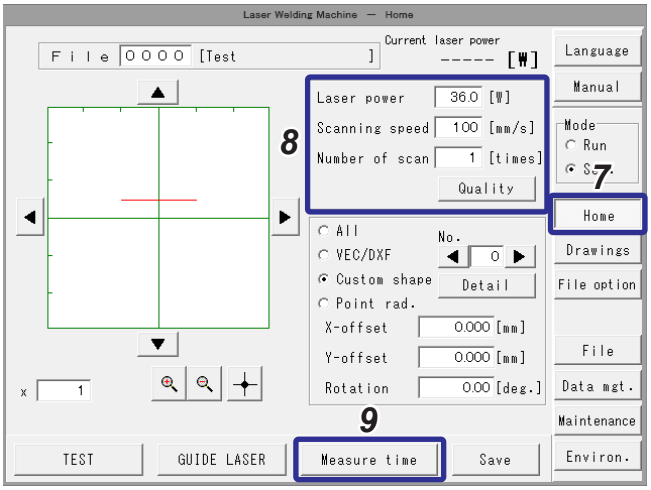
7. Click “Home” and confirm the working image and layout.

“2-3-2 Working image view” (P.33)

“2-3-4 Layout/position adjustment” (P.36)

8. Set laser power, scanning speed and number of scans.

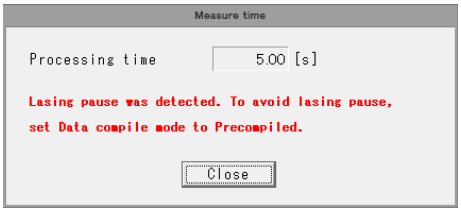
“2-3-3 Laser and speed setting” (P.34)

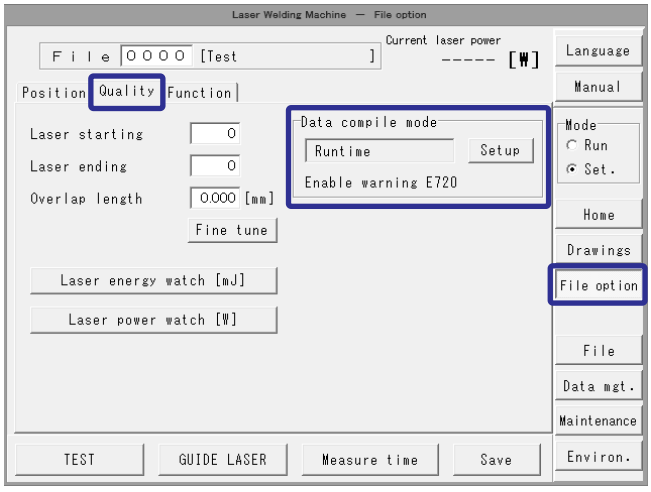


9. Click “Measure time” and confirm the reference time of the processing. If a message “Lasing pause was detected.” appears, change Data compile mode to Precompiled in File option menu.

“2-3-6 Processing time measurement” (P.41)

“2-5-4 Data compile mode” (P.72)





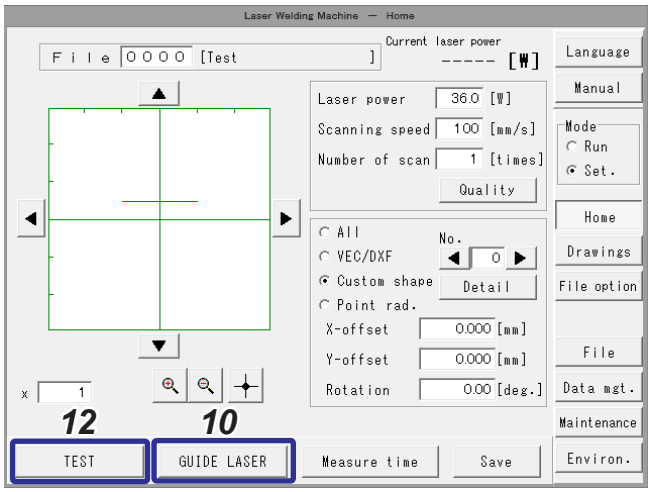
10. Click “GUIDE LASER” and radiate guide laser. Adjust lasing position and place of the target object.

“2-3-5 Guide laser” (P.38)

11. Turn ON the laser supply switch on the controller to start laser pumping.

12. Click “TEST” and start lasing.

“2-3-7 Test lasing” (P.42)



Reference

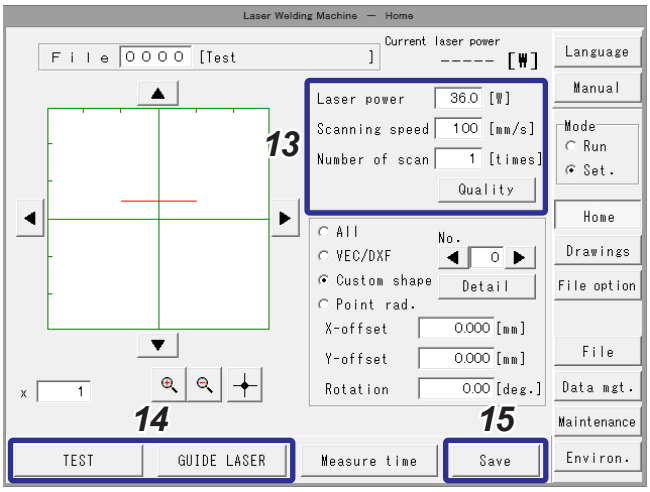
- If a message “Lasing pause was detected.” appears after the test lasing, change Data compile mode to Precompiled in File option menu. Refer to “2-5-4 Data compile mode” (P.72).

⚠WARNING

- Take laser protection measures such as wearing protective goggles or using protective enclosures during laser radiation.

13. Check the lasing quality and adjust laser parameters such as laser power and scanning speed.

- To set detailed parameters: “2-5-3 Quality adjustment” (P.69)
- To make drawing line wider: “Spiral line” (P.49)



Reference

- The lasing quality is also adjusted by using the control dial of output beam diameter in head unit. Refer to Setup/Maintenance Guide.

14. Repeat test lasing and adjustment until find the appropriate parameters.

To set the threshold of the laser power at lasing: “2-5-5 Laser energy / laser power warning threshold” (P.73)

15. If you want to save the file, click “Save”.

“2-6-4 Save the file to laser welding machine” (P.83)

16. Turn off the laser supply switch on the controller.

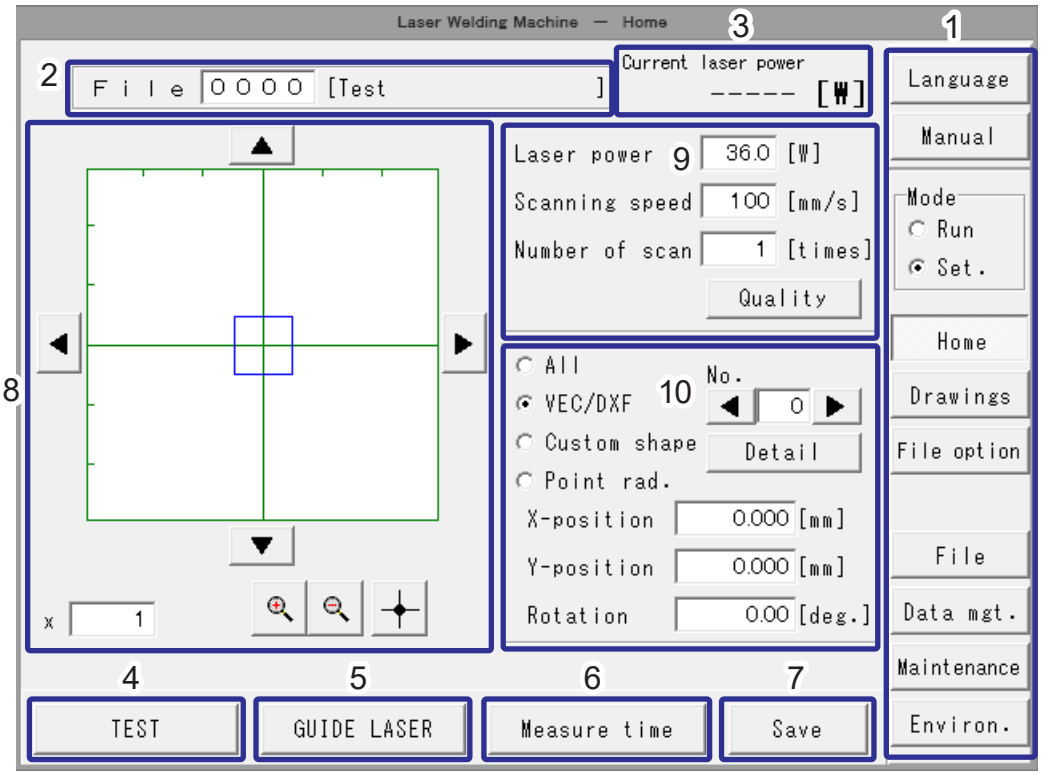
17. Turn off the key switch and pull it out from the controller.

“1-2 Start-up & Termination” (P.12)

2-3 Home

Set the basic parameters and check the working image in Home screen.

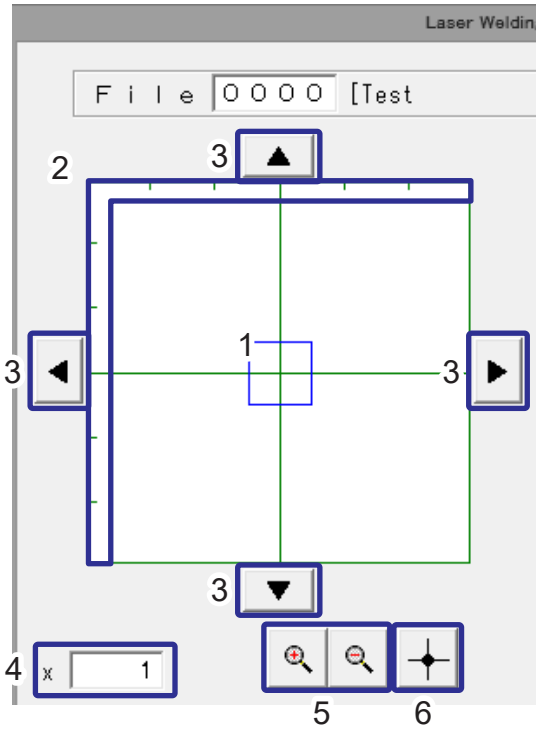
2-3-1 Configuration of home screen



	Panel name	Description
1	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).
2	File	Displays the selected file No. and name. By clicking on the file No. field, file selection window appears. Refer to “2-6-2 File selection” (P.80).
3	Current laser power	Displays the measurement result of the laser power [W]. Available only during the lasing operation. Refer to “2-3-8 Laser power monitoring” (P.44).
4	TEST	Controls Test lasing operation. Refer to “2-3-7 Test lasing” (P.42).
5	GUIDE LASER	Controls Guide laser operation to confirm the lasing position visually. Refer to “2-3-5 Guide laser” (P.38).
6	Measure time	Indicates the estimated processing time of the selected file. Refer to “2-3-6 Processing time measurement” (P.41).
7	Save	Overwrites the file in the laser welding machine. Refer to “2-6-4 Save the file to laser welding machine” (P.83).
8	Working image	Displays the image of the set drawing data. Refer to “2-3-2 Working image view” (P.33).
9	Laser setting	Sets the lasing parameters such as laser power and scanning speed. Refer to “2-3-3 Laser and speed setting” (P.34).
10	Position adjustment	Moves the lasing position of the selected drawing. Refer to “2-3-4 Layout/position adjustment” (P.36).

2-3-2 Working image view

The layout image of the setting file is displayed on the working image view.
When the setting size or position is changed, check the layout on the working field with this view.
The working image is displayed on Home screen and Operation monitor screen.



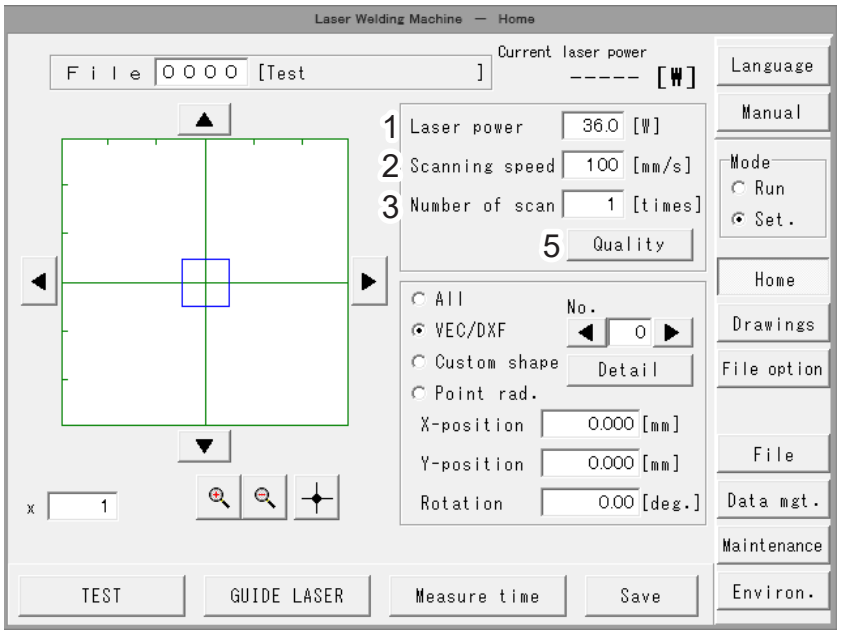
	Item	Description
1	Working image	Displays the image of the set drawing data. The center of the cross line indicates the center of the working field (X=0mm, Y=0mm). On the working image view, the setting data is displayed in the following colors depending on the data status. • Red: currently selected drawing • Blue: not selected drawings • Gray: drawings with laser power correction 0% (Masked data)
2	Ruler	Tick marks for the working field. One division indicates 10 mm.
3	Display position adjustment	Clicking the arrow key moves the display position of the working image field.
4	Display magnification	Indicates the scale of the display.
5	Zoom-in / zoom-out	Zoom-in or Zoom-out the image display by clicking “+” or “-” icon. Scale: x0.1 to x100 (19 steps)
6	Show center of working field	Moves the display position to the center of the working field.

Reference

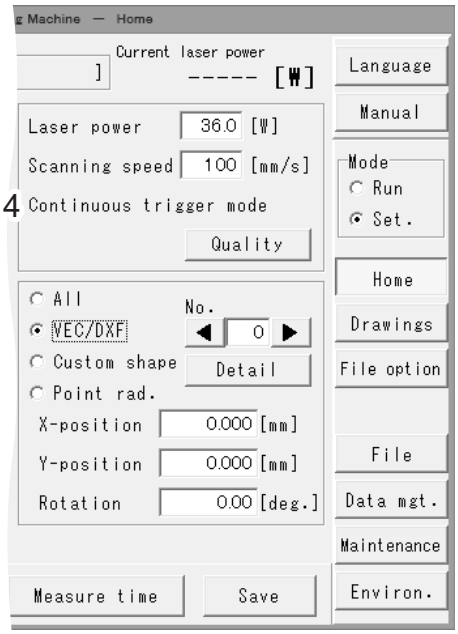
- The image view position and scale settings are common in all files.

2-3-3 Laser and speed setting

Sets the basic lasing parameter such as laser power and scanning speed.
This setting is applied to the all data in a file.



At “Single trigger” mode



At “Continuous trigger” mode

	Setting elements	Description
1	Laser power [W]	Sets the laser power.

Setting range	VL-W1500-N, VL-W1506-N	: 9.0 to 45.0 W
	VL-W1A00-N, VL-W1A06-N	: 18.0 to 90.0 W
	VL-W1500-N, VL-W1506-N	: 18.0 W
	VL-W1A00-N, VL-W1A06-N	: 36.0 W

Reference

- Though the laser power is set in [W], in some cases there is a difference between the actual output power and the setting value. It is recommended to measure the actual laser power regularly and to adjust the setting value.
- The laser power gradually decreases due to the degradation of laser source. For the future adjustment, it is recommended not to set the upper limit as the initial setting.
- With the file set the warning threshold of laser energy or laser power, change the threshold setting when laser power setting is changed. Refer to “2-5-5 Laser energy / laser power warning threshold” (P.73).

2 Scanning speed [mm/s]

Specifies the scanning speed of laser.

Setting range	1 to 3000 mm/s
Initial setting	100 mm/s

⚠ CAUTION

- If too high laser power is set or too low scanning speed is set, the lasing object may flame up or burn depending on the material. At test lasing, radiate the laser by setting rather low laser power and rather fast scanning speed, check the laser processing quality, and adjust the setting value gradually.

	Setting elements	Description
3	Number of scans [times] *1	Sets how many times the all data in a file is drawn by laser with one trigger input. (Overwriting times) When this setting is changed, the same parameter in File option (function) screen changes together. Refer to “2-5-6 Trigger mode / Number of scans” (P.76). Setting range: 1 to 9999 times

Reference

- If you need a certain interval period between each lasing operation, set “scan interval” in function tab of the file option screen. Refer to “2-5-6 Trigger mode / Number of scans” (P.76).

4	Trigger mode *2	When “Continuous trigger mode” is displayed in Home screen, it indicates that the laser welding machine will repeat lasing operation while TRIGGER IN is on at the remote control mode or run mode. Refer to “2-5-6 Trigger mode / Number of scans” (P.76).
5	Quality	Moves to File option screen to adjust the detailed lasing quality. Refer to “2-5-3 Quality adjustment” (P.69).

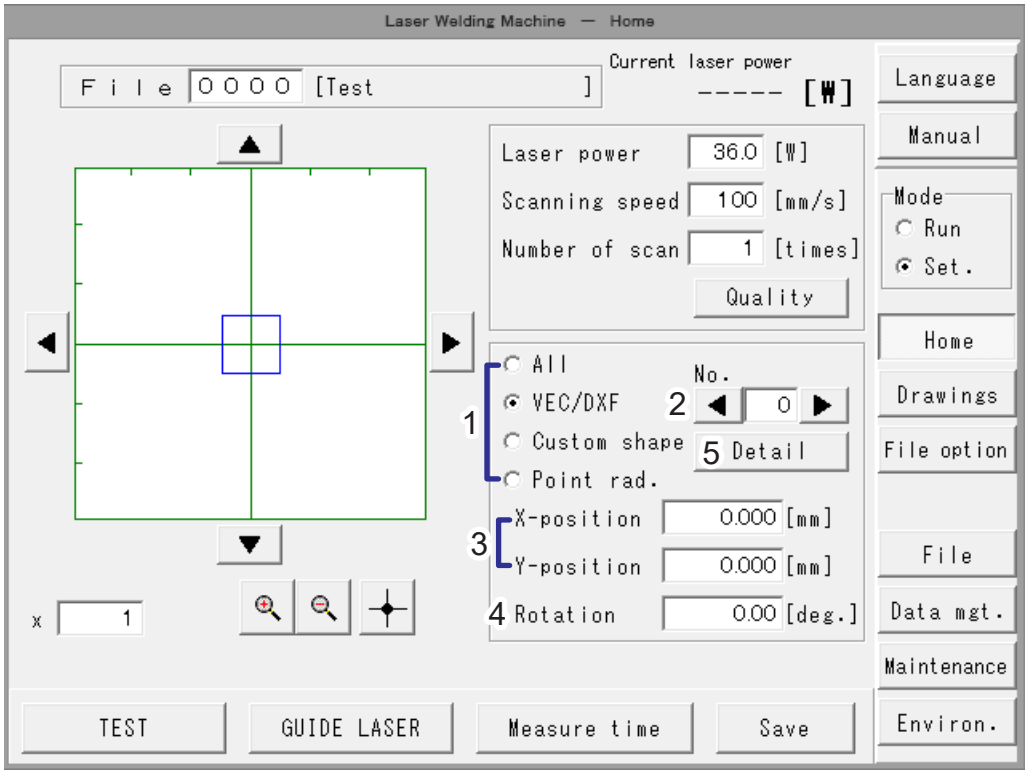
*1 : Available when the trigger mode is “Single trigger”.
*2 : Available when the trigger mode is “Continuous trigger”.

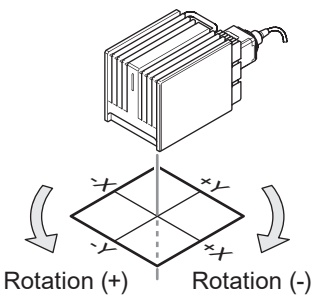
Reference

- Laser power and scanning speed settings in Home screen are applied to all data in a file. To change them for some data, set the laser power correction and scanning speed correction by each drawing data.
- When the setting value of the laser power is changed in Home screen, the laser power for Laser radiation for measurement and Working field calibration changes together. Refer to “2-8 Maintenance” (P.95).

2-3-4 Layout/position adjustment

Adjusts the drawing position referring to the working image view.



	Setting elements	Description
1	Target data	Select the type of the target data to adjust the position in Home screen. The selected data is shown in red in working image view. • All drawings • VEC/DXF • Custom shape • Point radiation
2	No. *1	Select the No. of the target data to adjust the position. Setting range: 0 to 15
3	X-position [mm] *2 Y-position [mm] *2	Specifies the position of the selected VEC/DXF. X- and Y-position represents the original point of the drawing. Setting range: -999.999 to +999.999 mm
	X-offset [mm] *3 Y-offset [mm] *3	Moves the selected data with the specified distance from the current position. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
4	Rotation [deg.] *4	Rotates the selected drawing at the input angle. The drawing rotates in CW direction with minus angle, and in CCW with plus angle. For VEC/DXF the rotation center is the origin of the drawing. For the all drawings and custom shape, the rotation center is the center of the working field. Setting range: -360.00 to +360.00 °  Rotation (+) Rotation (-)

	Setting elements	Description
5	Detail *1	Click here to move to the detail setting screen for the selected drawings.

*1 : Available when the target data is “VEC/DXF”, “Custom shape” or “Point radiation”.
*2 : Available when the target data is “VEC/DXF”.
*3 : Available when the target data is “All”, “Custom shape” or “Point radiation”.
*4 : Available when the target data is “All”, “VEC/DXF” or “Point radiation”.

Reference

- When the setting value in Home screen is changed, the corresponding parameters in Drawings screen and File option screen change together.

2-3-5 Guide laser

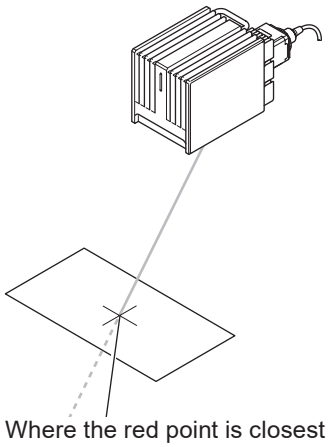
The lasing position can be checked visually by using the red guide laser.
With the guide laser the following data can be indicated.

- Working field
- Scanning image
- Masked data
- Work distance

Notice

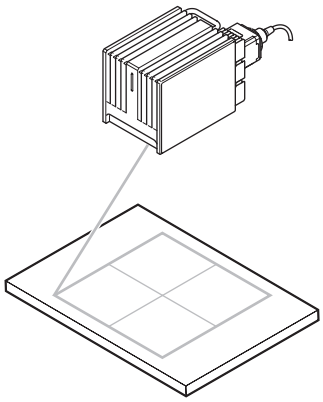
- Use the guide laser only as the guideline. For the appropriate laser processing quality, fine adjust the work distance and setting position of the target object by checking the actual lasing results.
- When the fiber unit is removed and re-installed, the lasing position might be misaligned relative to the guide laser radiation position. To align the lasing position, calibrate the working field with following the procedures described in “2-8-3 Working field calibration” (P.99).

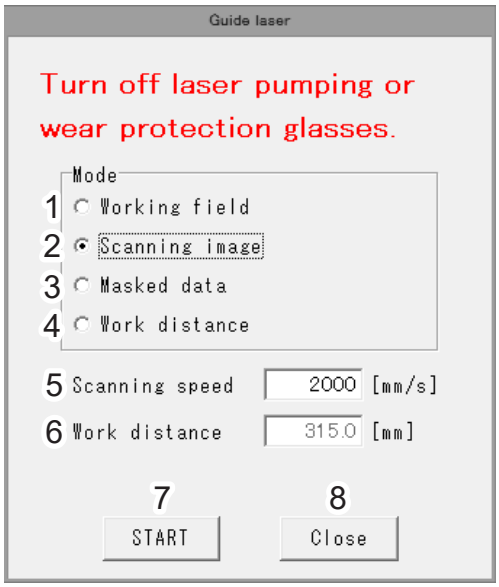
Work distance image



Where the red point is closest to the center of the cross is the rough indication of the work distance.

Working field image





	Item	Description
1	Working field	Displays the working field frame and center lines with the guide laser.
2	Scanning image	Displays the setting data in the file. The drawing data with laser power correction 0% setting is not displayed.
3	Masked data	Displays only VEC/DXF and Custom shape drawings with laser power correction 0% setting.
4	Work distance	The guide laser shows the rough indication of the work distance (distance from the head base to the processing surface). The red point emitted in oblique and the red cross emitted perpendicularly from the head are displayed. The distance where the laser point is closest to the center of the cross represents the guide of the work distance set in File option screen. The center of the cross indicates the working field center if the work distance is set to the base position*. If the work distance setting is changed, the center of the cross is shifted from the center of the working field. * : VL-W1500-N, VL-W1A00-N: 315 mm VL-W1506-N, VL-W1A06-N: 685 mm
5	Scanning speed [mm/s]	Sets the scanning speed of the guide laser. This setting is independent from the scanning speed value set in Home screen. Setting range: 1 to 2000 mm/sec.

Reference

- The setting of the guide laser scanning speed is common in all files.

	Item	Description
6	Work distance [mm]	Displays the work distance value set in File option screen. When the guide laser mode is set to “Work distance”, at this distance the laser pointer overlaps with the center of the cross. Display range: VL-W1500-N, VL-W1A00-N : 300.0 to 330.0 mm Display range: VL-W1506-N, VL-W1A06-N : 670.0 to 700.0 mm
7	START / STOP	Clicking “START” radiates guide laser. During the guide laser radiation, “START” button changes “STOP”. Clicking “STOP” ends the guide lasing operation. Guide laser radiates for max. 60 minutes until clicking “STOP”.
8	Close	Closes the guide laser window.

Reference

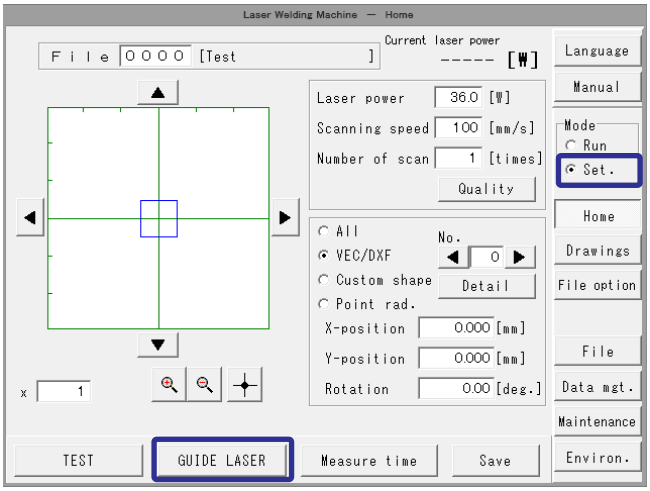
- Confirm that the displayed value of the work distance is the same with the actual distance. If the work distance setting is wrong, the actual lasing position may be different from the setting coordinate.

■ Guide lasing procedures

1. Select the screen mode to “Set” and click “GUIDE LASER”.

Guide laser is available on the following screen.

- Home
- Drawings
- File option
- File



2. Select the guide indication mode.

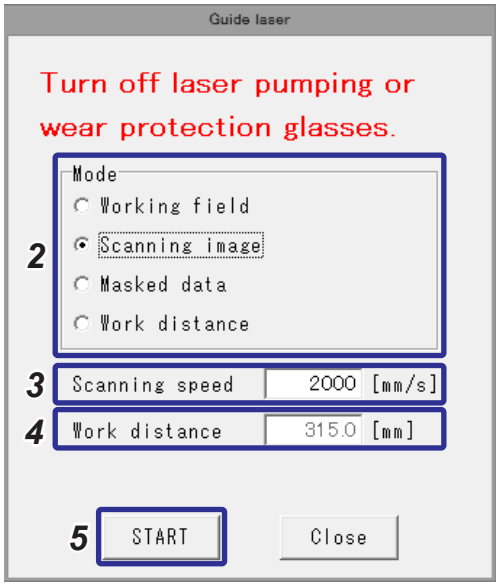
- Working field
- Scanning image
- Masked data
- Work distance

3. Set the scanning speed of the guide laser with an easily viewable speed.

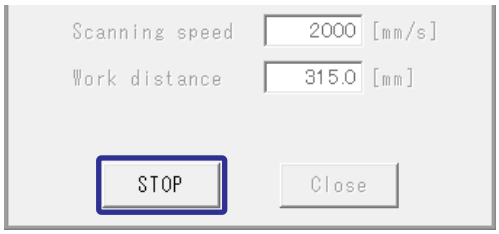
4. Confirm that the displayed value of the work distance is the same with the actual distance.

If the work distance setting is wrong, correct the setting on File option screen.

5. Click “START” to radiate guide laser.



6. Click “STOP” to stop radiating the guide laser.



Reference

- Availability of the guide laser varies depending on LASER STOP 1A/1B IN, LASER STOP 2A/2B IN and INTERLOCK state as follows.

I/O and INTERLOCK state	Guide laser availability
When LASER STOP 1A/1B IN (X14, X19) terminal is open	Available
When LASER STOP 2A/2B IN (X16, X17) terminal is open	Not available
When INTERLOCK terminal is open under non-remote control mode	Available
When INTERLOCK terminal is open under remote control mode	Not available

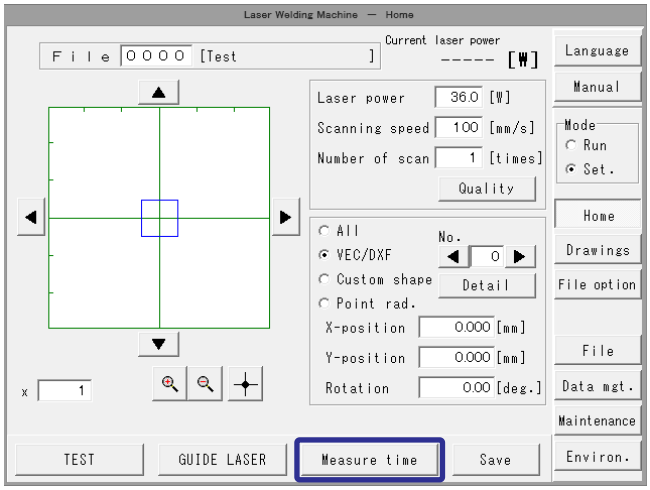
2-3-6 Processing time measurement

This function simulates the lasing operation of the laser welding machine and displays the processing time for the setting data.
The measurement is executed without laser emission.

1. Select the screen mode to “Set” and click “Measure time”.

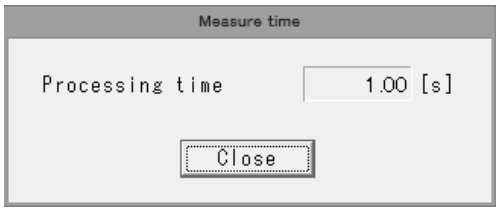
Time measurement is available on the following screen.

- Home
- Drawings
- File option
- File



2. Processing time is displayed.

Click “Stop” to stop the measurement in the middle of operation.

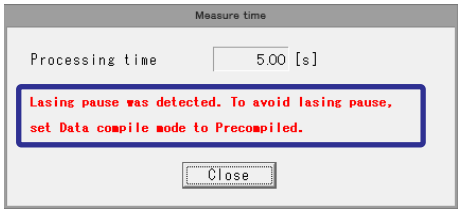


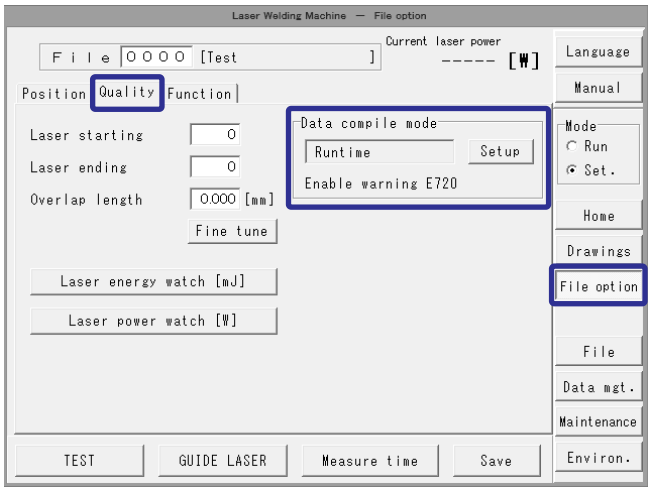
Reference

- The max. measurable time is 9999 seconds.
- In case the actual processing time is shorter than the one-shot output time, the result of measurement is same as the one-shot output time. Refer to “2-9-3 I/O and communication settings” (P.109) for setting method.
- When the trigger mode is set to “Continuous trigger”, the measurement result indicates the time for one lasing operation.

3. If a message “Lasing pause was detected.” appears after measuring time, change Data compile mode to Precompiled in File option menu.

Refer to “2-5-4 Data compile mode” (P.72).





2-3-7 Test lasing

Test lasing executes the laser radiation manually.
Use Test lasing when you want to check the lasing results while changing the setting parameters, such as during the testing to find the appropriate parameters or the maintenance work.

■ Test lasing procedures

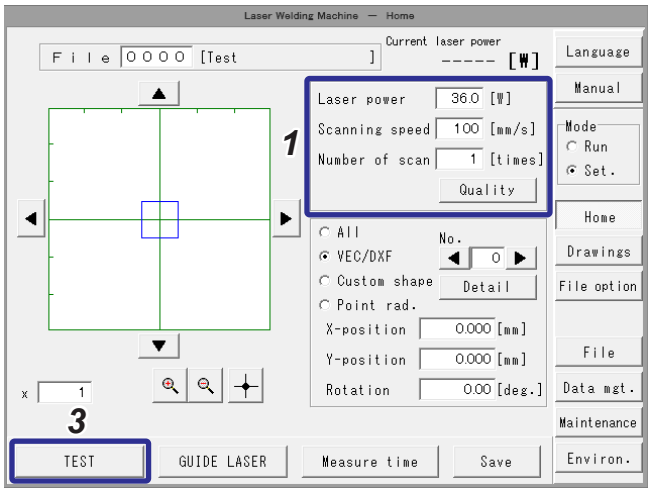
1. Set laser power, scanning speed and other parameters.

2. Turn ON the laser supply switch on the controller to start laser pumping.

3. Click “TEST”.

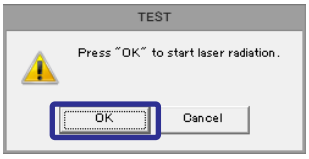
Test lasing is available on the following screen.

- Home
- Drawings
- File option
- File



4. The confirmation dialog box will appear.

To start lasing, click “OK”.



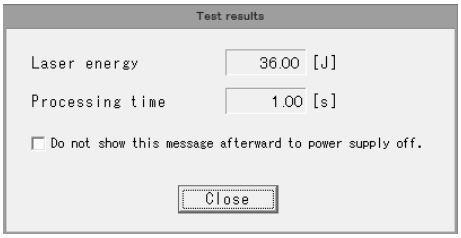
⚠WARNING

- Take laser protection measures such as wearing protective goggles or using protective enclosures during laser radiation.

5. To stop lasing before finishing the test lasing, click “STOP”.



6. When the test lasing is finished, laser energy and processing time are displayed.

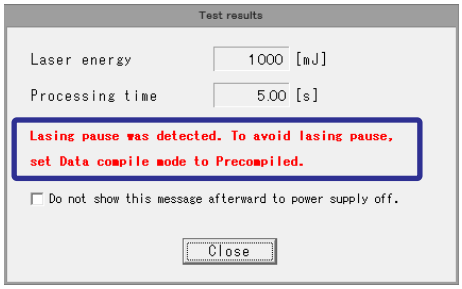


Reference

- Test lasing operation is not counted in Trigger count and Error count of Trigger counter function.
- Based on the test lasing results, set the warning threshold of laser energy. Refer to “2-5-5 Laser energy / laser power warning threshold” (P.73).
- When the trigger mode is set to “continuous trigger”, one lasing operation is executed at the test lasing. If you need to confirm the results of repeated lasing operation, set the trigger mode to “single trigger” and specify the “number of scans” while the test lasing.

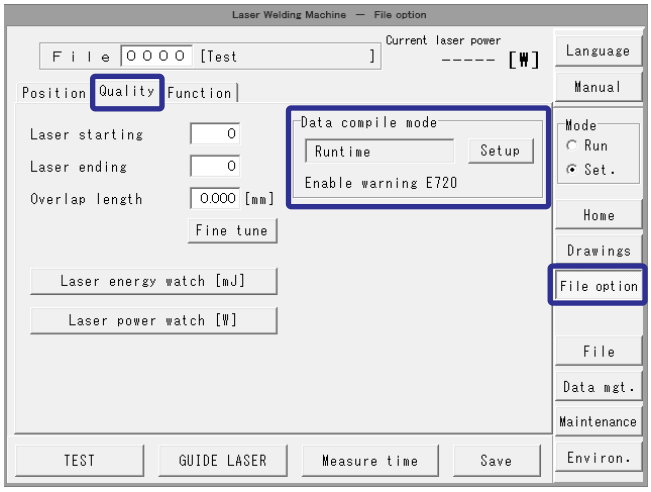
7. If a message “Lasing pause was detected.” appears after the test lasing, change Data compile mode to Precompiled in File option menu.

Refer to “2-5-4 Data compile mode” (P.72).



Reference

- When executing the processing time measurement before the test lasing, you can know the possibility of Lasing pause warning preliminarily. Refer to “2-3-6 Processing time measurement” (P.41).



2-3-8 Laser power monitoring

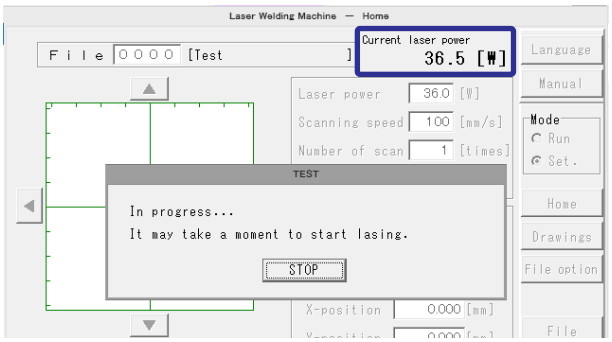
Measures the laser power in watt during the lasing operation automatically and displays the results as “Current laser power” in the screen.
The current laser power is displayed only during the lasing operation in the following screen.

- Under Setting mode: Home, Drawings, File option and File screens
- Under remote control mode or Run mode: Operation monitor and I/O monitor

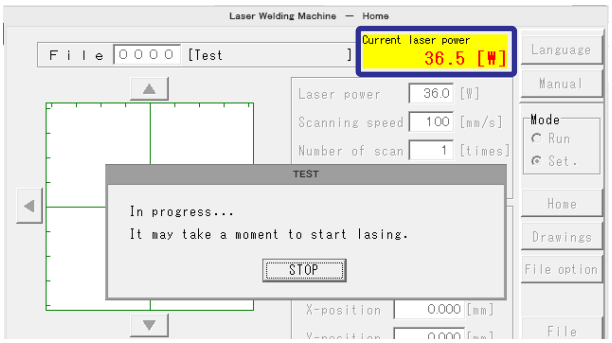
With the setting of warning threshold of laser power, the warning occurs when the measured laser power is out of the threshold. For the threshold setting, refer to “2-5-5 Laser energy / laser power warning threshold” (P.73).

■ Setting mode

In the range of the warning threshold
or
Without warning threshold setting

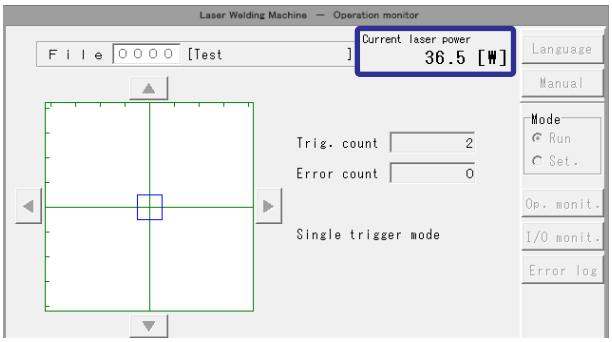


When exceeding the warning threshold

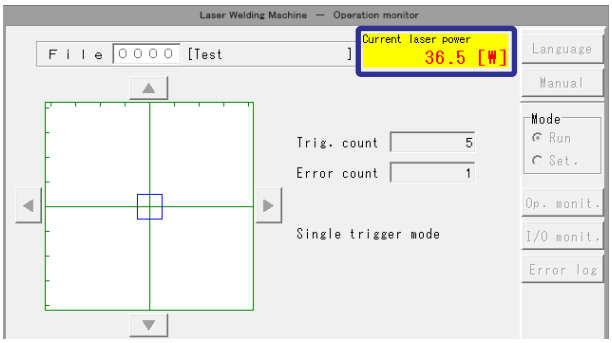


■ Remote mode and Run mode

In the range of the warning threshold
or
Without warning threshold setting



When exceeding the warning threshold



Reference

- The current laser power is updated at 0.5 second interval.
- If the lasing time is too short, the current laser power may not be shown.
- The power monitor function is a function to monitor fluctuations in the output laser power. The measurement results by the power monitor function may have max. ± 3.6W* difference from the laser power setting results.

* There may be a max. ± 3.6W difference for VL-W1A00-N/VL-W1A06-N and a max. ± 1.8W difference for VL-W1500-N/VL-W1506-N.
The power monitor installed in this product is not a measuring instrument. The setting difference between the laser power setting value and the power monitor measurement value may increase with the number of years of use. Use a commercially available power meter during daily maintenance and check the difference. When this difference interferes with the customer’s operation, our service staff will inspection and repair. Contact our agency.

- Warning for exceeding laser power threshold is released automatically when the lasing operation ended.
- If the laser power is measured at the laser off moment such as the interval of scanning lines, the measured laser power may be low. In this case, the measured results become invalid at the warning threshold detection.
- The current laser power can be output with the serial communication data. For details, refer to Setup/Maintenance Guide.

2-4 Drawings

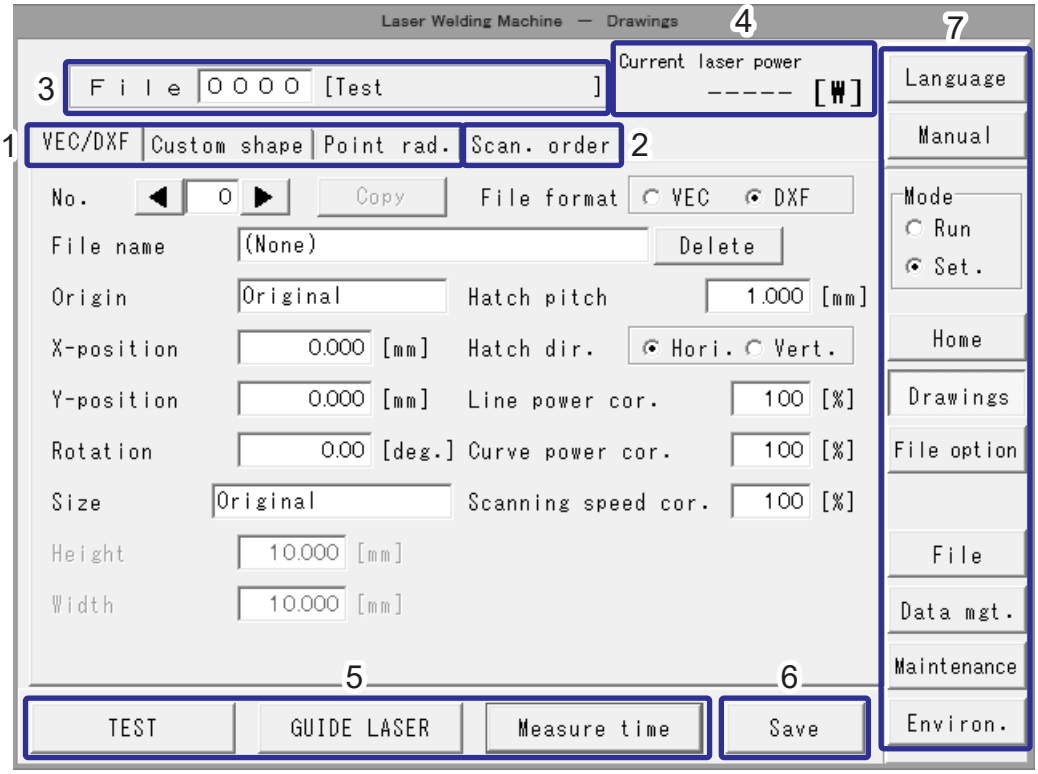
Set the drawing data for lasing in Drawings screen.

2-4-1 Type of drawing data

The following types of the drawing can be set as the scanning data for lasing.
It is possible to set the several drawings in one file.

Drawing type	Setting data
VEC file	Drawings converted to the laser welding machine special format “VEC” from DXF, HPGL, BMP or JPEG by using the attached “Logo Data Conversion Software”. Import a VEC file to the laser welding machine and set it as a scanning data for lasing.
DXF file	Drawings in DXF format. Import a DXF file to the laser welding machine and set it as a scanning data for lasing.
Custom shape	Drawings created with line, circle, arc and rectangle by specifying their sizes and positions.
Point radiation	Radiates laser to the point of the specified coordinate.

2-4-2 Configuration of drawings screen



	Item	Description
1	Drawing type	Select the drawing to set. • VEC/DXF: Refer to “2-4-3 VEC/DXF” (P.47). • Custom shape: Refer to “2-4-4 Custom shape” (P.56). • Point rad.: Refer to “2-4-5 Point radiation” (P.63).
2	Scanning order	When more than two drawings (VEC/DXF, Custom shape or Point radiation) are set in one file, specifies these scanning order. Refer to “2-4-6 Scanning order and group No.” (P.65).

	Item	Description
3	File	Displays the selected file No. and name. By clicking on the file No. field, file selection window appears. Refer to “2-6-2 File selection” (P.80).
4	Current laser power	Displays the measurement result of the laser power [W]. Available only during the lasing operation. Refer to “2-3-8 Laser power monitoring” (P.44).
5	TEST GUIDE LASER Measure time	Refer to “2-3-7 Test lasing” (P.42), “2-3-5 Guide laser” (P.38) and “2-3-6 Processing time measurement” (P.41).
6	Save	Overwrites the file in the laser welding machine. Refer to “2-6-4 Save the file to laser welding machine” (P.83).
7	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).

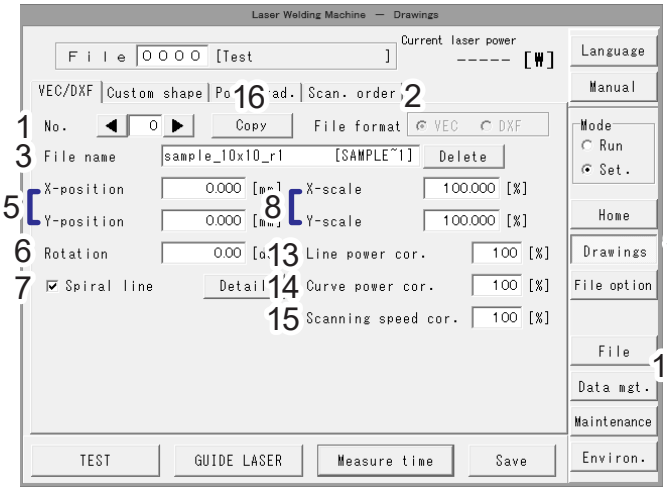
2-4-3 VEC/DXF

Sets a drawing file in VEC or DXF format pre-stored in the laser welding machine as the scanning data.

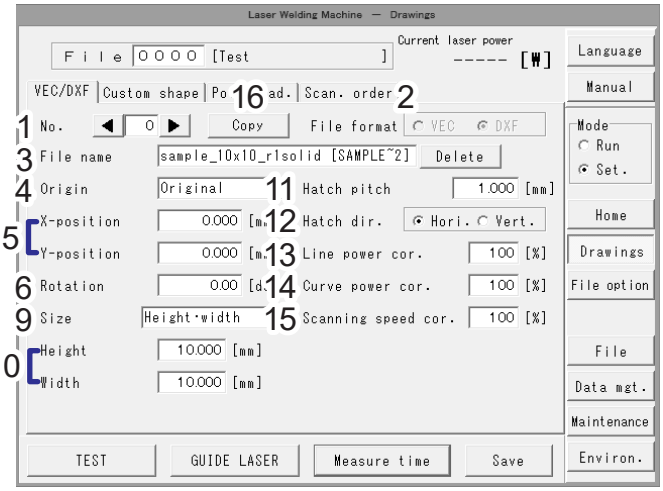
Reference

- Before set the VEC or DXF parameters, import the VEC/DXF files to the laser welding machine on Data management screen. Refer to “2-7 Data Management” (P.85).

VEC file



DXF file



	Setting elements	Description
1	VEC/DXF No.	Specifies the number of the VEC/DXF setting. Max. 16 VEC/DXF settings can be stored in one file. With this number the scanning order at lasing can be specified. This number is also used for the external control with a serial communication command. Setting range: 0 to 15
2	File format	Select the drawing file format (VEC or DXF).
3	VEC/DXF file name	Select VEC/DXF file to use. Clicking on the file name display field opens the list of VEC/DXF files pre-stored on Data management screen. To clear the file selection, click “Delete”.

Reference

- For the supported DXF files, refer to “Readable DXF File” (P.54).
- If the file is saved without selecting VEC/DXF file, the all setting parameters in the VEC/DXF No. are reset to default.
- Compared to the VEC file, the file size of the DXF becomes larger and its time to be in ready for lasing will be longer. In case of registering much VEC/DXF data or shortening the time for file change, convert the DXF file into the VEC file using the attached “Logo Data Conversion Software”.

4	Origin *2	Specifies where is the original point in the drawing. • Center • Upper left • Lower left • Upper right • Lower right • Original
5	X-position [mm] Y-position [mm]	Specifies the origin coordinate of the drawing. Setting range: -999.999 to +999.999 mm

	Setting elements	Description

Reference

- For the VEC drawings, the original point is specified when it is converted to VEC format with Logo data conversion software.

6	Rotation [deg.]	Rotates the drawing at the input angle. The rotation center is the origin of the drawing. The drawing rotates in CW direction with minus angle, and in CCW with plus angle. Setting range: -360.00 to +360.00 °
7	Spiral line *1	The all lines in the selected drawing become spiral form to make thick lines. Refer to “Spiral line” (P.49).
8	X-scale [%] *1 Y-scale [%] *1	Specifies the magnification to enlarge or reduce the size of VEC drawings. Setting range: 10.000 to 1000.000 %
9	Size specification *2	Select how to specify the drawing size. • Height and width: specifies the both length. • Width (keep ratio): specifies width. The height changes keeping the original aspect ratio. • Height (keep ratio): specifies height. The width changes keeping the original aspect ratio. • Original: keeps original size.
10	Height [mm] *2 Width [mm] *2	Specifies the length according to the size specification setting. Setting range: VL-W1500-N, VL-W1A00-N : 000.100 to 300.000 mm VL-W1506-N, VL-W1A06-N : 000.100 to 600.000 mm
11	Hatch pitch [mm] *2	Specifies the line interval of the hatching. This setting is valid with the DXF file created by using hatching or solid function. Setting range: VL-W1500-N, VL-W1A00-N : 000.010 to 200.000 mm VL-W1506-N, VL-W1A06-N : 000.010 to 400.000 mm
12	Hatch direction *2	Select the direction of the hatching lines. This setting is valid with the DXF file created by using hatching or solid function. • Horizontal • Vertical
13	Line power correction [%]	Corrects the laser power and scanning speed of the selected drawings. The correction ratio is calculated using the value set at Home screen as 100%. Setting range: Line power correction : 0 to 999 % Curve power correction : 1 to 999 % Scanning speed correction : 1 to 999 %
14	Curve power correction [%]	
15	Scanning speed correction [%]	

Reference

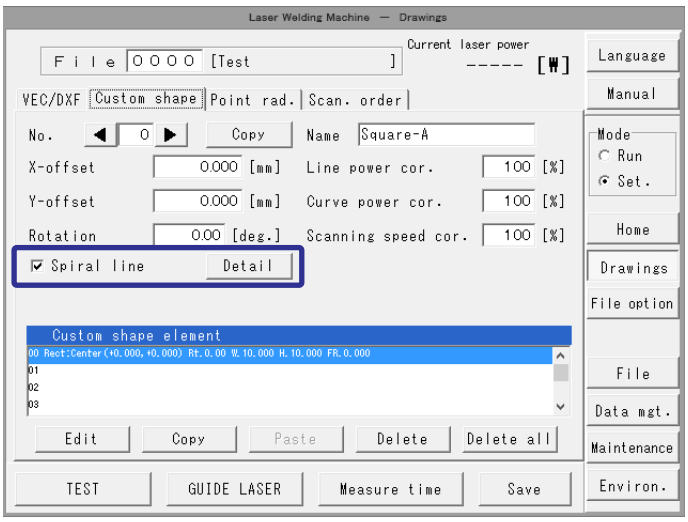
- When Line power correction is 0%, the whole data of this drawing including the curved lines is not scanned at lasing.
- When Line power correction is 0%, the drawing can be indicated with guide laser by selecting “Masked data” to guide mode.
- The drawing data with Line power correction 0% does not affect the processing time at lasing.
- If the corrected value exceeds the setting limit, the nearest upper or lower limit value of the each item is set.

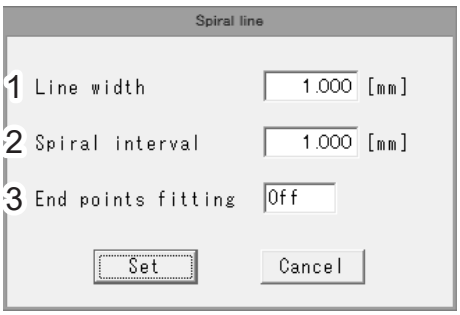
16	Copy	Copies the VEC/DXF parameters of the selected VEC/DXF No. and paste it to another No.

*1 : Available when the drawing format is VEC.
*2 : Available when the drawing format is DXF.

■ Spiral line

With the setting of Spiral line, the all lines in the selected drawing become spiral form to make thick lines.
Spiral line is available for the VEC drawings and Custom shape drawings.
To use this function, check “Spiral line” and click “Detail” to set the line parameters.



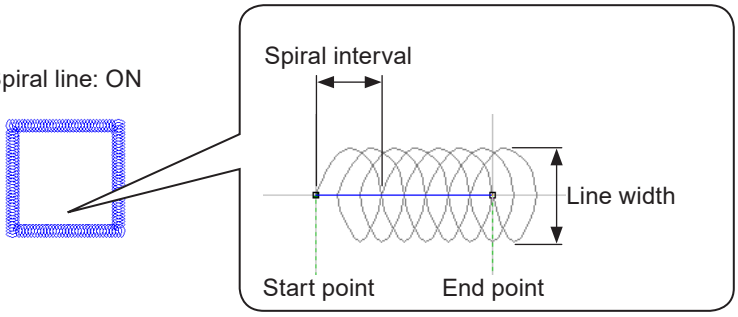


Example of spiral line

Spiral line: OFF



Spiral line: ON

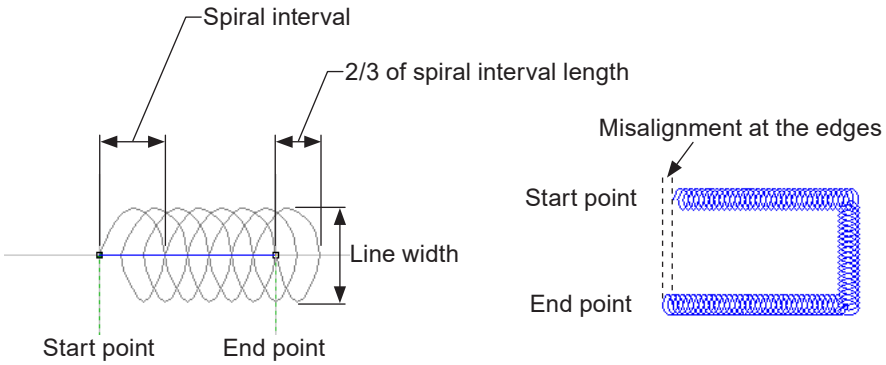
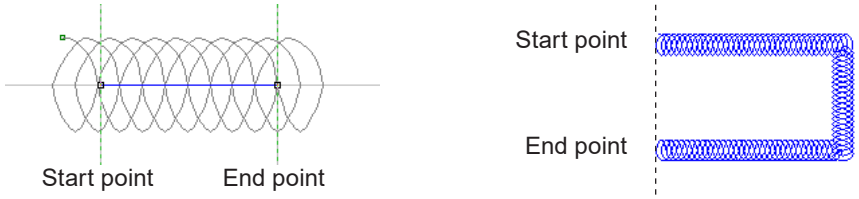


Spiral line parameters

	Item	Description
1	Line width [mm]	Specifies the width of the spiral line. Setting range: VL-W1500-N, VL-W1A00-N : 0.010 to 200.000 mm; VL-W1506-N, VL-W1A06-N : 0.010 to 400.000 mm Initial setting: 1.000 mm
2	Spiral interval [mm]	Specifies the cycle of the spiral. Setting range: VL-W1500-N, VL-W1A00-N : 0.010 to 200.000 mm; VL-W1506-N, VL-W1A06-N : 0.010 to 400.000 mm Initial setting: 1.000 mm

Reference

- If the drawing data contains serial short lines, there is a case that the spiral line setting does not work properly. For such drawing data, set smaller value for spiral interval.

	Item	Description
3	End points fitting	With End points fitting, the spiral line length is auto-adjusted according to the attribute of start and end points. Check the start, end and crossed points of the spiral line in the image view of Home screen, and if the line length needs to be adjusted, use this function. • When End points fitting is Off: The spiral line starts from the specified start point and always ends at the offset point of 2/3 of the spiral interval length behind from the specified end position. • When End points fitting is On: The spiral length is auto-adjusted according to the attribute of start and end points. When the start and end points are on the coaxial position, set “On” to justify the edges. Example of End points fitting • End points fitting: OFF  • End points fitting: ON 

Reference

- End points fitting is not applied to the lines which start and end points are in the same coordinate, such as a circle and a rectangle. For such lines, the spiral line edges are optimized by default. However, if the lines are corrected by using Overlap length or other parameters and the start and end points are not in the same position, End points fitting is applied to such lines.
- If the spiral lines overlap at the crossed points and to avoid this overlapping, change the property of these start or end points to “1” by using the attached “Logo Data Conversion Software”. Refer to Logo Data Conversion Operation Manual.

■ VEC/DXF setting procedures

Set the selected drawing file (VEC/DXF) as a scanning data for lasing.

1. Store the VEC or DXF file in a USB memory and insert it to the controller of the laser welding machine.

Reference

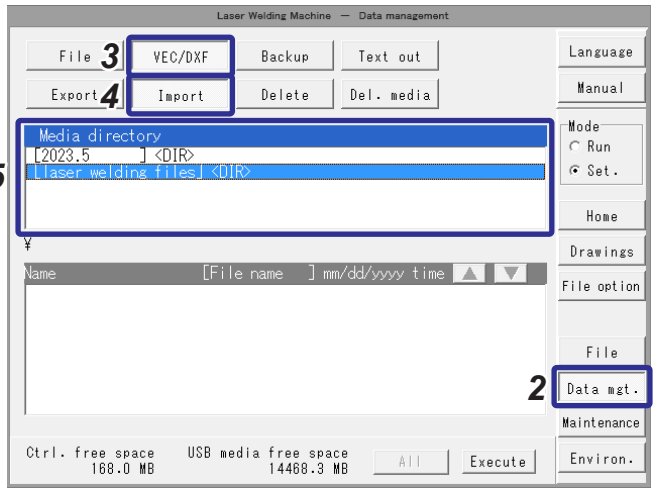
- To upload a VEC file directly from the attached “Logo Data Editing Software” to the laser welding machine, refer to “Upload or Download a VEC file by using Logo Data Editing software” (P.53).

2. Click “Data mgt.” on the right menu.

3. Click “VEC/DXF”.

4. Click “Import”.

5. Select the directory where the drawing data is stored.



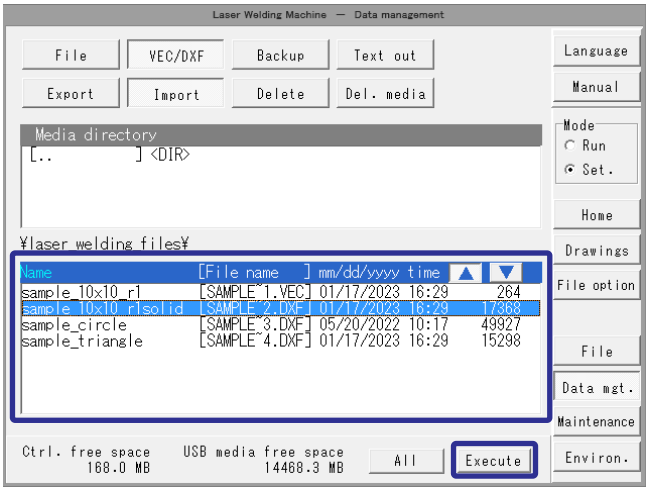
6. Select the drawing file and click “Execute”.

Available file type:

- VEC file
- DXF file

Reference

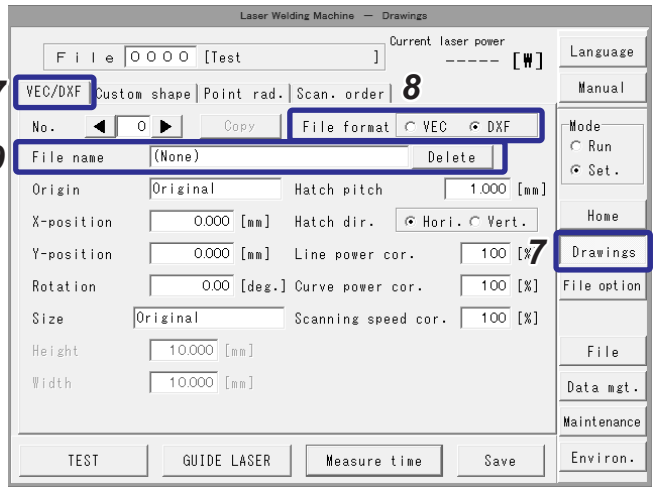
- Refer to “2-7-3 Import data to laser welding machine” (P.88) for details.



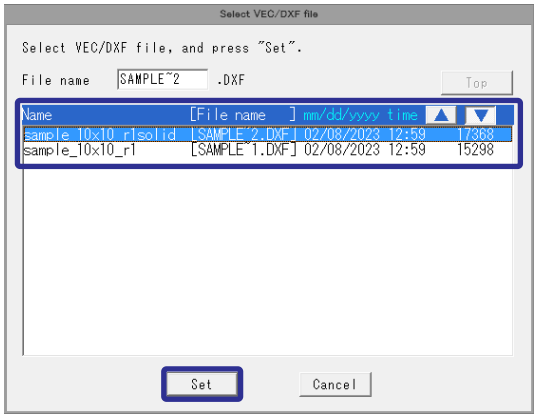
7. Click “Drawings” on the right menu and select “VEC/DXF” tab.

8. Select the file format between VEC or DXF.

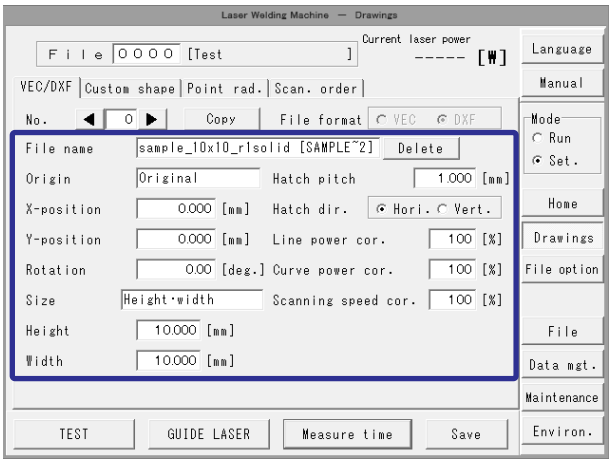
9. Open the VEC or DXF file list by clicking on the file name field.



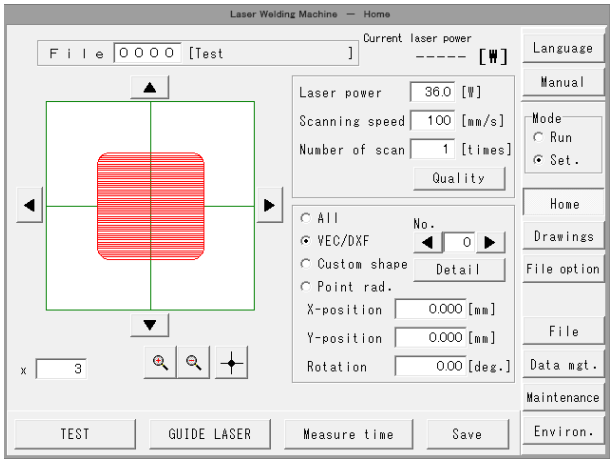
10. Select the drawing file and click “Set”.



11. Set the drawing parameters such as position and size.



12. Click “Home” on the right menu and check the working image.



Reference

- VEC is the laser welding machine special format for the drawings converted from DXF, HPGL, BMP or JPEG by using the attached “Logo Data Conversion Software”.
- To modify the VEC drawings, use the attached “Logo data editing software”.

■ Upload or Download a VEC file by using Logo Data Editing software

When drawing or modifying a VEC file by using the attached software “Logo Data Editing”, it is possible to upload the file directly from the software to the laser welding machine.
It is also possible to download a VEC file stored in the laser welding machine to the software.

Upload and download procedures

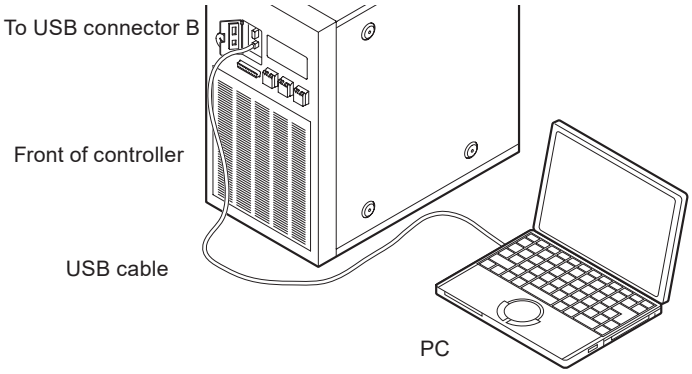
1. Turn ON the power of laser welding machine.

Reference

- During remote control mode or run mode operation, you cannot upload or download a VEC file.
- While uploading or downloading a VEC file, display other than Data management screen in the laser welding machine.

2. Connect the PC to the laser welding machine with the attached USB cable and start up Logo Data Editing software.

To upload a VEC file, open the target file on Logo Data Editing software.

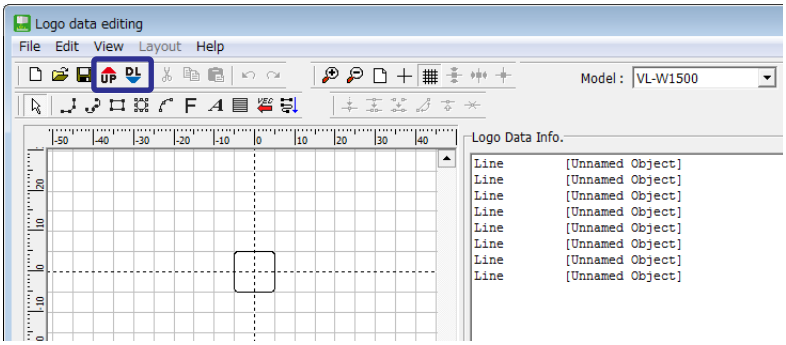


Reference

- Connect a PC to one Laser welding machine. It is not possible to connect two or more Laser welding machines via a USB hub, etc.

3. Click “UP” or “DL” icon in the left upper of Logo Data Editing.

At uploading a VEC file, input the file name and comment shown in the laser welding machine.



4. The confirmation dialog for the connecting model of the laser welding machine appears. Click “Yes” to continue.

5. Upload or download the VEC file.

- At uploading:
  The VEC file opened in Logo Data Editing software is uploaded to the laser welding machine. The uploaded file is shown in VEC/DXF file list in Data management screen of the laser welding machine.
- At downloading:
  The list of VEC files stored in the laser welding machine is displayed. Select a VEC file and click “Download”. The downloaded file is opened in Logo Data Editing software.

Reference

- To use the uploaded VEC file, set it to Drawing data by following the procedures in “VEC/DXF setting procedures” (P.51).
- Up to 2048 VEC/DXF files can be saved in the laser welding machine.
- While the upload/download processing, the laser welding machine is under the online control mode and other operations are disabled.
- For the detail of Logo Data Editing software, refer to Logo data editing operation manual.

■ Readable DXF File

This laser welding machine can read the DXF file with the following format.

- DXF-R12J, R13, R14 format

It is recommended to use DXF file created by AutoCADLT (AutoCAD are produced by Autodesk, Inc.).
The DXF-R12J, R13J, R14J format file to be created by AutoCADLT can be prepared using the “Writing” function in “File” menu of AutoCADLT.
At this time, select “AutoCADLT R2/R12J/R13J/R14DXF” from “File Format” in “Data Writing” dialog, and then click [Save] button.
Refer to “Operation Method” that is appeared on the screen by searching the reference pages on the online help of AutoCADLT using the keyword such as “Writing”.

Applicable DXF functions and elements

DXF version	Entity name	Graphic name	Applica-bility*	Remarks
R12J R13J R14	3DFACE	3D face	N	
	3DLINE	3D line	N	
	ARC	Arc	Y	
	ATTDEF	Attribute definition	N	
	ATTRIB	Attribute	N	
	CIRCLE	Circle	Y	
	DIMENSION	Dimension	N	
	INSERT	Insert graphic	Y	
	LINE	Segment	Y	
	POINT	Point	N	
	POLYLINE	2D polyline	Y	Bold line is not supported.
		3D polyline	N	
	SEQEND	Sequence end	Y	SEQEND in combination with POLYLINE element is available.
	SHAPE	Shape	N	
	SOLID	2D paint	Y	The SOLID element is converted to the outline and filling lines. The filling lines are either of vertical or horizontal lines.
	TEXT	Character	N	
	TRACE	Bold line	N	
	VERTEX	Vertex	Y	VERTEX in combination with POLYLINE element is available.
	VIEWPORT	View port	N	

DXF version	Entity name	Graphic name	Applica-bility*	Remarks
R13J R14	3DSOLID	3D paint	N	
	ACAD_PROXY_ ENTITY	Proxy graphic	N	
	BODY	Body	N	
	ELLIPSE	Ellipse	Y	
	IMAGE	Image	N	
	LEADER	Lead line	N	
	LWPOLYLINE	Light Weight polyline	Y	Bold line is not supported.
	MLINE	Multi-line	N	
	MTEXT	Multi-text	N	
	OLEFRAME	OLE frame	N	
	OLE2FRAME	OLE2 frame	N	
	RAY	Radiation (half line)	Y	
	REGION	Region	N	
	SPLINE	Free curve	Y	
	TOLERANCE	Geometric tolerance	N	
	XLINE	Line (straight line)	Y	
R14	HATCH	Hatching	Y	Graphics which contain POLYLINE or SPLINE are not supported. The HATCH element is converted to the outline and filling lines. The filling lines are either of vertical or horizontal lines.
	ARCALIGNEDTEXT	Character string on arc	N	
	RTEXT	Reference character string	N	
	WIPEOUT	Masking graphic	N	

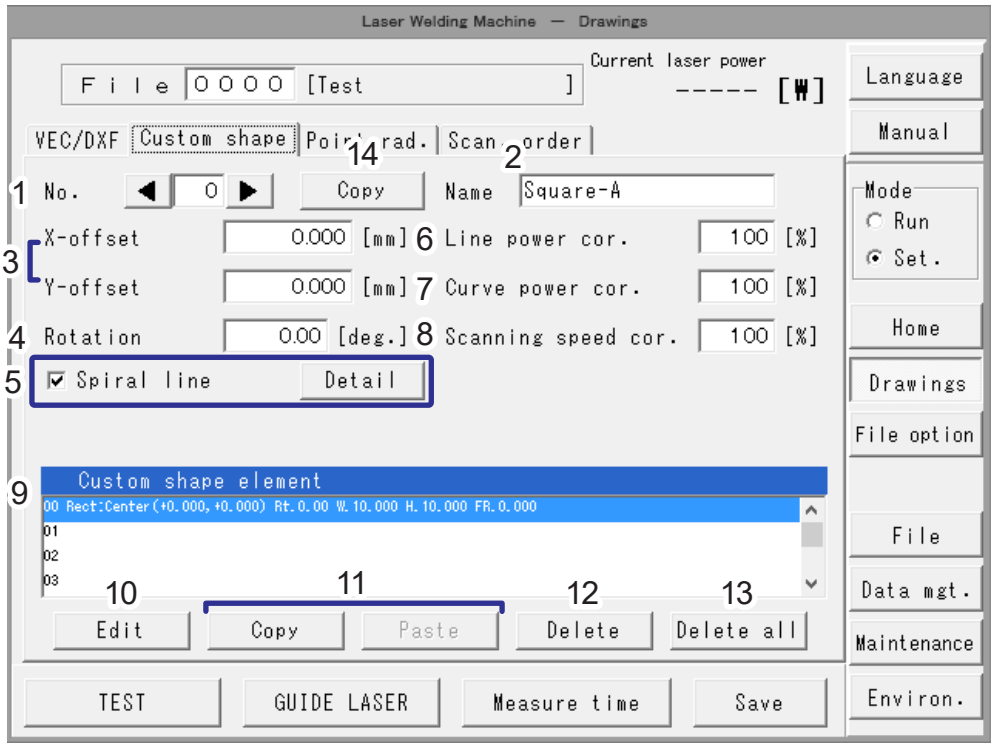
* For the applicability of the function, “Y” means “applicable” and “N” means “not applicable for this laser welding machine”.

Reference

- If the graphic data which contains filling lines cannot be converted properly, change the file format of the DXF file.
- The DXF file including entity not applicable to the laser welding machine cannot be used.
- Max. 128 layers in one DXF file are supported.
- When the drawing magnification of VEC file is set less than 100% in the laser welding machine setting, the drawing including curve might not be drawn by laser as just the original images.
- Depending on the drawing procedures and methods of the DXF data, there might be a minor conversion error and some graphics might not be drawn by the laser welding machine as just the original images.

2-4-4 Custom shape

Creates drawings with line, circle, arc and rectangle by specifying their sizes and positions.



	Item	Description
1	Custom shape No.	Specifies the number of the custom shape setting. Max. 16 custom shape settings can be stored in one file. With this number the scanning order at lasing can be specified. This number is also used for the external control with a serial communication command. Setting range: 0 to 15
2	Custom shape name	Each custom shape can be named. This name is shown in the scanning order list. The following characters can be used for the name. • Alphanumeric: less than 20 digits • Symbols and Japanese characters: less than 10 digits
3	X-offset [mm] Y-offset [mm]	Moves the all custom shape elements in the selected No. to X- or Y-direction from the current setting position. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
4	Rotation [deg.]	Rotates the custom shape at the input angle. The rotation center is the center of the working field. It rotates in clockwise direction with minus angle, and in counterclockwise with plus angle. Setting range: -360.00 to +360.00°
5	Spiral line	The all lines in the selected drawing become spiral form to make thick lines. Refer to “Spiral line” (P.49).

	Item	Description
6	Line power correction [%]	Corrects the laser power and scanning speed of the selected drawings. The correction ratio is calculated using the value set at Home screen as 100%.
7	Curve power correction [%]	
8	Scanning speed correction [%]	

Setting range	Line power correction	: 0 to 999 %
	Curve power correction	: 1 to 999 %
	Scanning speed correction	: 1 to 999 %

Reference

- When Line power correction is 0%, the whole data of this drawing including the curved lines is not scanned at lasing.
- When Line power correction is 0%, the drawing can be indicated with guide laser by selecting “Masked data” to guide mode.
- The drawing data with Line power correction 0% does not affect the processing time at lasing.
- If the corrected value exceeds the setting limit, the nearest upper or lower limit value of the each item is set.

9	Custom shape element	The list of the drawing elements such as line, circle, arc and rectangle that constitutes a custom shape. Max. 32 elements can be set in one custom shape No. Refer to “Straight line” (P.58), “Circle” (P.59), “Arc” (P.60) and “Rectangle” (P.61).

Reference

- The line No. of the list represents the scanning order of the elements in a custom shape.
- If the two or more elements meet the following all conditions, these elements are connected as one line.
  - The end point of the line is in the same position with the start point of the next line.
  - Elements are created with lines or arcs.
  - Elements are set in the consecutive line No. in the same custom shape No.

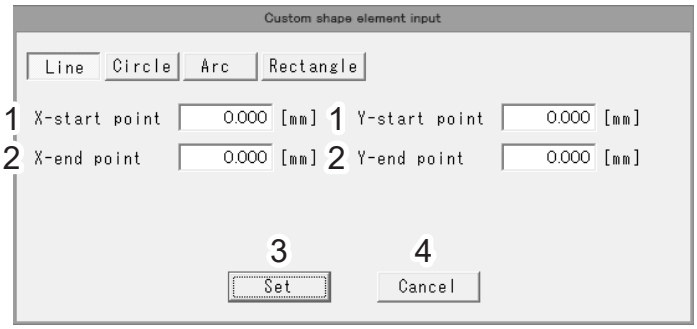
10	Edit	Inputs or modifies the custom shape element. After selecting a line, click “Edit”.
11	Copy, Paste	Copies the selected custom shape element and paste it to another line.

Reference

- The copied element can be pasted to the other file.

12	Delete	Deletes the selected custom shape element.
13	Delete all	Deletes the all custom shape elements.
14	Copy	Copies the custom shape parameters including all elements setting of the selected custom shape No. and paste it to another No. After the clicking “Copy”, specify the custom shape No. to paste it.

■ Straight line



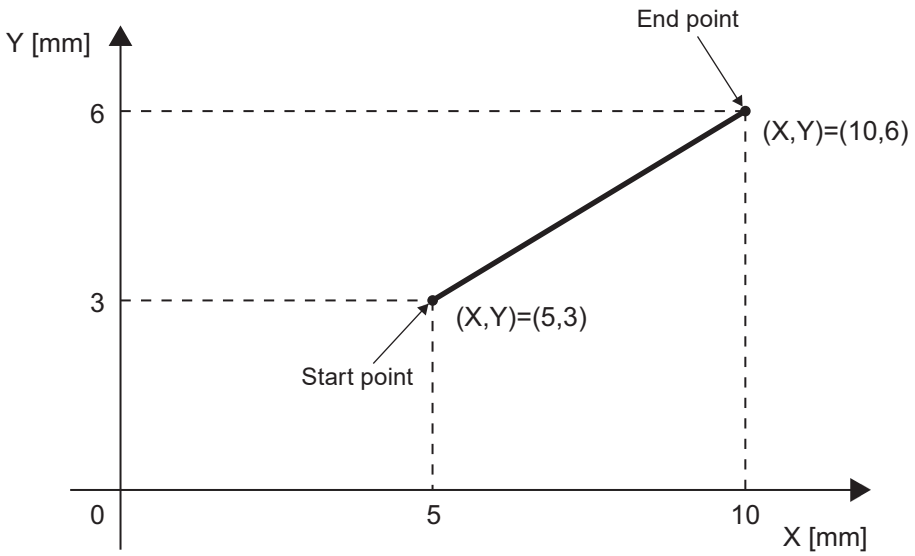
	Item	Description
1 2	X-/Y-start point [mm] X-/Y-end point [mm]	Specifies the coordinate of the start and end point of the line. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm

Reference

- If the position of all four points are the same, the line setting becomes invalid.

3	Set	Applies the settings and closes the window.
4	Cancel	Cancels the settings and closes the window.

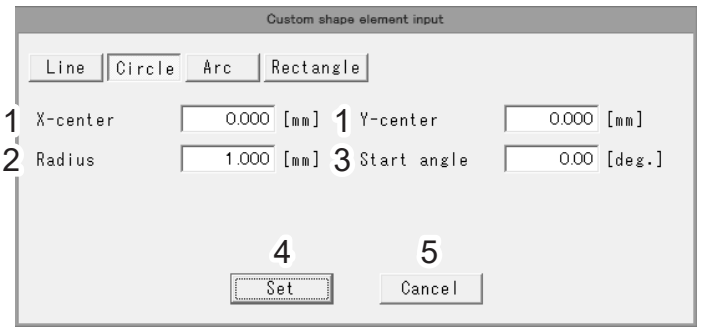
Setting example of line



Reference

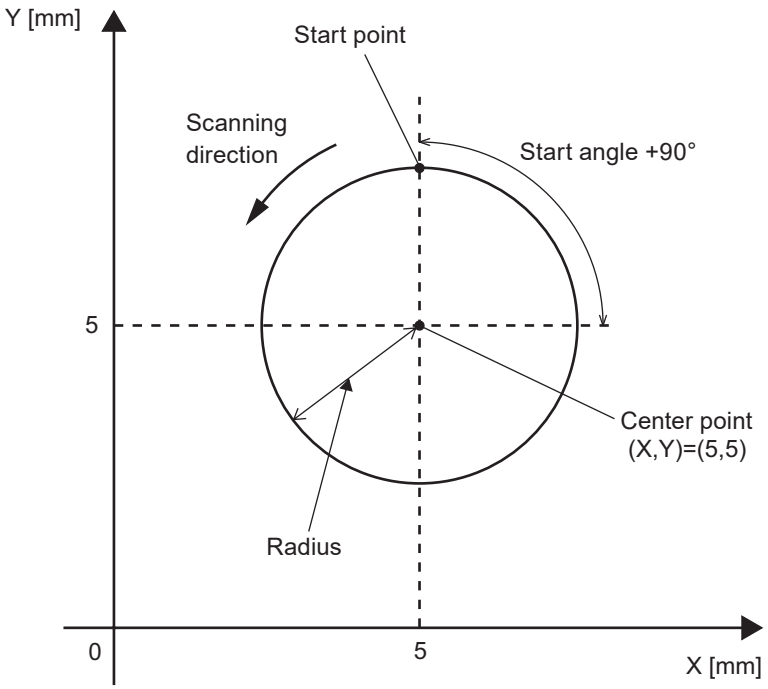
- If the two or more elements meet the following all conditions, these elements are connected as one line.
  - The end point of the line is in the same position with the start point of the next line.
  - Elements are created with lines or arcs.
  - Elements are set in the consecutive line No. in the same custom shape No.

■ Circle



	Item	Description
1	X-/Y-center [mm]	Specifies the center position of the circle. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
2	Radius [mm]	Specifies the radius of the circle. Setting range: VL-W1500-N, VL-W1A00-N : 0.010 to 100.000 mm VL-W1506-N, VL-W1A06-N : 0.010 to 200.000 mm
3	Start angle [deg.]	Specifies the start position with the angle for the scanning of the circle. Setting range: -360.00 to +360.00°
4	Set	Applies the settings and closes the window.
5	Cancel	Cancels the settings and closes the window.

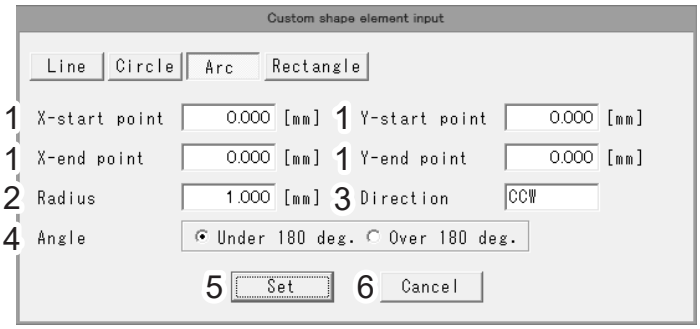
Setting example of circle



Reference

- For the circle, the start point of the scanning is specified by Start angle. From there, the circle is drawn to the counterclockwise direction at lasing.
- To adjust the overlapping position of the start and end points, refer to “2-5-3 Quality adjustment” (P.69).

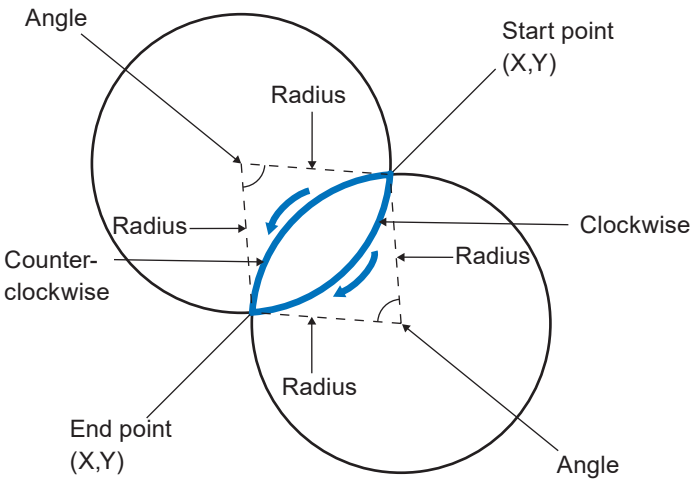
■ Arc



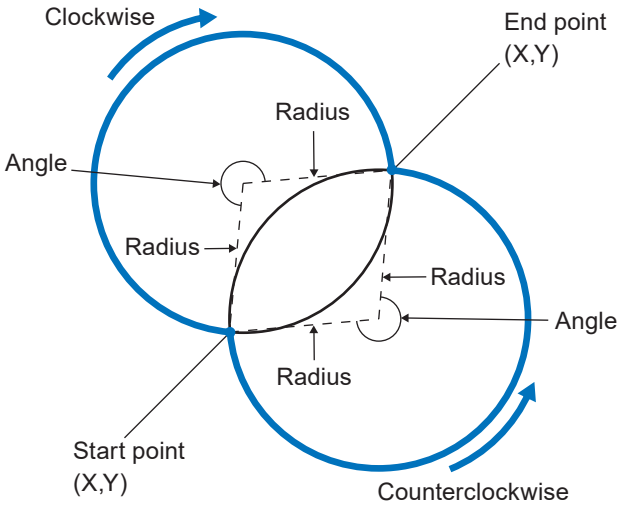
	Item	Description
1	X-/Y-start point [mm] X-/Y-end point [mm]	Specifies the coordinate of the start and end point of the arc. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
2	Radius [mm]	Specifies the radius of the arc. Setting range: 0.010 to 999.999 mm
3	Direction	Select the drawing direction of the arc from “CCW (counterclockwise)” or “CW (clockwise)”.
4	Angle	Select the arc angle from “Under” or “Over” 180 degree.
5	Set	Applies the settings and closes the window.
6	Cancel	Cancels the settings and closes the window.

Setting example of arc

- Angle: under 180 degree



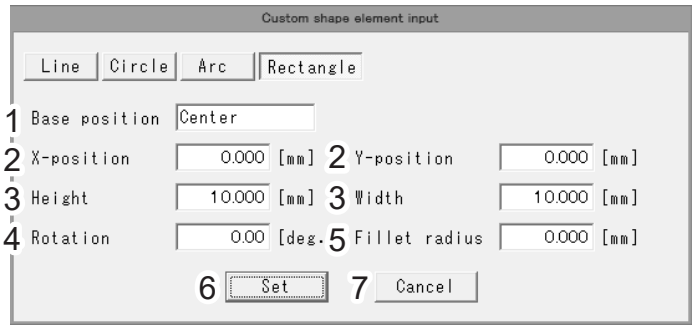
- Angle: over 180 degree



Reference

- If the two or more elements meet the following all conditions, these elements are connected as one line.
  - The end point of the line is in the same position with the start point of the next line.
  - Elements are created with lines or arcs.
  - Elements are set in the consecutive line No. in the same custom shape No.

■ Rectangle



	Item	Description
1	Base position	Select the origin of the rectangle. X- and Y-position are applied to this position. Setting range: Center/ Upper left / Upper right / Lower left / Lower right
2	X-/Y-position [mm]	Specifies the coordinate of the base position. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
3	Height / Width [mm]	Specifies the vertical and horizontal length of the rectangle. Setting range: VL-W1500-N, VL-W1A00-N : 0.100 to 300.000 mm VL-W1506-N, VL-W1A06-N : 0.100 to 600.000 mm
4	Rotation [deg.]	Rotates the rectangle at the input angle. The rotation center is the base position. The rectangle rotates in CW direction with minus angle, and in CCW with plus angle. Setting range: -360.00 to +360.00°
5	Fillet radius [mm]	To make the corners rounded, input the value here. For the rectangle without rounded corners, set 0 mm here. Setting range: VL-W1500-N, VL-W1A00-N : 000.000 to 100.000 mm VL-W1506-N, VL-W1A06-N : 000.000 to 200.000 mm

Reference

- For the fillet radius, set smaller value than half of the width or height of the rectangle.

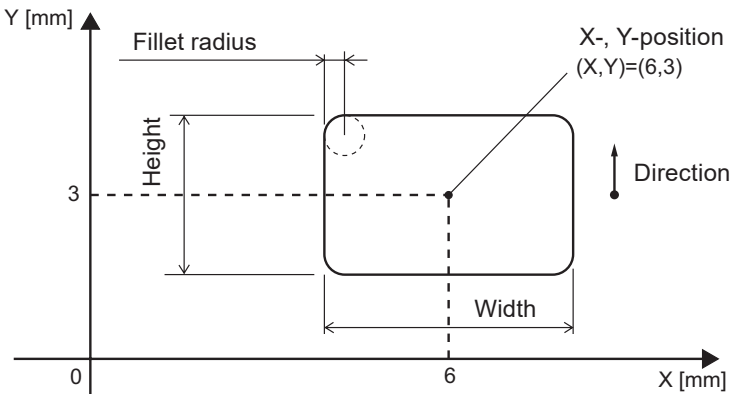
6	Set	Applies the settings and closes the window.
7	Cancel	Cancels the settings and closes the window.

Reference

- For the rectangle, the start point of the scanning is the center of the right side line. From there, the rectangle is drawn to the counterclockwise direction at lasing.
- To adjust the overlapping position of the start and end points, refer to “2-5-3 Quality adjustment” (P.69).

Setting example of rectangle

Base position = Center

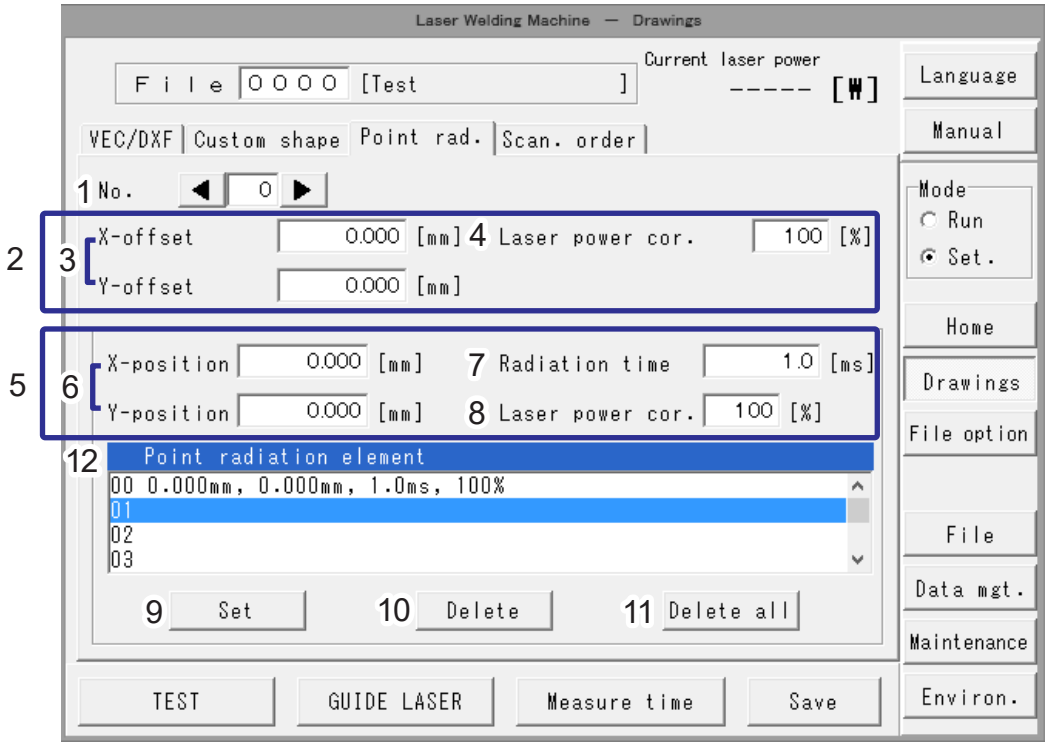


2-4-5 Point radiation

Point radiation is a function lasing at a point of the specified coordinate with the setting time and laser power.

⚠WARNING

- During the radiation, the laser energy is concentrated to one point. Use due caution with long period radiation, it may cause a fire or damage to the object.



	Item	Description
1	Point radiation No.	Specifies the number of the point radiation setting. Max. 16 settings can be stored in one file. With this number the scanning order at lasing can be specified. This number is also used for the external control with a serial communication command. Setting range: 0 to 15
2	Point radiation correction (to all points)	Specifies the offset value of the position and laser power to the all points (max. 50 points) set in the selected point radiation No.
3	X-offset [mm] Y-offset [mm]	Moves the all points set in the selected point radiation No. from currently set position. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
4	Laser power correction [%]	Corrects the laser power of the all points in the selected point radiation No. The correction ratio is calculated using the value set at Home screen as 100%. Setting range: 0 to 999 %

Reference

- When Laser power correction is 0%, the all points set here are not scanned at lasing.
- The points with Laser power correction 0% does not affect the processing time at lasing.
- If the corrected value exceeds the setting limit, the nearest upper or lower limit value is set.

	Item	Description
5	Point radiation parameters (to one point)	Sets the position, time and laser power correction ratio of each point. Max. 50 points can be set in one point radiation No.
6	X-position [mm] Y-position [mm]	Specifies the position of each point. Setting range: VL-W1500-N, VL-W1A00-N : -100.000 to +100.000 mm VL-W1506-N, VL-W1A06-N : -200.000 to +200.000 mm
7	Radiation time [ms]	Specifies the period of the laser radiation. Setting range: 0.1 to 99999.9 ms
8	Laser power correction [%]	Corrects the laser power of the selected point. The correction ratio is calculated using the value set at Home screen as 100%. Setting range: 0 to 999 %

Reference

- When Laser power correction is 0%, the selected point is not scanned at lasing.
- The points with Laser power correction 0% does not affect the processing time at lasing.
- If the corrected value exceeds the setting limit, the nearest upper or lower limit value is set.

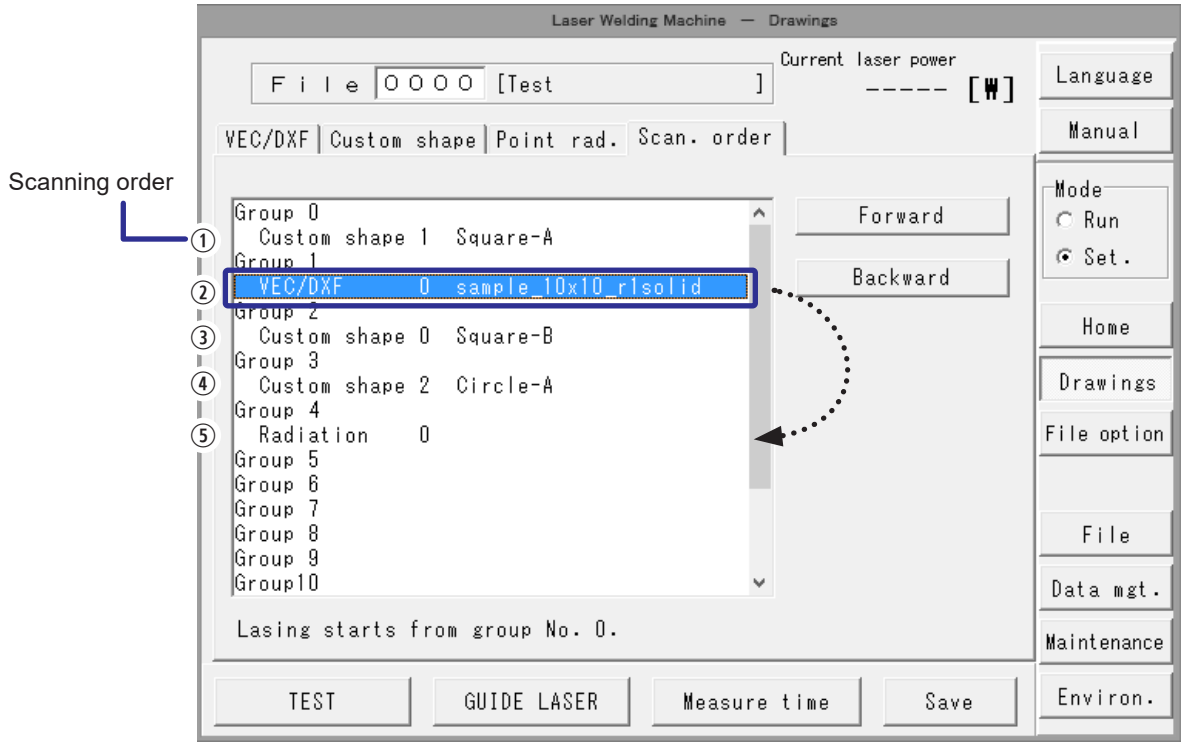
9	Set	Applies the setting of the each point radiation parameters.
10	Delete	Deletes the selected radiation position and time setting.
11	Delete all	Deletes the all radiation position and time settings.
12	List of radiation points	Displays each point parameters such as the position and radiation time.

Reference

- To adjust the on/off timing of the point radiation, refer to “2-5-3 Quality adjustment” (P.69).

2-4-6 Scanning order and group No.

The all drawings set in the file are displayed on the list.
The display order indicates the scanning order. The drawings are scanned from top to bottom in the list.
To change the scanning order, move the drawing to other Group No. by clicking “Forward” or “Backward”. The setting data is scanned from smallest to largest Group No.



Reference

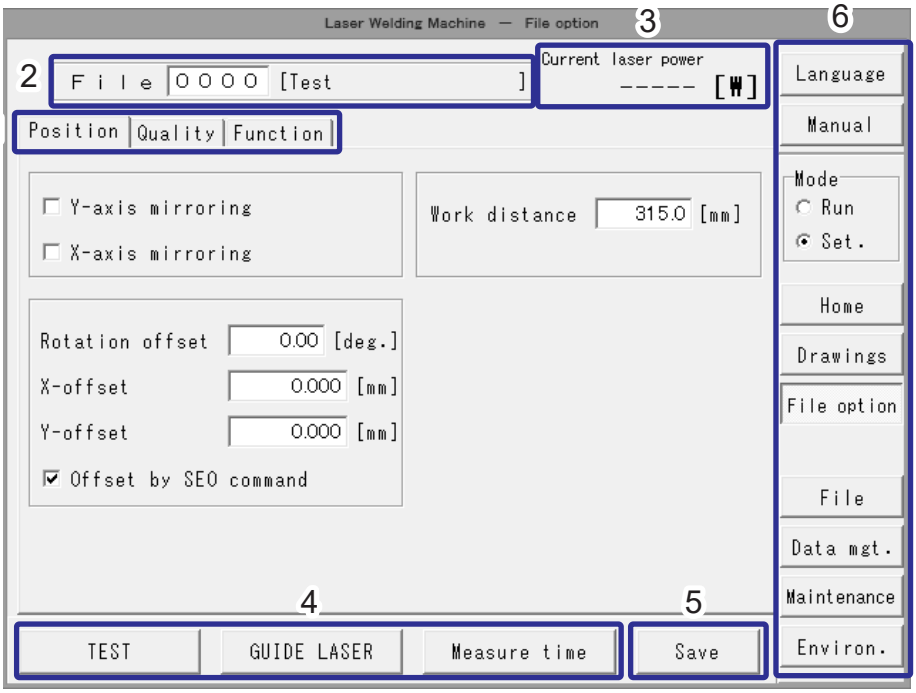
- Group No. specifies the scanning order at lasing. In default setting, the all drawings are in Group No. 0.
- If two or more drawings belongs to one Group No., the scanning order in the group is defined by the following rules.
  - Among the different drawing types, they are scanned in the order from VEC/DXF, Custom shape, and then Point radiation.
  - Among the same drawing type, they are scanned in the order of the drawing No. from smallest to largest.
- The scanning order in a group cannot be specified. To change the scanning order, move the drawings to other Group No.
- When the name of the custom shape is set, the name is shown in the scanning order list.

2-5 File Option

In File option screen the following items are set. This setting is applied to all drawings in a file.

- Adjustment of lasing position and layout
- Adjustment of lasing quality
- Laser energy and Laser power monitoring condition
- Trigger mode setting
- Trigger delay and Trigger counter settings

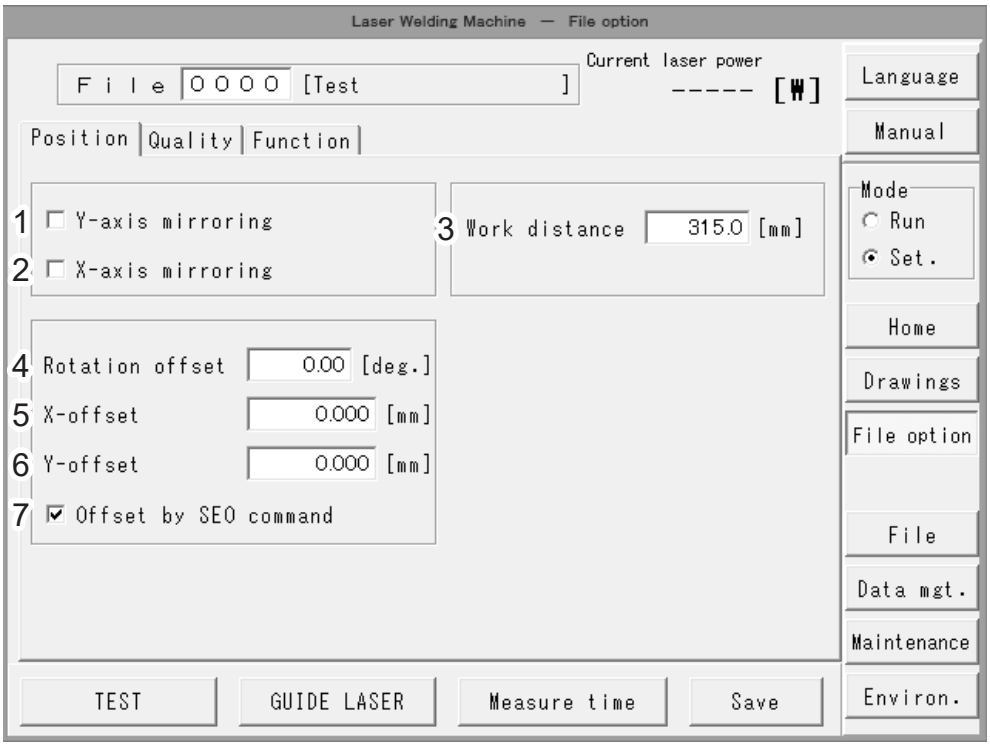
2-5-1 Configuration of file option screen



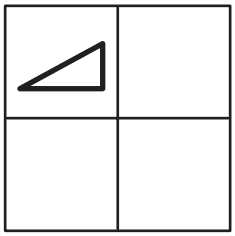
	Setting elements	Description
1	File option menu	Select the setting category from the followings. • Position: Adjusts the position and layout of the all data in the file. • Quality: Adjusts laser parameters in detail and sets Laser energy and Laser power monitoring function. • Function: Sets Trigger mode, Trigger delay and Trigger counter details.
2	File	Displays the selected file No. and name. By clicking on the file No. field, file selection window appears. Refer to “2-6-2 File selection” (P.80).
3	Current laser power	Displays the measurement result of the laser power [W]. Available only during the lasing operation. Refer to “2-3-8 Laser power monitoring” (P.44).
4	TEST GUIDE LASER Measure time	Refer to “2-3-7 Test lasing” (P.42), “2-3-5 Guide laser” (P.38) and “2-3-6 Processing time measurement” (P.41).
5	Save	Overwrites the file in the laser welding machine. Refer to “2-6-4 Save the file to laser welding machine” (P.83).
6	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).

2-5-2 Position adjustment of whole data

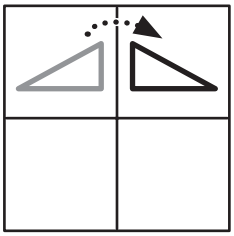
Adjusts the lasing position and layout for all data in a file.



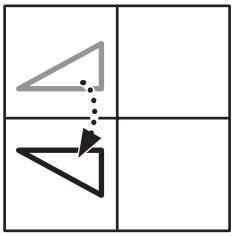
	Setting elements	Description
1	Y-axis mirroring	Inverts the whole setting data in a file.
2	X-axis mirroring	



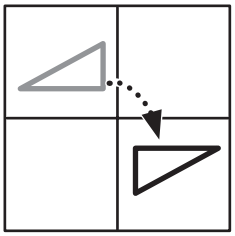
☐ Y-axis mirroring
☐ X-axis mirroring



☑ Y-axis mirroring
☐ X-axis mirroring



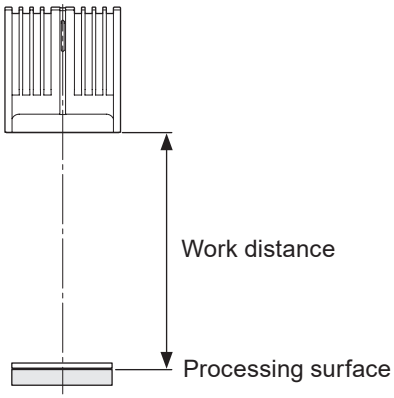
☐ Y-axis mirroring
☑ X-axis mirroring



☑ Y-axis mirroring
☑ X-axis mirroring

	Setting elements	Description
3	Work distance [mm]	Sets the distance from the mounting surface of the laser welding machine to the processing surface of the lasing object. The lasing position (X, Y) is corrected to correspond to the setting work distance.

Setting range	VL-W1500-N, VL-W1A00-N	: 300.0 to 330.0 mm
	VL-W1506-N, VL-W1A06-N	: 670.0 to 700.0 mm
Initial setting	VL-W1500-N, VL-W1A00-N	: 315.0 mm
	VL-W1506-N, VL-W1A06-N	: 685.0 mm

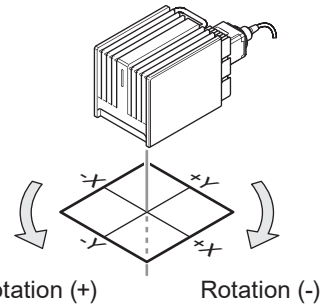


Reference

- Confirm that the setting value of the work distance is the same with the actual distance. If the work distance setting is wrong, the actual lasing position may be different from the setting coordinate (X, Y).
- The work distance setting is linked to the indicating work distance by the guide laser.

4	Rotation offset [deg.]	Rotates the all data in the file from currently set position. The rotation center is the center of the working field.

Setting range	-360.00 to +360.00 °



5 6	X-offset [mm] Y-offset [mm]	Moves the all data set in the file from currently set position.

Setting range	VL-W1500-N, VL-W1A00-N	: -100.000 to +100.000 mm
	VL-W1506-N, VL-W1A06-N	: -200.000 to +200.000 mm

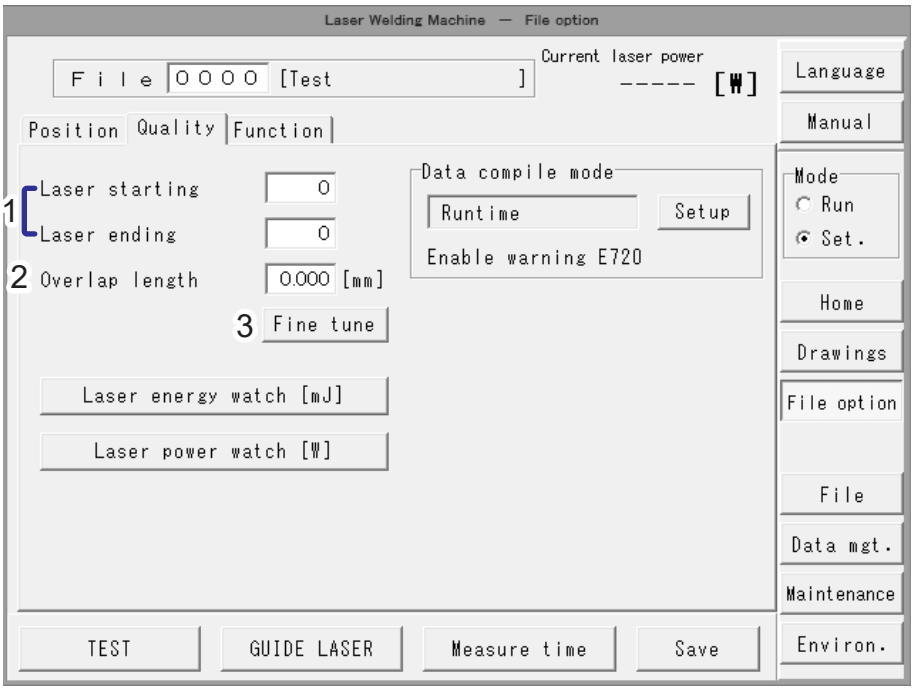
7	Offset by SEO command	Sets whether you use SEO command or not. SEO command specifies the offset value of lasing position and laser power for all data in the file. SEO command should be sent per each lasing trigger. For details, refer to “Serial Communication Command Guide”.

Reference

- SEO command is not available when Data compile mode is set to Precompiled in File option menu.

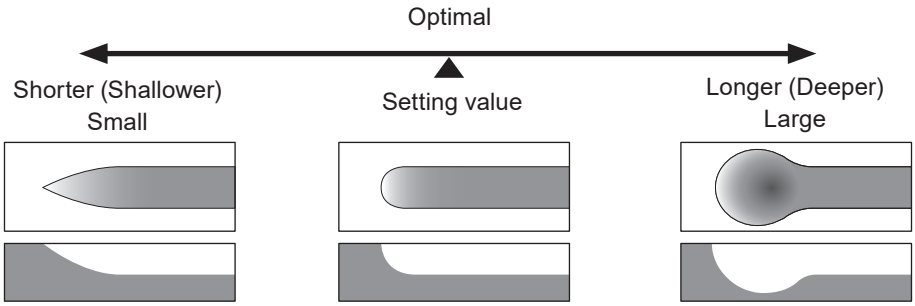
2-5-3 Quality adjustment

Adjusts the detailed lasing quality to improve the setting in Home screen.



	Setting elements	Description
1	Laser starting Laser ending	The timing for turning on the laser at the starting or ending point is adjusted. The smaller the value is, the longer (deeper) the drawing lines at the starting or ending point is.

Setting range	-100 to +100
Initial value	0



Reference

- Too small value for the laser starting/ending may be the cause of chipped short lines.
- This setting is not applied to Point radiation.

2	Overlap length [mm]	Extends the line length at the start and end points respectively with a half length of the setting overlap length. This setting is applied to a line which start point and end point are in the same coordinate, such as a circle or a rectangle.

Setting range	0.000 to 5.000 mm

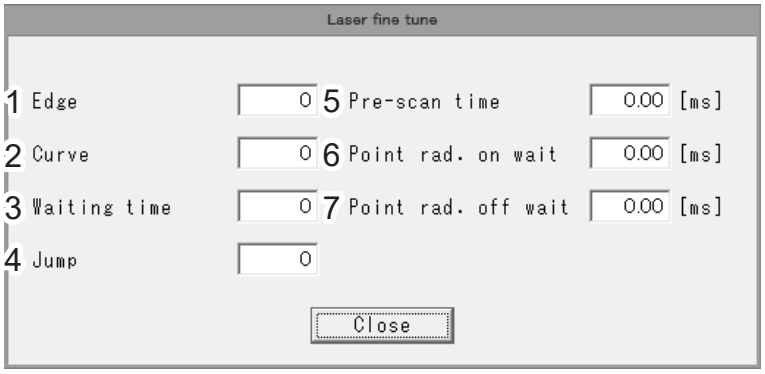
Reference

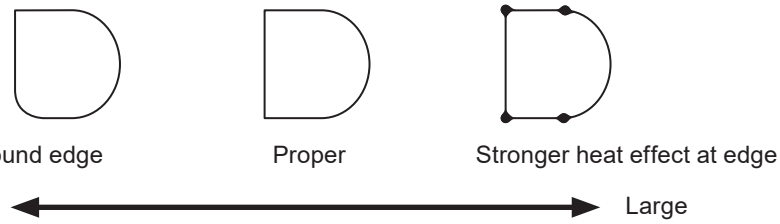
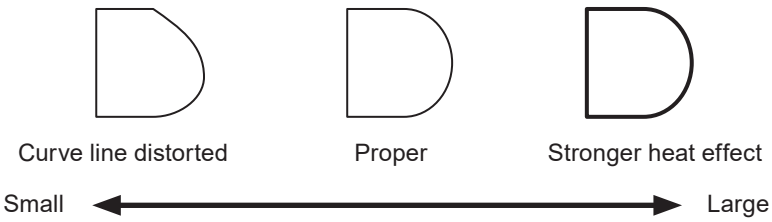
- This setting is not applied to Point radiation.

3	Fine tune	Fine-tunes lasing quality such as on/off timing of the radiation. Refer to “Laser fine tune” (P.70).

■ Laser fine tune

Fine-tunes lasing quality such as on/off timing of the radiation.
Before setting these parameters, set laser power, scanning speed, laser starting and ending properly.



	Setting elements	Description
1	Edge	Adjust the edge of the drawing line. Though setting a small value here can shorten the processing time, the line edge becomes dull. Setting larger value makes the heat effect at the edge stronger. Setting range: 0 to 100 Initial value: 0 
2	Curve	The shape of curve line in the drawing is adjusted. Though setting a small value here can shorten the processing time, the curve line is distorted. Setting larger value makes the heat effect stronger. Setting range: 0 to 100 Initial value: 0 
3	Waiting	Adjusts the waiting time for starting radiation at the start point of the line. It is applied to all lines. Setting a large value improves the disordered lines at the start points. Setting range: 0 to 100 Initial value: 0

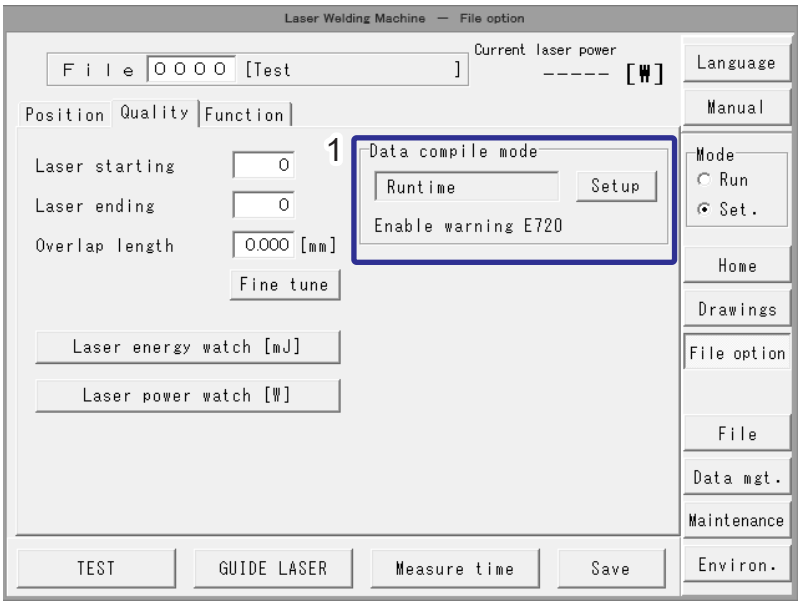
<table>
<tr><th></th><th>Setting elements</th><th>Description</th></tr>
<tr><td>4</td><td>Jump</td><td>Adjusts the waiting time for starting radiation at the start point of the line.
It is applied only to the lines which distance to the next line is long.
Setting a large value improves the disordered lines at the start points.
<table><tr><td>Setting range</td><td>0 to 100</td></tr><tr><td>Initial value</td><td>0</td></tr></table></td></tr>
<tr><td>5</td><td>Pre-scan time [ms]</td><td>The pre-scan time soften the effects of acceleration and deceleration of the scanning speed at the start/end points. Setting this value reduces the impact of heat at the start/end points.
<table><tr><td>Setting range</td><td>0.00 to 10.00 ms</td></tr><tr><td>Initial value</td><td>0.00 ms</td></tr></table></td></tr>
<tr><td>6</td><td>Point radiation on waiting time [ms]</td><td rowspan="2">Adjusts the on/off timing of the radiation for “2-4-5 Point radiation” (P.63).
On waiting time specifies the waiting time for starting radiation.
Off waiting time specifies the waiting time for moving to the next radiation points.
<table><tr><td>Setting range</td><td>0.00 to 9.99 ms</td></tr><tr><td>Initial value</td><td>0.00 ms</td></tr></table></td></tr>
<tr><td>7</td><td>Point radiation off waiting time [ms]</td></tr>
</table>

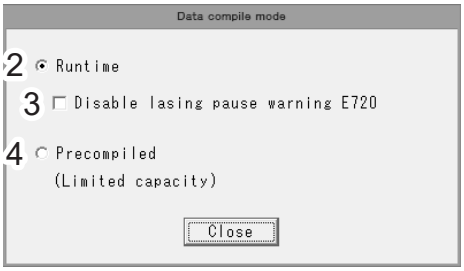
Reference

- With a larger value in these parameters, lasing time becomes longer.

2-5-4 Data compile mode

Select how the laser welding machine compiles the drawing data for lasing from Runtime or Precompiled. Runtime is set by default and it is not needed to change unless a lasing pause warning appears. To avoid lasing pause during operation (warning E720), set Data compile mode from Runtime to Precompiled.





	Setting elements	Description
1	Data compile mode	Displays the current setting of Data compile mode. Click “Setup” to open the setting window.
2	Runtime	With Runtime mode the drawing data is sequentially compiled during lasing operation. When lasing pause warning (E720) is not occur, use Runtime mode. Runtime mode has the following attributes. • Lasing pause during operation (warning E720) may occur due to data compiling. • The available data capacity (total length of the drawing lines) is larger than that of Precompiled mode. • The required time for turning on READY OUT is shorter than that of Precompiled mode.
3	Disable lasing pause warning E720	By checking this box, the warning E720 will not be output even when the lasing pause occurred.

Notice

- Before disabling lasing pause warning E720, make sure that the processing results are not impaired by lasing pause.

Reference

- The detection of the lasing pause is enabled at the test lasing and the processing time measurement even when disabling the warning E720.

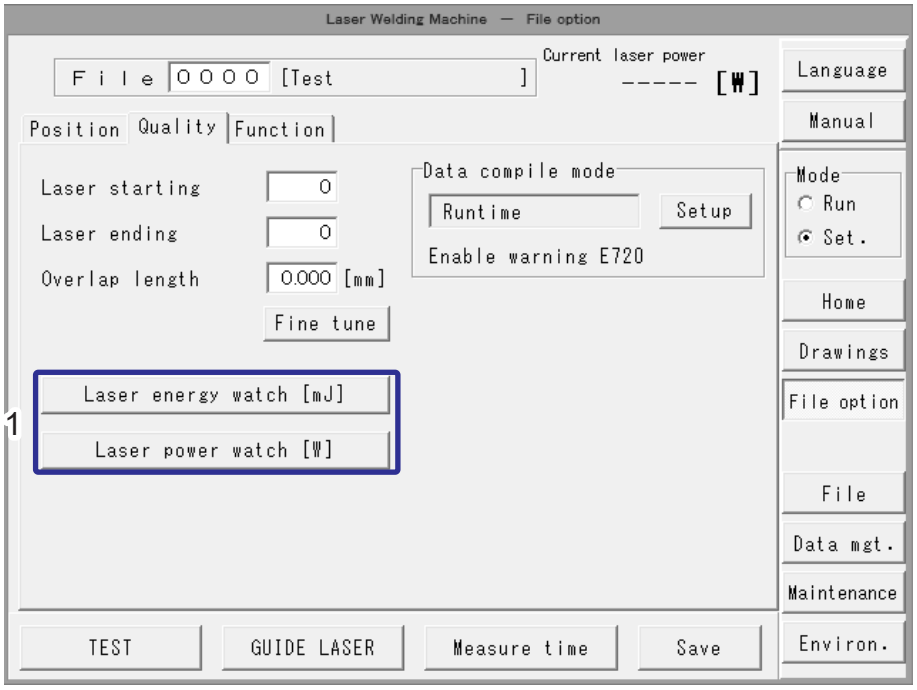
4	Precompiled	With Precompiled mode the all drawing data in a file is compiled before starting lasing operation. To avoid lasing pause, set Data compile mode to Precompiled. Precompiled mode has the following attributes. • No lasing pause. • The available data capacity (total length of the drawing lines) is lower than that of Runtime mode. • The required time for turning on READY OUT is longer than that of Runtime mode.

Reference

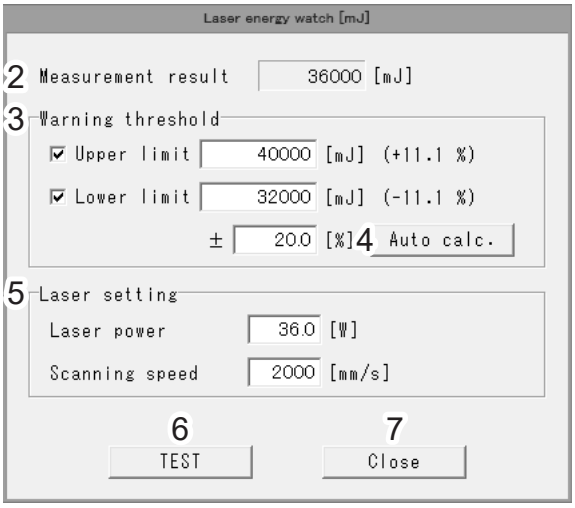
- SEO command is not available when Data compile mode is set to Precompiled.
- The faster the scanning speed, the larger the available data capacity (total length of the drawing lines).

2-5-5 Laser energy / laser power warning threshold

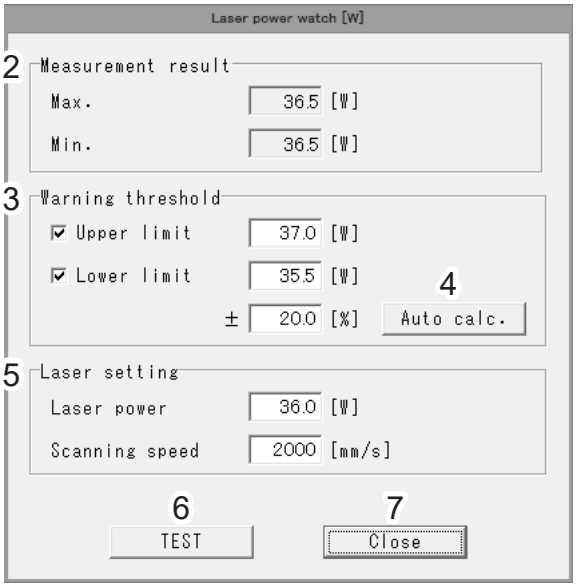
Sets the laser energy [mJ] and the laser power [W] threshold at lasing to check the lasing quality.
When the measured value is out of the threshold, warning is output.
For the monitoring of the measurement results, refer to “2-3-8 Laser power monitoring” (P.44) and Setup/Maintenance Guide.



Laser energy watch



Laser power watch



	Item	Description
1	Laser energy watch [mJ] Laser power watch [W]	Click on the item to set the warning threshold. It is possible to use both monitoring function of laser energy and laser power.
2	Measurement result	After the test lasing is executed in this window, the measurement results are displayed. For laser energy, the total amount of the laser energy measured during the lasing operation is displayed. For laser power, the maximum and the minimum value measured during the lasing operation are displayed. Display range: Laser energy : 0 to 429496729 mJ; Laser power : 0 to 100.0 W

	Item	Description
3	Warning threshold: Upper limit Lower limit	Sets the threshold of laser energy or laser power at lasing. When the measured value is out of the threshold, the following warning is output. • When the laser energy is out of the threshold: E710 • When the laser power is out of the threshold: E812 Setting range: Laser energy : 100 to 999999999 mJ; Laser power : 0.1 to 100.0 W

Reference

- If the measured laser energy is lower than 100 mJ, it is not possible to set the threshold.
- Set the larger value to the upper limit than the lower limit.
- It is possible to specify only one side of the limit value.
- Set the threshold based on the actual power and energy measured at test lasing.
- With the file set the warning threshold of laser energy or laser power, change the threshold setting when laser power setting or drawing parameters are changed.
- Though the laser energy threshold can be set up to 999999999 mJ, the measurable value is up to 429496729 mJ.

4	Auto calculation	By clicking “Auto calc.”, the threshold value is set automatically with the specified ratio. “Auto calc.” button is available after Test lasing is executed in this window. Setting range: 0 to 99.9%
5	Laser setting	Specifies the laser power and scanning speed for test lasing. Change the settings and confirm how much laser energy or laser power is needed for the acceptable lasing quality to find the threshold range. When these settings are changed, the corresponding parameters in Home screen change together.
6	TEST	Executes the test lasing and then displays the measured results.

Reference

- When the trigger mode is set to “continuous trigger”, one lasing operation is executed at the test lasing. If you need to confirm the energy of repeated lasing operation, set the trigger mode to “single trigger” and specify the “number of scans” while the test lasing.

7	Close	Applies the settings and closes the window.

Reference

- Laser energy and laser power monitoring refers to the function to measure the output power. It is not possible to detect the defect in the laser processing quality caused by the external factors.
- Laser energy and laser power monitoring function do not provide the warranty of the quality of the laser processing results.
- The power monitor function is a function to monitor fluctuations in the output laser power. The measurement results by the power monitor function may have max. ± 3.6W* difference from the laser power setting results.

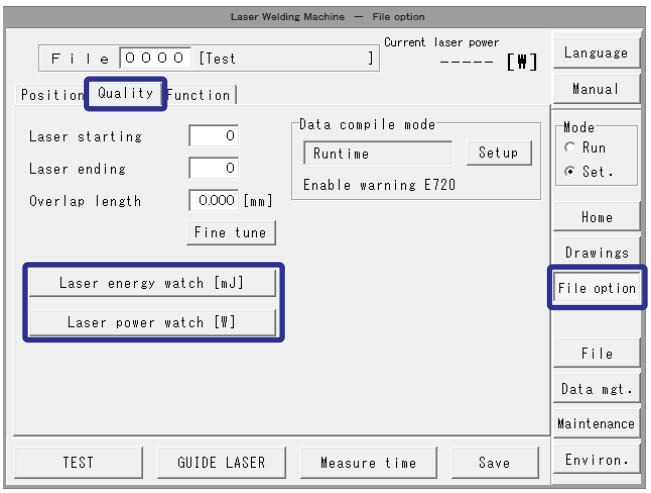
* There may be a max. ± 3.6W difference for VL-W1A00-N/VL-W1A06-N and a max. ± 1.8W difference for VL-W1500-N/VL-W1506-N.
The power monitor installed in this product is not a measuring instrument. The setting difference between the laser power setting value and the power monitor measurement value may increase with the number of years of use. Use a commercially available power meter during daily maintenance and check the difference. When this difference interferes with the customer’s operation, our service staff will inspection and repair. Contact our agency.

- If the laser energy is lower than 1000 mJ or the lasing time is shorter than 0.4 second, the measurement results may be unstable.
- The current laser power can be output with the serial communication data. For details, refer to Setup/Maintenance Guide.
- When the trigger mode is set to “Continuous trigger”, the monitoring laser energy is the total energy of the all lasing operation repeated during the period from turning on of TRIGGER IN to turning on of LASING END OUT.

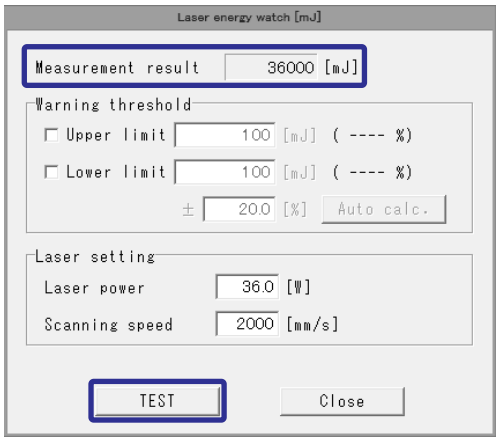
■ Setting procedures of laser energy / laser power warning threshold

1. Click “File option” on the right menu and select “Quality” tab.

Click “Laser energy watch” or “Laser power watch”.



2. Click “TEST” to measure the energy or power at lasing for the selected file.

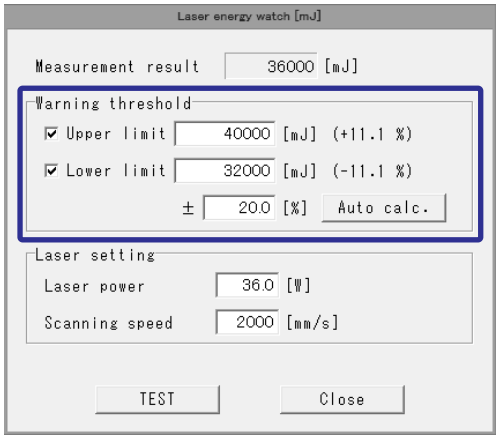


Reference

- When the trigger mode is set to “continuous trigger”, one lasing operation is executed at the test lasing. If you need to confirm the energy of repeated lasing operation, set the trigger mode to “single trigger” and specify the “number of scans” while the test lasing.

3. Confirm the acceptable range of the laser energy or laser power by Test lasing with several laser power settings.

4. Check on upper or/and lower limit to enable the threshold setting.



5. Specify the threshold.

By clicking “Auto calc.”, the threshold value is set automatically with the specified ratio.

Reference

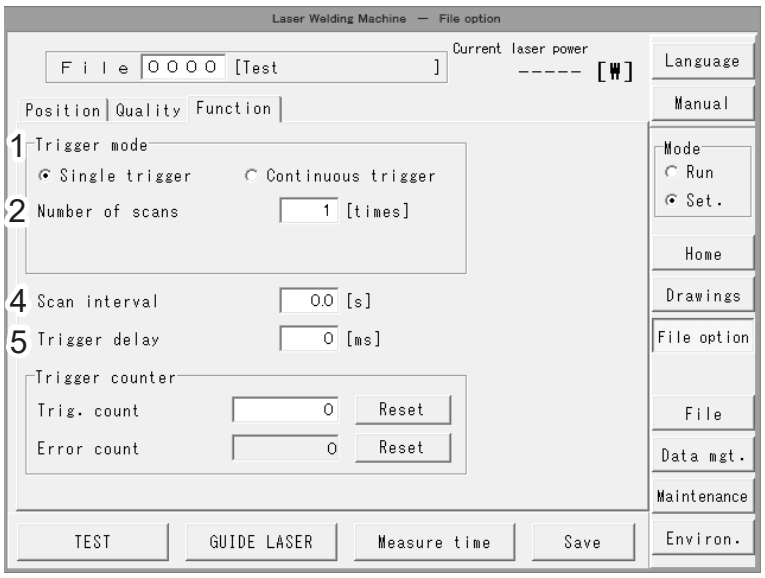
- “Auto calc.” button is available after Test lasing is executed in this window.

6. Execute Test lasing several times and confirm that the measurement results are in the range of the threshold.

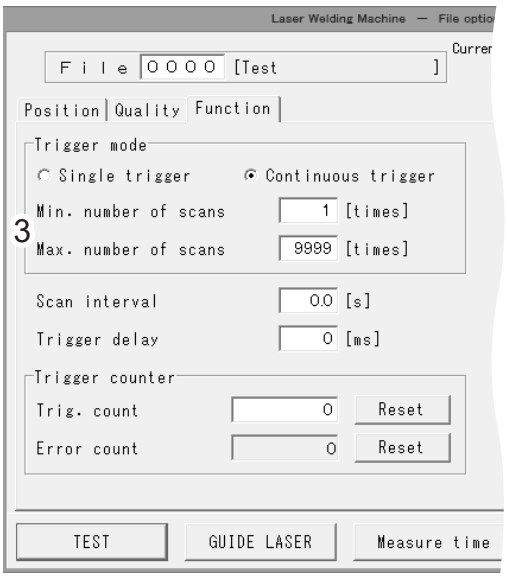
7. Click “Close” to apply the settings.

2-5-6 Trigger mode / Number of scans

Specifies how you will input TRIGGER IN (lasing start signal) at the remote control mode or run mode.
If you will repeat the lasing operation with one trigger input, specify the number of scans according to the trigger mode.



At “Single trigger” mode



At “Continuous trigger” mode

	Setting elements	Description
1	Trigger mode	Select the control method of TRIGGER IN (lasing start signal) at the remote control mode or run mode. According to this setting, the behavior of TRIGGER IN signal in I/O terminal is defined. • Single trigger: One lasing operation is executed by the edge of turning on of TRIGGER IN signal. • Continuous trigger: Lasing operation is repeated while TRIGGER IN signal is on.

Reference

- The default setting of the trigger mode is “single trigger”.
- When the trigger mode is set to “continuous trigger”, the setting of “number of scans” is not shown in Home screen.
- For the control details of TRIGGER IN signal at each trigger mode, refer to Setup/Maintenance Guide.

2	Number of scans [times] *1	Sets how many times the setting data is scanned with one lasing trigger input. (Overwriting times) When this setting is changed, the same parameter in Home screen changes together. Setting range: 1 to 9999 times
3	Min. number of scans [times] *2 Max. number of scans [times] *2	Sets the limitation to the number of scans when the trigger mode is set to “continuous trigger”. If the executed number of lasing operation are less than the specified minimum number, warning E730 occurs. If TRIGGER IN signal remains on though the executed number of lasing operation reaches the specified maximum number, warning E731 occurs and the subsequent lasing is canceled. Setting range: Minimum number: 1 to maximum number Maximum number: minimum number to 9999 times

	Setting elements	Description
4	Scan interval [s]	Sets the interval period at overwriting. Setting range: 0.0 to 60.0 sec.

Reference

- Even though 0 second is set to the scan interval, there is a certain interval between each lasing operation. (around 10ms to 100ms)

5	Trigger delay [ms]	Sets the delay time from trigger input to starting trigger processing (lasing) operation. Trigger delay setting is applied to only the selected file. Setting range: 0 to 5000 ms

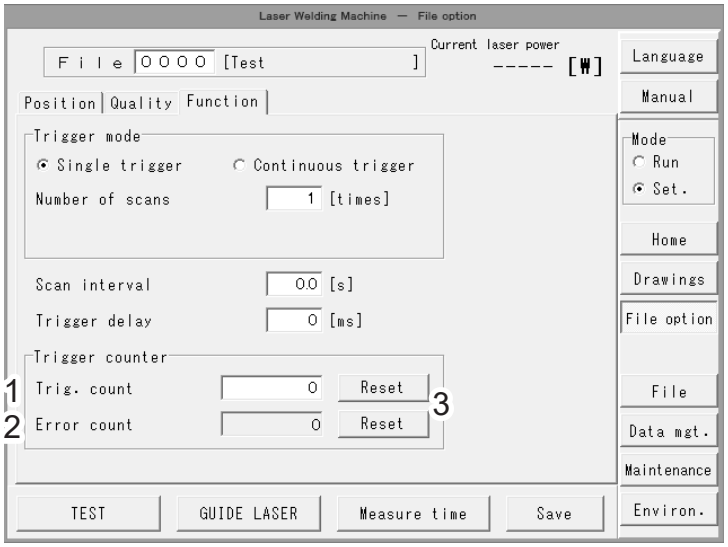
*1 : Available when the trigger mode is “Single trigger”.
*2 : Available when the trigger mode is “Continuous trigger”.

Reference

- The settings in file option screen are applied to only the selected file. When you use several files, set the trigger mode, trigger delay and etc. for each file.

2-5-7 Trigger counter

Sets the counter to show the trigger numbers that are accepted by laser welding machine during remote control mode or run operation mode.



	Setting elements	Description
1	Trigger count	Indicates the total number of the received trigger for the selected file. Trigger count includes the error count. Trigger count does not include the test lasing operation. Setting and display range: 0 to 999999999

Reference

- It is possible to change the trigger count value arbitrarily.
- When the trigger count is changed, the error count is reset to “0”.
- The updated value of the trigger and error count during the remote mode or run mode operation is saved in the laser welding machine without overwriting to the file.
- Trigger count is updated at the rising edge of LASING OUT signal.

2	Error count	Indicates the number of the abnormal lasing operation from the received trigger with the following reasons. • When the lasing operation is interrupted because of the alarm or warning occurrence. • When the lasing operation done with the laser energy or power out of the setting threshold. (Warning “E710” or “E812” occurrence) • Lasing operation is completed, but the warning “E720” for the lasing pause is detected. • With “continuous trigger” mode when the executed number of lasing were not within the specified minimum or maximum number. (Warning “E730” or “E731” occurrence) Display range: 0 to 999999999

Reference

- The warning “E800” for the invalid trigger input is not included in the error count.

3	Reset	Resets the trigger count and the error count for the selected file to “0”.

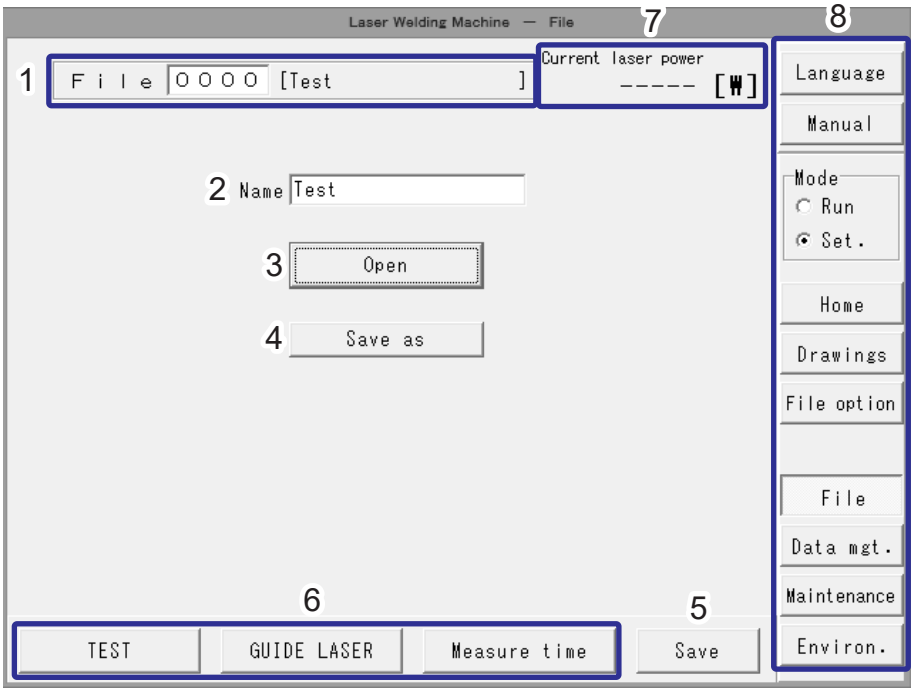
Reference

- When the trigger count is reset, the error count is reset to “0”, too. It is not possible to reset only the trigger count.
- Resetting of Trigger count and Error count is applied and saved to the laser welding machine immediately without saving operation. It is not possible to return to the former value.
- After Trigger count or Error count reaches to the upper limit, reset the counter value. Otherwise, it is not updated.

2-6 File

In the laser welding machine the drawing data is set and saved in a “file” format.
A file is composed of one or more drawing data and the all data in one file is drawn by laser with one trigger.
Up to 2048 files are stored in one laser welding machine.
In File screen, set the file name and change the selected file of the laser welding machine.

2-6-1 Configuration of file screen



	Item	Description
1	File	Displays the selected file No. and name. By clicking on the file No. field, file selection window appears. As the file No., from 0000 to 2047 are available. Refer to “2-6-2 File selection” (P.80).
2	Name	Displays the name of the selected file No. By clicking on the input field, file name input window appears. Refer to “2-6-3 File name setting” (P.82).
3	Open	Changes the file to edit or display. By clicking on this button, file selection window appears. Refer to “2-6-2 File selection” (P.80).
4	Save as	Saves or copies the selected file to the other file No. Refer to “2-6-5 Save the file to other file No.” (P.84).
5	Save	Overwrites the file in the laser welding machine. Refer to “2-6-4 Save the file to laser welding machine” (P.83).
6	TEST GUIDE LASER Measure time	Refer to “2-3-7 Test lasing” (P.42), “2-3-5 Guide laser” (P.38) and “2-3-6 Processing time measurement” (P.41).
7	Current laser power	Displays the measurement result of the laser power [W]. Available only during the lasing operation. Refer to “2-3-8 Laser power monitoring” (P.44).
8	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).

2-6-2 File selection

Selects the file to edit or display.

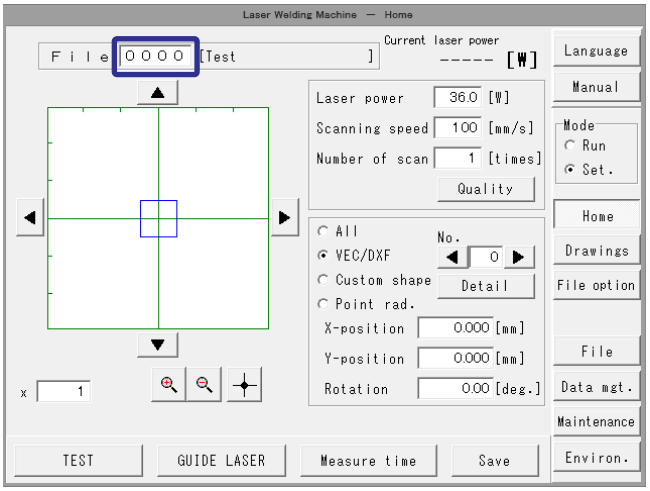
Reference

- When creating a new file referring to the existed file, copy and paste the file and modify the data. Refer to “2-6-5 Save the file to other file No.” (P.84).

1. Click the file number field on the left upper of the screen.

File selecting operation is possible on the following screen.

- Home
- Drawings
- File option
- File
- Operation monitor
- I/O monitor
- Error log



2. When the currently selected file is modified, the confirmation dialog box for the overwriting appears. To save it, click “Yes”.



3. Select a file.

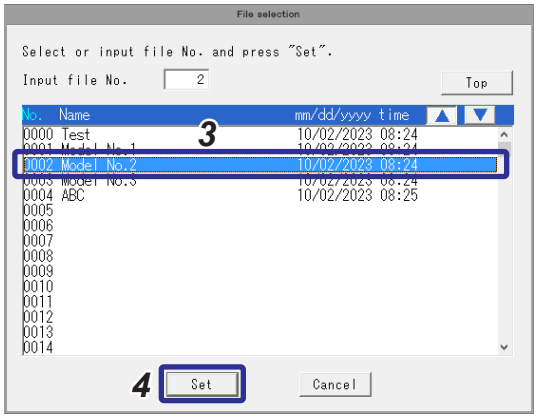
Click the file name in the list or input the file number.

Reference

- Clicking the title name of the list, such as file name, modified date and etc., the files are sorted in ascending or descending order by the selected categories.

4. Click “Set”.

The file of the laser welding machine changes.

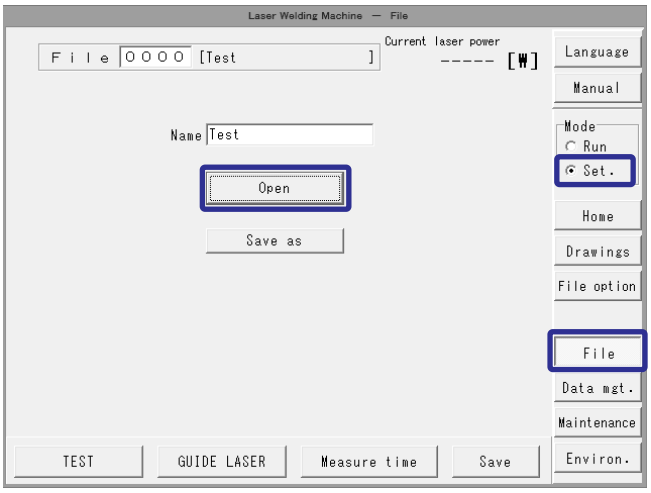


Reference

- The following files are saved at the delivery state.
  - File No. 2047 “TEST FILE”: Sample settings for the reference. You can delete this file, if not needed.
  - File No. 2046 “WORK AREA”: Use this file when executing “2-8-3 Working field calibration” (P.99).

■ File selection on File screen

1. Select the screen mode to “Set” and click “File” on the right menu.



2. Click “Open”.

3. When the currently selected file is modified, the confirmation dialog box for the overwriting appears. To save it, click “Yes”.



4. Select a file.

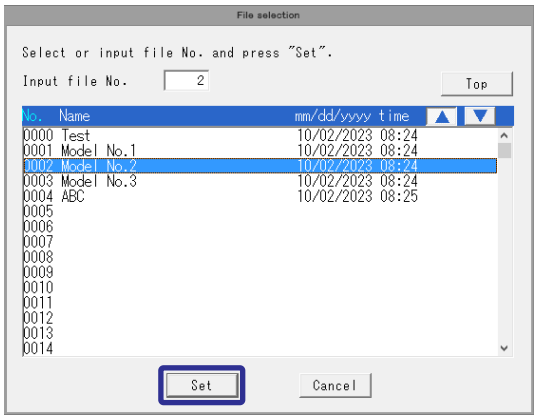
Click the file name in the list or input the file number.

Reference

- Clicking the title name of the list, such as file name, modified date and etc., the files are sorted in ascending or descending order by the selected categories.

5. Click “Set”.

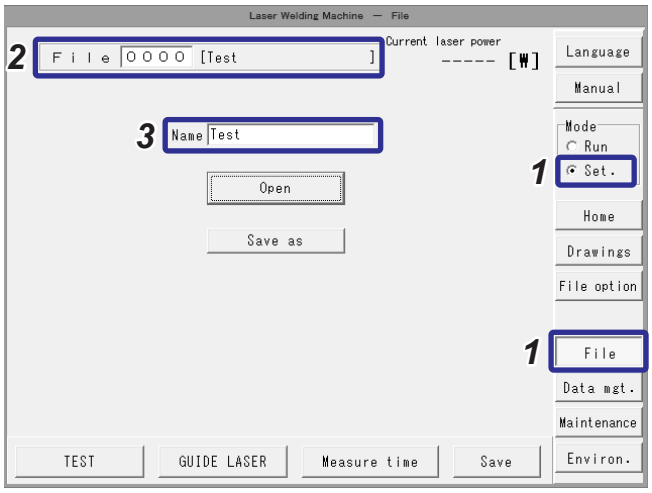
The file of the laser welding machine changes.



2-6-3 File name setting

Sets the name of the selected file No.

1. Select the screen mode to “Set” and click “File” on the right menu.



2. Select the file No. to set the name.

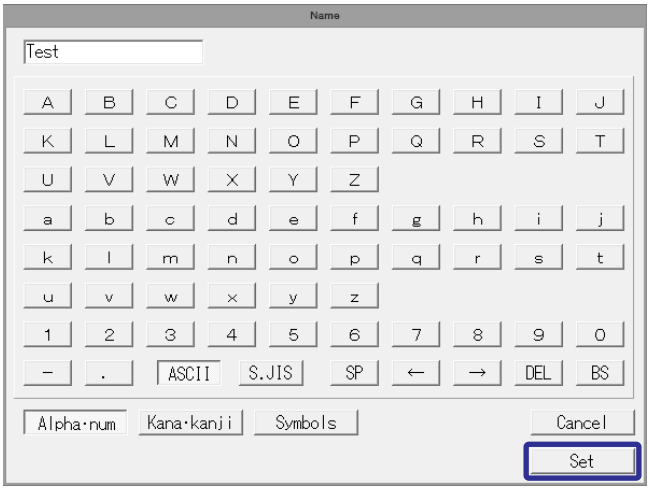
Refer to “2-6-2 File selection” (P.80).

3. Click on the name input field.

4. Input the name and click “Set”.

The following characters can be used for the file name.

- Alphabet and numerics: Up to 20 digits (when specifying all characters in single-byte (ASCII) letter)
- Japanese Katakana, Hiragana, Kanji (JIS level-1 and JIS level-2) and symbols: Up to 10 digits



Reference

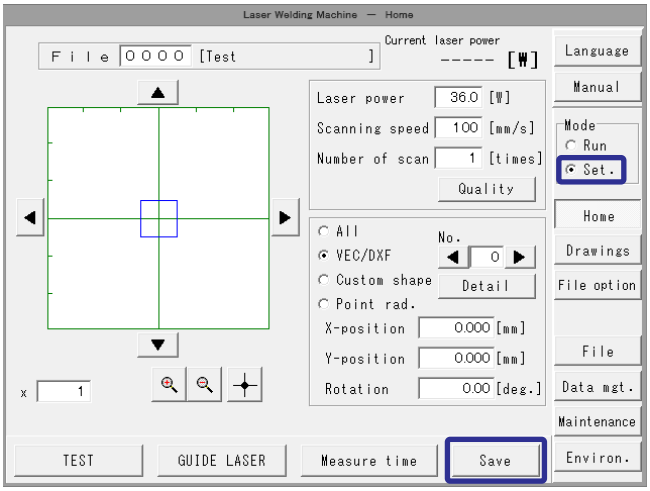
- For the details of the available characters, refer to the Character Code Table of Serial Communication Command Guide.

2-6-4 Save the file to laser welding machine

Overwrites the file in the laser welding machine.
If the laser welding machine is shut down without saving operation, the modified data is unsaved.

1. Select the screen mode to “Set”.

2. Click “Save” on the right bottom of the screen.



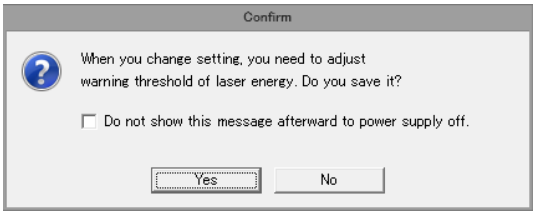
Reference

- “Save” button is available on the following screen under the setting mode.
  - Home
  - Drawings
  - File option
  - File

3. Confirmation dialog box for overwriting appears. Click “Yes” to save the setting file.



4. When the warning threshold of laser energy is specified in the file, confirmation dialog box for the threshold setting appears. To save the file with the current setting, click “Yes”.



To change the warning threshold, click “No” and save the file after confirming the threshold setting.

For the laser energy monitoring, refer to “2-5-5 Laser energy / laser power warning threshold” (P.73).

Reference

- Laser energy may change when laser power setting or drawing parameters are changed. With the file set the warning threshold of laser energy, change the warning threshold of laser energy based on the test lasing results.

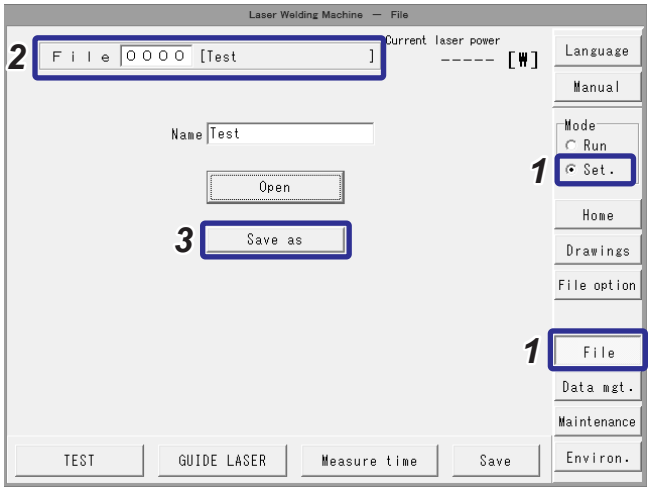
2-6-5 Save the file to other file No.

Saves or copies the selected file to the other file No.
When creating a new file referring to the existed file, use this function to copy and paste the file and then, modify the file.

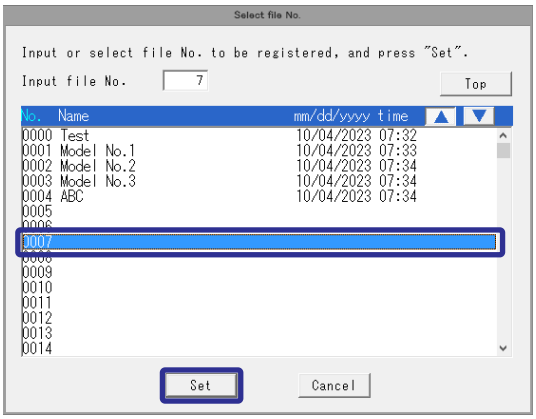
1. Select the screen mode to “Set” and click “File” on the right menu.

2. Select the file to copy.

3. Click “Save as”.



4. Select the file No. to paste the copied file and click “Set”.



Reference

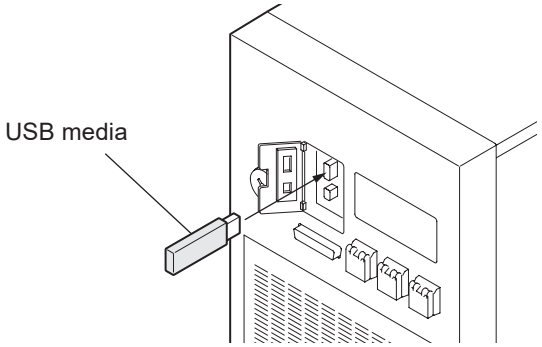
- Clicking the title name of the list, such as file name, modified date and etc., the files are sorted in ascending or descending order by the selected categories.

5. To rename the file, click on the name input field and set the new name.

Refer to “2-6-3 File name setting” (P.82).

2-7 Data Management

On the data management screen, data saved in the laser welding machine such as setting files, VEC and DXF files can be exported and deleted. It is also possible to import externally saved data to the laser welding machine.
To import and export the data, use a USB media.



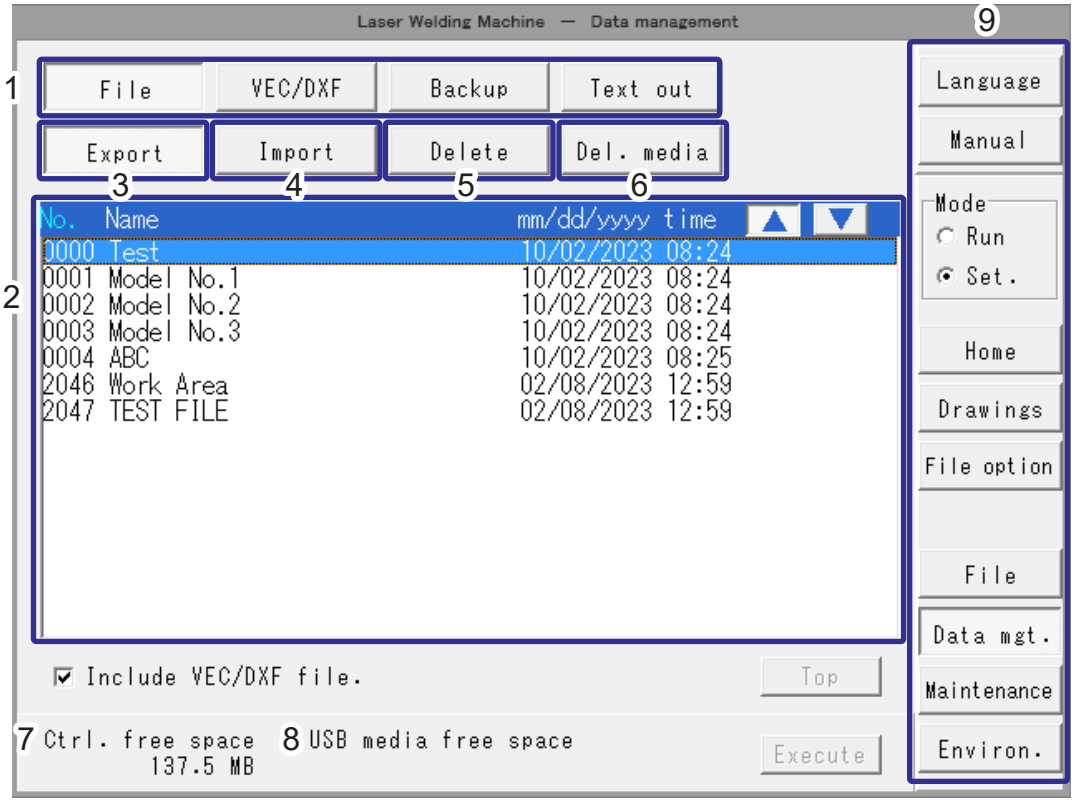
Notice

- Do not remove the USB media nor turn off the power during the data writing and reading operation. Any losses or failures of data might be caused. Please note that we shall not be liable for any losses incurred due to loss or failure of data arising from use of this product.
- Do not insert/remove the USB media into/from the USB connector during lasing, guide laser scanning or remote control. The laser welding machine may get unstable or stop.
- Do not start the laser welding machine with the USB media being connected into the USB connector. Connect the USB media to the connector after the start-up is completed.
- Do not connect any other USB products for the purpose of data writing or reading than USB media to USB connector. Before using a USB media, check it for compatibility with the laser welding machine. We shall not be responsible for performance of all kinds of USB media.
- USB media with security features cannot be used.
- USB hub cannot be used for this product. Connect a USB flash drive directly to the laser welding machine.
- Use a USB flash drive formatted with FAT32.

■ File types for data management

Name	Extension	Description
Setting file	.VLW	The setting parameters saved in a selected file. The setting file does not contain the VEC/DXF file used in a file. Up to 2,048 setting files are stored in one laser welding machine.
Backup data	saved in a folder	As a backup file, the following data in a laser welding machine is saved. • Setting file • VEC file • DXF file • Environment setting (partly not included in backup)
VEC file	.vec	Drawings converted to the laser welding machine special format “VEC” from DXF, HPGL, BMP or JPEG by using the attached “Logo Data Conversion Software”.
DXF file	.dxf	Drawing file in DXF format.

2-7-1 Configuration of data management screen



	Item	Description
1	Management data type	Select the managing data type. • Setting file • VEC file / DXF file • Backup • Text output of setting file
2	File list	Displays the all files stored in the laser welding machine or the backup file. Clicking the title name of the list, such as file name, modified date and etc., the files are sorted in ascending or descending order by the selected categories.
3	Export	Saves the selected file to a USB memory.
4	Import	Registers the externally saved file to the laser welding machine via USB memory.
5	Delete	Deletes the selected file.
6	Delete media	Deletes the selected file stored in the USB media connected to laser welding machine.
7	Controller free space	Displays the space capacity of the laser welding machine.
8	USB media free space	Displays the space capacity of the USB media connected to the laser welding machine.
9	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).

2-7-2 Export data to external memory

Save the setting file, VEC file or DXF file in the laser welding machine to the USB media with the procedures as follows.

1. Click “Data mgt.” on the right menu.

2. Insert a USB memory to the controller of the laser welding machine.

3. Select the file type for the data to export.

- File (Setting file)
- VEC/DXF

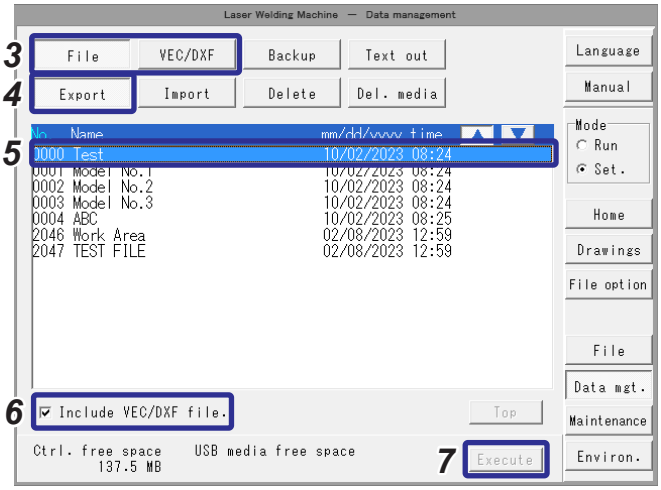
4. Click “Export”.

5. Select the file to save.

Clicking the title name of the list, such as file name, modified date and etc., the files are sorted in ascending or descending order by the selected categories.

6. When exporting a setting file which contains VEC/DXF setting, enable “Include VEC/DXF file” to export the VEC/DXF file together.

7. Click “Execute”.



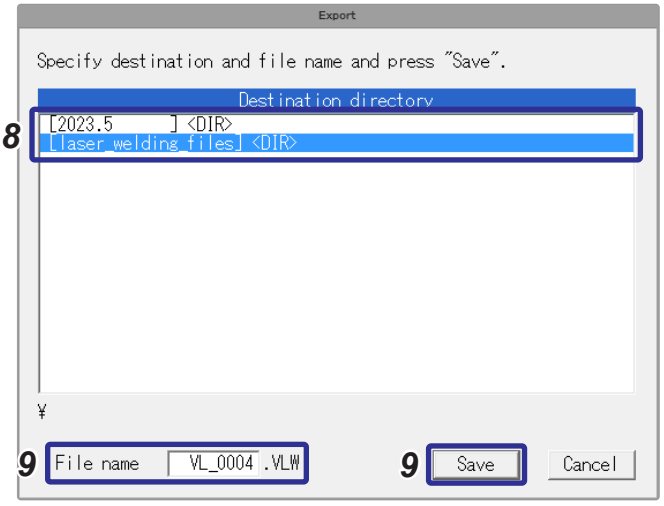
8. Select the destination directory to save the file.

Without specifying the directory, the file is saved in the root directory of the USB media.

9. Input the file name (.VLW) and click “Save”.

The following characters can be used for the file name.

- Alphabet and numerics: Up to 8 digits (when specifying all characters in single-byte (ASCII) letter)
- Japanese Katakana, Hiragana, Kanji (JIS level-1 and JIS level-2) and symbols: Up to 4 digits



Reference

- The following text can not be used as a file name.
  CLOCK$, CON, AUX, NUL, PRN, COM1 to COM9, LPT1 to LPT9
- To export a VEC file directly to the PC by using the attached software Logo data editing, refer to “Upload or Download a VEC file by using Logo Data Editing software” (P.53).

2-7-3 Import data to laser welding machine

Import the externally saved files (setting file, VEC file and DXF file) to the laser welding machine via USB memory with the procedures as follows.

1. Click “Data mgt.” on the right menu.

2. Copy the setting data to a USB memory and insert it to the controller of the laser welding machine.

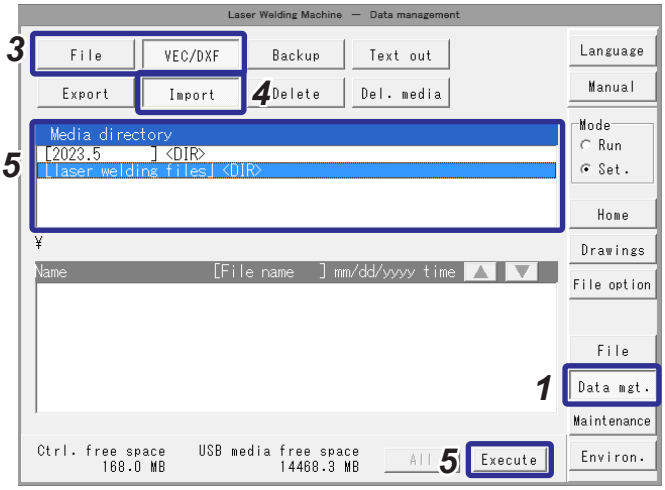
3. Select the file type for the data to import.

- File (Setting file)
- VEC/DXF

4. Click “Import”.

5. Select the directory (folder) in which the importing data is stored and click “Execute”.

The files in the directory are displayed.



Reference

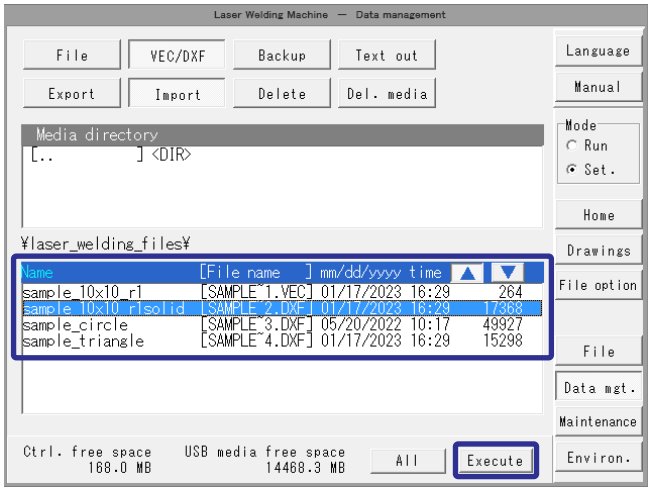
- To return to the upper directory, select [..] <DIR> and click “Execute”.

6. Select the file to import and click “Execute”.

Files in the following format are displayed.

- Setting file (.VLW)
- VEC file (.VEC)
- DXF file (.dxf)

To select all files, click “All”.



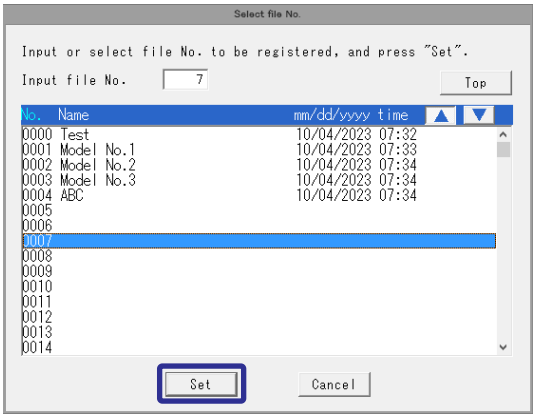
Reference

- By selecting the directory in which the backup data is saved, it is possible to import an individual file from the backup data.

7. When exporting a setting file, select the file No. as the saving destination.

If a setting file already exists in the selected file No., confirmation dialog box for the overwriting appears.

To overwrite it, click “OK”.



8. The selected data is added to the laser welding machine.

Reference

- A DXF file over than 1411.5 kB cannot be saved in the laser welding machine.
- Up to 2048 VEC/DXF files can be saved in the laser welding machine.
- VEC/DXF files used in the imported setting file are not imported together with a setting file. To use these VEC/DXF files, import them to the laser welding machine separately.
- To import a VEC file directly from the PC by using the attached software Logo data editing, refer to “Upload or Download a VEC file by using Logo Data Editing software” (P.53).

2-7-4 Delete data

Delete the setting file, VEC file or DXF file in the laser welding machine with the procedures as follows.

1. Select the file type to delete.

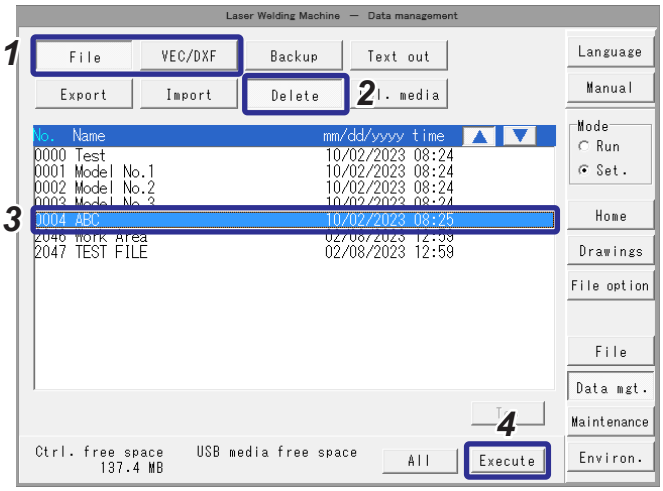
- File (Setting file)
- VEC/DXF

2. Click “Delete”.

3. Select the file to delete.

To select all files, click “All”.

Clicking the title name of the list, such as file name, modified date and etc., the files are sorted in ascending or descending order by the selected categories.



4. Click “Execute”.

5. The confirmation dialog box appears.

Click “Yes” to delete.

Reference

- When the setting file (.VLW) is deleted, the VEC/DXF files used in the file remain in the laser welding machine. To clear them, select the VEC/DXF file and delete them separately.

2-7-5 Delete data in USB media

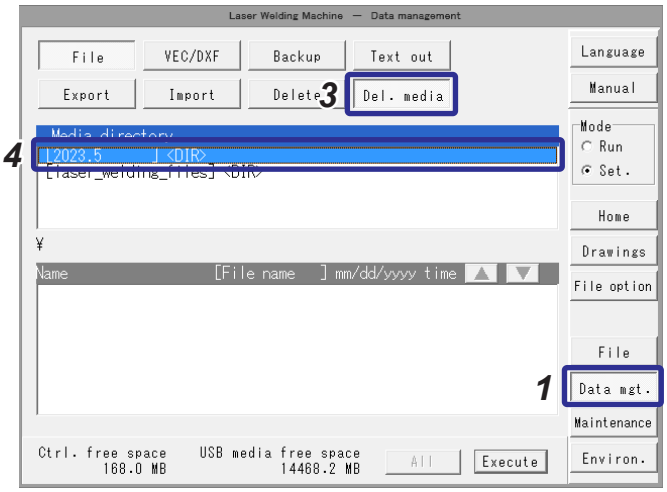
Delete the setting file, VEC file or DXF file in the USB media connected to laser welding machine with the procedures as follows.

1. Click “Data mgt.” on the right menu.

2. Insert a USB memory to the controller of the laser welding machine.

3. Click “Del. media”.

4. Select the directory (folder) in which the data to be deleted is stored.

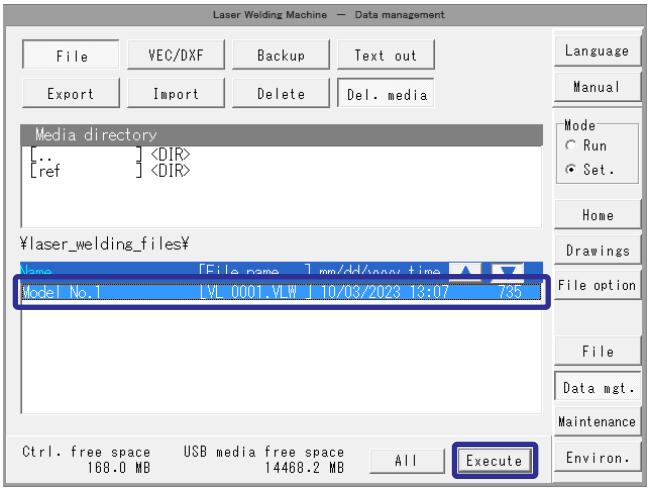


5. Select the file to delete and click “Execute”.

Files in the following format are displayed.

- Setting file (.VLW)
- VEC file (.VEC)
- DXF file (.dxf)

To select all files, click “All”.



6. The confirmation dialog box appears.

Click “Yes” to delete.

Reference

- Other than the setting file (.VLW), VEC file (.VEC) and DXF file (.DXF) cannot be deleted with this function.
- With this function, it is not possible to delete the files in the backup data.

2-7-6 Export backup data

Executes the exporting the backup data of the laser welding machine.
The backup consists of the following data.

- Setting file (The current value of “Trigger count” and “Error count” are not included in backup data.)
- VEC file
- DXF file
- Environment setting (“Date and time” and “Display device” settings are not included in backup data.)

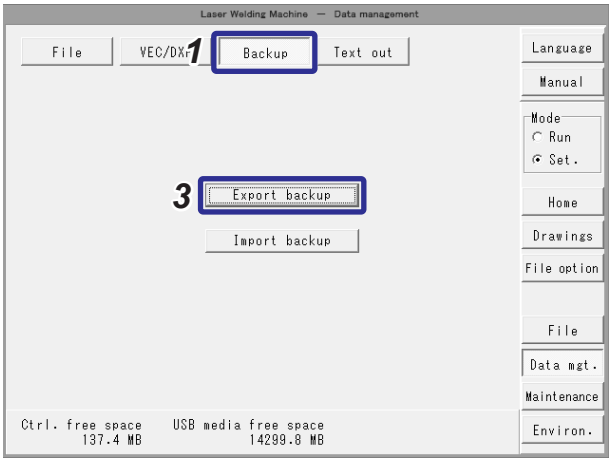
Reference

- Error log is not included in a backup. To output Error log, refer to “2-10-4 Error log” (P.117).

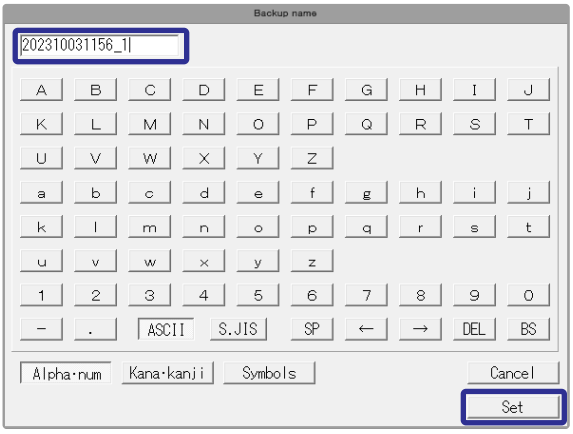
1. Click “Data mgt.” on the right menu and click “Backup”.

2. Insert a USB memory to the controller of the laser welding machine.

3. Click “Export backup”.



4. Input the backup name, and then click “Set”.



5. The backup data is saved in the USB media with the following folder structure.

USB media
└ “SUNX_VLW_BACKUP” folder
  └ Folder (can be renamed)
    ├ “BACKUP” folder
    ├ BACKUP.LOG
    └ BKUP. INI

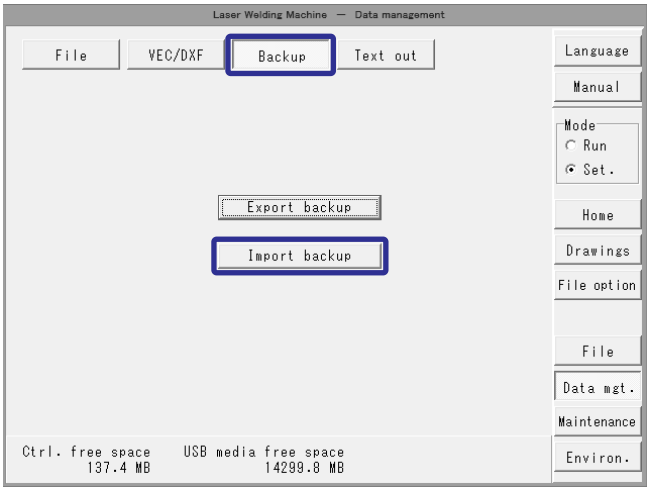
Notice

- Do not change the folder structure of the backup data. Changing or deleting data in the backup might be a cause of the reading error.

2-7-7 Import backup data to laser welding machine

Restore (Overwrite) the file data (setting files, VEC files, DXF files and environment settings) in the laser welding machine with the externally saved backup data by the following procedures.

1. Click “Data mgt.” on the right menu and click “Backup”.



2. Copy the backup data to a USB memory and insert it to the controller of the laser welding machine.

The following folder structure of backup data can be read.

USB media
- “SUNX_VLW_BACKUP” folder
  - Folder (can be renamed)
    - “BACKUP” folder
    - BACKUP.LOG
    - BKUP. INI

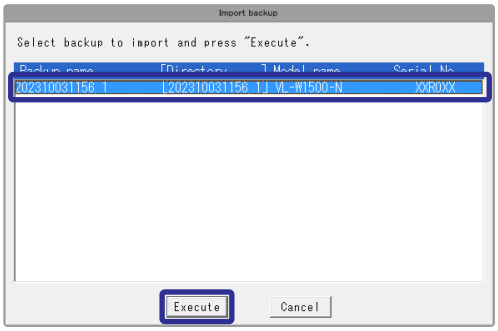
Reference

- Store “SUNX_VLW_BACKUP” folder in the root directory of the USB media.

3. Click “Import backup”.

4. The folders in “SUNX_VLW_BACKUP” directory are displayed.

Select the folder in which the importing backup data is stored and click “Execute”.



5. Confirmation dialog box appears.

To overwrite the current data with the backup data, click “OK”.



Reference

- When the backup importing is executed, the following files are not deleted and remains in the laser welding machine.
  - Setting files saved in the file numbers in which no files are existed in the backup data
  - VEC/DXF files whose file name (.vec or .dxf) is not existed in the backup data
- The following parameters are not restored at the importing of the backup data. For them the laser welding machine keeps the original setting.
  - Date and time of internal clock, Display device setting, System information (Environment setting)
  - Maintenance - setting values of “Calibrate working field”
  - Current value of Trigger count and Error count of trigger counter function
  - Display language
  - Error log
- When the backup data is imported to the laser welding machine, communication parameter settings are overwritten with the backup data.
- It is possible to import an individual file from the backup data to the laser welding machine. Refer to “2-7-3 Import data to laser welding machine” (P.88).

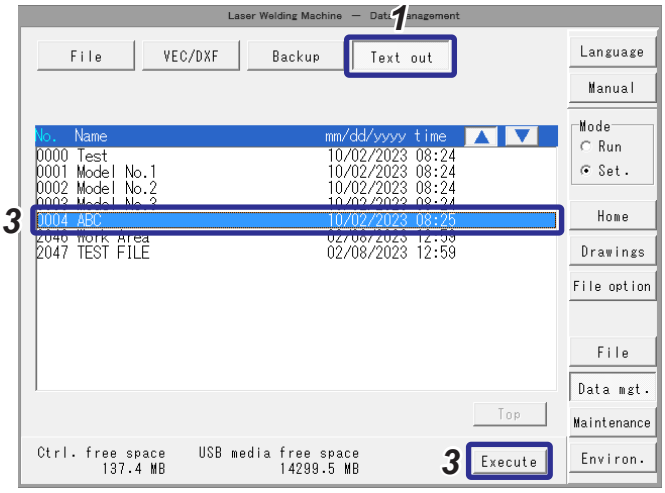
2-7-8 Text output

Outputs the setting file to the USB media with a text format.
This text data can be read with “Notepad”, etc. of “Windows”.

1. Click “Data mgt.” on the right menu and click “Text out”.

2. Insert a USB memory to the controller of the laser welding machine.

3. Select the file to output in text format and click “Execute”.



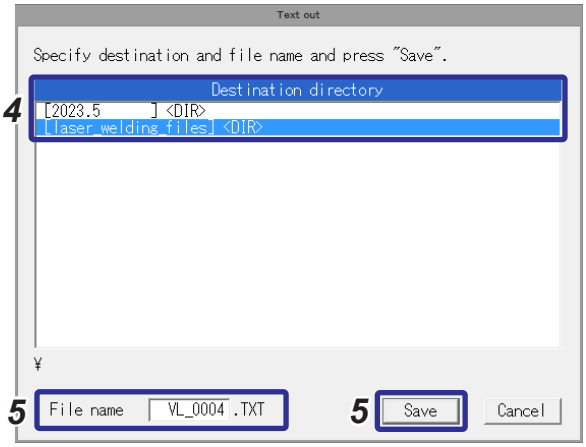
4. Select the destination directory to save the text file.

Without specifying the directory, the text file is saved in the root directory of the USB media.

5. Input the file name (.TXT) and click “Save”.

The following characters can be used for the file name.

- Alphabet and numerics: Up to 8 digits (when specifying all characters in single-byte (ASCII) letter)
- Japanese Katakana, Hiragana, Kanji (JIS level-1 and JIS level-2) and symbols: Up to 4 digits



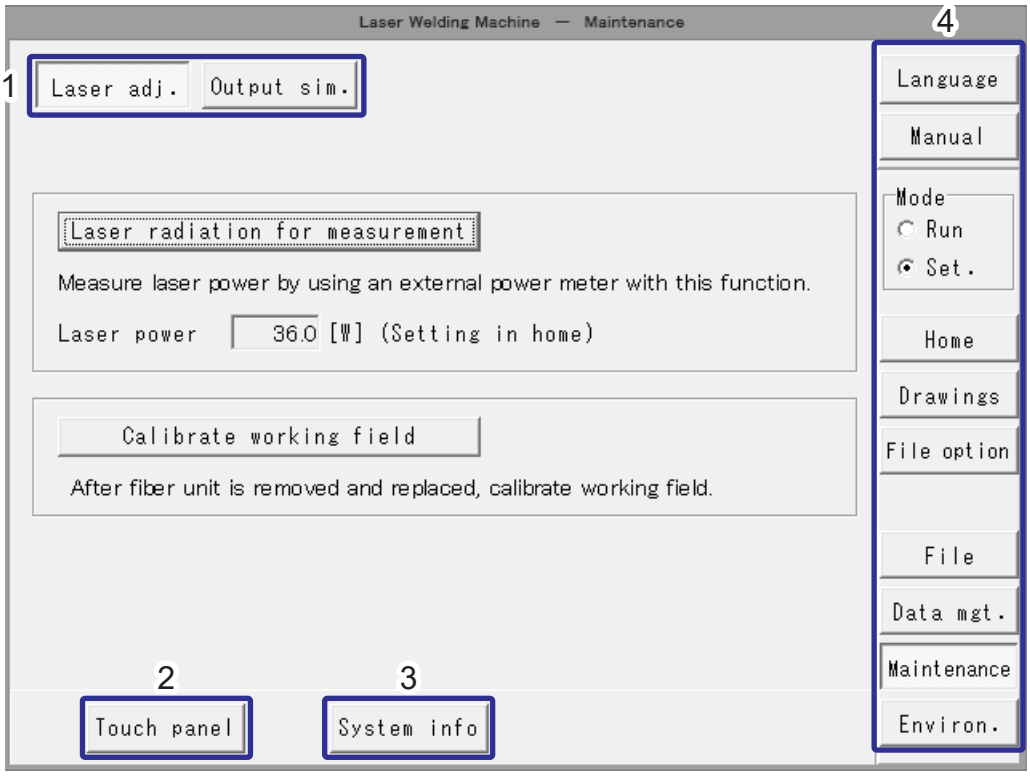
Reference

- The following text can not be used as a file name.
  CLOCK$, CON, AUX, NUL, PRN, COM1 to COM9, LPT1 to LPT9
- The language of the text output corresponds to the display language set in “1-3-3 Language selection” (P.17).

2-8 Maintenance

The maintenance screen is used for the maintenance and checking of the system operation capabilities.

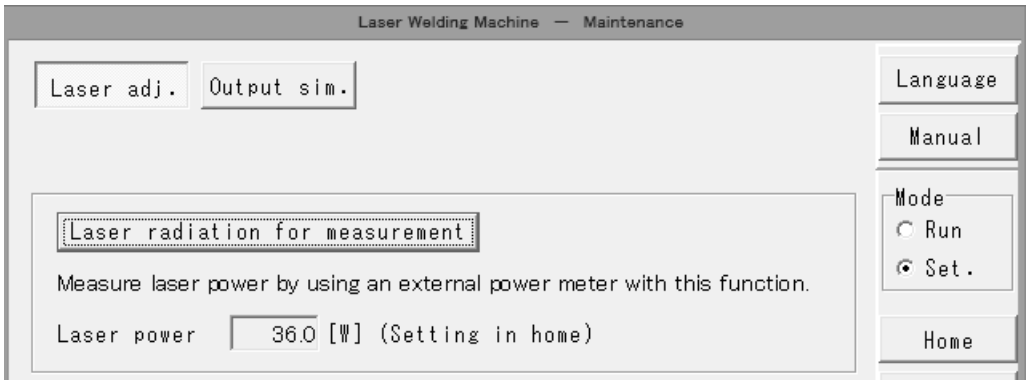
2-8-1 Configuration of maintenance screen



	Item	Description
1	Maintenance menu	Select the sort of maintenance. • Laser adjustment: Refer to “2-8-2 Laser radiation for measurement” (P.96), “2-8-3 Working field calibration” (P.99). • Output simulation: Refer to “2-8-4 Output simulation” (P.104).
2	Touch panel	Calibrates the touch panel console LP-ADP40 if it responds out of the pointed position. Refer to “1-3-4 Touch panel calibration” (P.18).
3	System information	Displays the identification and operating information about the laser welding machine. Refer to “2-8-5 System information” (P.105).
4	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).

2-8-2 Laser radiation for measurement

Radiates laser to measure the output power by using a commercially available power meter. Confirm the output power regularly in order to maintain consistent laser processing quality.
The laser power set in Home screen is applied to the power setting of Laser radiation for measurement.



Reference

- It is also possible to check the approximate laser power by using the laser power monitoring function. To control the laser power with higher accuracy, measure the power regularly by using the commercially available power meter. For the laser power monitoring function, refer to “2-5-5 Laser energy / laser power warning threshold” (P.73).

■ Laser measurement procedures

1. Prepare a commercially available power meter.

Notice

- Use the power meter with the following specifications:
  - The damage threshold (maximum average power density) of the detector is more than 10 kW/cm^2.
  - The size of the detector is more than ϕ 10 mm.
- Be sure to use the calibrated power meter.
- A difference may arise under the high/low temperature. Measuring power with normal temperature (20 to 30 Celsius degree) is recommended.
- Before measuring the laser power, make sure there is no contamination in the laser emission port. If the laser emission port is contaminated or damaged, an error may result in the measurement of the laser power.

2. Set the output beam diameter to 2.0 mm in the head of laser welding machine.

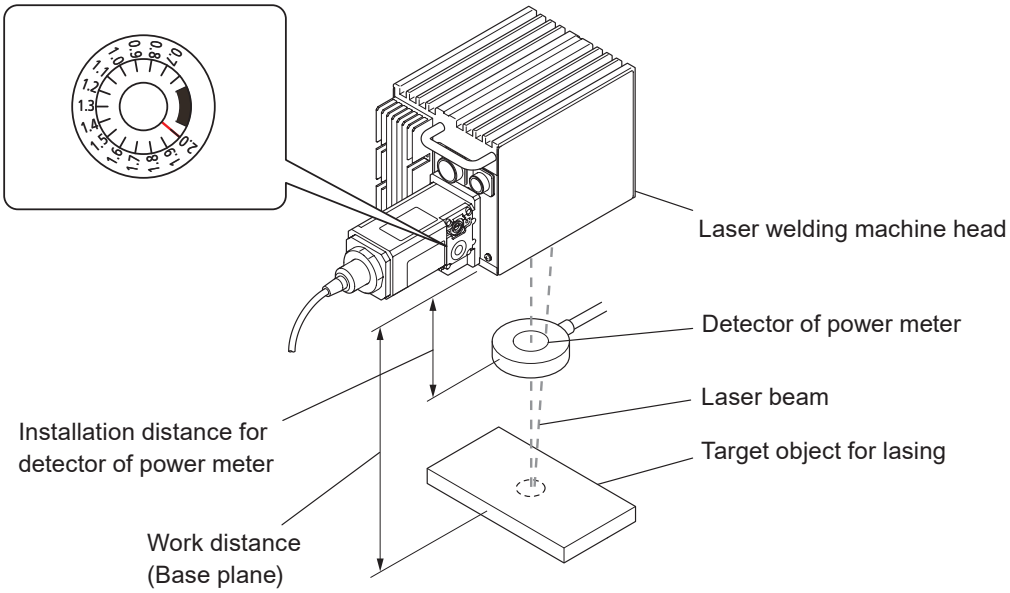
Refer to Setup/Maintenance Guide.

3. Install the power meter.

Put the detector of the laser power meter vertically down from the center of the laser emission port and place it at the following distance, i.e. one-third to half of the focal length (specified work distance) of the laser welding machine.

Laser welding machine model	Installation distance for detector of power meter *1
VL-W1500-N, VL-W1A00-N	Approx. 150 mm
VL-W1506-N, VL-W1A06-N	Approx. 400 mm

*1 : The values represent the recommended values for the case where the damage threshold (maximum average power density) of the detector of power meter is 10kW/cm^2.



Notice

- Do not install the power meter at the specified work distance of the laser welding machine. This may cause destruction of the power meter.
- Make sure to set the output beam diameter to 2.0 mm in the head of laser welding machine. The smaller beam diameter may cause destruction of the power meter.

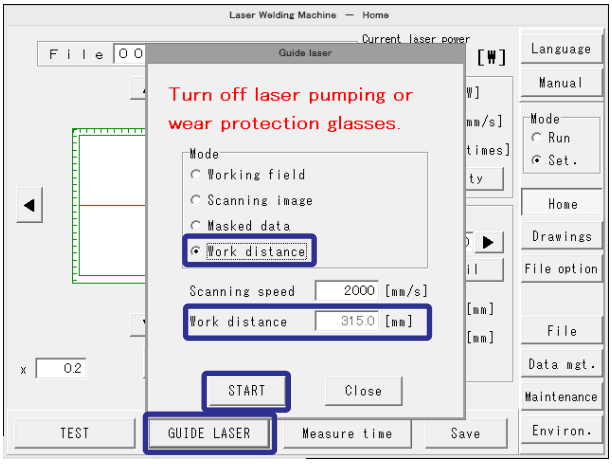
4. To confirm the lasing position to the detector of the power meter, click “GUIDE LASER”.

Confirm the work distance value shown in guide laser screen is set to the base position * and then select the mode to “Work distance”.

* : VL-W1500-N, VL-W1A00-N: 315 mm
VL-W1506-N, VL-W1A06-N: 685 mm

Click “START”.

Place the detector so that the cross indication of the guide laser radiates on the center of the detector. (Do not set it to the position where the dot indication and cross indication overlap.)

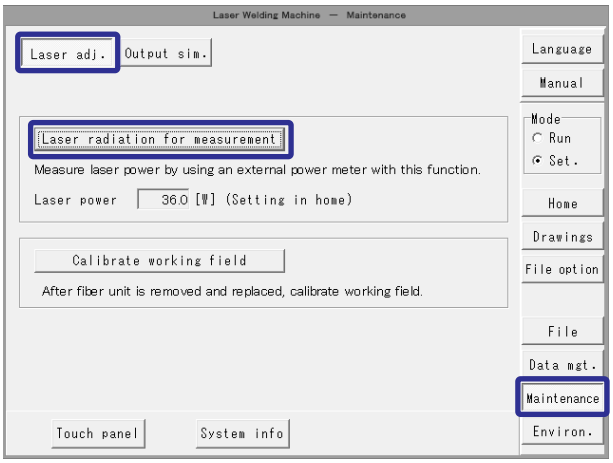


Reference

- If the work distance is set other than the base position, the center of the cross indication dose not refer to the center of the working field.

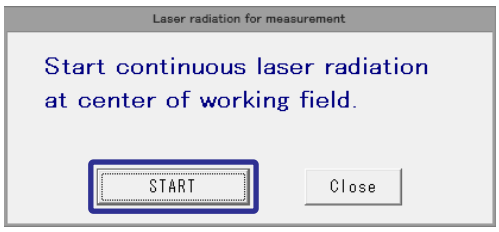
5. Turn ON the laser supply switch on the controller to start laser pumping.

6. Click “Maintenance” on the right menu and select “Laser adj.” tab.



7. Click “Laser radiation for measurement”.

Click “START” in the laser radiation confirmation dialog to irradiate the laser.



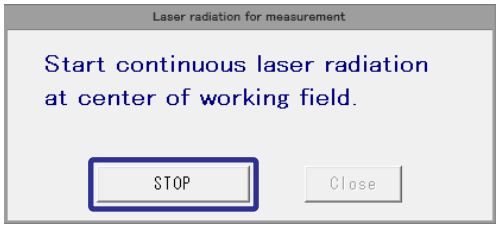
Reference

- The laser power set in Home screen is applied to the power setting of Laser radiation for measurement.
- If the laser power is corrected in System offset of the environment setting, the corrected value is applied also to the power for the measurement.
- The laser radiates to the center of the working field. The X-/Y-offset value in System offset of the environment setting is not applied to the lasing position of this function.
- For stable measurement results, it is recommended to obtain the average output value by measuring the output after about 30 seconds from the start of laser radiation for 10 to 30 seconds. However, if laser radiates more than 1 minute, make sure it does not exceed the damage threshold of the power meter.

⚠WARNING

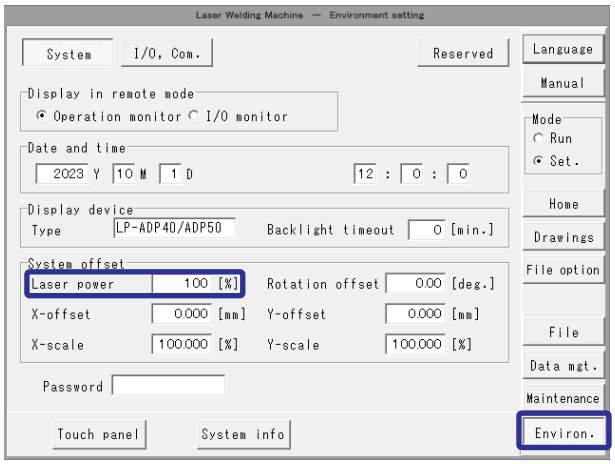
- Be sure to wear protective goggles.
- During the radiation, the laser energy is concentrated to one point. Use due caution with long period radiation, it may cause a fire or damage to the object.

8. Click “STOP” to stop laser radiation.



9. Check the measurement results of the power meter. If the power decays lower than the initial status, correct the laser power setting value using the “System Offset” parameter of the “Environment Setting” screen.

Setting range of laser power correction: 50 to 200 [%]



Notice

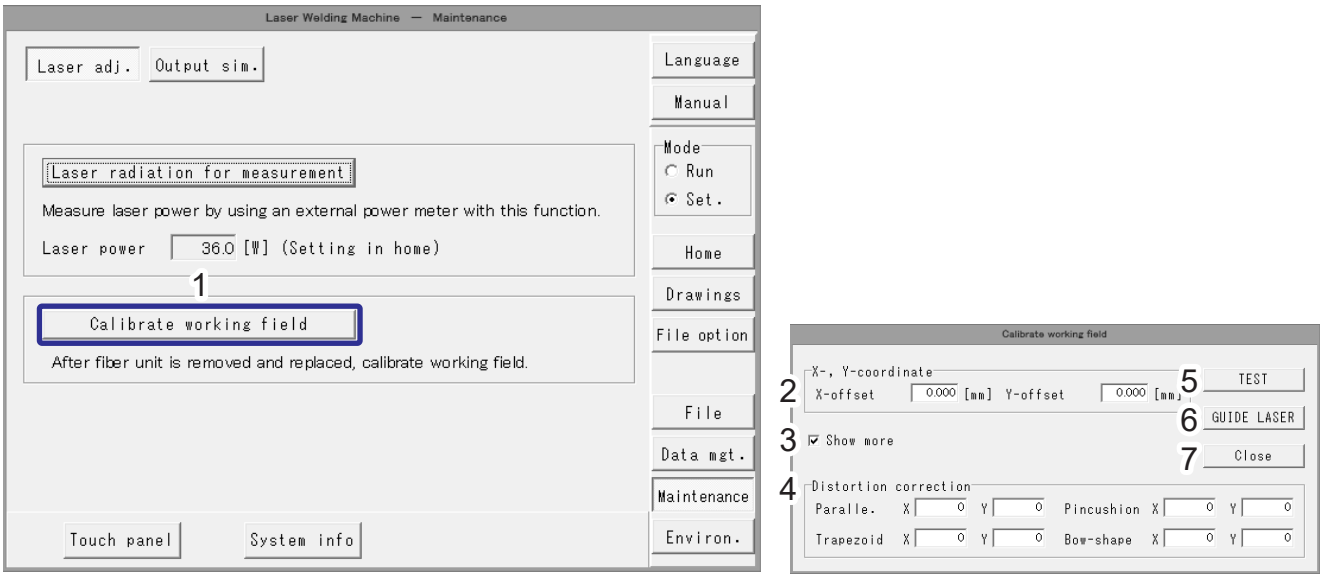
- If the power decays more than 20%, compared to the initial status, the laser oscillator needs maintenance. Contact our sales office or representatives.

Reference

- If the corrected value exceeds the setting limit, the nearest upper or lower limit value is set.
- Power correction refers to the function to correct not the max. laser power [W] value, but the laser power setting value. Power correction cannot increase the output power at the maximum power setting.

2-8-3 Working field calibration

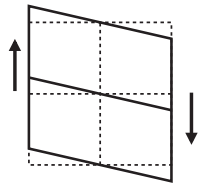
The fiber unit of this product can be removed from the head at the installation temporarily.
When the fiber unit is removed and re-installed, the lasing position might be misaligned. To align the lasing position, calibrate the working field with this function.



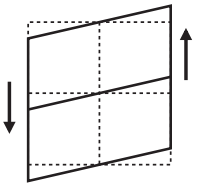
	Item	Description
1	Calibrate working field	Opens the setting window of the calibration.
2	X-offset [mm] Y-offset [mm]	Moves the center position of the working field to X- or Y-direction. Setting range: -2.000 to +2.000 mm
3	Show more	Displays the distortion correction parameters.
4	Distortion correction	Fine tunes the working field with the following parameters. Refer to “Distortion correction image” (P.100). • Parallelogram X/Y • Pincushion X/Y • Trapezoid X/Y • Bow-shape X/Y Setting range: -10000 to +10000
5	TEST	Executes test lasing or guide laser radiation to confirm the lasing position at the calibration. Refer to “Calibration procedures of working field” (P.101).
6	GUIDE LASER	
7	Close	Applies the calibration setting to the laser welding machine and closes the window.

■ Distortion correction image

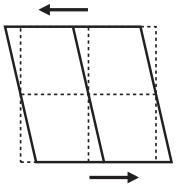
Parallelogram



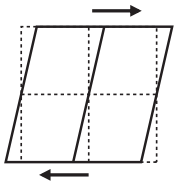
When making the X value smaller



When making the X value bigger

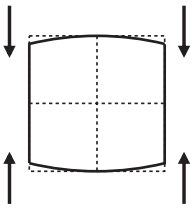


When making the Y value smaller

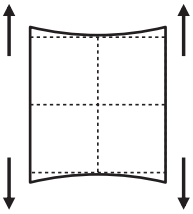


When making the Y value bigger

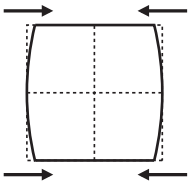
Pincushion



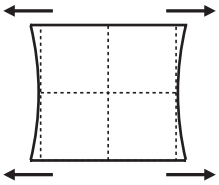
When making the X value smaller



When making the X value bigger

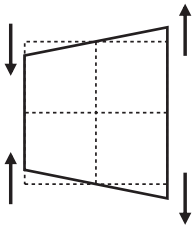


When making the Y value smaller

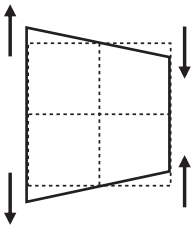


When making the Y value bigger

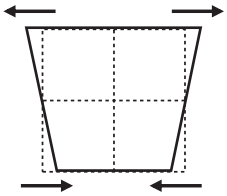
Trapezoid



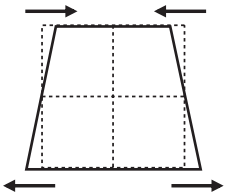
When making the X value smaller



When making the X value bigger

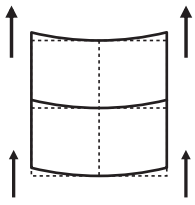


When making the Y value smaller

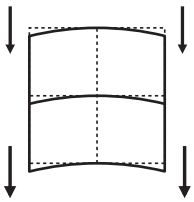


When making the Y value bigger

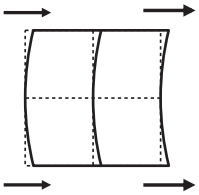
Bow-shape



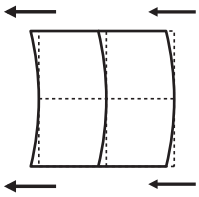
When making the X value smaller



When making the X value bigger



When making the Y value smaller



When making the Y value bigger



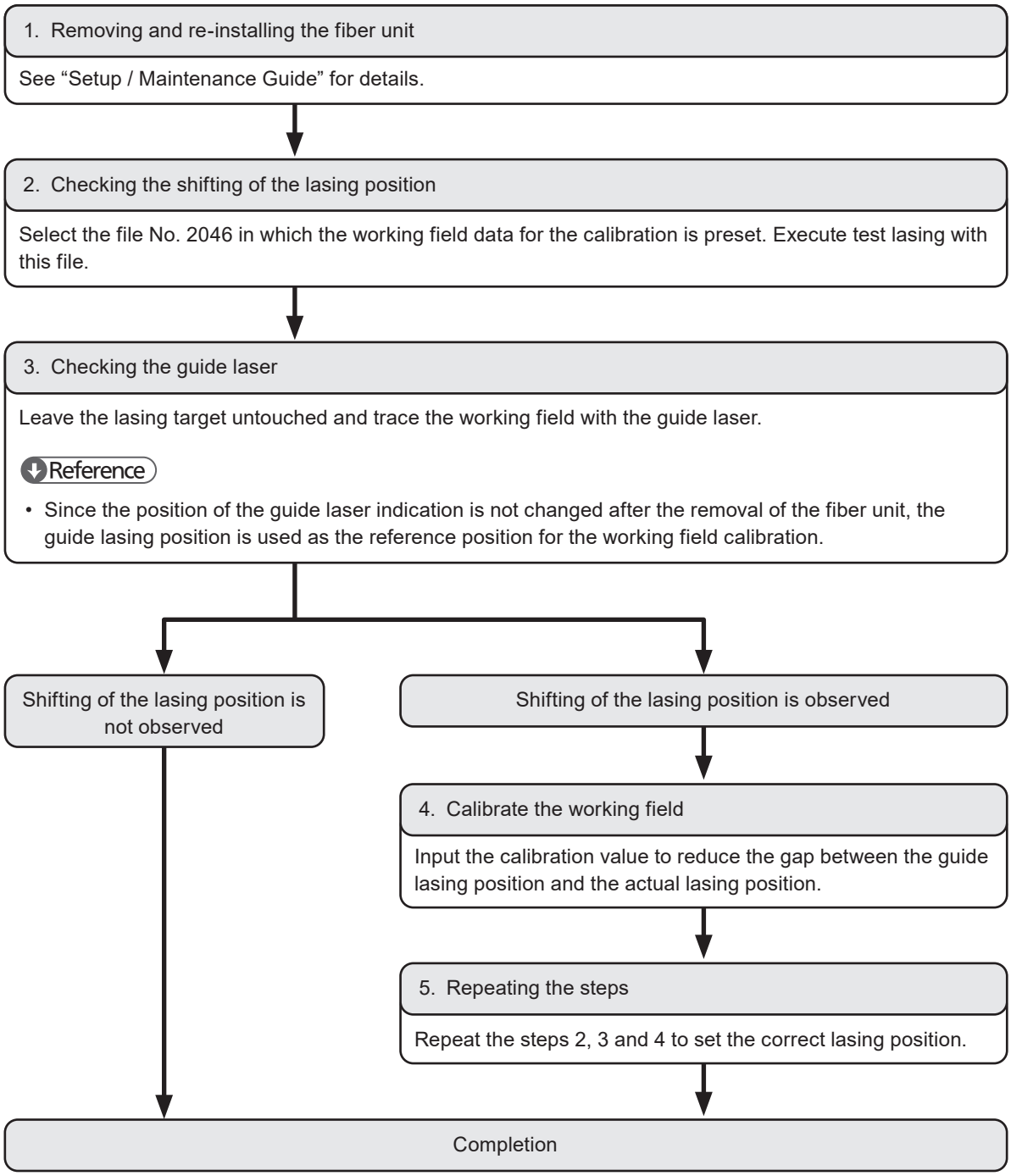
Shows the original working field.

Shows the change of the lasing position when each value is input.

■ Calibration procedures of working field

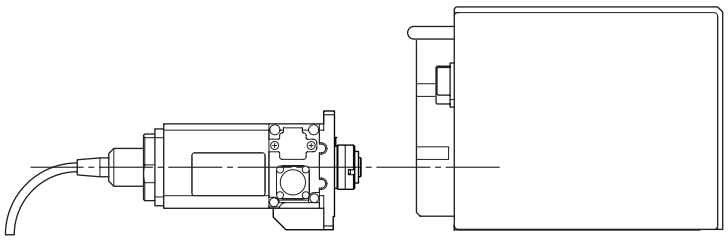
Reference

- Calibration of working field is required when the fiber unit is removed and re-installed. If the fiber unit is not removed, the calibration is not needed.



1. Mount the fiber unit to the head of the laser welding machine properly.

For the mounting procedures, refer to Setup/Maintenance Guide.



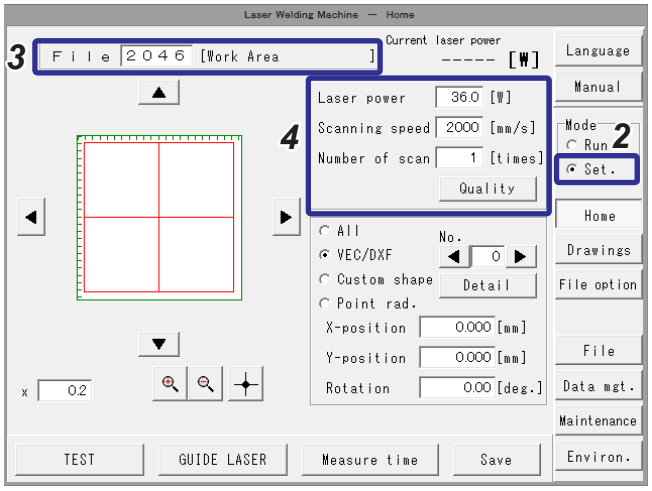
Fiber unit

2. Turn on the power and select the screen mode to “Set”.

3. Select file No. 2046.

In file No. 2046 the working field data (WORKAREA.VEC) for the calibration is preset. Execute test lasing with this file to draw the working field frame and center lines by the actual laser.

4. Set the suitable value to laser power and scanning speed for the target application.



Reference

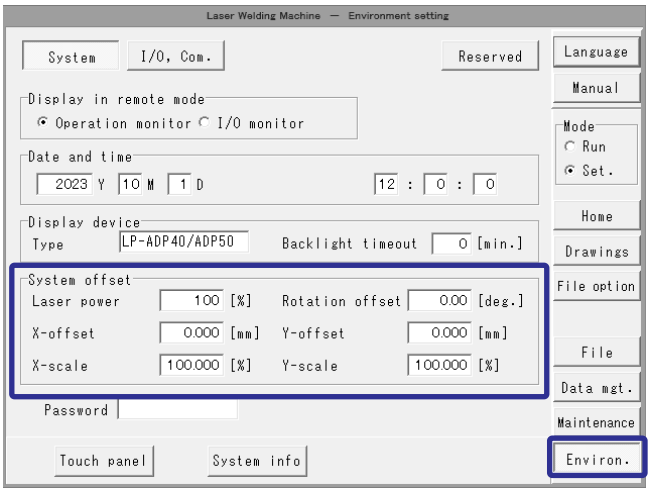
- During the calibration of the working field, set the default value to all settings other than laser power and scanning speed.

5. Click “Environment” on the right menu and set the system offset parameters to the default.

- Rotation offset = 0 degree
- X-offset, Y-offset = 0 mm
- X-scale, Y-scale = 100%

Reference

- After the calibration is finished, set the system offset parameters as before.

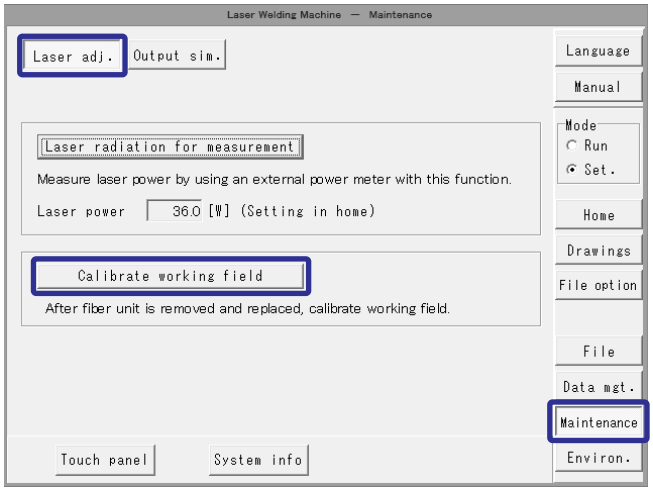


6. Place the lasing target at the base position of the work distance *.

* : VL-W1500-N, VL-W1A00-N: 315 mm
VL-W1506-N, VL-W1A06-N: 685 mm

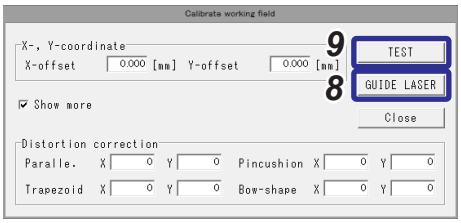
7. Click “Maintenance” on the right menu and click “Laser adj.”.

Click “Calibrate working field”.

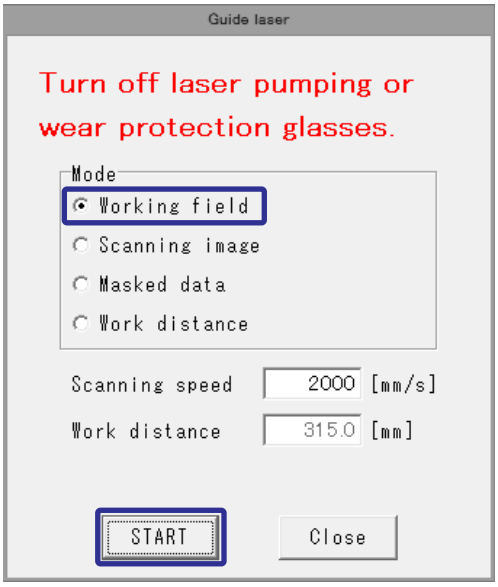


8. Click “GUIDE LASER”. Select the mode to “Scanning image” and click “START”. Confirm the lasing position and place the lasing target.

9. Click “TEST” and start lasing.

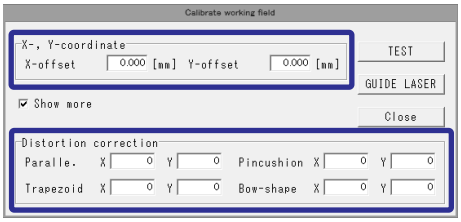


10. Leave the lasing target untouched and click “GUIDE LASER”. Select the mode to “Working field” and click “START”.



11. Check the gap between the guide lasing position and the actual lasing position. If they do not overlap, input the calibration value.

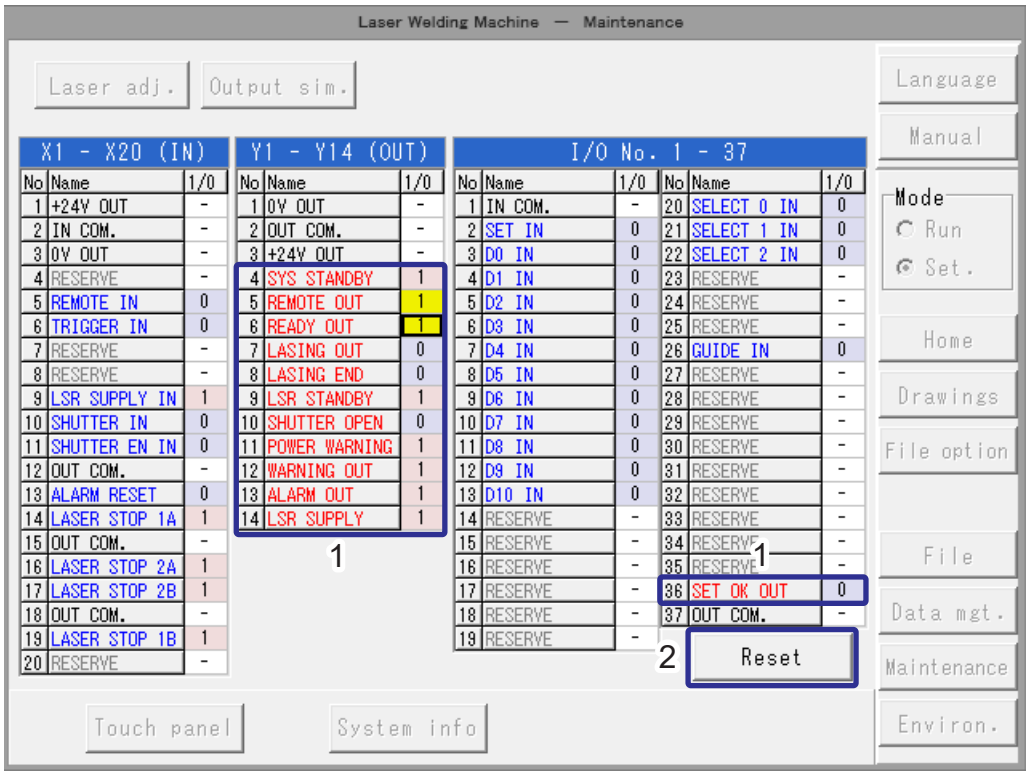
12. Repeat the steps 7 to 10 until the working field indication of the guide laser overlaps with the actual lasing position.



2-8-4 Output simulation

With the output simulation you can check the output signals of the laser welding machine without an actual operation. Use this function to confirm the operation of the external devices connected with the laser welding machine.

- “1” represents ON in the table.
- “0” represents OFF in the table.



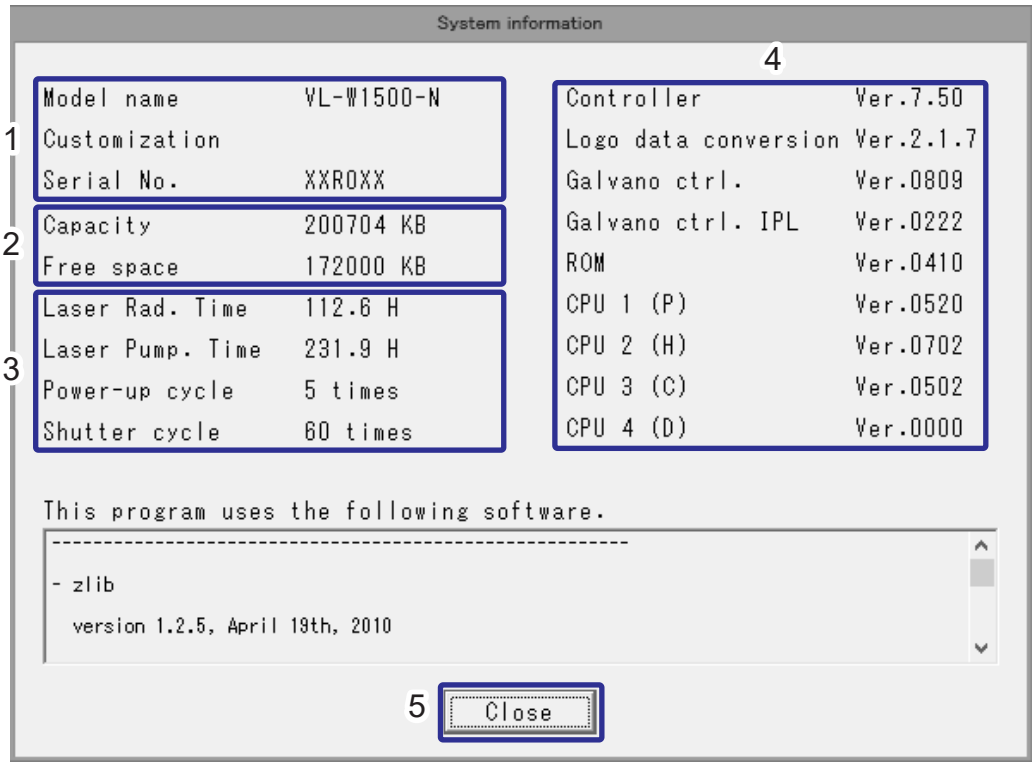
	Item	Description
1	Simulation terminals	Clicking on the output signal name to switch the on/off state. During the output simulation, the status display is in yellow. The input terminals and terminals in “-” cannot be simulated.
2	Reset	Terminates the simulation mode and reset the ON/OFF status of the output signals. Reset button appears when output simulation is started.

Reference

- During the output simulation, other operation and settings are disabled.
- For the details of I/O terminals, refer to “Setup/Maintenance Guide”.

2-8-5 System information

Displays the identification and operating information about the laser welding machine. Confirm them for the maintenance.



	Item	Description
1	Identification information	Displays identification information of laser welding machine. • Model name • Customization: If customized specifications are installed, the custom software name is displayed. • Serial No. of the controller
2	Memory space	Displays the memory amount of the controller. • Capacity • Free space
3	Operating information	Displays total operating time or cycles for the following parts. • Total laser radiation time [H] • Total laser pumping time [H] • Power-up cycle: Total power on times • Shutter cycle: Total shutter open/close times
4	System version	Displays the version information of the following items. • Controller • Logo data conversion • Galvano controller • Galvano controller IPL • ROM • CPU1 to CPU4
5	Close	Closes the system information window.

Reference

- The contents shown in the system information may partly vary depending on the models and versions.

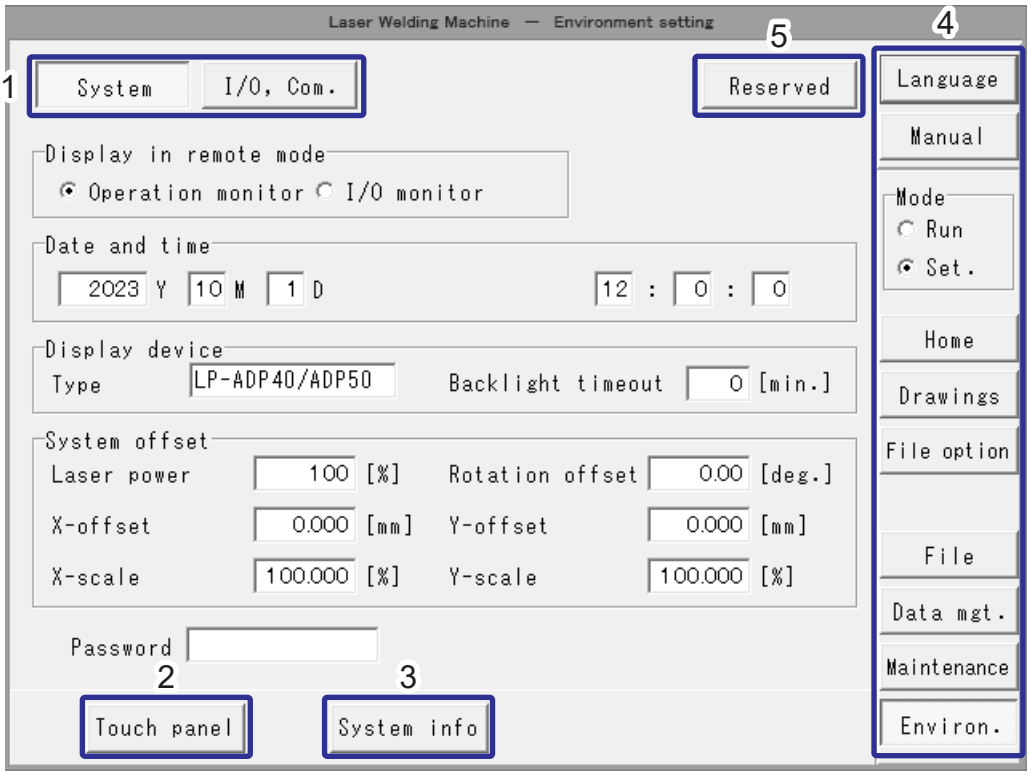
2-9 Environment Setting

On this screen set the system properties of the laser welding machine.
Environment settings are applied to all files and operations of the laser welding machine.
If changes are required, configure the settings before operation.

Reference

- Environment settings are applied and saved to the laser welding machine immediately without saving operation.

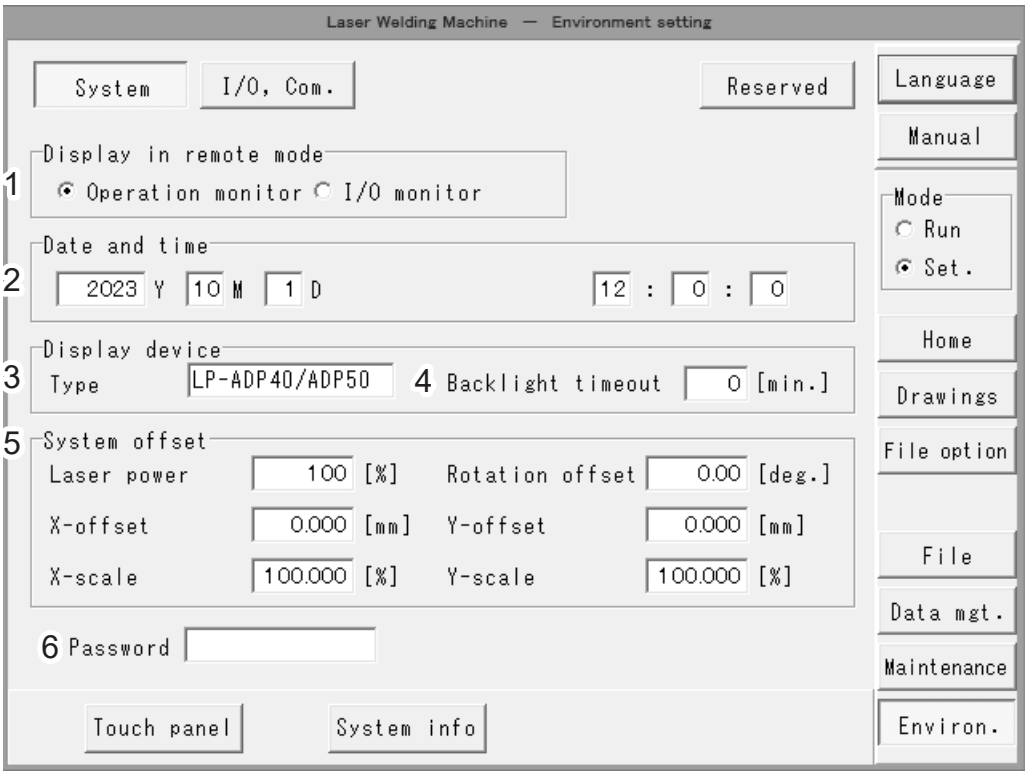
2-9-1 Configuration of environment setting screen



	Setting elements	Description
1	Environment setting menu	Select the setting category from the followings. • System • I/O and communication settings
2	Touch panel	Calibrates the touch panel console LP-ADP40 if it responds out of the pointed position. Refer to “1-3-4 Touch panel calibration” (P.18).
3	System information	Displays the system information and the operating information of the laser welding machine. Refer to “2-8-5 System information” (P.105).
4	Right menu	Switches the screen to display. Refer to “1-3-1 Screen layout” (P.14).
5	Reserved	Maintenance menu for the dedicated service staffs only. Do not use this field.

2-9-2 System settings

Sets the system properties of the laser welding machine.



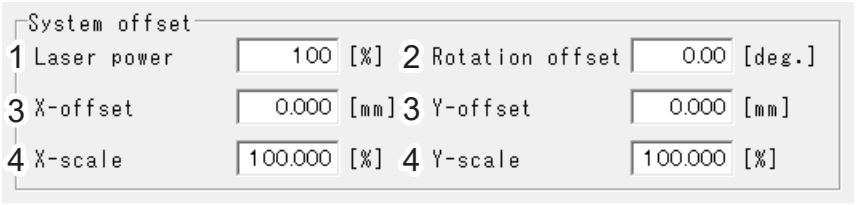
	Setting elements	Description
1	Display in remote mode	Select the display contents shown during the remote control operation. • Operation monitor: “2-10-1 Operation monitor” (P.112) • I/O monitor: “2-10-3 I/O monitor” (P.116)
2	Date and time	Sets the date and time of the internal clock of the laser welding machine. Based on this internal clock, the date and time information for the saving data and error log is updated. Reference • The internal clock might be deviated due to error of the internal parts or degree of the battery drain.
3	Display device	Select the display connected to the controller from the following devices. • LP-ADP40/ADP50: Optional touch panel console (LP-ADP40/ADP50) • 15” Monitor: Commercially available 15-inch monitor • 17” Monitor: Commercially available 17-inch monitor
4	Back light timeout [min.]	When the display device is “LP-ADP40/ADP50”, set the period till the automatic back light off. The light is always turned on when “0” is specified here. Setting range: 0 to 60 minutes
5	System offset	Corrects the working field and laser power of the laser welding machine. This setting applies to all files in the laser welding machine. Refer to “System offset” (P.108)
6	Password	To restrict access to setting change, sets the password here with less than 15 digits numbers. With the password setting, the password is required to switch the screen view from “Run” mode to “Setting” mode. Refer to “1-3-6 Screen selection” (P.23).

Notice

- The password function is designed for the purpose to prevent a wrong configuration or unintended operation. You cannot use this password for security purpose.

■ System offset

Corrects the lasing position and the laser power to all files in the laser welding machine.
This function is used to adjust the installation position or individual difference when the multiple laser welding machines are used.

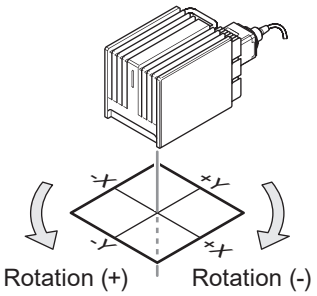


	Setting elements	Description
1	Laser power [%]	The laser power setting in all files are corrected with the offset value internally. Setting range: 50 to 200%

Reference

- If the corrected value exceeds the setting limit, the nearest upper or lower limit value is set.
- If the laser power is corrected in System offset, the corrected value is applied also to the power of the laser radiation for measurement.
- Power correction refers to the function to correct not the max. laser power [W] value but the laser power setting value. Power correction cannot increase the output power at the maximum power setting.

2	Rotation offset [deg.]	Rotates the working field. The rotation center is the center of the working field. It rotates in clockwise direction with minus angle, and in counterclockwise with plus angle. Setting range: -360.00 to +360.00°
3	X-/Y-offset [mm]	Shifts the working field to X-/Y-direction. Setting range: -30.000 to +30.000 mm



Reference

- The X-/Y-offset value in System offset of the environment setting is not applied to the lasing position of the laser radiation for measurement.

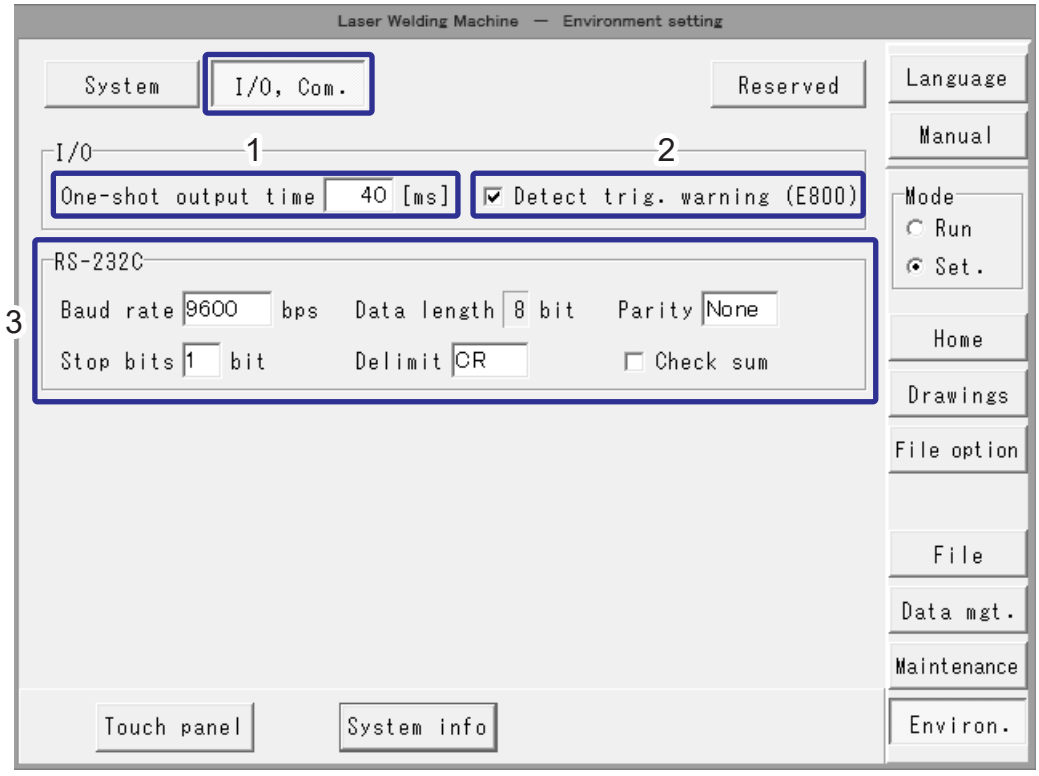
4	X-/Y-scale [%]	Enlarges or reduces the working field size. The scaling origin is at the center of the working field. Setting range: 70.000 to 130.000 %

Reference

- The system offset settings are not shown in the image view on Home screen and Operation monitor.
- If the system offset value exceeds the working field size, only the range in the specified working field can be used.

2-9-3 I/O and communication settings

Sets the I/O and communication conditions to control the laser welding machine with an external devices.



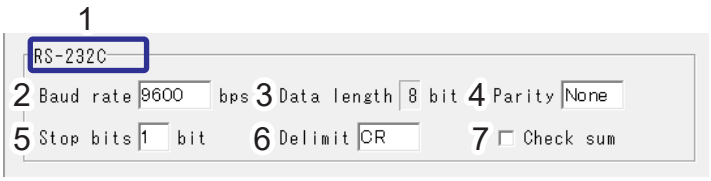
	Item	Description
1	One-shot output time [ms]	Sets the output duration for the following signals. There is a margin of error between the setting value and actual output time. • LASING END OUT (Y8) • SET OK OUT (No. 36) Setting range: 20 to 510 ms Initial setting: 40 ms
2	Detect trig. warning (E800)	Configure if you will output (ON) or will not output (OFF) the warning E800 for the invalid trigger. With enabling this setting, the warning E800 is output when the trigger that cannot be accepted is input while the shutter is opened. This warning “E800” is output in the duration of the one-shot output time. Initial setting: Enabled
3	RS-232C	Specifies the communication settings for the serial communication control.

Reference

- In some case, one-shot output time is also applied to the following outputs.
  - LASING OUT (Y7): In case the lasing time is shorter than the set one-shot output time, the lasing output remains ON until the one-shot output time ends.
  - POWER WARNING OUT (Y11): The minimum output duration of the power warning is the same with the one-shot output time.

■ RS-232C for external control

Sets the RS-232C conditions to control the laser welding machine by using the serial communication command.



	Setting elements	Description
1	RS-232C	Select “RS-232C” to use the RS-232C interface for the serial communication control.
2	Baud rate [bps]	Specifies the baud rate. Setting entry: 1200 / 2400 / 4800 / 9600 / 19200 / 38400 [bps] Initial setting: 9600 bps
3	Data length [bit]	Indicates the data length. 8-bit fixed.
4	Parity	Specifies the parity. Setting entry: None / Odd / Even Initial setting: None
5	Stop bits [bit]	Specifies the stop bit. Setting entry: 1bit / 2bit Initial setting: 1bit
6	Delimiter	Sets the delimiter (code to identify the end of telegraphic message). Setting entry: CR / CR+LF Initial setting: CR
7	Check sum	Specifies ON/OFF of check sum (error detection information). For the calculation method of the check sum, refer to “Serial Communication Command Guide”. Initial setting: None

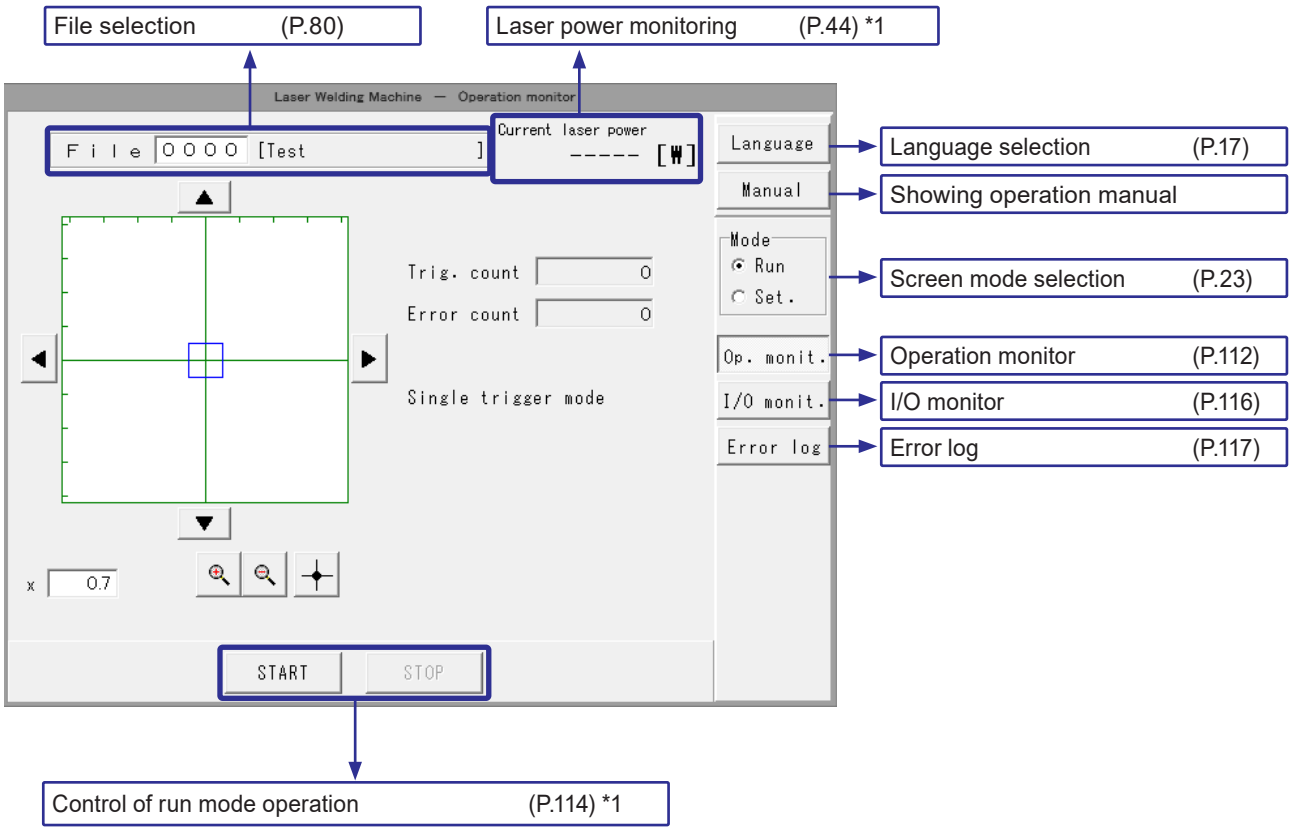
Reference

- The communication conditions of RS-232C must match the settings of the external control device. If the settings are different, communication will fail.
- For the details of the serial communication control, refer to “Serial Communication Command Guide”.
- This settings are not applied to the power monitoring by the serial data output. For the details of RS-232C for power monitoring, refer to “Setup/Maintenance Guide”.

2-10 Run Mode

Run mode is the screen mode to confirm the operating status of laser welding machine.

■ Function of Run mode



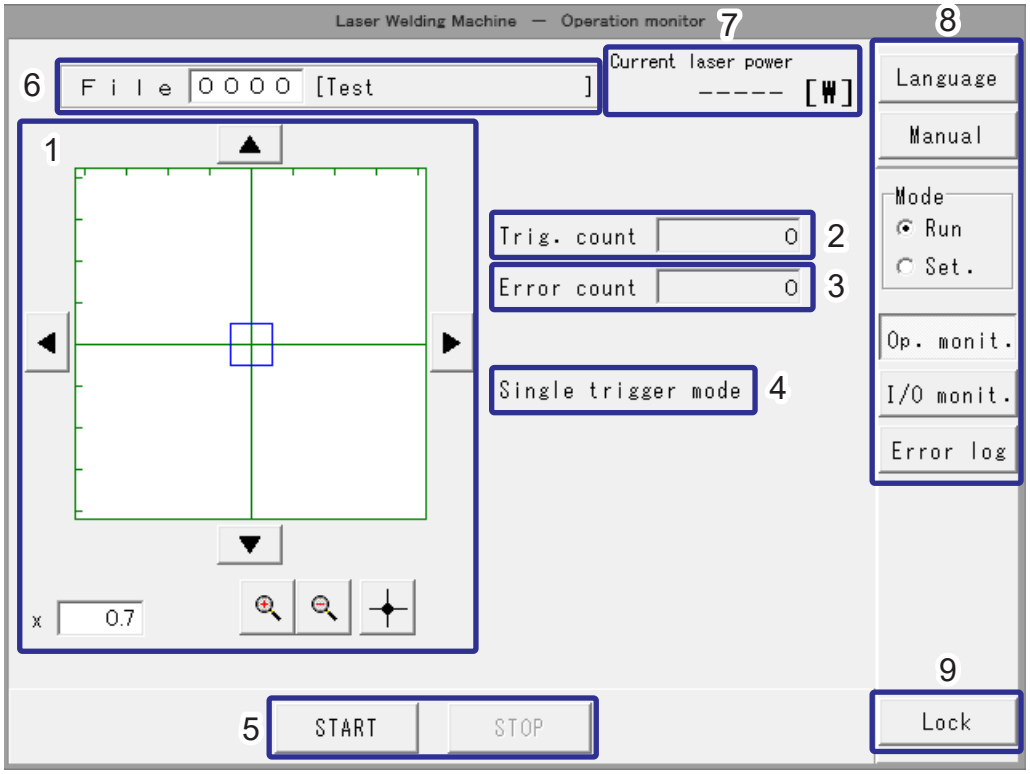
*1 : Available in “Operation monitor” or “I/O monitor” screen.

Reference

- During remote control operation, it is not possible to operate the screen.

2-10-1 Operation monitor

With Operation monitor, confirm the operating status of laser welding machine during the remote control or run mode operation.
Under the remote mode or run mode, the file selected in the laser welding machine is displayed on the Operation monitor screen.
When the file is switched by using I/O or communication command, the displayed file is also switched.



	Item	Description
1	Working image	Displays the image of the file selected by the laser welding machine. Refer to “2-3-2 Working image view” (P.33).
2	Trigger count	Indicates the total number of the received trigger for the selected file. Trigger count includes the error count. Trigger count does not include the test lasing operation. Display range: 0 to 999999999

Reference

- The updated value of the trigger and error count during the remote mode or run mode operation is saved in the laser welding machine without overwriting to the file.
- After Trigger count or Error count reaches to the upper limit, reset the counter value. Otherwise, it is not updated.
- To reset the trigger counter value, refer to “2-5-7 Trigger counter” (P.78).
- Trigger count is updated at the rising edge of LASING OUT signal.

	Item	Description
3	Error count	Indicates the number of the abnormal lasing operation from the received trigger with the following reasons. • When the lasing operation is interrupted because of the alarm or warning occurrence. • When the lasing operation done with the laser energy or power out of the setting threshold. (Warning “E710” or “E812” occurrence) • Lasing operation is completed, but the warning “E720” for the lasing pause is detected. • With “continuous trigger” mode when the executed number of lasing were not within the specified minimum or maximum number. (Warning “E730” or “E731” occurrence) Display range: 0 to 999999999
4	Trigger mode	Select the control method of TRIGGER IN (lasing start signal) at the remote control mode or run mode. According to this setting, the behavior of TRIGGER IN signal in I/O terminal is defined. • Single trigger: One lasing operation is executed by the edge of turning on of TRIGGER IN signal. • Continuous trigger: Lasing operation is repeated while TRIGGER IN signal is on. Refer to “2-5-6 Trigger mode / Number of scans” (P.76).
5	START / STOP	Starts or stops run mode operation. Run mode is an operation method to control the lasing start signal from the external devices such as switches or sensors connected to I/O terminal. Clicking “START” enters the laser welding machine to the standby status for the lasing start signal from I/O terminal X6: TRIGGER IN. To terminate run mode operation, click “STOP”. Refer to “2-10-2 Run mode operation” (P.114).
6	File	Displays the selected file No. and name. By clicking on the file No. field, file selection window appears. Refer to “2-6-2 File selection” (P.80).
7	Current laser power	Displays the measurement result of the laser power [W]. Available only during the lasing operation. Refer to “2-3-8 Laser power monitoring” (P.44).
8	Right menu	Switches the screen to display. Under Run mode, the following screen is available. • Operation monitor • I/O monitor • Error log Refer to “1-3-1 Screen layout” (P.14).
9	Lock	This button is displayed when the password is set in Environment setting screen and it is once unlocked. To reactivate the password locking for the restriction on the access to the setting mode, click this button. For the password, refer to “2-9-2 System settings” (P.107) and “1-3-6 Screen selection” (P.23).

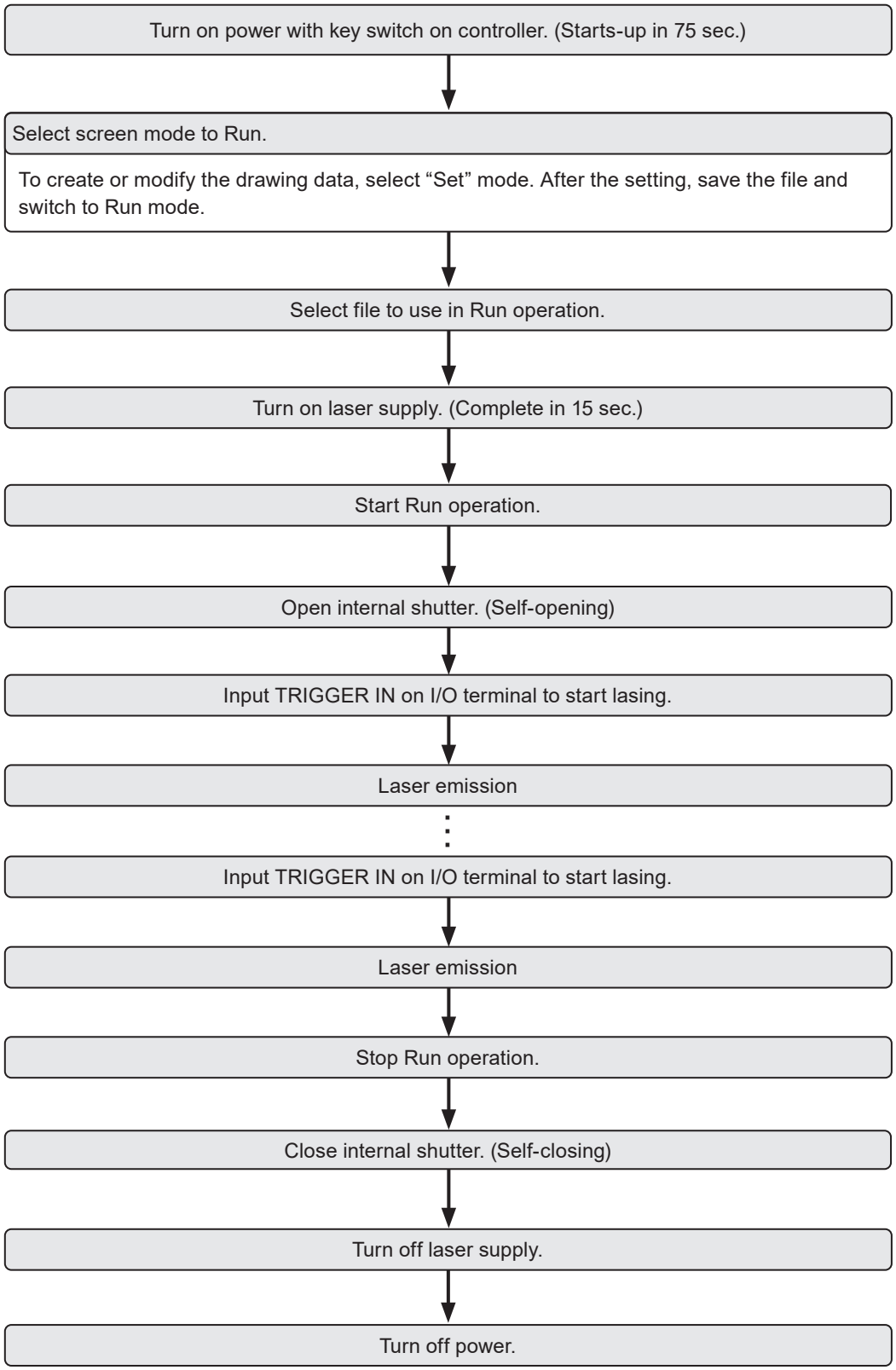
Reference

• The warning “E800” for the invalid trigger input is not included in the error count.

2-10-2 Run mode operation

Run mode is an operation method to configure the settings of the laser welding machine by manual screen operation and to control the lasing start signal from the external devices such as switches or sensors connected to I/O terminal.
Use this operation mode to configure the laser welding machine without using the external control devices as PLC.

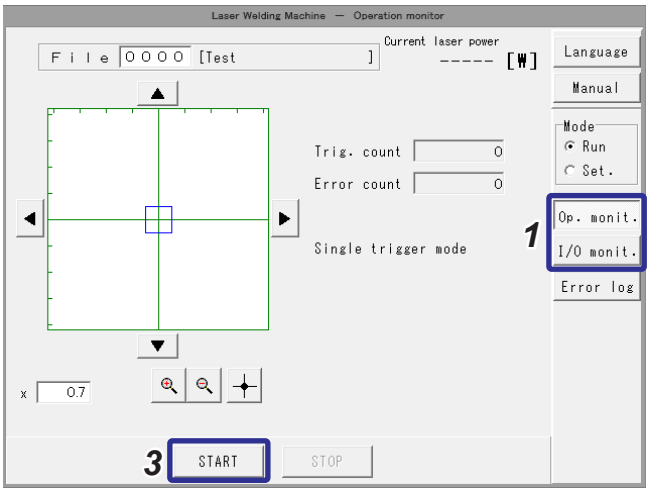
■ Operation flow for Run mode



■ Procedures of starting run mode operation

1. Set the screen mode to “Run” and select any of the following screens:

- Operation monitor
- I/O monitor



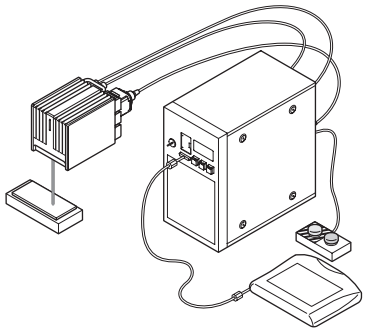
2. Turn ON the laser supply switch on the controller to start laser pumping.

3. Click “START”.

Under the RUN mode operation, the laser welding machine is in the standby status for the lasing start signal from I/O terminal X6: TRIGGER IN.

4. Laser radiation starts by inputting the lasing trigger on the I/O terminal.

Connect a switch or sensor to X6: TRIGGER IN on the I/O terminal as the input method of the lasing start signal (trigger).



5. To terminate run mode operation, click “STOP”.

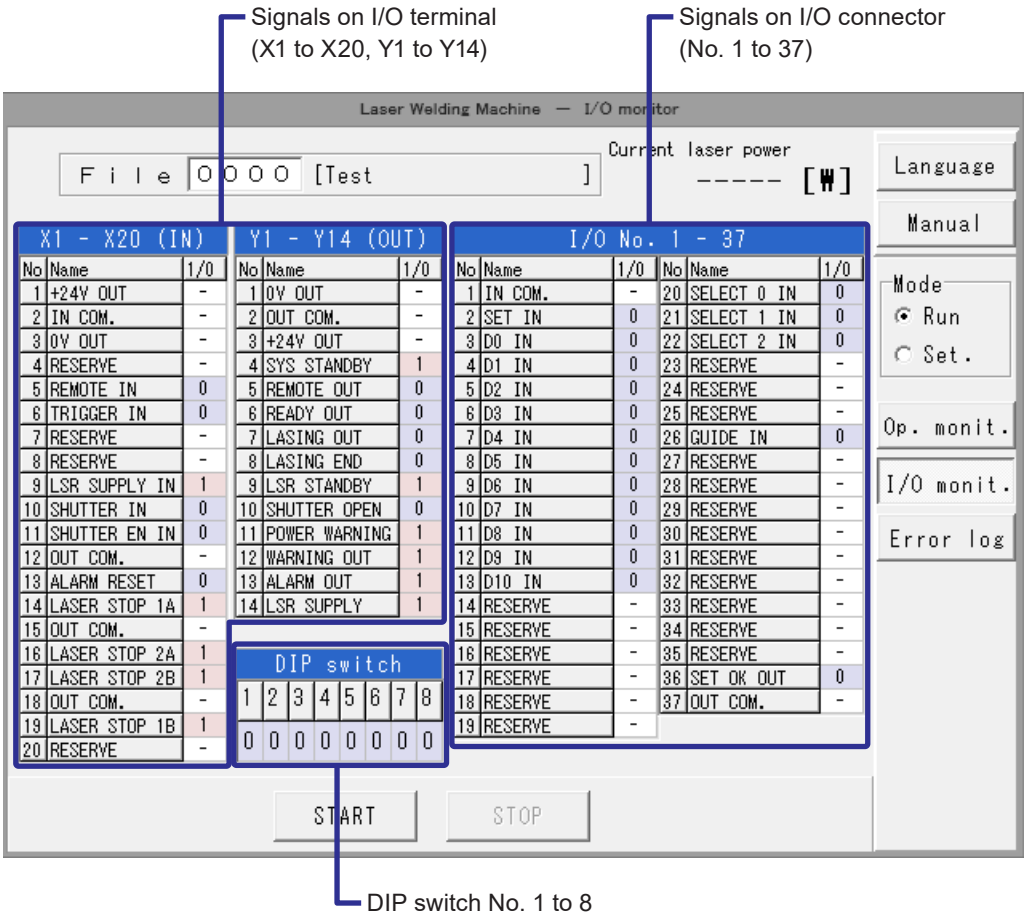
Reference

- If you click “STOP” during laser radiation, run mode operation terminates after the completion of the lasing operation.

2-10-3 I/O monitor

I/O monitor indicates ON/OFF status of the I/O terminals and DIP switch on the laser welding machine.

- “1” represents ON in the table.
- “0” represents OFF in the table.



X1 - X20 (IN)

No	Name	1/0
1	+24V OUT	-
2	IN COM.	-
3	0V OUT	-
4	RESERVE	-
5	REMOTE IN	0
6	TRIGGER IN	0
7	RESERVE	-
8	RESERVE	-
9	LSR SUPPLY IN	1
10	SHUTTER IN	0
11	SHUTTER EN IN	0
12	OUT COM.	-
13	ALARM RESET	0
14	LASER STOP 1A	1
15	OUT COM.	-
16	LASER STOP 2A	1
17	LASER STOP 2B	1
18	OUT COM.	-
19	LASER STOP 1B	1
20	RESERVE	-

Y1 - Y14 (OUT)

No	Name	1/0
1	0V OUT	-
2	OUT COM.	-
3	+24V OUT	-
4	SYS STANDBY	1
5	REMOTE OUT	0
6	READY OUT	0
7	LASING OUT	0
8	LASING END	0
9	LSR STANDBY	1
10	SHUTTER OPEN	0
11	POWER WARNING	1
12	WARNING OUT	1
13	ALARM OUT	1
14	LSR SUPPLY	1

I/O No. 1 - 37

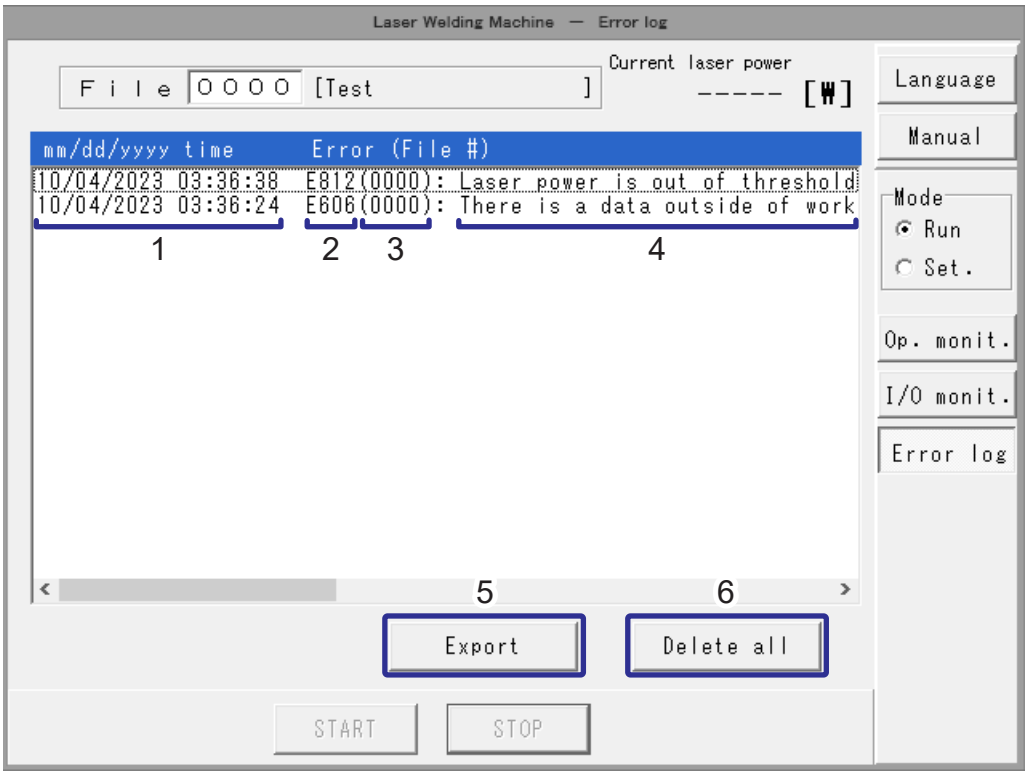
No	Name	1/0	No	Name	1/0
1	IN COM.	-	20	SELECT 0 IN	0
2	SET IN	0	21	SELECT 1 IN	0
3	D0 IN	0	22	SELECT 2 IN	0
4	D1 IN	0	23	RESERVE	-
5	D2 IN	0	24	RESERVE	-
6	D3 IN	0	25	RESERVE	-
7	D4 IN	0	26	GUIDE IN	0
8	D5 IN	0	27	RESERVE	-
9	D6 IN	0	28	RESERVE	-
10	D7 IN	0	29	RESERVE	-
11	D8 IN	0	30	RESERVE	-
12	D9 IN	0	31	RESERVE	-
13	D10 IN	0	32	RESERVE	-
14	RESERVE	-	33	RESERVE	-
15	RESERVE	-	34	RESERVE	-
16	RESERVE	-	35	RESERVE	-
17	RESERVE	-	36	SET OK OUT	0
18	RESERVE	-	37	OUT COM.	-
19	RESERVE	-			

Reference

- The I/O monitor updates the ON/OFF status every 200 ms under the remote control mode. When the remote control mode is turned off, it updates every 20 ms.
- There is a margin of error between the actual input/output time and the ON/OFF time displayed on the screen.
- For the details of I/O terminals, refer to “Setup/Maintenance Guide”.
- When the one shot output is set with short output time, it might not update on I/O monitor. To check the update status of the one shot output on the I/O monitor, set the one shot output with long time. Refer to “2-9-3 I/O and communication settings” (P.109).
- The terminal represented with “-” cannot be monitored on the list.
- Signals on Interlock connector and Shutter closing output terminal are not displayed in I/O monitor.

2-10-4 Error log

Displays the errors that had occurred to the laser welding machine in the past (Maximum: 256) with the information of the date and time, error code No., file No. and the error details.



	Item	Description
1	Date and time	Displays the date and time of occurrence of the error. This information is based on the internal clock of the laser welding machine set in Environment setting.
2	Error code	For the error details of each code, refer to “Error Indication” (P.127).
3	File number	Displays the file number selected when the error occurs.
4	Error details	Displays the error message.
5	Export	Outputs the error log in a text file format to the external memory. This function is available when a USB media is inserted to the controller.
6	Delete all	Deletes the all errors recorded.

Reference

- The oldest error log is deleted when the log exceeds 256 records.
- Some warning errors such as E800, E811 and alarm errors caused by system problem cannot be recorded.

Troubleshooting

Troubleshooting

If any operation errors occur, check items below.
When the problems cannot be resolved, please contact our sales office or representatives.

■ Start-up

Troubles	Causes	Measures
• Power supply is not turned on. • The system does not start up.	Power cable is not connected.	Connect the power supply cable.
	Key switch is not turned on.	Turn on the key switch.
	Power is not supplied.	Check the power supply.
	Fuse is blown.	Replace the fuse by following the procedures described in the Setup/Maintenance Guide.

■ Laser pumping (Laser supply)

Troubles	Causes	Measures
Laser pumping does not start.	The interlock terminal is disconnected.	• Check the wiring of INTERLOCK 1 and INTERLOCK 2 respectively. • If the safety equipment such as door and switch connected to the INTERLOCK 1 and 2 is in released status, restore the original condition.
	LASER STOP 2 IN of the I/O terminal is disconnected.	• Check the connection between LASER STOP 2A IN, LASER STOP 2B IN and OUT COM. of the I/O terminal. • If the safety equipment such as door and switch connected to the LASER STOP 2A IN and LASER STOP 2B IN is in released status, restore the original condition.
	Power is not supplied to the common terminal of the I/O terminal.	Connect the internal or external power supply to IN COM. and OUT COM. in the I/O terminal respectively.
Laser pumping does not start in remote mode.	Signals from the external control device are refused.	Refer to “External Control” in Troubleshooting.

	The DIP switch setting is not consistent with the actual control method of laser pumping (laser supply).	• Check if the setting of DIP switch No. 2 and the control method for laser pumping (laser supply) are consistent:
		  • By I/O: OFF
		  • By communication command : ON
		• If the DIP switch setting is changed, restart the laser welding machine.

■ Display/Configuration

Troubles	Causes	Measures
Touch panel console shows nothing.	Laser welding machine has not been started.	See remedial action against “Start-up”.
	Cable of the touch panel is not connected.	Check that the cable is connected to connector [CONSOLE] on front of controller.
	Return harness is not connected.	Connect return harness to [RETURN OUT], [VGA OUT] and [(VGA+RETURN) IN] on the rear of the controller.
Touch panel console does not respond to screen tap.	Return harness is not connected.	Connect return harness to [RETURN OUT], [VGA OUT] and [(VGA+RETURN) IN] on the rear of the controller.
Monitor shows nothing.	Monitor is not turned on.	Check power to monitor.
	Monitor cable is not connected.	Check that monitor cable is securely connected to connector [VGA OUT] on rear of controller.
	The connected monitor is not applicable with the laser welding machine.	Connect a VGA-compatible monitor.
Mouse does not work.	The mouse is connected to the USB hub.	Connect the USB mouse to the laser welding machine controller directly without USB hub.
	The mouse type is not supported by the laser welding machine.	Use the USB mouse with Human interface device (HID) class.
A USB flash drive cannot be recognized.	• A USB flash drive with a security function is used. • The file system selected when formatting the USB flash drive is not appropriate. • The connector of the USB flash drive is dirty. • The laser welding machine was launched with the USB flash drive connected.	• USB flash drives with a security function cannot be used. • Use a USB flash drive formatted with FAT32. • Clean the connector according to the procedure in the instruction manual of your USB flash drive. • Insert the USB flash drive after the activation of the laser welding machine is completed.

■ Lasing operation

Troubles	Causes	Measures
Laser processing cannot be done. (The laser emission indicator blinks but laser processing is not performed on the object.)	Obstacle hinders laser beam.	Remove obstacle between laser emission port of laser welding machine head and object.
	Distance to object is not appropriate.	Adjust distance between bottom surface of laser welding machine head and target surface of object.
	Object is not in place.	Check the lasing position using the guide laser if the object is out of the specified position.
	Laser power is insufficient.	• Increase laser power (including correction factor). • Decrease scanning speed (including correction factor).
Lasing is not performed in RUN/REMOTE Mode. (The laser emission indicator does not light.)	In RUN Mode: The start button for RUN mode is not activate or the lasing trigger is not input.	Start the RUN Mode, and then input a signal to TRIGGER IN on the I/O terminal.
	The lasing trigger signal on the I/O terminal is not input.	Check connections with external equipment for mis-connection, disconnection or contact failure due to any loose connector.
		Confirm that lasing trigger by one-shot signal of more than 10 ms is input per lasing cycle.
	The lasing trigger is entered while the trigger ready is OFF.	Refer to “External Control” in Troubleshooting.
Sometimes laser is emitted unintentionally.	Fumes causes malfunction of photoelectric sensor for lasing trigger signal.	• Install a dust collector to eliminate the fume (smoke) generated during lasing. • Check that dust collector works well.

■ Lasing quality

Troubles	Causes	Measures
There is a decrease in laser processing quality.	Laser emission port is not clean.	Refer to the “Maintenance” in Setup/Maintenance Guide and clean contaminants off the laser emission port. If contaminants persist, replace laser emission port protective glass. Contact our sales office.
	Fumes occurring during lasing hinder laser beam.	• Install dust collector. • Check that dust collector works well.
	Distance to object is not appropriate.	Adjust distance between bottom surface of laser welding machine head and lasing surface of object.
	Lasing surface of object is inclined.	Make adjustment so that bottom surface of laser welding machine head and lasing surface of object are parallel with each other.
	There are variations in properties of objects. • Thickness varies. • Surface roughness varies (including those in gloss). • Material varies (including those in chemical composition).	Adjust the setting parameters and work distance according to respective target objects.
	Object feeder is not stable.	Adjust object feeder so that position of objects become stable.
	Performance of laser oscillator deteriorates due to aging.	• Increase setting value of laser power. • Decrease scanning speed. If it is not possible to get the same laser processing quality as before even with the max. value of the laser power setting, laser oscillator must be replaced. Contact our sales office.
Lasing does not work partially.	Obstacle hinders laser beam.	Remove obstacle between laser emission port of laser welding machine head and object.
	Laser emission port is not clean.	Refer to the “Maintenance” in Setup/Maintenance Guide and clean contaminants off the laser emission port. If contaminants persist, replace laser emission port protective glass. Contact our sales office.
Drawing line runs over the intended start or end points.	The setting in lasing quality parameters does not match the other settings.	Adjustment the lasing quality parameters such as laser starting, laser ending, or wait value in file option menu.

Troubles	Causes	Measures
Lasing position is out of the setting place.	Head lacks fixation strength.	• Fix head with the specified torque. • Improve strength of head mounting.
	Constant vibration from surrounding equipment (motor and press, etc.) influences.	Perform vibration prevention measures.
	There are irregular vibrations coming from surrounding equipment (air cylinder and forklift, etc.). (Lasing position moves at irregular intervals.)	
	Start and/or stop timing of feeder does not match with lasing operation.	Lasing position moves at the beginning: Lasing trigger signal is likely to be input before object is fully stopped or with a vibration remaining. Turn the lasing trigger signal ON after vibrations are completely damped.
		Lasing position moves at the ending: Object is likely to start moving before completion of lasing. Delay start timing of feeder or speed up scanning speed so that lasing is finished before object starts moving.
	The setting work distance does not match the distance to the actual target object.	Set the same value to the work distance with the actual distance from the head mounting surface to the target object.
	There are noises coming from surrounding equipment.	Protect laser welding machine against noises as follows: • Securely ground the frame ground terminal of laser welding machine or surrounding equipment. • Isolate power and signal lines from each other if they have been routed in parallel. • Shield signal line. • Isolate power supply for laser welding machine from other equipment. • Use noise cut transformer to absorb noises from power supply.

■ External control

Troubles	Causes	Measures
Signals from the external device are refused	Laser welding machine is not in remote mode.	Select the remote mode by following the procedure indicated in Setup/Maintenance Guide.
	The connection with external devices is inadequate.	• Check connections with external equipment for mis-connection, disconnection or contact failure due to any loose connector. • Check for continuity using tester or the like.
	There are noises coming from surrounding equipment.	Protect laser welding machine against noises as follows: • Securely ground the frame ground terminal of laser welding machine or surrounding equipment. • Isolate power and signal lines from each other if they have been routed in parallel. • Shield signal line. • Isolate power supply for laser welding machine from other equipment. • Use noise cut transformer to absorb noises from power supply.
Control by serial communication fails	The RS-232C cable is connected to the wrong connector (RETURN OUT).	Connect the RS-232C cable to “RS-232C” connector on the rear of the controller.
	The connection of the communication cable is incorrect.	• Check the connection method described in Setup/ Maintenance Guide for proper wiring. • For RS-232C connection, confirm the wiring of the external device including the loop back connection.
	Communication parameter settings are incorrect.	• Match communication parameter settings to external equipment. • When using RS-232C, specify the “Flow control” to “None” at the communication port settings of the external control device.
	The communication setting was changed at the time of backup file importing.	Check the communication setting. When the backup file is restored, the communication setting is overwritten by the backup data.
	Command data is not received from external equipment.	Using commercially available line monitor or protocol analyzer, check if the external equipment transmits data.
	Communication data format is inadequate.	• Check if start code STX (02: HEX) is placed at beginning of transmitted data. • Check if a delimiter is placed at the end of the transmitted data. • Check if the delimiter is the value specified in the laser welding machine on the environment setting screen.

Troubles	Causes	Measures
Trigger ready does not turn ON	An error occurs.	Check the error code and cancel the alarm or warning.
	Lasing operation is in progress.	Do not input the next lasing trigger until the lasing operation is completed.
	Laser supply is turned OFF.	Turn ON the laser supply. If the laser pumping fails, refer to “Laser pumping” in Troubleshooting.
	Internal shutter is closed.	• Open the internal shutter. • Check if the setting of DIP switch No. 2 and the actual control method for shutter operation (by I/O or communication command) are consistent. • If the DIP switch setting is changed, restart the laser welding machine.
	File switching is not complete.	If the file number is changed, the trigger ready is turned OFF for dozens of ms or seconds to create drawing data. Input lasing trigger signal after making sure that READY output is ON if you changed the file.
	Though the setting of “Offset by SEO Command” is enabled in the file, SEO command is not input from the external control device.	When the file with the setting to use SEO command is selected, transmit SEO command by every trigger input. Input the lasing trigger signal after making sure that the READY output is on, or checking the status of READY using the status checking command (STS).
	For communication command control: “reception mode ON” is set for command reception permission (MKM command).	Set “reception mode OFF” for command reception permission (MKM command). Before inputting the lasing trigger signal, use the status checking command (STS) to make sure that trigger ready is on.
The required time for turning on READY OUT (Y6) after opening the shutter or changing the file is longer.	Data compile mode was set to Precompiled.	If Lasing pause warning (E720) is not occurred with the selected file, change Data compile mode to Runtime in File option menu.

Troubles	Causes	Measures
The sending command is not accepted with NAK response.	The requested operation can be controlled only by I/O with the current DIP switch setting.	To control the following commands with the serial communication, turn ON DIP switch No. 2 and restart the laser welding machine. • Laser pumping (LSR) • Shutter open/close (SHT) • Guide Laser (GID) • Laser radiation for measurement (SPT)
	“Reception mode ON” is not set for command reception permission (MKM command).	The laser welding machine does not accept commands except the following unless it is in the “reception mode ON” status. For command transmission, set “reception mode ON” for “command reception permission (MKM command)”. • File selection by file No. (FNO) • File selection by file name (FNN) • Shutter open/close (SHT) • Command reception permission (MKM) • Laser pumping (LSR) • Trigger counter reset (CTR) • Status checking (STS) • Lasing trigger (MRK) • Position and power adjustment per trigger (SEO)
	Alarm or Warning occurred.	All commands except the following are refused while alarm or warning is active. When alarm occurred: • Status checking (STS) When warning occurred: • Status checking (STS) • Shutter open/close (SHT) (Only for closing request, and readout) • Command reception permission (MKM) (reception mode ON and readout only)
	Two or more command data are transmitted at the same time.	After sending the command, confirm the response data from the laser welding machine. Do not send the next command before receiving the response.

Error Indication

When an error occurs, an error code appears on the front panel of the laser welding machine controller.
Errors are categorized into alarm and warning depending on their details.
This chapter describes the details and measures of errors.

Alarm

Errors that occur when highly emergent safety function is activated or there is any abnormality in laser welding machine are output as alarm.
When an alarm occurs, the laser supply (laser pumping) is turned OFF, and the laser radiation is stopped if during lasing.

■ Release method of alarm

1. Remove a cause of alarm and confirm the safety. (Any alarms due to hardware's problem cannot be released.)
2. For error codes E004, E011, E260, and E700, use any of the following means to input the alarm reset.
   - Press the alarm reset switch on the controller.
   - Turn on ALARM RESET IN (X13) on the I/O terminal.

For the alarms you are unable to reset such as the ones caused by hardware or system error, restart the laser welding machine.

ERROR CODE	Description	Measures *1
E004	LASER STOP 2 IN is disconnected.	• Connect the LASER STOP terminals of the I/O terminal. • Check the status of the safety equipment connected to the LASER STOP terminals. • Confirm operation logic of the connected devices. • Connect the internal or external power supply to IN COM. and OUT COM. in the I/O terminal respectively.
E011	LASER STOP 1 IN is disconnected during lasing operation.	
E021	Fiber unit or head housing is detached.	• Install the fiber unit properly by following the procedures described in the Setup/ Maintenance Guide. • If there is a looseness in the head housing, contact our sales office or representatives.
E205 - E207	Temperature error in galvanometer or driver.	• Check if the ambient temperature of the laser welding machine is not exceeding the range of its specification. • Avoid placing heat sources near the head.
E208 E209	Improper setting combination of scanning speed and drawing data.	Turn off the power and after rebooting the laser welding machine, correct the following settings. • Decrease the drawing lines and coordinate numbers. • Decrease the scanning speed.
E210 - E218 *2	Galvanometer error.	• Check and correct the power status. • Check if the AC power line is effected by noise. • Check the connection of the cables and signal lines, and then restart the laser welding machine.
E220 *2	Internal shutter error.	Check the connection of the cables and signal lines, and then restart the laser welding machine.

ERROR CODE	Description	Measures *1
E233 *2	Laser error. • Failure of laser oscillator is detected. • Fiber cable is broken. • Instantaneous interruption of laser power supply is detected. • Temperature in the laser oscillator exceeds the limit.	• Check and correct the power status. • Check if the AC power line is effected by noise. • Check the connection of the cables and signal lines, and then restart the laser welding machine. • Check if the ambient temperature of the laser welding machine is not exceeding the range of its specification.
E234	Detected unintended-irradiation.	Contact our sales office or representatives.
E240 E241	Temperature error in laser oscillator.	• Check if the ambient temperature of the laser welding machine is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the filter of the air-cooling part. • When not recovered, contact our sales office or representatives.
E242	Temperature error in head.	• Check if the ambient temperature of the laser welding machine is not exceeding the range of its specification. • Avoid placing heat sources near the head.
E250	Power supply voltage is low.	• Check and correct the power status. • Check if the AC power line is effected by noise from other devices. • Check the connection of the cables and signal lines, and then restart the laser welding machine.
E260	Interlock is disconnected.	• Confirm the connection of the interlock terminals. • Check the status of the safety equipment connected to the interlock terminals. • Confirm operation logic of the connected devices.
E300	Head connection error. Turn the power off and check connection.	Turn off the power and check the followings: • Check the head and controller model. Connect models in the correct combination. • Check the connection of the cables and signal lines, and then restart the laser welding machine. • If the cable is disconnecting, replace it.
E310 *2 E320 *2	Unsupported combination of the head and controller.	
E311 E312 E410	Internal system error occurs in the laser welding machine.	Check the connection of the cables and signal lines, and then restart the laser welding machine.
E411 - E413	Internal process data in the laser welding machine may be corrupted.	Restart the laser welding machine. If it doesn't reboot normally, contact our sales office or representatives.

ERROR CODE	Description	Measures *1
E420 - E443	Internal system error occurs in the laser welding machine.	Check the connection of the cables and signal lines, and then restart the laser welding machine.
E451 - E456	Internal memory error occurs in the laser welding machine.	
E700	Unable to lase as laser pumping is turned OFF.	• Confirm that the laser pumping (laser supply) remains on during lasing operation. • Check wiring of I/O or communication port to the external control devices. • Check the procedures and operation logic of laser pumping (laser supply) control.
E990 - E999	System error.	• Check the connection of the cables and signal lines, and then restart the laser welding machine. • Check if the signal lines are effected by noise.

*1 : If the error persists after restart of the laser welding machine, contact our sales office or representatives.
*2 : The error may occur when the cable between the head and controller is not connected correctly.

Warning

Errors that notify of that the setting data are incorrect or laser radiation conditions are not met are output as warnings. Lasing cannot be started while any warning is active. Laser pumping maintains the state before the warning.

■ Release method of warning

1. Remove a cause of warning. If the setting is incorrect, correct it.
2. In Remote Mode, close the shutter.
   In addition, the following error code warnings are released automatically. Shutter close input is not necessary.
   - E800: After the warning outputs in the duration of the one-shot output time, the warning is released.
   - E811: The warning is only output while the connection between LASER STOP 1A/1B IN (X14, X19) and OUT COM. is opened and the warning is released when it is closed.
   - E812: POWER WARNING OUT (Y11) turns off when the measured laser power exceeds the threshold and it is released after a lapse of the one-shot output time from the lasing operation is finished.
3. To be in ready state for lasing, make sure that WARNING OUT (Y12) is turned on, and then open the internal shutter.

ERROR CODE	Description	Measures *
E251	Internal clock battery is low. Set date and time.	• Check the date and time on the environment setting screen and set it again. After the setting, the warning status is released while laser welding machine power is on. When the power is off, set the date and time again. • To replace the internal battery, contact to our sales office.
E500	Insufficient disk space to save file.	Delete the setting files or VEC/DXF files stored in the laser welding machine on the data management screen.
E502 E503	Cannot read VEC file.	• Import the VEC file again on the data management screen. • Convert the drawing file to VEC format again with Logo data conversion software.
E600	Unset file is selected.	• Input the setting data and save the file. • If you want to use a blank file, save the file without setting data.
E603	No VEC/DXF file.	Import the VEC/DXF file on the data management screen.
E606	There is a data outside of working field.	• Check the working image view on Home screen and adjust the data position and size located outside of the working field. • When there is no data outside of the working field on the working image view, check the X-/Y-offset value of the system offset on the environment setting screen.
E607	Cannot create spiral line in VEC or custom shape drawing.	• If the line length of the custom shape is too small relative to the spiral interval, set the larger value. • Check if there are incorrect data in VEC file. • Convert the drawing file to VEC format again with Logo data conversion software.
E610	Too much coordinate data in file.	• Reduce the number of segments in the drawings. • Reduce the number of start/end points of the drawings.
E612	There is a too long line data to scan.	• Separate the long segment into short data. • Speed up scanning speed.

ERROR CODE	Description	Measures *
E613	Precompiled mode is not available for this drawing data.	• Change Data compile mode to “Runtime” in File option menu. • To use Precompiled mode, speed up scanning speed.
E614	SEO command is not available with Precompiled mode.	• To use SEO command, change Data compile mode to “Runtime” in File option menu. • To use Precompiled mode, disable “Offset by SEO command” in File option menu.
E650	Invalid setting in custom shape elements.	• For arc shape, set the distance between the start point and end point to less than double for radius. • For rectangle shape, set the height or width to more than double for fillet radius.
E651	Invalid line length in custom shape elements.	Set the distance between start point and end point of a line more than 0.01 mm.
E660	Cannot read DXF file.	• Import the DXF file again on the data management screen. • Save the DXF file with DXF-R12J, R13J or R14 format. • Delete the entities which are not supported by laser welding machine in the DXF file. • Reduce the number of layers to 128 or less.
E690	Measurement time over: Over 9999 sec.	• Reduce the number of segments in the drawings and measure the time. • Speed up scanning speed.
E700	Unable to lase as laser pumping is turned OFF.	• Turn ON the laser supply and after the laser pumping has completed, start lasing. • Change timing so that the lasing trigger is input after the laser supply input is turned ON. • Check wiring of I/O or communication port to the external control devices. • Check the procedures and operation logic of laser pumping (laser supply) control.
E710	Laser energy is out of threshold.	• Check the setting value of thresholds. • If there is a decrease in lasing quality, check the output power.
E720	Lasing pause was detected due to data compiling during operation. It might affect the processing results.	• To avoid lasing pause, set Data compile mode to Precompiled in File option menu. • To use Runtime mode, decrease scanning speed. • If the processing results are not impaired by lasing pause, it is possible to use Runtime mode. In such case this warning can be disabled by selecting “Disable warning E720” at Data compile mode setting.
E730	TRIGGER IN turned off before the minimum number of scans was reached.	• Confirm the on/off control of the TRIGGER IN on the I/O terminal. • If TRIGGER IN turns on/off properly, change the setting value of Minimum number of scans in File option menu.
E731	Lasing stopped because the maximum number of scans was reached.	• Confirm the on/off control of the TRIGGER IN on the I/O terminal. • If TRIGGER IN turns on/off properly, change the setting value of Maximum number of scans in File option menu.

ERROR CODE	Description	Measures *
E800	Invalid input of lasing trigger because trigger ready output is off.	• Make sure that the trigger ready output is ON and input to the TRIGGER IN terminal. • Do not input the lasing trigger while the lasing output is ON. • Check for any malfunctions of the switch/sensor connected to the TRIGGER IN on the I/O terminal. • Check wiring of I/O or communication port to the external control devices. • Check the procedures and operation logic of trigger control.
E811	LASER STOP 1 IN on I/O terminal is disconnected.	• Check wiring of LASER STOP 1A/1B IN on the I/O terminal. • Check the status of the safety equipment connected to the LASER STOP terminals. • Confirm operation logic of the connected device.
E812	Laser power is out of threshold.	• Check the setting value of thresholds. • If there is a decrease in lasing quality, check the output power.

* : If the error persists after restart of the laser welding machine, contact our sales office or representatives.

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MEMO

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