PULSETIG® WELDING POWER SUPPLY

MAWA-050A EU

Dedicated to Touch Start

OPERATION MANUAL

AMADA®

OM1182268
MAWA-050A-E14-202307

Thank you for purchasing our product.
This operation manual describes its method of operation and precautions for use.
Read this operation manual carefully prior to use. Store appropriately for ready reference.

Contents

Notification of Risk Information

This “Notification of Risk Information” is intended to notify the risk or others related to this machine (Ordinance on Industrial Safety and Health, Article 24-13) so as to promote the execution of risk assessment (Industrial Safety and Health Act, Article 28-2) on the enterprise side for prevention of labor disasters.

The risk map and residual risk table in this chapter include the matters to be described which are specified in the guide (Notification No.132 of the Ministry of Health, Labor and Welfare issued in 2012) related to the promotion of notice of the risk or others on the machine by the transferor of the machine.

This chapter is a part of the operation manual. Accordingly, do not operate the machine with an understanding of only this chapter. Be sure to read through all the operation manual with a good understanding of its contents before operating the machine.

In this “Notification of Risk Information” and the operation manual, “Injury Levels” are classified according to the following definitions.

 WARNING	This indicates the existence of potential hazard which, if not avoided, may result in death or serious injury of a personal.
 CAUTION	This indicates the existence of potential hazard which, if not avoided, may result in a less serious injury of a personal.

Also, the Ministry of Health, Labor and Welfare in Japan revealed that “weld fumes” may cause worker’s health problems such as neurological disorder. When using this product, wear a dust-proof mask and perform ventilation in the workshop to prevent the occurrence of health problems.

(1) Responsibility for Overall Management

(1) -1. Observance of laws, regulations and safety standard related to the pulse TIG welding machine

When selecting an installation place of the pulse TIG welding machine, performing the power supply work on the input side, handling and taking charge of high-pressure gas, and taking charge of products after welding, and disposing wastes, please observe the laws, regulations and safety standard of your company.

(1) -2. Execution of safety and health education

For the operator of the pulse TIG welding machine, give a special education of arc welding. (Labor Safety and Health Regulations, Article 36)

In particular, execute an education and training about the following items.

- Structure of the arc welding machine
- How to handle the arc welding machine
- Performance and handling of the light-shielding protector
- Measures to be taken in an emergency
- Prohibition of using the machine for other purposes than welding

(1) -3. Clothes for operations

For executing welding operations, put on clothes with long sleeves, foot covers, leather protective globes, and other protectors such as apron. If scattered wastes (spatters) are directly applied to the skin, this will result in a burn.

In accordance with the contents of each operation, put on an appropriate protector such as safety cap, protective glasses and dust-proof mask.

Select each protector based on the safety standard for each operation.

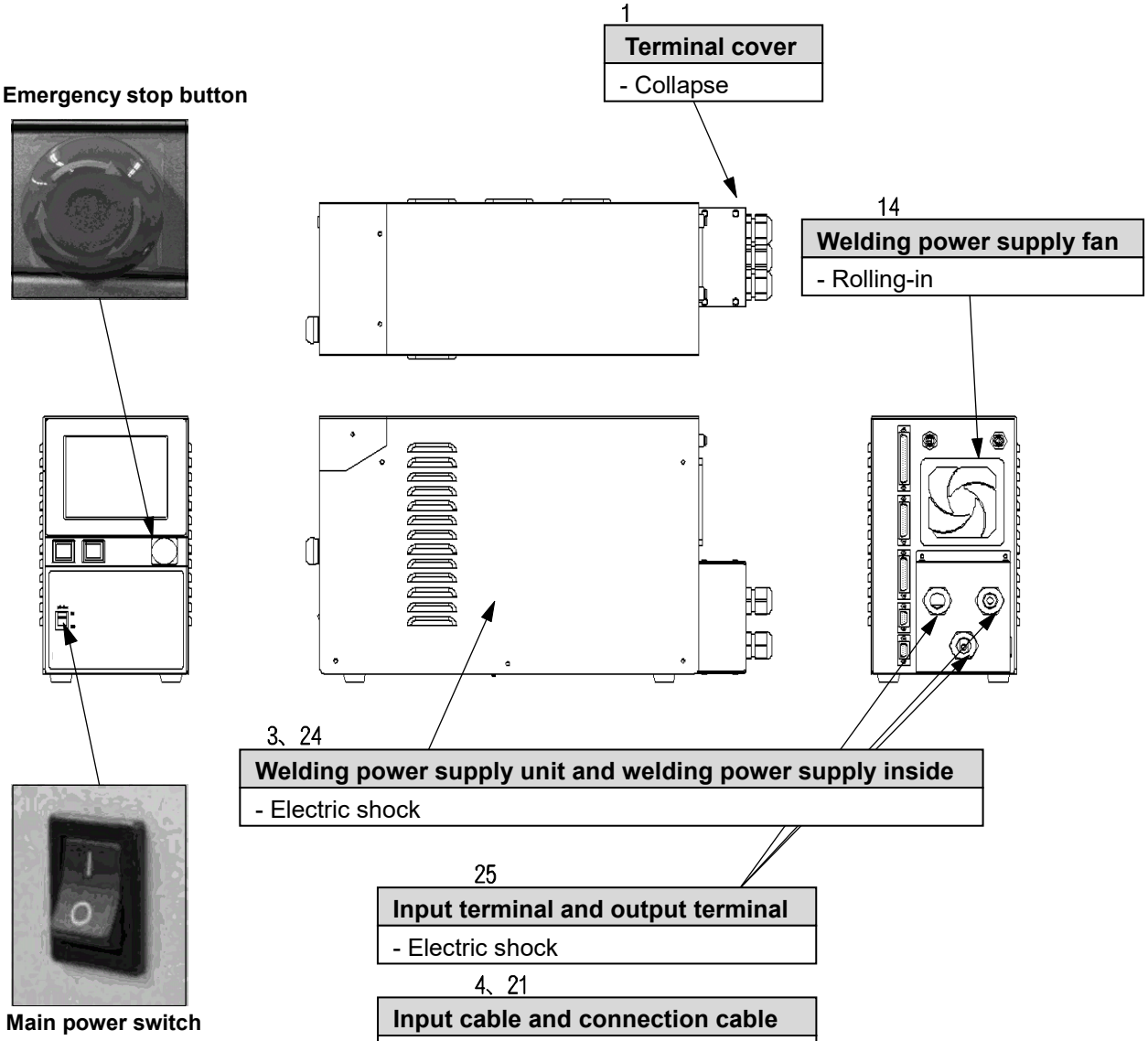
(2) Prohibition of Disassembly, Repair and Modification of the Welding Power Supply

A high voltage is applied to the inside of the welding power supply. Even after the supply power to the welding power supply is shut off, a high voltage status is kept for a certain time. If the case of the welding power supply is removed, this may result in a serious accident. Do not operate the machine in the status where the terminal cover on the rear side of the welding power supply is removed.

(3) Map of Residual Risks

For the details of various residual risks, refer to “(4) Table of Residual Risks.”

(3) -1. Map of residual risks of the welding power supply unit

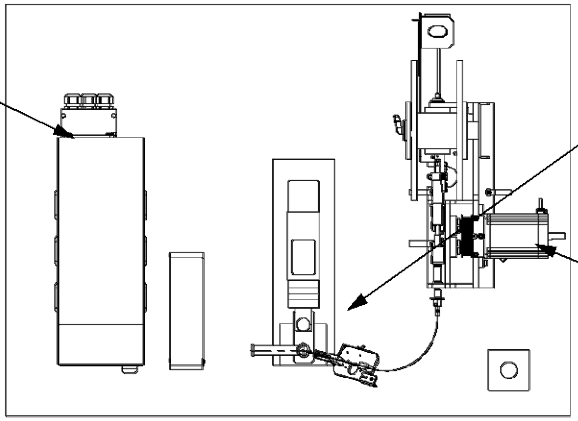


(3) -2. Map of residual risks of the standard system

(Welding power supply + Torch + Torch driving unit + Wire supply unit)

Remarks

- This is supposed on the case where the standard welding machine is incorporated. Execute risk assessment by using the customer's actual specification.



20
Argon gas
- Poisoning
- Suffocation

6
Gas cylinder
- Collapse

7
Gas flow rate adjuster
- Breakage

11
Dust and argon gas
- Poisoning
- Suffocation
- Respiratory trouble

15、16
Wire supply unit
- Rolling-in
- Fire

Emergency stop button

Main power switch

13、23
Electrode and torch
- Electric shock

Emergency stop button

2、8、9
Arc light
- Optic trouble
- Burn

12
Gas generated from workpiece
- Respiratory trouble

17
Welding jig
- Electric shock

10
Combustible
- Fire
- Explosion

22、26
Dust
- Fire
- Respiratory

19
Workpiece and electrode immediately after welding
- Burn

18
Electromagnetic wave from the vicinity of the welding power supply and torch
- Effect on the medical devices in the body

Explanation of the map (example)

1 ← Residual risk No.

Terminal cover ← Source of danger

- Collapse ← Result of the source of danger

(4) Table of Residual Risks

For concrete positions of residual risks, refer to “(3) Map of Residual Risks.”

(4) -1. Installation

1	⚠ WARNING	Transporting the welding power supply
[Source of risk]	Terminal cover	
[Contents of risk]	If the welding power supply is transported by holding such a projection as the terminal cover, the foot may be collapsed if it is fallen down.	
[Protective measure]	When transporting the welding power supply by holding it with hands, hold its bottom.	

2	⚠ WARNING	Installing the welding power supply
[Source of risk]	Arc light	
[Contents of risk]	In the pulse TIG welding machine, strong arc light will be scattered at welding. If this arc light is caught by eyes, the eyes may be inflamed.	
[Protective measure]	Install a light-shielding partition or light-shielding curtain around the welding machine to mark off the welding work place so that arc light may not be applied to the human eyes directly. (Ordinance on Industrial Safety and Hygiene, Article 325)	

3	⚠ WARNING	Electric wiring
[Source of risk]	Welding power supply unit	
[Contents of risk]	Unless the specified primary supply voltage and Class D grounding work are omitted, an electric shock may be caused by electric leakage or by high voltage due to mis-operation.	
[Protective measure]	Execute the primary power supply work and grounding work according to the electric connection diagram. Connect the welding power supply to the ground independently.	

4	⚠ WARNING	Electric wiring
[Source of risk]	Input cable and input/output signal cable	
[Contents of risk]	If the cover is deteriorated or damaged, the cable is directly touched, or a metallic part touched with the cable is touched, an electric shock may be caused.	
[Protective measure]	Do not use a deteriorated or damaged cable or plug. Put a cable cover on the moving part or part touched with the human body so that the input cable or input/output signal cable may not be damaged.	

5	⚠ WARNING	Electric wiring
[Source of risk]	Output cable (torch cable and grounding cable)	
[Contents of risk]	A large current flows and a high voltage of about 10 kV is applied at a start of welding. If a cable with an insufficient capacity or a cable with a low electric strength is used, a fire or electric shock may be caused.	
[Protective measure]	Use the dedicated torch cable or grounding cable dedicate as the output cable. Fix the cable connecting part securely. Do not extend torch-side cable and workpiece-side cable unnecessarily. The cable length should be 10 m or less.	

6	⚠ WARNING	Gas piping
[Source of risk]	Gas cylinder	
[Contents of risk]	If the gas cylinder is fallen down, the foot may be collapsed.	
[Protective measure]	Fix the gas cylinder securely on the gas cylinder stand or a structure such as a wall or pillar.	

7	⚠ WARNING	Gas piping
[Source of risk]	Gas flow rate adjuster	
[Contents of risk]	If an inappropriate gas flow rate adjuster is used for the gas cylinder, explosion may be caused.	
[Protective measure]	Entrust the specialist with the gas piping work.	

(4) -2. Machine operation

8	⚠ WARNING	Welding
[Source of risk]	Arc light	
[Contents of risk]	If arc light is directly seen, the eyes may be inflamed.	
[Protective measure]	Before performing welding operations, put on light-shielding glasses or protective mask with light-shielding level No.9 or more. To monitor welding, put on protective glasses with light-shielding level No.9 or more or perform monitoring through a light-shielding curtain. Do not allow any person thoughtlessly to enter an area around the welding machine and welding operation place.	

9	⚠ WARNING	Welding
[Source of risk]	Arc light	
[Contents of risk]	If arc light is directly applied to the skin, the skin may get burnt.	
[Protective measure]	Before performing welding operations, put on protectors such as the leather protective glasses for welding, clothes with long sleeves, foot cover, and leather apron. Do not allow any person thoughtlessly to enter an area around the welding machine and welding operation place.	

10	⚠ WARNING	Welding
[Source of risk]	Combustibles	
[Contents of risk]	If the waste (spatter) to be generated at welding is applied to any combustible, it may catch fire, causing a fire or explosion.	
[Protective measure]	Do not perform welding near combustible gas. Do not put any combustible around the welding operation place. If the waste cannot be removed, put an incombustible cover on it. Install a fire extinguisher in the welding operation place so that even if a fire occurs, it may be extinguished immediately. A fire extinguisher suitable for each target material must be selected for use. Fire extinguishers are classified into a type for common fire, type for oil fire, type for electric fire, and type for special fire (metals, etc.). Prepare a fire extinguisher suitable for a presupposed fire.	

11	⚠ WARNING	Welding
[Source of risk]	Dust and argon gas	
[Contents of risk]	If the area is filled with dust and argon gas, the human body may be badly affected.	
[Protective measure]	Perform ventilation around the welding operation place and the whole factory at all times. Install sealed-up equipment, local exhaust device, etc. and put on a gas mask or dust-proof mask as required.	

12	⚠ WARNING	Welding
[Source of risk]	Gas generated from workpieces	
[Contents of risk]	After a covered steel plate is welded, the human body may be affected by the generated gas.	
[Protective measure]	Perform ventilation around the welding operation place and the whole factory at all times. Install sealed-up equipment, local exhaust device, etc. and put on a gas mask or dust-proof mask as required.	

13	⚠ WARNING	Welding
[Source of risk]	Electrode and torch	
[Contents of risk]	At a start of arc discharge, a high voltage will be generated between the electrode at the end of the torch and a workpiece. If a person touches or approaches the electrode, an electric shock may occur.	
[Protective measure]	Do not touch or approach the electrode portion during welding operations. Do not perform welding by holding the torch with hands.	

14	⚠ CAUTION	At all times
[Source of risk]	Welding power supply cooling fan	
[Contents of risk]	If fingers or hairs are rolled into the welding power supply cooling fan, this may result in an injury.	
[Protective measure]	Do not cause fingers and hairs to approach the fan that is rotated.	

15	⚠ CAUTION	At all times
[Source of risk]	Rotary part of the wire supply unit	
[Contents of risk]	If hands, fingers, hairs or clothes are brought near the rotary part of the wire supply unit, they may be rolled into it.	
[Protective measure]	While the power supply of the welding machine is ON, do not bring hands, fingers, hairs, clothes, etc. close to the rotary part.	

16	⚠ CAUTION	At all times
[Source of risk]	Arc discharge of the wire supply unit	
[Contents of risk]	If the wire supply unit and a workpiece are electrically connected, a high voltage may be applied through the wire, thereby causing an arc discharge and a fire in an unexpected place.	
[Protective measure]	Perform insulation between the wire and the workpiece.	

17	⚠ CAUTION	Welding
[Source of risk]	Welding jig	
[Contents of risk]	Electrification is performed neat the welding jig. If a person touches such a place, an electric shock may occur.	
[Protective measure]	Perform grounding so as not to allow a workpiece or the welding jig which is electrically connected with a workpiece to be an electrified part. During welding operations or just after welding operations, do not touch the welding jig and area around the welding jig.	

18	⚠ CAUTION	Welding
[Source of risk]	Electromagnetic wage from the welding power supply and torch	
[Contents of risk]	In the case of a person using an electronic medical device such as pace maker and germ eliminating device, the operation of an electronic medical device may be affected by the electromagnetic wave generated during arc discharge.	
[Protective measure]	Those who use any electronic medical device must not approach around the welding machine or welding operation place without a doctor’s permission. If they feel unwell or are out of order, leave the place at once.	

19	⚠ CAUTION	Taking out a workpiece
[Source of risk]	Workpiece and electrode immediately after welding	
[Contents of risk]	Immediately after welding, the workpiece and electrode are still hot. If the welded workpiece is touched with a bare hand or the electrode is touched in taking out a workpiece, this may result in a burn.	
[Protective measure]	Put on leather gloves when handling a workpiece.	

(4) -3. Maintenance

20	⚠ WARNING	Gas piping
[Source of risk]	Argon gas	
[Contents of risk]	In case the argon gas piping work is inappropriate, a gas leak may occur. If the welding operation place is filled with argon gas, the human body may be affected badly.	
[Protective measure]	After replacement of a gas cylinder, consult with a gas piping specialist or gas supply company about the gas pressure adjusting operation.	

21	⚠ WARNING	Power inspecting
[Source of risk]	Primary power piping	
[Contents of risk]	When inspecting the primary power wire on the factory side, an electric shock may be caused by touching the charged part by mistake.	
[Protective measure]	Before performing inspection operations, stop the electric power supply and turn off the source power supply on the factory side. Put a notice to notify “Under inspection” to the other operators.	

22	⚠ WARNING	Workshop cleaning
[Source of risk]	Dust	
[Contents of risk]	If dust is inhaled, the human body may be affected. And if dust is accumulated, a fire may occur.	
[Protective measure]	Perform cleaning periodically around the welding operation place and workshop. Perform cleaning by using a method that does not scatter dust, for example, by using a vacuum cleaner or washing with water. When dust is scattered, put on a dust-proof mask.	

23	⚠ WARNING	Electrode replacement
[Source of risk]	Electrode	
[Contents of risk]	If another worker operates the welding power supply by mistake, this may cause an electric shock due to a high voltage to the worker who replaces the electrode. In case a voltage is left by charged electrode, an electric shock may occur.	
[Protective measure]	Before performing electrode replacing operations, turn off the welding power supply. For other workers, “Under electrode replacement” should be indicated. Short-circuit the electrode with the grounding side to discharge a charged status and then start electrode replacing operations.	

24	⚠ WARNING	Welding power supply maintenance
[Source of risk]	Inside of the welding power supply	
[Contents of risk]	If the case is removed and the internal high-voltage portion is touched immediately after the power supply is turned on or off, this may result in a death. Even after the power supply is turned off, the capacitor remains charged for a certain time.	
[Protective measure]	Do not open the case of the welding power supply. If a welding power supply trouble occurs, make contact with us or the distributor.	

25	⚠ WARNING	Welding power supply removal
[Source of risk]	Input terminal and output terminal	
[Contents of risk]	If the primary supply voltage is supplied to the input terminal or the output terminal remains charged when the welding power supply is removed, this may cause an electric shock.	
[Protective measure]	Before removing the welding power supply, shut off the power to the welding power supply and short-circuit the electrode with the grounding side to discharge the electricity charged in the output terminal. Then, remove the output terminal.	

(4) -4. Scrapping

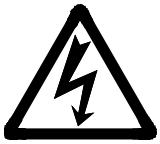
26	⚠ WARNING	Dust scrapping
[Source of risk]	Dust	
[Contents of risk]	If dust is inhaled, the human body may be badly affected.	
[Protective measure]	Classify collected dust according to materials and keep it in a can with a cover so that it may not be scattered. Scrap it as industrial waste. Do not scrap it like general waste.	

(5) On Disposal

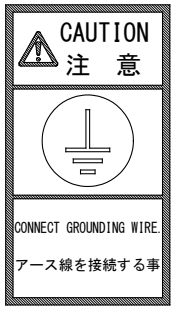
This product incorporates parts containing gallium arsenide (GaAs). At the time of disposal, separate it from general industrial waste or domestic waste and carry out the disposal in accordance with applicable laws and regulations.

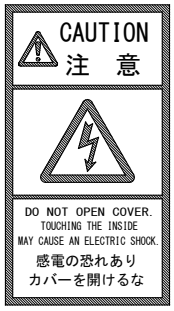
(6) Warning Labels

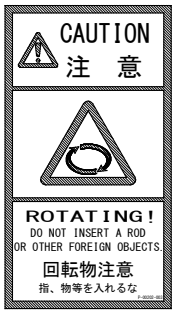
A warning label is pasted on the welding power supply unit for safe use. The pasting place and meaning of each label are as shown below.



Pasting place: Upper part of the terminal cover
Meaning: Danger of electric shock







Pasting place: Front side of the upper part of the main unit
Meaning:

Caution for grounding wire connection	Danger of electric shock	Pay attention to rotary materials such as fan

Pasting place: Rear side of the upper part of the main unit
Meaning: Danger of electric shock

Pasting place: Side surface of the terminal cover
Meaning: Danger of electric shock

(Only models subject to CCC)
Pasting place: Rear side of the upper part of the main unit
Meaning: Danger of electric shock
Danger of welding dust and fume
Danger of fire
Danger of arc light

1. Overview

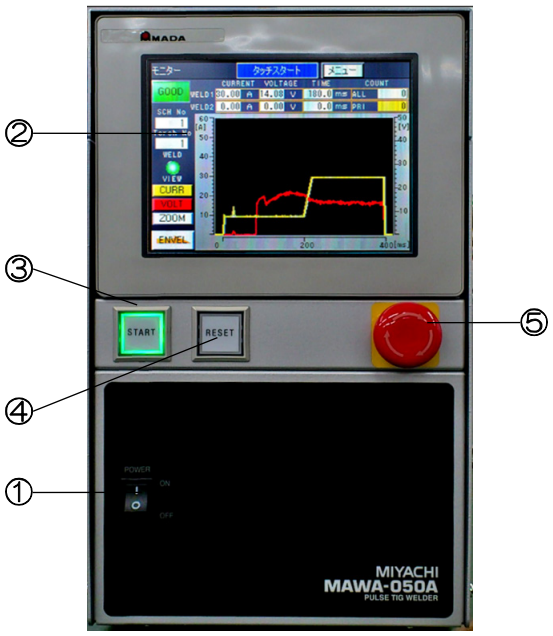
(1) Features

- Since this equipment is designed in a compact form, it can be moved and installed easily.
- The equipment is provided with a welding current monitoring function to support the OK/NG judgment of welding.
- Stabilized welding quality is realized by constant-current control.
- Noiseless performance and positioning of discharge can be achieved by the touch start function.
- Each setting can be easily performed by using a menu selection system of the touch panel.

(2) Names of Parts

(2) -1. Front panel

The names of operating parts such as switches on the front panel are shown below. For the function of each part, refer to “3. (1) Front Panel.”



① Main power switch

② Touch panel display

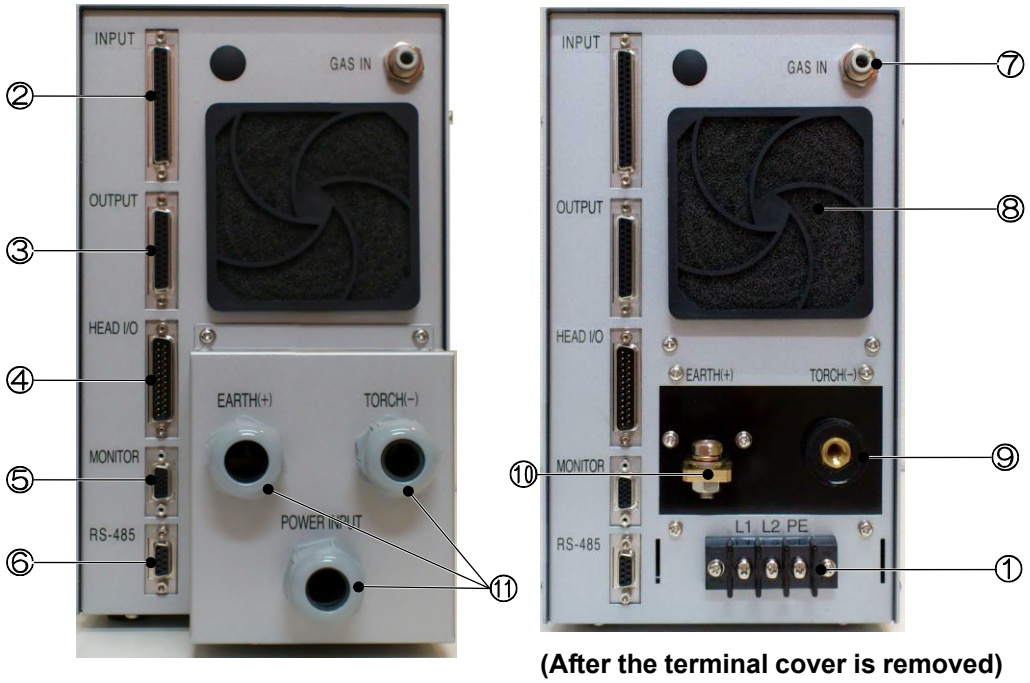
③ START button (with a green LED incorporated)

④ RESET button (with an orange LED incorporated)

⑤ Emergency stop button

(2) -2. Rear panel

The names of terminals and connectors provided on the rear panel are shown below.
For the cables to be connected to each part, refer to “2. (2) Connections.”



(After the terminal cover is removed)

① Welding power supply input terminal block

② Input connector (D-Sub 37-pin, female)

③ Output connector (D-Sub 25-pin, female)

④ Optional input/output connector (D-Sub 25-pin, male)

⑤ Current/voltage monitor connector (D-Sub 15-pin, female)

⑥ Communication connector (D-Sub 9-pin, female)

⑦ Gas connector

⑧ Cooling fan

⑨ Torch terminal

⑩ Grounding terminal

⑪ Cable gland (applicable cable diameter: φ9 ~ 17 mm)

(3) Specifications

(3) -1. Product specifications

Model name	MAWA-050A-00-00	
Power supply voltage	Single-phase 200 V AC ±10% (50/60 Hz)	
Power consumption	1.3 kVA	
Maximum output current	50 A	
Control method	Secondary constant current control DC inverter type (Control frequency: approx. 45 kHz)	
Start type	Touch start	
Maximum no-load voltage	110 V DC	
Rated load voltage	12 V (50-A power ON status)	
Duty cycle (Weld time: 1 sec.)	5.5% (50 A), 10% (38 A), 20% (28 A), 30% (21 A), 40% (16 A), 50% (12 A) Maximum duty cycle 50% (12 A or less) (*1)	
Cooling method	Air cooling (fan motor)	
Supply gas (*2)	Argon, pressure 0.1 ~ 0.6 MPa, flow rate 0.5 L/min or more (Any foreign substance, water and oil must not come into piping.)	
Case protection	IP21S	
Protection class	I	
Safety category	Corresponding to category 3	
CE marking	Applicable	
EMC class	CISPR11, Class A (*3)	
CCC	Applicable	
Display	Setting/display	Touch panel, 5.7-inch TFT color LCD display
Installing conditions (*4)	Ambient temperature	+5 ~ +40°C
	Maximum humidity	85% or less (without condensation)
	Maximum altitude	1000 m or lower
Transport/storage conditions	Temperature range	-10 ~ 55°C
	Maximum humidity	85% or less (without condensation)
External dimensions	294 (H) mm × 169 (W) mm × 440 (D) mm (excluding projections) 294 (H) mm × 169 (W) mm × 542 (D) mm (including the cable gland of the terminal cover)	
Mass	Approx. 13 kg	
Number of conditions (SCHEDULE)	127 conditions	

Time setting range	Pre-flow		0 ~ 9999 ms (in unit of 1 ms)
	Initial current		0 ~ 999 ms (in unit of 1 ms) (*9)
	WELD1 (*5)	Up slope Main welding Down slope	0 ~ 99.9 ms (in units of 0.1 ms) 100 ~ 999 ms (in unit of 1 ms)
	Cooling (*5)		0 ~ 1000 ms (in unit of 1 ms)
	WELD2 (*5)	Up slope Main welding Down slope	0 ~ 99.9 ms (in units of 0.1 ms) 100 ~ 999 ms (in unit of 1 ms)
	After flow		0 ~ 9999 ms (in unit of 1 ms)
Current setting range	Initial current WELD1 WELD2	Settable in the rage of 5.00 to 9.99 A (in units of 0.01 A) (*10) Settable in the range of 10.0 to 50.0 A (in units of 0.1 A) (Welding current, peak current, base current)	
Current accuracy	Setting accuracy (*6)		Within ±1% (full scale) (Guarantee range: 5 ~ 50 A)
	Repetitive accuracy (*6)		Within 0.5% (full scale) (Guarantee range: 5 ~ 50 A)
Current monitor	PEAK (maximum value) / RMS (effective value)		
	Upper limit		0 ~ 60.00 A (in units of 0.01 A)
	Lower limit		
Current envelope	Upper limit from the reference waveform		0 ~ 60.00 A (in units of 0.01 A)
	Lower limit from the reference waveform		
Voltage monitor	PEAK (maximum value) / RMS (effective value)		
	Upper limit		0 ~ 50.00 V (in units of 0.01 V)
	Lower limit		
Time monitor	Upper limit		0 ~ 5000 ms
	Lower limit		
Pulse modulation function	WELD1 WELD2	Up slope Main welding Down slope	0 ~ 99.9 ms (in units of 0.1 ms) 100 ~ 999 ms (in unit of 1 ms)
		Base current (*11)	WELD1: 1.00 ~ 9.99 A (in units of 0.01 A) WELD2: 5.00 ~ 9.99 A (in units of 0.01 A) 10.0 ~ 50.0 A (in units of 0.1 A)
		Modulation frequency setting	1 ~ 3000 Hz If 1000 Hz is over, the set waveform (current value) may not be obtained.
Monitor screen	Measured welding waveform display		WAVE (WELD 1 / WELD 2 / FULL)
Weld count	Total count		0 ~ 999999 times (each welding condition)
	Work count		0 ~ 60000 times (each welding condition)
	Weld count		0 ~ 255 times (each welding condition)

Protecting functions	Emergency stop	EM input circuit	Main power supply shut-off, welding current stop and starts prohibition
	Overcurrent protection	Primary current detection	Welding current stop (peak: approx. 30 A) Fuse: 15 A
	Temperature protection	Internal temperature detection	Welding current stop and start prohibition
	Start signal ON	Start signal ON detection during starting	Start prohibition
	Self-diagnosis error	Set data diagnosis	Start prohibition
	WELD NG	Monitor judgment NG	Start prohibition (Function ON/OFF is settable.)
	COUNT UP	Preset count over	Start prohibition (Function ON/OFF is settable.)
	MEMORY	Flash memory error	Start prohibition
Input/output signals	Inputs	START	Welding start (Established time 1 ~ 100 ms is settable.)
		RESET	Error reset
		SCH1/2/4/8/16/32	Condition input
		PARITY	Parity (Function ON/OFF is settable.)
		WELD STOP	Welding interruption
		PURGE	Gas flow ON/OFF (*7)
		EM1/2	Emergency stop
		TORCH SELECT	Torch selection input terminal
		WELD ON	Welding current output ON/OFF
		IN1/2	User input terminal
		INT24V	24 V output
		OV/24V	Power supply for flow sensor
		Contact rating: +24 V DC/approx. 10 mA, EM1/2 is the non-voltage contact +24 V DC/30 mA	
	Outputs	GOOD	Welding OK (settable in the range of 1 ~ 200 ms)
		NG	Welding NG (settable in the range of 1 ~ 200 ms)
		END	Termination (settable in the range of 1 ~ 200 ms)
		ERROR	Error
		E.STOP	Emergency stop (*8)
		SYNC	Welding tine synchronism (independent common)
		OUT1/2/3/4/5/6/7	Output allocated to user
		WIRE START	Brazing wire supply start signal
		Contact rating: +24 V DC/100 mA	

Terminal shape	Input terminal	L1, L2 and PE crimp-style terminals for M4
	Output terminal	Torch (-): 3/8-24 UNF Grounding (+): Φ8 (terminal thickness 5 mm)
	Gas connector	One-touch joint: Φ6
	Input connector	D-Sub 37-pin (female), 2.6 mm screw
	Output connector	D-Sub 25-pin (female), 2.6 mm screw

*1: The duty cycle (load time for a period of 10 minutes) of “JIS C9300-1 3.37” is not adopted.

*2: This product is dedicated to argon gas. When the initial current and base current of pulse current and modulation is set lower than 15 A and the flow rate of argon gas is higher than 1 L/min, a misfire may occur. Adjust the flow rate of argon gas according to the welding conditions to use.

*3: This welding machine is classified as Class A in electromagnetic compatibility (EMC) based on CISPR11. The Class A equipment is intended for use in industrial environments and not intended for use in general households.

*4: Use this product in the environment without conductive dust. If conductive dust enters in the product, this may result in a failure, electric shock, or fire. When using this product in this environment, make contact with us.

*5: WELD1 + Cooling +WELD2 ≤ 4000 ms

*6: Our specified torch and workpieces should be used as a condition. Full scale is 50 A.

*7: Internal timer and OR operation. Regarding internal timer control, the ON/OFF of the function can be set.

*8: The count value is displayed for 6 seconds after the emergency stop signal is reset. In this period, only the reset signal or reset button can be operated.

*9: In 0-ms setting of the initial current time, the auto mode is selected when the fine weld mode setting is OFF, and the fine weld mode is selected when the fine weld mode setting is ON.

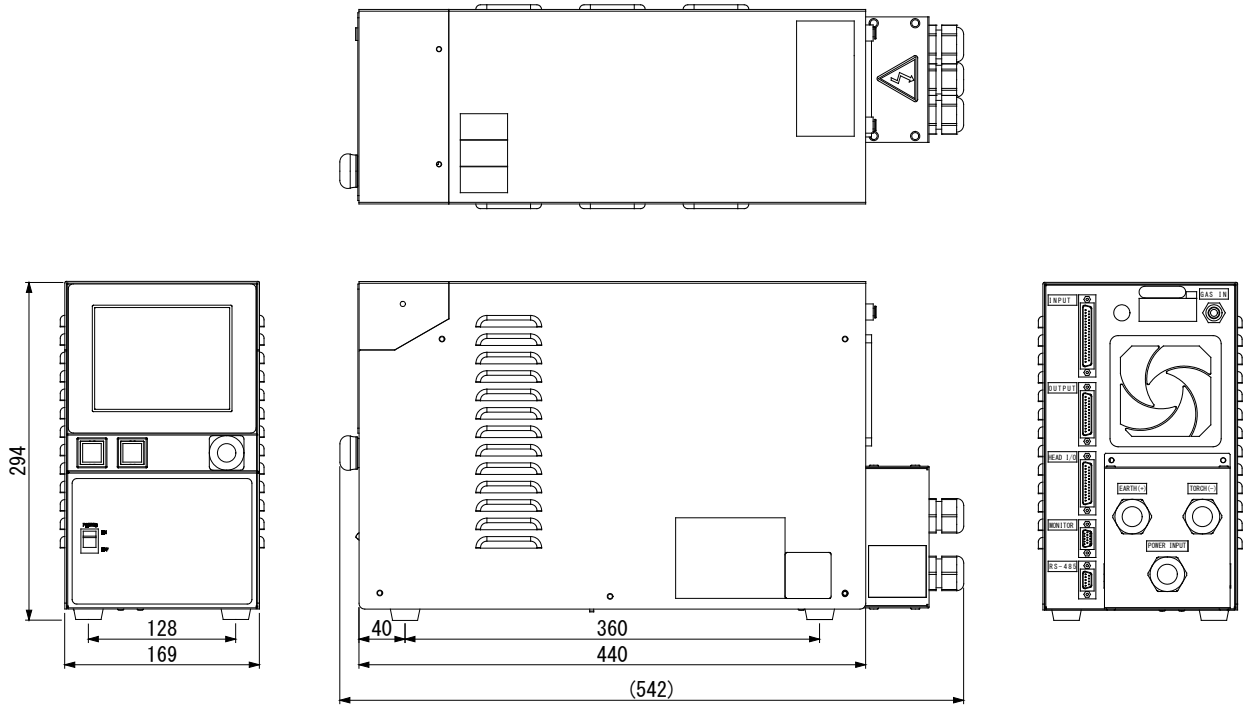
*10: For welding very small workpieces in the fine weld mode, the initial current and the first up-slope can be set from 1 A. However, if a misfire occurs with 1-A setting due to the welding conditions, increase the current setting from 1 A gradually.

*11: The modulation base current can be set from 1 A. However, if a misfire occurs with 1-A setting due to the welding conditions, increase the current setting from 1 A gradually.

(3) -2. Product dimensions

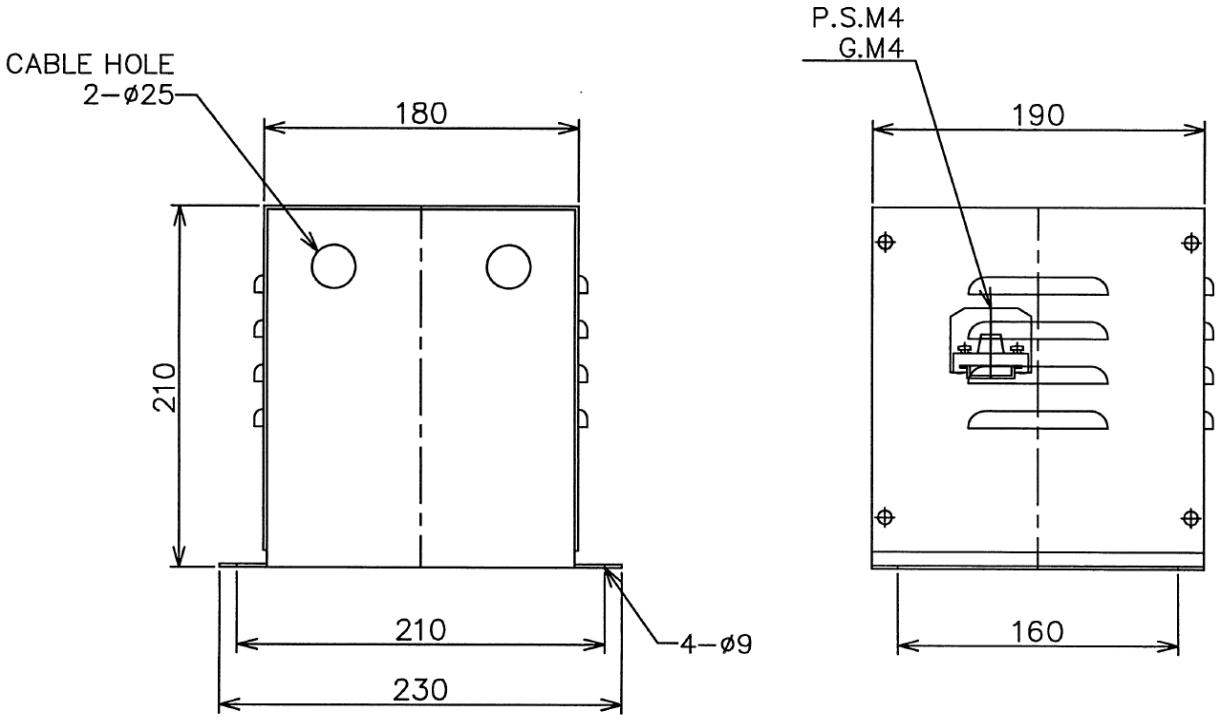
(3) -2-1. Main unit

(Unit: mm)



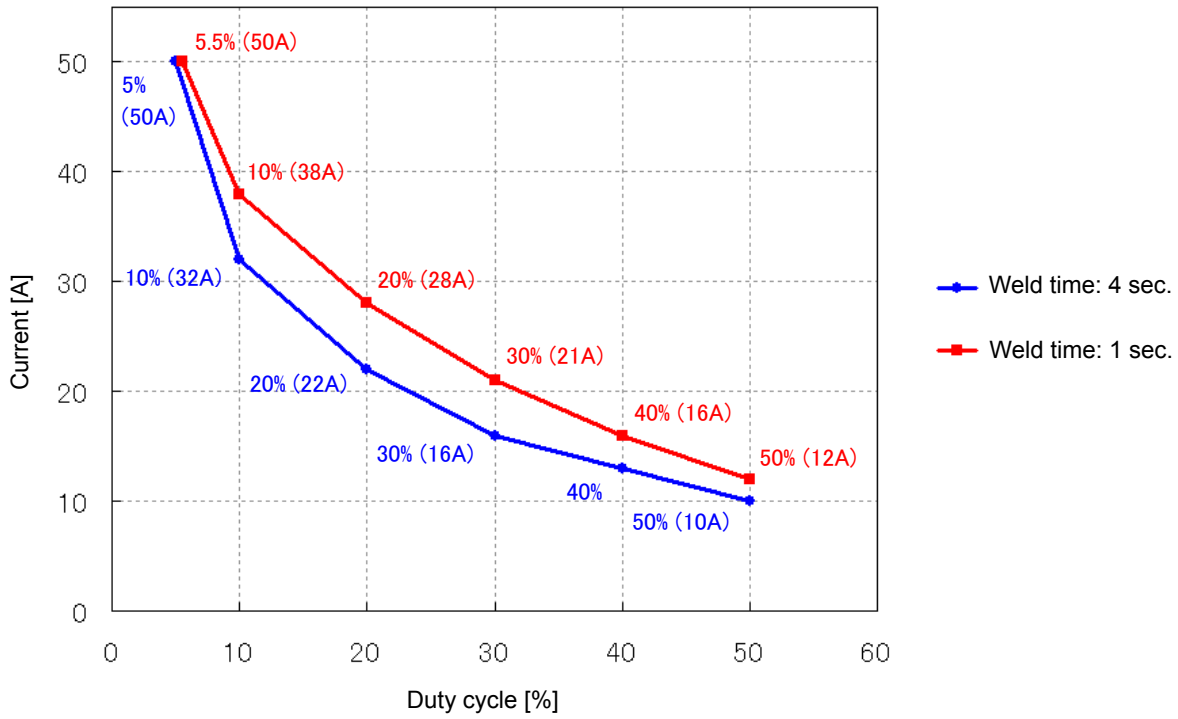
(3) -2-2. Step-down transformer (option)

(Unit: mm)



Phase quantity / Winding	Single phase / One winding
Primary / Secondary voltage	230 V / 200 V
Secondary current	10 A
Capacity	2 kVA
Weight	8.2 kg
Protection class	IP00
Maximum operating temperature	40°C

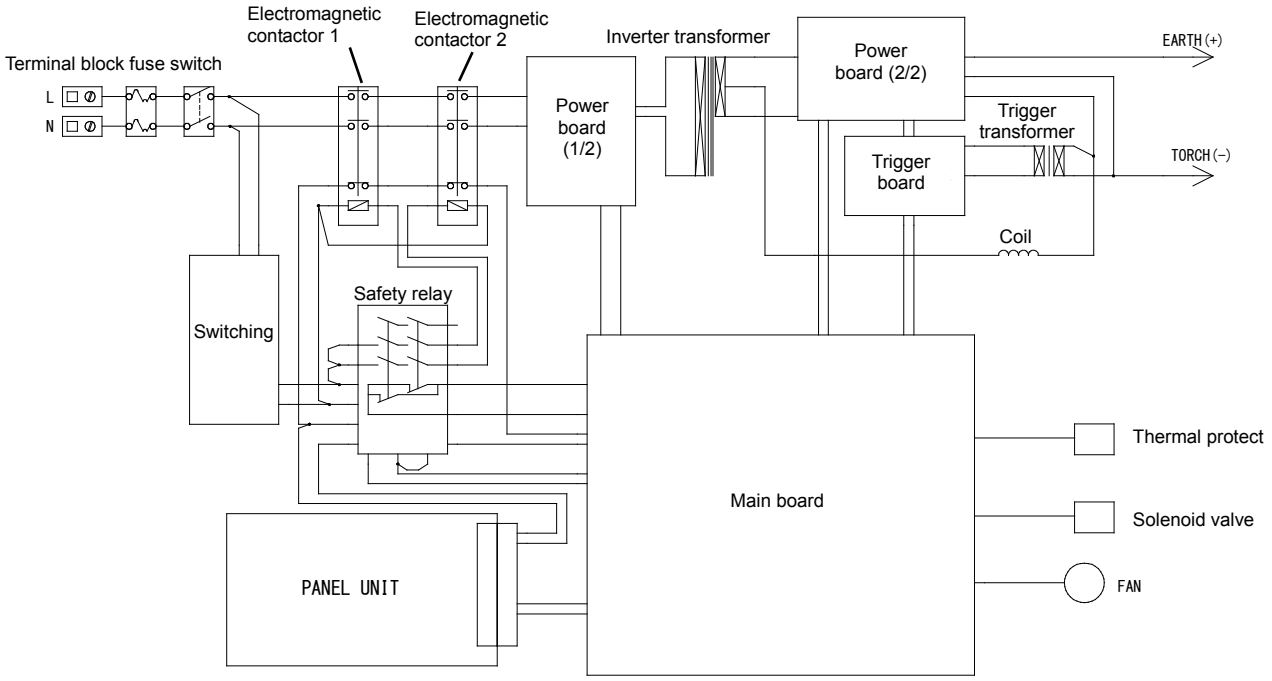
(3) -3. Duty cycle graph (Ambient temperature: 40°C)



* The duty cycle is the ratio (in percent) of load time for the total time.
  Duty cycle X (%) = (weld time of the 1st welding + the 2nd welding T_{weld}) / weld cycle T_{cycle} × 100
  In this product, a period of 10 minutes of the total time of “JIS C9300-1 3.37” is not adopted.
  Also, the duty cycle changes depending on the set time of the 1st welding + the 2nd welding.

  Example computation)
  When weld time of the 1st welding + the 2nd welding T_{weld} = 800 ms and weld cycle T_{cycle} = 4000 ms
  Duty cycle X (%) = (weld time of the 1st welding + the 2nd welding T_{weld}) / weld cycle T_{cycle} × 100
  = 800 ms / 4000 ms × 100 = 20%
  In this case, weld time 1 sec. or less is adopted. According to the duty cycle graph for weld time 1 sec., up to welding current 28 A is available.

(4) Operational Principle Diagram



(5) Main Parts List

Part name	Quantity
DC fan (axial flow fan)	1
Thermal protector	1
Inverter transformer	1
Trigger transformer	1
Thyristor module	1
Electromagnetic contactor 1	1
Electromagnetic contactor 2	1
Safety relay	1

(6) Accessories

Accessory name	Model	Quantity
Operation manual CD-ROM	AS1185612(OM1182267+OM1182268)	1
D-Sub connector (*1)	AS1184321	1

*1: 37-pin D-Sub connector. Emergency stop 1 input (terminals 16 and 19), Emergency stop 2 input (terminals 17 and 18), WELD ON input (terminals 21 and 37), and internal power supply setting (terminals 35 and 36) are short-circuited.

(7) Options

The main options are shown in the table below.
For options that are not described here (torch selector), make contact with us for information.

Product name		Model
Step-down transformer		T-114378-MC
Input cable (*1)	3 m	EP1182297
	5 m	EP1182298
	10 m	EP1182299
Input power cable	3 m	PK-1209133
	5 m	PK-1209134
	10 m	PK-1209135
Transformer input cable	3 m	PK-1209136
	5 m	PK-1209137
	10 m	PK-1209138
Grounding cable	2 m	MB0909181-2
	3 m	MB0909181-3
	4 m	MB0909181-4
	5 m	MB0909181-5
Torch (with meshes) φ1.0 (*2)	2 m	TA-23SSPC-2000-FL
		TA-150AC-2000-FL
	3 m	TA-23SSPC-3000-FL
		TA-150AC-3000-FL
	4 m	TA-23SSPC-4000-FL
		TA-150AC-4000-FL
Torch (gas lens) φ1.0 (*2)	2 m	TA-150AC-2000-13
	3 m	TA-150AC-3000-13
	4 m	TA-150AC-4000-13
Torch (with meshes) φ1.6 (*2)	2 m	TA-23SSPC-2010-FL
		TA-150AC-2010-FL
	3 m	TA-23SSPC-3010-FL
		TA-150AC-3010-FL
	4 m	TA-23SSPC-4010-FL
		TA-150AC-4010-FL
Torch (gas lens) φ1.6 (*2)	2 m	TA-150AC-2010-13
	3 m	TA-150AC-3010-13
	4 m	TA-150AC-4010-13
Tungsten electrode Lanthanum 1.5%	φ1.0	018320
	φ1.6	018321

Product name		Model
Tungsten electrode Lanthanum 2%	φ1.0	φ1.0 mm (with lanthanum 2%)
		TEC lanthanum, φ1.0
	φ1.6	φ1.6 mm (with lanthanum 2%)
		TEC lanthanum, φ1.6
Flow meter		FR-IIS-P
Digital flow meter		FSM2-NAF100-S06ARN-P70
Input/output signal cable (3 m) (*3)		SK1187086
Electrode grinder		MT-10M
Touch start head		MH-TL01A-00-01
Touch start head		MH-109TA-00-00
Foot switch cable 2 (*4)		SK-1202978

*1: Rated voltage U0/U: 450/750 V, 3-core, 2.5 mm^2, cable diameter approx. 10 mm
Welding power supply side crimp-style terminal for M4, input-side crimp-style terminal for M5

*2: Used when the Torch drive type is set to “CYLINDER.” The torch includes torch cables as a matter of structure.

*3: The input/output signal cable is used when extending the panel unit. When extending it, use M4 panel screws with a depth of 20 mm for panel installation.

*4: Attached to the touch start head **MH-TL01A-00-01**. Used when connecting the touch start head **MH-109TA-00-00** and **MAWA-050A-00-00**.

(8) CE Marking

The **MAWA-050A-00-00** is applicable to CE marking. For fitting for CE marking, there are limitations shown below.

- This product is classified into Class A of EN55011 and is not intended to be used for a residential area to which power is supplied by low-voltage distribution network. In such an area, there is a latent difficulty to keep consistency with electromagnetism because of conductivity and radiation disturbance.

2. Installation and Connections

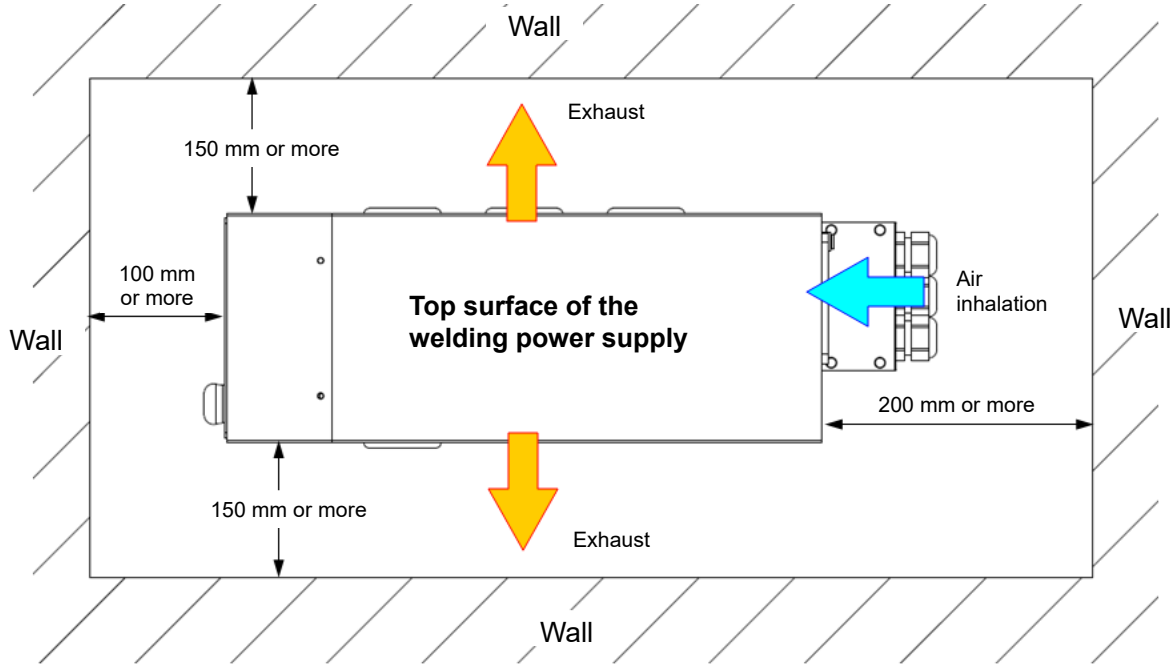
⚠ WARNING

- When transporting the welding power supply with hands, hold the bottom surface. If the welding power supply is carried by holding such a projection as the terminal cover and the projection is damaged, causing the welding power supply to fall down, the foots may be collapsed by it.

(1) Installing Conditions

IMPORTANT

- For installing the welding power supply, do not install it in the following places.
  - Where there is a high noise generating source in the neighborhood
  - Where chemicals are handled
  - Where it is very dusty
  - Where there are lots of vibrations and shocks
- Install the welding power supply in a solid place and operate it in a horizontal status to the ground. If the equipment is used in an inclined or fallen-down status, this may result in a failure.
- When installing the equipment near a wall, keep a certain distance from the wall. If this distance is short, the internal temperature will rise and easily cause “E03 Overheat error.”



The installing conditions for the welding power supply are explained below. Take a serious view of the following contents.

Installing conditions	Ambient temperature	+5 ~ +40°C
	Maximum humidity	85% or less (without condensation)
	Maximum altitude	1000 m or lower
	Pollution level	2
Transport and storage conditions	Temperature range	-10 ~ +55°C
	Maximum humidity	85% or less (without condensation)

(2) Connections

(2) -1. Preparation for connections

The standard connection status is as shown in the following figure.

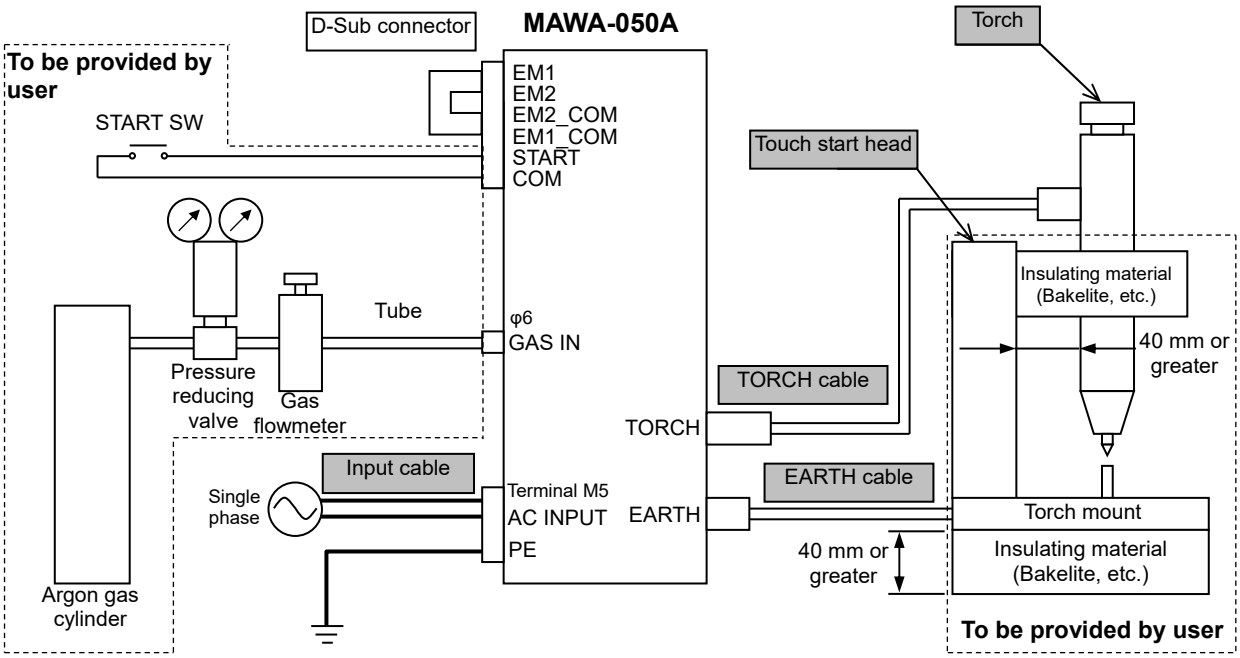
The input cable, grounding cable, torch and torch cable are options.

(Refer to “1. (6) Accessories” and “1. (7) Options.”)

For the information on options, make contact with us.

The argon gas, reducing valve, flow meter, tube, torch fixing base and insulating material except accessories and options should be prepared by the user.

: Accessory : Option



IMPORTANT

- PE (Protective Earth) must be grounded.
- PE must be independently grounded. When PE of separate instrument is connected to this terminal, such an instrument may erroneously function by interference. Refer to “2. (2)-2. Connecting the power supply.”
- To avoid a malfunction caused by noise, do not bundle the external I/O cable, the power cable, and the TORCH/EARTH cable. Also, keep them more than 100 mm apart from each other.
- Do not use any gas other than argon gas to avoid a misfire.
- There is a solenoid valve inside of **MAWA-050A** to turn on/off the argon gas. At least 0.1 MPa of pressure is required. However, the maximum allowable pressure is 0.6 MPa. Set the flow rate to 0.5 liters/min or more according to the condition to use. (Use dry gas and connect the tube to prevent foreign matter, water and oil from flowing into piping.)
- Be sure to insulate the torch and torch fixing base by Bakelite, etc. The distance of the torch and torch fixing base from the insulating material should be 40 mm or more.
- When the customer prepares the input cable, use a cable with a power line with a size of 1.25 ~ 2 mm^2.
  * The clamp range of the cable gland of the terminal cover is a cable diameter of 9 ~ 17 mm.
- Use a breaker with a capacity of 10 A or more.

Products to be prepared by customer	
Argon gas (cylinder type)	Pressure: 0.1 ~ 0.6 MPa Flow rate: 0.5 L/min or more
Reducing valve and flow meter	<Reference> Manufacturer: YUTAKA Co., Ltd. Product name: 2-step pressure adjuster with a flow meter Model: FR-II S-P
Tube	<Recommended item> Manufacturer: SMC Product name: Polyurethane tube Product No.: TU0604B-20
Torch fixing base	Optional one
Insulating material	Bakelite, etc.

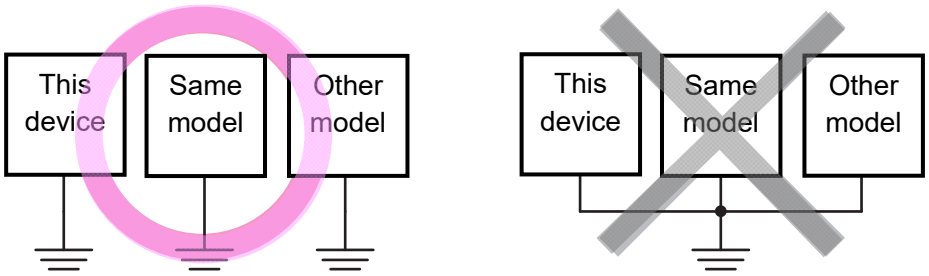
(2) -2. Connecting the power supply

⚠ WARNING

- Before connecting the primary power supply, turn off the source power supply on the factory side.
- Execute the grounding work (class D grounding or higher) for the primary power supply and PE terminal according to the electrode connection diagram. Unless Class D grounding work is executed, an electric shock may be caused by electric leakage or a high voltage may be cause by malfunction, resulting in an electric shock.
- Do not use a deteriorated or damaged input cable. Put a cable cover on the contact portion with the moving part or human body so as not to damage the cable. If a cable with a deteriorated or damaged cover is directly touched or if the metal part with which the cable is brought into contact is touched, an electric shock may occur.

IMPORTANT

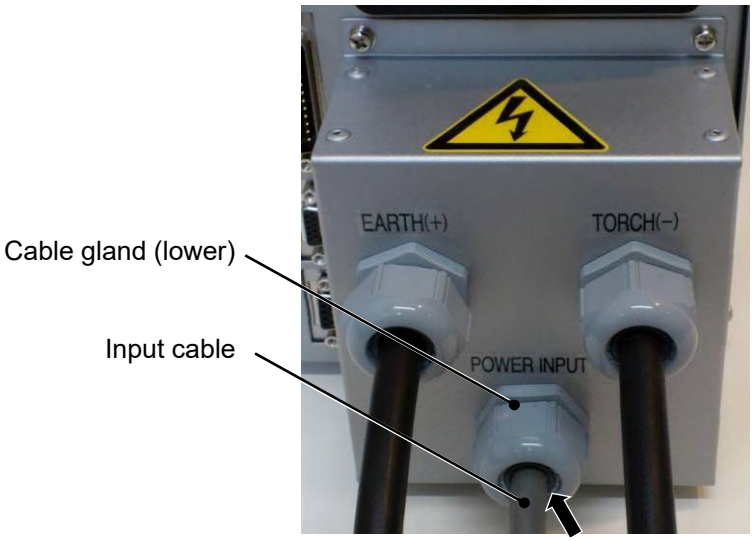
- To avoid a malfunction due to noise, do not bundle the input cable together with the input/output signal cable, grounding cable and torch cable. Perform wiring of each cable with a separation of 100 mm or more.
- Be sure to ground the PE terminal independently. If grounding is performed together with the PE terminal of another device, this device and other device may malfunction.



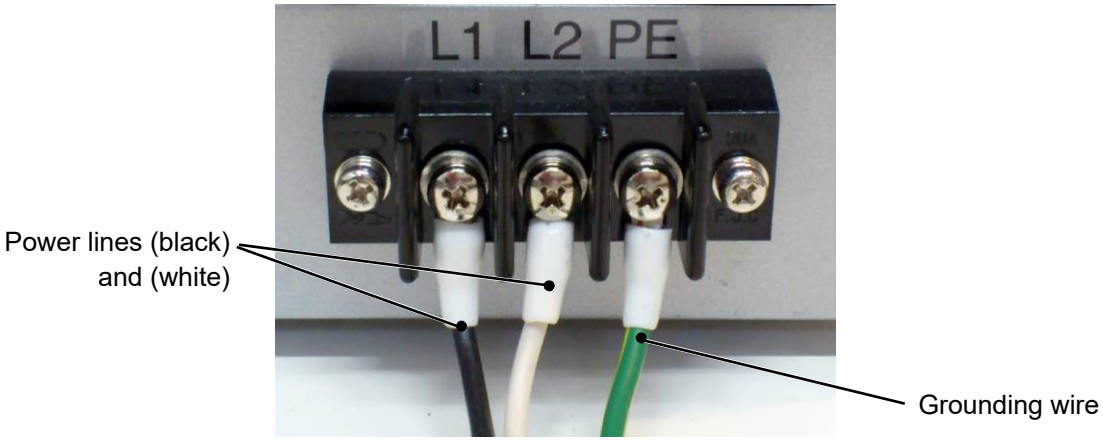
In the following, how to connect the power supply will be described.
Connect the input cable to the welding power supply input terminal block provided on the rear panel according to the following procedure.

1. Turn off the source power supply on the factory side.

2. Pass the input cable through the cable gland (lower) of the terminal cover.



3. Connect each of the round terminals of 2 power lines (black) and (white) of the input cable to each of the power input terminals (L1) and (L2).



4. Connect the round terminal of the grounding wire to the PE terminal.

(2) -3. Connecting the ground

⚠ WARNING

- Use the dedicated grounding cable.
  Fix the cable connecting part securely. Do not extend the cable more than the necessary length. The cable length should be 10 m or less. A large current will flow and a high voltage of about 10 kV will be applied at a start of welding.
  If a cable with an insufficient capacity or a cable with a low withstand strength is used, a fire or electric shock may occur.
- Do not use a deteriorated or damaged cable or plug.
  Put a cable cover on the contact portion with the moving part or human body so as not to damage the torch cable. If a cable with a deteriorated or damaged cover is directly touched or if the metal part with which the cable is brought into contact is touched, an electric shock may occur.

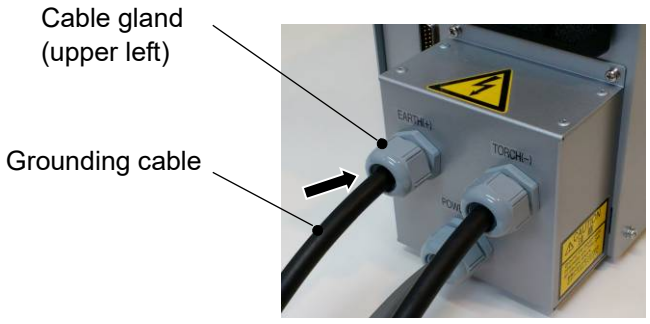
IMPORTANT

- To avoid a malfunction due to noise, do not bundle the grounding cable together with the input/output signal cable, input cable and torch cable. Perform wiring of each cable with a separation of 100 mm or more.

In the following, how to connect the ground will be described.

Connect the grounding cable to the grounding terminal provided on the rear panel according to the following procedure.

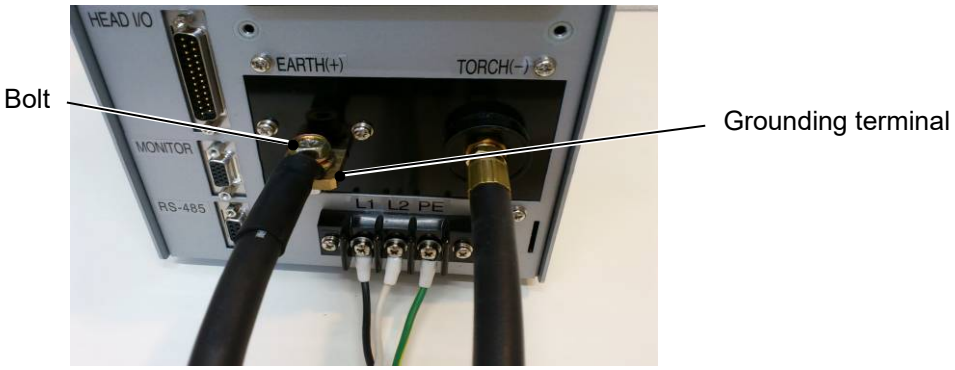
1. Pass the grounding cable through the cable gland (upper left) of the terminal cover.



2. Fix the end of the grounding cable to the grounding terminal with the attached bolts and nuts.

Remarks

- When tightening the nut, perform it so that the grounding cable may face toward the rear.



(2) -4. Connecting the torch

⚠ WARNING

- Use the dedicated torch cable.
  Fix the cable connecting part securely. Do not extend the cable more than the necessary length. The cable length should be 10 m or less. A large current will flow and a high voltage of about 10 kV will be applied at a start of welding.
  If a cable with an insufficient capacity or a cable with a low withstand strength is used, a fire or electric shock may occur.
- Do not use a deteriorated or damaged torch cable.
  Put a cable cover on the contact portion with the moving part or human body so as not to damage the torch cable. If a cable with a deteriorated or damaged cover is directly touched or if the metal part with which the cable is brought into contact is touched, an electric shock may occur.

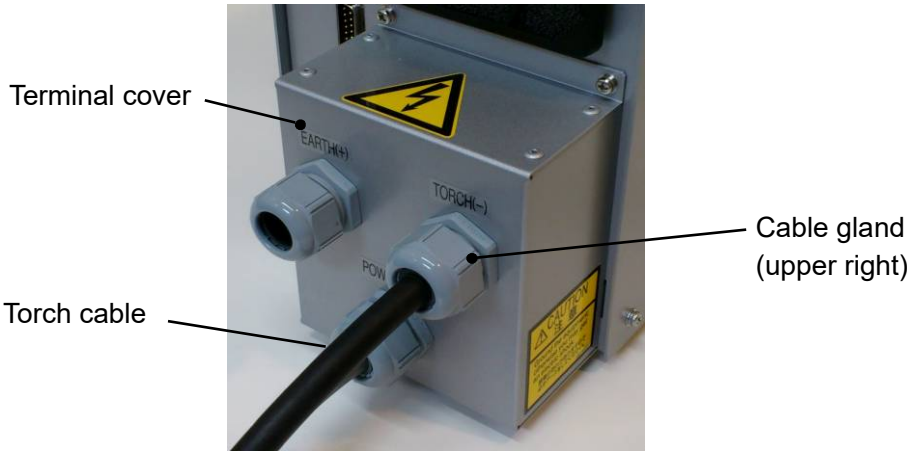
IMPORTANT

- To avoid a malfunction due to noise, do not bundle the torch cable together with the input/output signal cable, input cable and grounding cable. Perform wiring of each cable with a separation of 100 mm or more.

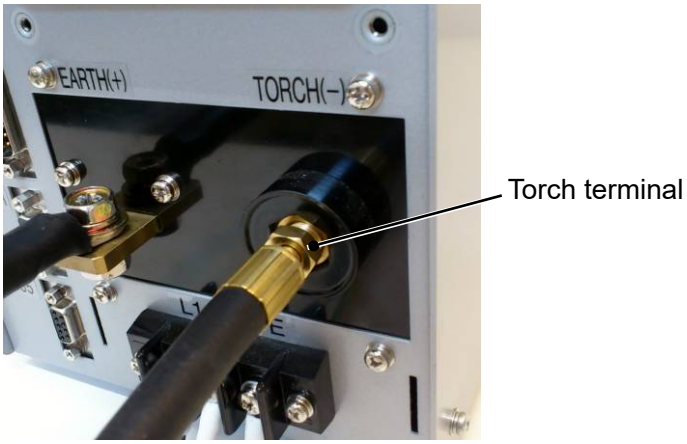
In the following, how to connect the torch will be described.

Connect the torch cable to the torch terminal provided on the rear panel according to the following procedure.

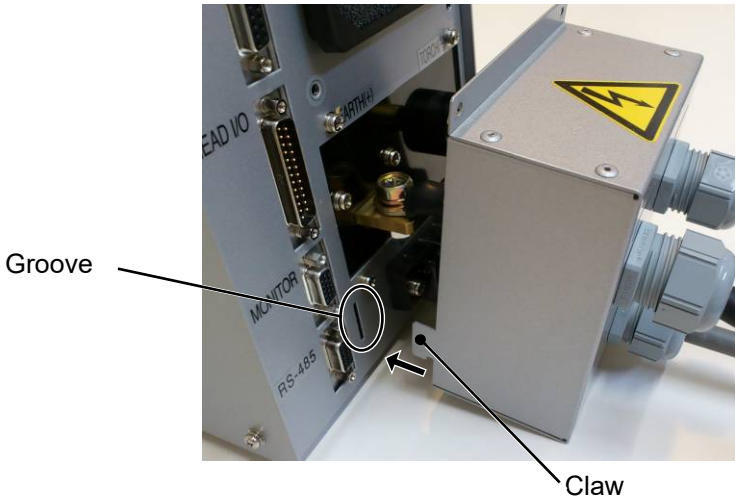
1. Pass the torch cable through the cable gland (upper right) of the terminal cover.



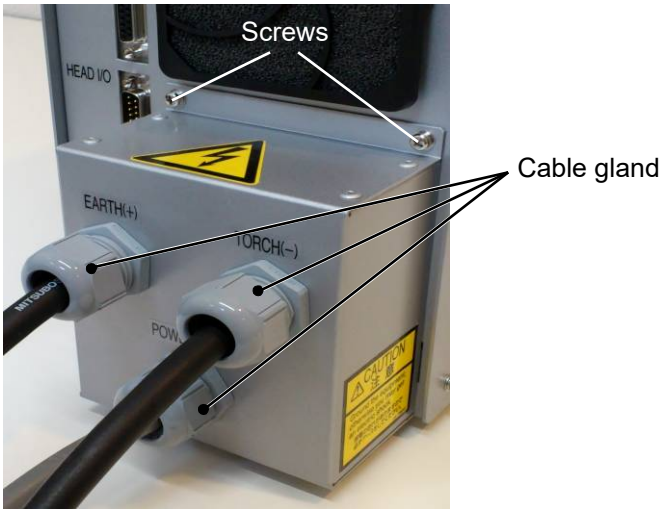
2. Turn the end of the torch cable and connect it to the torch terminal.



3. Install the terminal cover on the rear panel.
   Put the claws on the left and right side into the grooves of the rear panel.



Fix the terminal cover with the attached screws.



4. Loosen the cap of the cable gland and clamp the cable.

(2) -4-1. Improvement against a misfire

Our torch:

In order to improve the torch against a misfire (so that arc may not be scattered from the torch), we prepare a torch with a meshed nozzle and a nozzle ring.

The nozzle ring is attached to our torch. Install the nozzle ring on the nozzle and connect the wire to the PE terminal of **MAWA-050A**. The possibility of reducing a misfire will be more increased.

The meshed nozzle can be replaced as a single unit. For details, refer to the operation manual for the torch.

(2) -5. Connecting the argon gas

⚠ WARNING
● Fix the gas cylinder securely on the cylinder stand or such a structure as the wall and pillar. If the gas cylinder is fallen down, the foot may be collapsed. ● Entrust the gas piping work with the specialist. If an inappropriate gas flow rate adjuster is used for the gas cylinder, the gas cylinder may be exploded.

IMPORTANT
● Use dry gas and connect the tube so as not to cause a foreign substance, water and oil to flow into the piping.

In the following, how to connect the argon gas will be described.

Connect the argon gas tube to the gas connector (Φ6) provided on the rear panel according to the following procedure.

1. Connect the tube to the gas connector (Φ6).

Gas connector (Φ6)
*One-touch joint [Partition elbow: KQ2LE06-00N (SMC)]

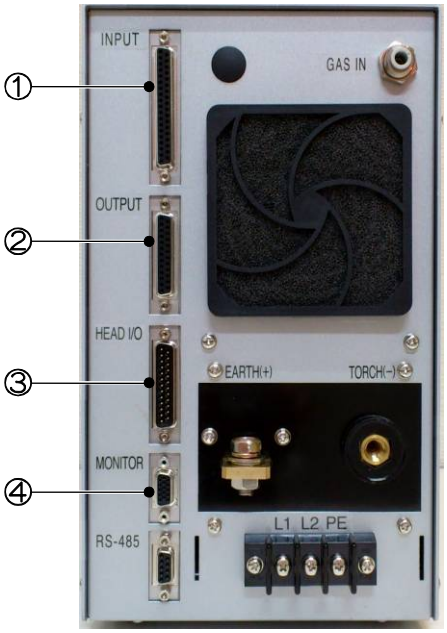
2. Set the pressure and flow rate of the argon gas.

Pressure	0.1 ~ 0.6 MPa
Flow rate	0.5 L/ min or more

(2) -6. Connecting the external input/output devices

In the following, how to connect the external input/output devices will be described. There are 4 connectors for external input/output on the rear panel. They are used for control from the outside and control of external devices.

For connecting to external input/output devices, refer to “2. (3) Interface.”



① Input connector (D-Sub 37-pin, female)
Used for control from the outside.

② Output connector (D-Sub 25-pin, female)
Used for control from the outside.

③ Option input/output connector (D-Sub 25-pin, male)
Used to control the optional torch selector and the servo motor type welding head.

④ Current/voltage monitor connector (D-Sub 15-pin, female)
Used to monitor the welding current/voltage.

(2) -7. Connecting the external communication device

In the following, how to connect the external communication device will be described.

There is a connector for external communication on the rear panel. This connector is used to set conditions and read data from PC.

For the connection with the external communication device, refer to “7. External Communication Function.”

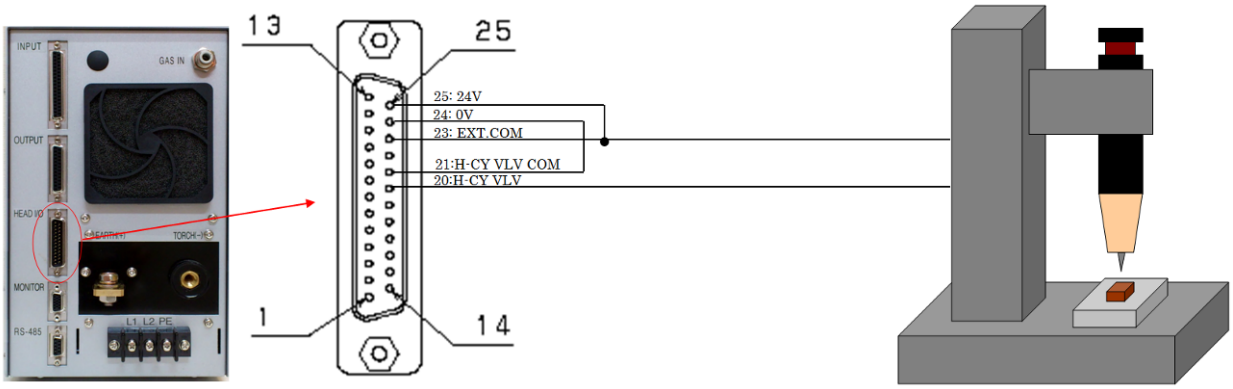
① Communication connector (D-Sub 9-pin, female)
Used to perform data communication with PC.

(2) -8. Connection with the torch head for touch start

In the following, connections to be made for a torch head will be described.

Make connections according to the following procedure. For the explanation and usage of the touch start function, refer to “5. (6) Touch Start.”

[Connection when the Torch drive type is set to “CYLINDER” (air type welding head)]



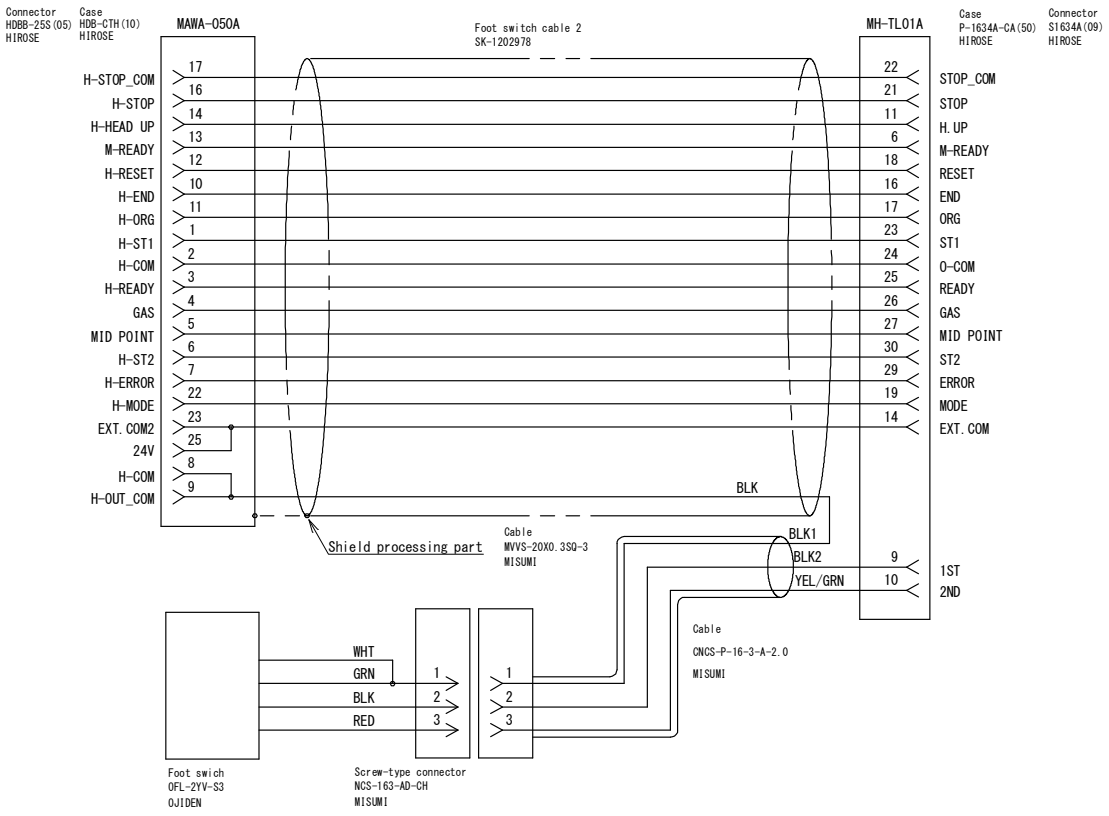
The H-CY VLV output signals (25-pin D-Sub connector, 20: H-CY VLV, 21: H-CY VLV_COM, 23: EXT. COM, 24: 0V, 25: 24V) of the option input/output connectors provided on the rear side of the **MAWA-050A** unit can be used.

Wire the H-CY VLV output signals to the signal inputs to move up and down the air type welding head.

Remarks

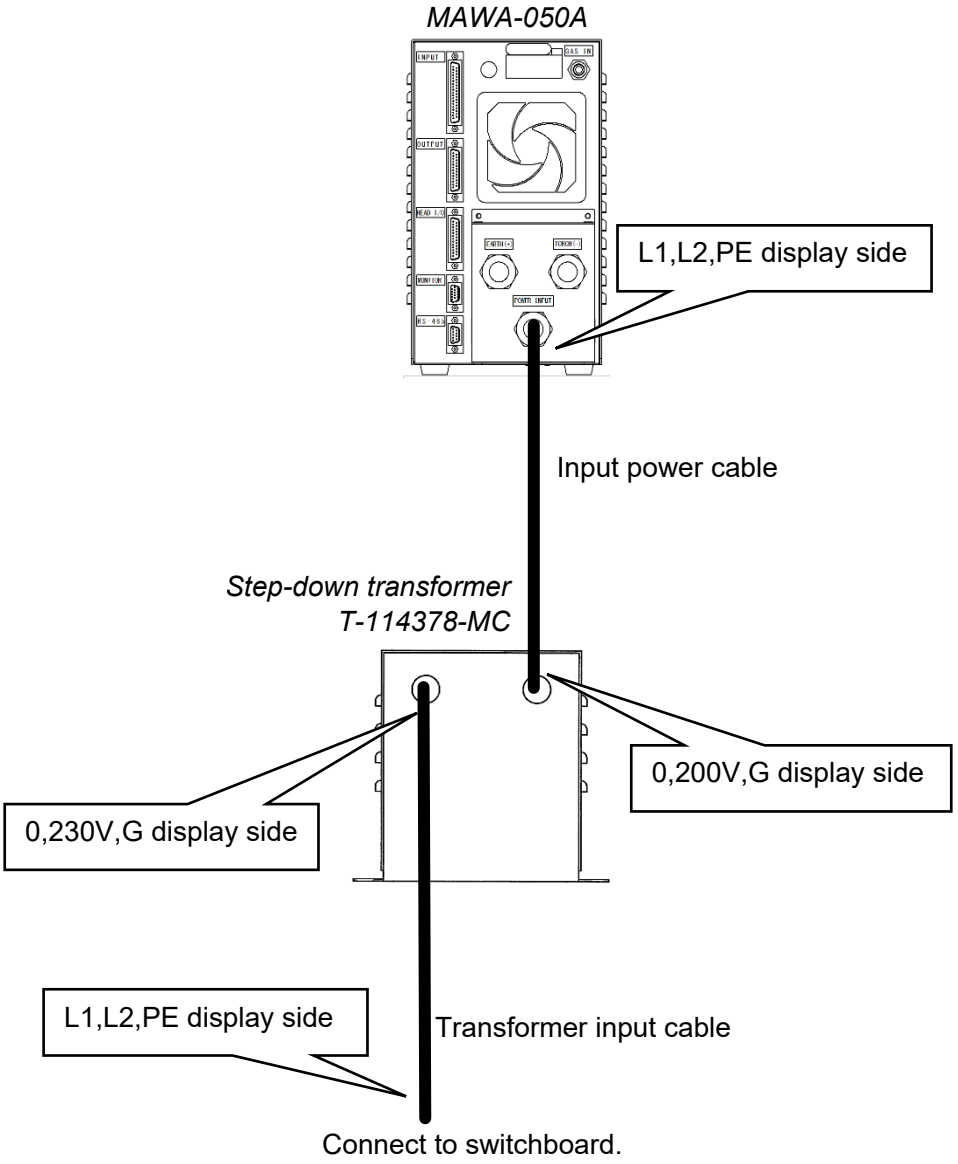
- The maximum rating for H-CY VLV output signals is +24 V DC/70 mA or less.

[Connection when the Torch drive type is set to “MOTOR” (touch start head (**MH-TL01A**))]



Connect between **MAWA-050A** and **MH-TL01A** with the foot switch cable 2 (SK-1202978).

(2) -9. Connecting the step-down transformer (option)



(3) Interface

(3) -1. Explanation of external input/output signals

(3) -1-1. Input connector (D-Sub 37-pin, female)

Remarks

- EM1, EM2, EM1_COM, and EM2_COM are non-voltage contact inputs of +24 V DC/30 mA. Other inputs are photo coupler inputs of +24 V DC/approx. 10 mA.
- For connecting to the input connector, use D-Sub connector 37-pin, male.

Recommended parts	Connector	HDCB-37P(05) (HIROSE ELECTRIC CO.,LTD.)
	Case	HDC-CTH(10) (HIROSE ELECTRIC CO.,LTD.)

Input signals

Terminal No.	Terminal name	Explanation
1	WELD STOP	To stop the welding on the way, this terminal is closed. When the circuit is closed while waiting start, the READY signal is turned OFF.
2	START	Welding start input terminal. The sequence is started by closing this terminal.
3	SCH1	Condition input terminal. 3 = Condition 1, 4 = Condition 2, 5 = Condition 4, 6 = Condition 8, 7 = Condition 16, 8 = Condition 32, 9 = Condition 64 (Refer to SCHEDULE of “6. (8) Schedule Changeover.”)
4	SCH2	
5	SCH4	
6	SCH8	
7	SCH16	
8	SCH32	
9	SCH64	
10	PARITY	Parity input terminal. A fault due to wire breakage of the condition selection signal can be detected by this terminal. Perform a setting so that the total of condition selection signal lines and parity signal close-circuits may be an “odd number” at all times. (Refer to SCHEDULE of “6. (8) Schedule Changeover.”)
11	PURGE	When the circuit is closed, the internal solenoid valve is turned on to allow a gas flow. When the circuit is opened, the solenoid valve is turned off to stop the gas flow. (*3)
12	RESET	Error resetting input terminal. When the circuit is closed after the cause of the error is removed, the error is reset.
13	EM_RESET	Error resetting input terminal exclusively for an emergency stop error.
16	EM1	Emergency stop 1 input terminal. (*1)
17	EM2	Emergency stop 2 input terminal. (*1)
18	EM2_COM	Common of the emergency stop 2 input terminal.

Terminal No.	Terminal name	Explanation
19	EM1_COM	Common of the emergency stop 1 input terminal.
20	TORCH SELECT	Torch selecting signal input terminal. When this terminal is open, torch 1 is used. When this terminal is closed, torch 2 is used.
21	WELD ON	Welding power ON/OFF changeover input terminal. When this terminal is closed, WELD ON is executed. (*2)
22	IN1	User input terminal. For each terminal, the following settings can be selected. 01. GAS FLOW 02. H-ORG 03. H-HEAD UP (Refer to “2. (3)-3-1. User input terminals.”)
23	IN2	
24	0V	Power supply for the gas flow rate sensor 0 V
25	24V	Power supply for the gas flow rate sensor 24 V
35	EXT.COM	Input terminal common.
36	INT.24V	24 V output
37	COM	Input terminal common.

*1: For resetting emergency stop, turn off both of EM1 and EM2, and then turn them on simultaneously.

*2: To output the welding current, close the WELD ON terminal. (Refer to the terminal 21 of “2. (3)-2-1 Input connector.”)
When the WELD ON terminal is opened, the welding current is not output and the welding result on the Monitor screen is displayed as NG.
When WELD is set to OFF on the Maintenance screen in 4. (18), the welding current is not output even if the WELD ON terminal is closed. To output the welding current, set WELD to ON on the Maintenance screen and open the WELD ON terminal.

*3: In addition to the normal welding, the PURGE input is used for gas flow check and manual control of gas.

(3) -1-2. Output connector (D-Sub 25-pin, female)

Remarks

- Output terminals are output by photo relay and the rating is +24 V DC/100 mA.
- For connecting to the output connector, use D-Sub connector 25-pin, male.

Recommended parts	Connector	HDBB-25P(05) (HIROSE ELECTRIC CO.,LTD.)
	Case	HDB-CTH(10) (HIROSE ELECTRIC CO.,LTD.)

Output signals

Terminal No.	Terminal name	Explanation
1	GOOD	Welding OK signal. When the result is within the range of upper limit and lower limit of the monitor judging condition, this signal is turned on. The pulses of 1 ~ 200 ms (set time) are output after the end of welding.
2	NG	Welding NG signal. When the result is out of the range of upper limit and lower limit of the monitor judging condition, this signal is turned on. The pulses of 1 ~ 200 ms (set time) are output after the end of welding.
3	END	End signal output terminal. The pulses of 1 ~ 200 ms (set time) are output after the end of welding.
4	E.STOP	Emergency stop output terminal. The signal is output during an emergency stop.
5	ERROR	This signal is output until the error is cleared by Error Reset at occurrence of a welding power supply error such as overheating and overcurrent.
6	OUT_COM	Common terminal of the output terminals (1 ~ 5 and 7 ~ 11).
7	OUT5	User output terminal. For each terminal, the following settings can be selected. 01.GOOD 02.NG 03.END 04.ERROR 05.READY 06.LOST 07.WEL1 LOWER CURRENT 08.WEL1 UPPER CURRENT 09.WEL1 LOWER VOLTAGE 10.WEL1 UPPER VOLTAGE 11.WEL1 LOWER TIME 12.WEL1 UPPER TIME 13.WEL1 LOWER ENVELOPE CUR 14.WEL1 UPPER ENVELOPE CUR 15.WEL1 LOWER ENVELOPE VLT 16.WEL1 UPPER ENVELOPE VLT 17.WEL2 LOWER CURRENT 18.WEL2 UPPER CURRENT 19.WEL2 LOWER VOLTAGE 20.WEL2 UPPER VOLTAGE 21.WEL2 LOWER TIME 22.WEL2 UPPER TIME 23.WEL2 LOWER ENVELOPE CUR 24.WEL2 UPPER ENVELOPE CUR 25.WEL2 LOWER ENVELOPE VLT 26.WEL2 UPPER ENVELOPE VLT 27.SYNC.OUT 28.WIRE START 29.H-READY 30.H-ST1 31.H-ST2 32.H-ERROR 33.H-HEAD UP 34.H-MODE 35.MID POINT (Refer to “2. (3)-3-2. User output terminals.”)
8	OUT4	
9	OUT3	
10	OUT2	
11	OUT1	
12	SYNC OUT	Output terminal of the synchronizing output. (*1)
13	SYNC OUT_COM	Common terminal of the synchronizing output. (*1)
14	OUT_COM 2	Common terminal of the output terminals (15 and 16)
15	OUT7	User output terminal. For each terminal, the setting equal to OUT 1 ~ OUT 5 can be selected.
16	OUT6	
17	WIRE START_COM	Common terminal of WIRE START.

Terminal No.	Terminal name	Explanation
18	WIRE START	Brazing wire supply start signal output terminal.

*1: For the synchronizing output timing, refer to timing charts in 6. (1), 6. (2), 6. (3), and 6. (4).

(3) -1-3. Option input/output connector (D-Sub 25-pin, male)

Remarks

- Every input terminal is a photo coupler input of +24 V DC/approx. 10 mA.
- Output terminals are output by photo relay and the rating is +24 V DC/100 mA.
- For the customer-prepared motor head, use this connector input/output.

Recommended parts	Connector	HDBB-25S(05) (HIROSE ELECTRIC CO.,LTD.)
	Case	HDB-CTH(10) (HIROSE ELECTRIC CO.,LTD.)

Refer to the timing chart in “6. (9) Option Input/Output Signals.”

Option input/output signals

Terminal No.		Terminal name	Explanation
Input	1	H-ST1	Initial current start input terminal.
	2	H-COM	Common terminal of the input terminals (1 and 3 ~ 7).
	3	H-READY	Head operation ready input terminal.
	4	GAS (*3)	Gas start signal input terminal.
	5	MID POINT	Head mid-point input terminal.
	6	H-ST2 (*1)	Main welding start input terminal.
	7	H-ERROR	Motor controller error signal input terminal.
	8	H-COM	Common terminal of the input terminals (1 and 3 ~ 7).
	23	EXT_COM2	Common terminal of the input terminal.
Output	9	H-OUT_COM	Common terminal of the output terminals (10 ~ 14).
	10	H-END	End signal output terminal.
	11	H-ORG	Return-to-start point signal output terminal.
	12	H-RESET	Reset signal output terminal.
	13	M-READY	Operation ready output terminal.
	14	H-HEAD UP	Head go-up start signal output terminal. Output when a user input “H-HEAD UP” is set and the “H-HEAD UP” signal is input.
	15	H-OUT_COM	Common terminal of the output terminals (10 ~ 14).
	16	H-STOP	Head emergency stop signal output terminal.
	17	H-STOP_COM	Common terminal of the head emergency stop signal output terminal.
	18	TORCH SELECT	Torch selection signal output terminal. When this terminal is open, torch 1 is selected. When this terminal is closed, torch 2 is selected.
	19	TORCH SELECT_COM	Common terminal of the torch selection signal output terminal.
	20	H-CY VLV	Cylinder solenoid valve signal output terminal.

Terminal No.		Terminal name	Explanation
Output	21	H-CY VLV COM	Common terminal of the cylinder solenoid valve signal output terminal.
	22	H-MODE (*2)	Terminal for switching the auto mode and the fine weld mode. When the circuit is open, “auto mode” is selected. When the circuit is closed, “fine weld mode” is selected.
	24	0V	0 V output terminal.
	25	24V	24 V output terminal.

*1: For the timing of the main welding start input (H-ST2) from the motor controller, refer to 6. (1), (2), (3), and (4) in the timing chart of the touch start. Only in “fine weld mode”, it is the timing from weld point (initial current) to head up.

*2: For “auto mode” and “fine weld mode”, refer to 4. (6) (i) and 5. (6)-2.

*3: The GAS input is an input signal from the controller of the touch start head. Gas flow not converted into pre-flow in the Welding conditions setting. (Refer to operation and control flow in 5. (6) and timing chart in 6. (1).)

(3) -1-4. Current/voltage monitor connector (D-Sub 15-pin, female)

Remarks

- Output terminals are output by isolation amplifier.
- For connecting to the monitor connector, use D-Sub connector high-density 15-pin, male.

Recommended parts	Connector	HD-15SP (MISUMI Corporation)
	Case	MDA-9H-M2.6 (MISUMI Corporation)

Current/voltage monitor

Terminal No.	Terminal name	Explanation
1	I	Welding current analog signal (*1)
2	I.COM	Welding current analog signal common
3	V	Welding voltage analog signal (*2)
4	V.COM	Welding voltage analog signal common

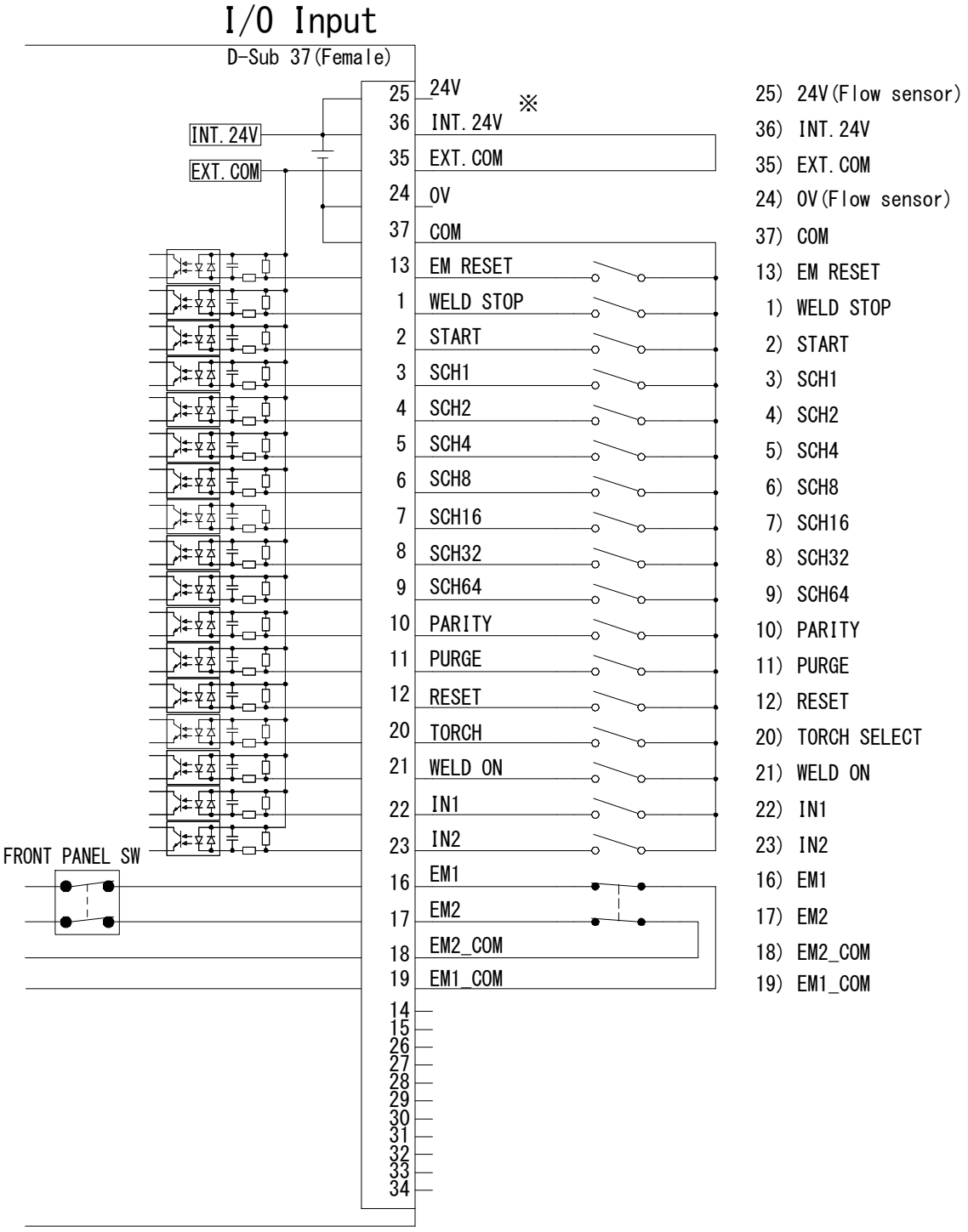
*1: When the welding current value is 50 A, a voltage of approx. 3.8 V is output.

*2: When the welding voltage value is 51.2 V, a voltage of approx. 5 V is output.

(3) -2. Connection diagram of external input/output signals

(3) -2-1. Input connector (D-Sub 37-pin, female)

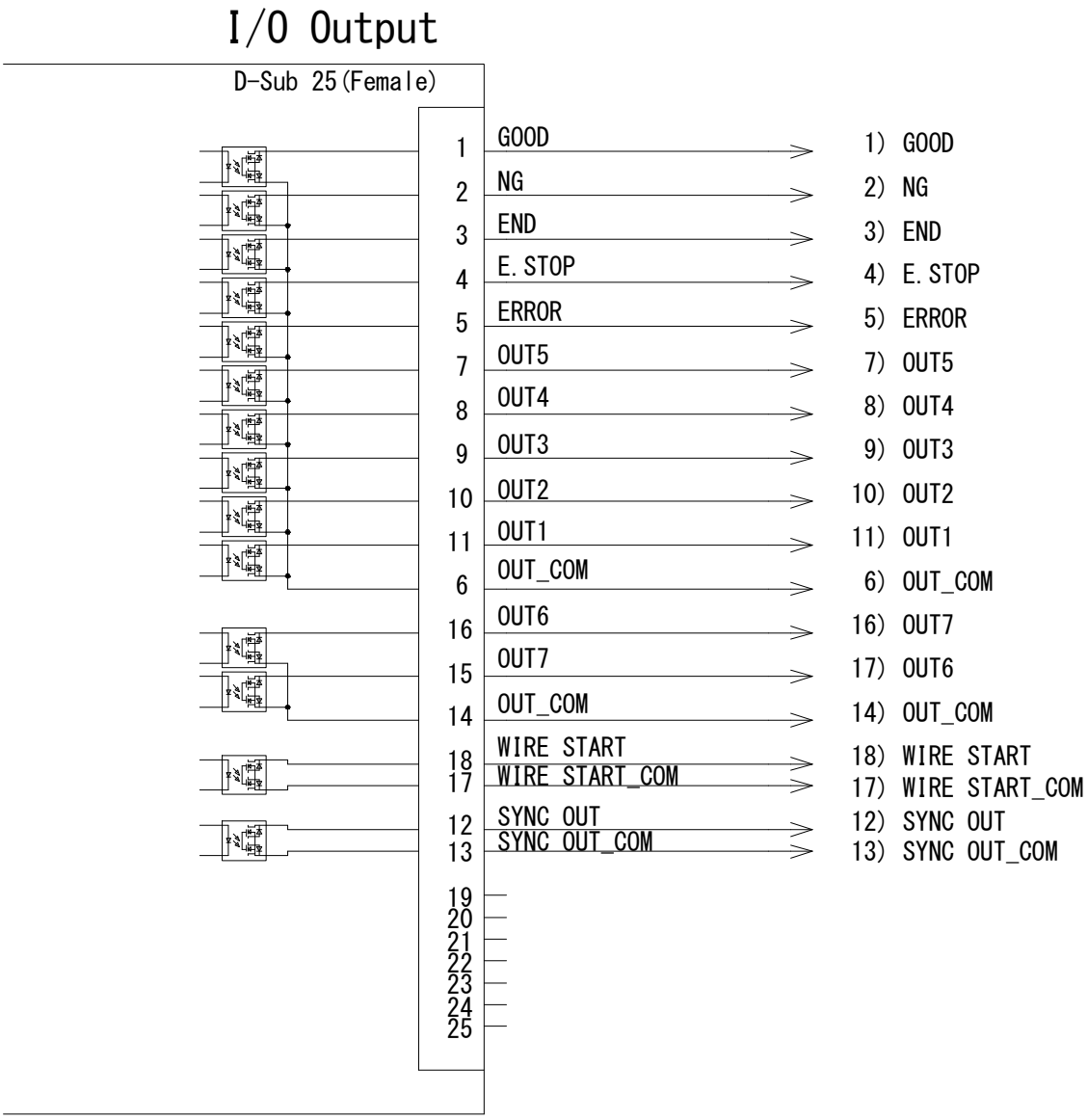
Input signals



*Connecting methods when the internal power supply is used and the external power supply is used, refer to “2. (3)-4.

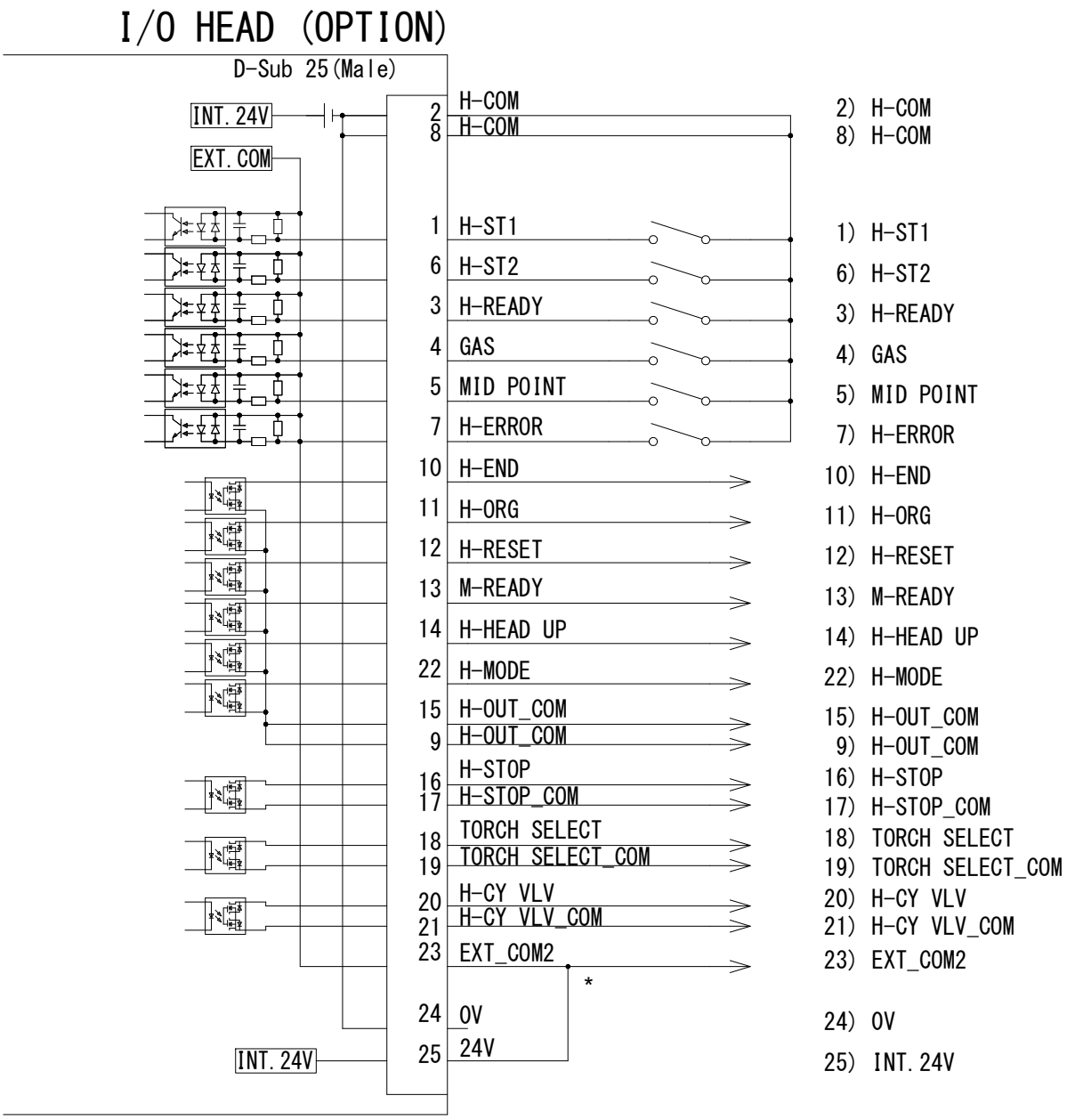
(3) -2-2. Output connector (D-Sub 25-pin, female)

Output signals



(3) -2-3. Option input/output connector (D-Sub 25-pin, male)

Option input/output signals



* When the internal power supply is used, connect terminal No.23 and terminal No.25.
  When the external power supply is used, connect 24 V DC to terminal No.23 and 0 V to terminal No.24.

(3) -3. External input/output signal table

(3) -3-1. User input terminals

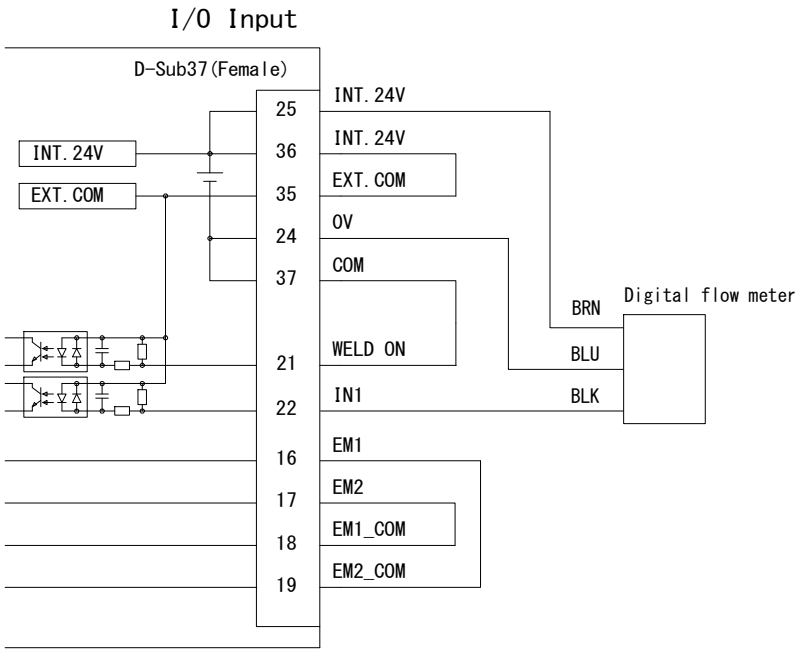
On the external input/output setting screen, input terminal Nos. 22 and 23 (IN1 and IN2) can be allocated from the following signals. (Refer to “4. (8) External I/O Setting Screen.”)
For wiring connection, refer to the connection diagram in “(3)-2-1. Input connector.”

Terminal name	Explanation
01.GAS FLOW	When the optional digital flow meter is connected, “E25 Gas flow error” occurs unless the sensor input is turned on at a gas purge.
02.H-ORG	When the optional servo motor type welding head is connected, the servo motor type welding head is returned to the origin by inputting H-ORG.
03.H-HEAD UP	When the optional servo motor type welding head is connected, the torch of the servo motor type welding head is moved to the start point by inputting H-HEAD UP.

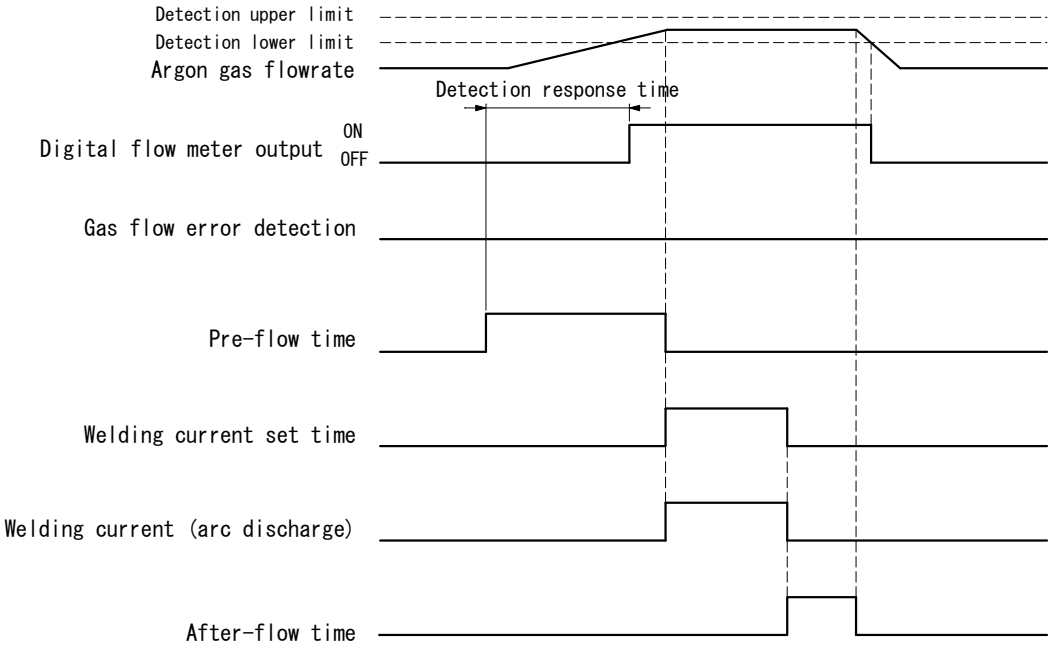
Caution

- When setting “01.GAS FLOW” for the user input with the optional digital flow meter (FSM2-NAF100-S06ARN-P70) connected, the argon gas flowrate during welding is detected and “E25 Gas flow error” occurs.
  Since the detection response time (response time of the solenoid valve or the digital flow meter) is not in time when the pre-flow time is shorter than 300 ms, an arc discharge may occur for a moment. (Refer to the timing chart “The argon gas flowrate is abnormal.”)
  When you want to detect the Gas flow error before an arc discharge occurs, set the pre-flow time of the welding conditions to 300 ms or more so that an arc discharge may not occur.

Connection example of the digital flow meter

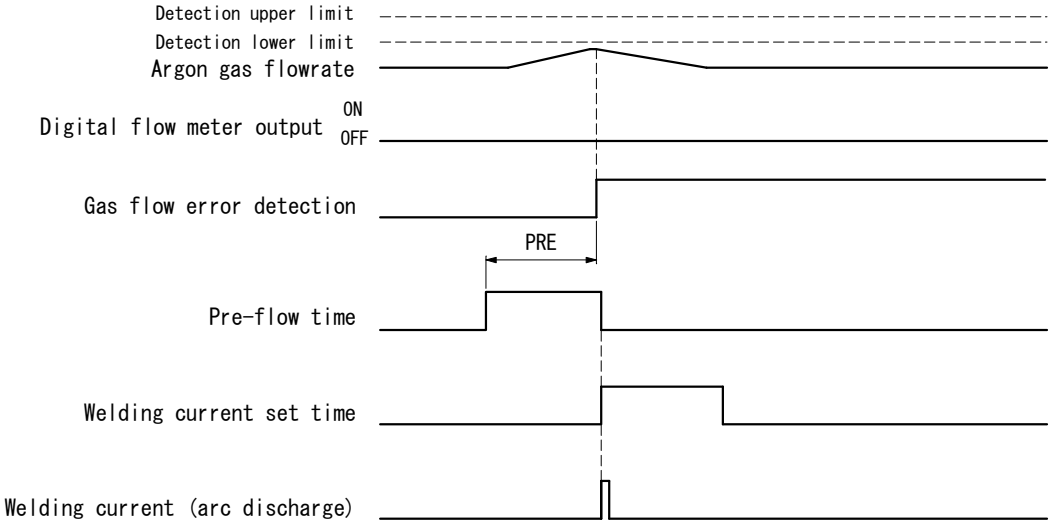


① Timing chart when the argon gas flowrate is normal

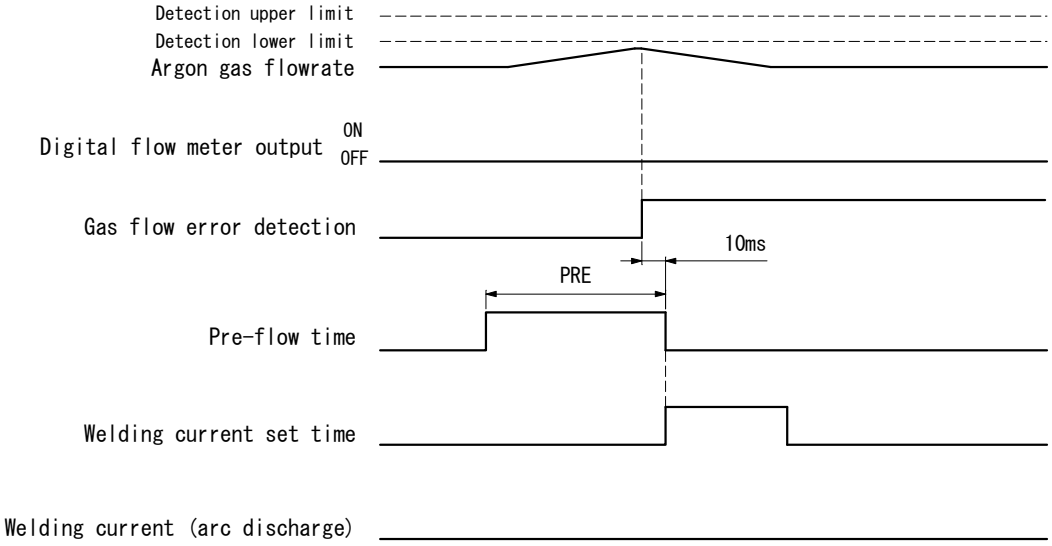


② Timing chart when the argon gas flowrate is abnormal

(1) When the pre-flow time: PRE < 300 ms, an error is detected at the welding start. Since an error is detected after the welding start (= pre-flow time completed), an arc discharge occurs for a moment.



(2) When the pre-flow time: PRE ≥ 300 ms, an error is detected 10 ms before the welding start. Since an error is detected 10 ms before the welding start (= pre-flow time completed), an arc discharge does not occur.



(3) -3-2. User output terminals

On the external input/output setting screen, output terminal Nos. 7 ~ 11 (OUT 1 ~ OUT 5) and output terminal Nos. 15 and 16 (OUT 6 and OUT 7) can be allocated from the following signals.
(Refer to “4. (8) External I/O Setting Screen.”)

Terminal name	Explanation
01.GOOD	After the end of the welding sequence, this signal is output when it is judged that the measured value is within the range set on the Upper/lower limit set screen. Output time setting: 1 ~ 200 ms (Refer to “6. Timing Chart.”)
02.NG	When the welding judgment result is NG, this signal is output for the set time. Output time setting: 1 ~ 200 ms (Refer to “6. Timing Chart.”)
03.END	After the end of the welding sequence, this signal is output for the set time. Output time setting: 1 ~ 200 ms (Refer to “6. Timing Chart.”)
04.ERROR	When such a welding power supply error as overheating and overcurrent occurs, this signal is output.
05.READY	When the welding is ready, this signal is output. The terminal is closed by welding ON. (*1)
06.LOST	This signal is output at occurrence of a misfire and the output is kept up to the next welding ON time. (*2)
07.WEL1 LOWER CURRENT	When the measured current value of the first welding is lower than the lower limit of judgment current value, this signal is output for the 02. NG signal setting time.
08.WEL1 UPPER CURRENT	When the measured current value of the first welding exceeds the upper limit of judgment current value, this signal is output for the 02. NG signal setting time.
09.WEL1 LOWER VOLTAGE	When the measured voltage value of the first welding is lower than the lower limit of judgment voltage value, this signal is output for the 02. NG signal setting time.
10.WEL1 UPPER VOLTAGE	When the measured voltage value of the first welding exceeds the lower limit of judgment voltage value, this signal is output for the 02. NG signal setting time.
11.WEL1 LOWER TIME	When the first welding is lower than the lower limit of judgment time, this signal is output for the 02. NG signal setting time.
12.WEL1 UPPER TIME	When the first welding exceeds the upper limit of judgment time, this signal is output or the 02. NG signal setting time.
13.WEL1 LOWER ENVELOPE CUR	When the measured current waveform of the first welding is lower than the lower limit of judgment current waveform, this signal is output for the 02. NG signal setting time.
14.WEL1 UPPER ENVELOPE CUR	When the measured current waveform of the first welding time exceeds the upper limit of judgment current waveform, this signal is output for the 02. NG signal setting time.
15.WEL1 LOWER ENVELOPE VLT	When the measured voltage waveform of the first welding is lower than the lower limit of judgment voltage waveform, this signal is output for the 02. NG signal setting time.
16.WEL1 UPPER ENVELOPE VLT	When the measured voltage waveform of the first welding exceeds the upper limit of the judgment voltage waveform, this signal is output for the 02. NG signal setting time.
17.WEL2 LOWER CURRENT	When the measured current waveform of the second welding is lower than the lower limit of the judgment current value, this signal is output for the 02. NG signal setting time.

Terminal name	Explanation
18.WEL2 UPPER CURRENT	When the measured current waveform of the second welding exceeds the upper limit of the judgment current value, this signal is output for the 02. NG signal setting time.
19.WEL2 LOWER VOLTAGE	When the measured voltage value of the second welding is lower than the lower limit of the judgment voltage value, this signal is output for the 02. NG signal setting time.
20.WEL2 UPPER VOLTAGE	When the measured voltage value of the second welding exceeds the lower limit of the judgment voltage value, this signal is output for the 02. NG signal setting time.
21.WEL2 LOWER TIME	When the second welding is lower than the lower limit of the judgment time, this signal is output for the 02. NG signal setting time.
22.WEL2 UPPER TIME	When the second welding exceeds the upper limit of the judgment time, this signal is output for the 02. NG signal setting time.
23.WEL2 LOWER ENVELOPE CUR	When the measured current waveform of the second welding is lower than the lower limit of the judgment current waveform, this signal is output for the 02. NG signal setting time.
24.WEL2 UPPER ENVELOPE CUR	When the measured current waveform of the second welding exceeds the upper limit of the judgment current waveform, this signal is output for the 02. NG signal setting time.
25.WEL2 LOWER ENVELOPE VLT	When the measured voltage waveform of the second welding is lower than the lower limit of the judgment voltage waveform, this signal is output for the 02. NG signal setting time.
26.WEL2 UPPER ENVELOPE VLT	When the measured current waveform of the second welding exceeds the upper limit of the judgment current waveform, this signal is output for the 02. NG signal setting time.
27.SYNC. OUT	This signal is output in the period from the pre-flow output to the end of the welding.
28.WIRE START	The brazing wire fed signal is output concurrently with a start of the main welding.
29.H-READY	This signal is output synchronously with the READY signal of the optional head controller. (*3)
30.H-ST1	This signal is output synchronously with the ST1 signal of the optional head controller. Turned on for the time set in “START signal input delay time.” (*3) (*5)
31.H-ST2	This signal is output synchronously with the ST2 signal of the optional head controller. (*3)
32.H-ERROR	This signal is output synchronously with the ERROR signal of the optional head controller. (*3)
33.H-HEAD UP	This signal is output synchronously with the H-HEAD UP signal of the optional input/output. (*3)
34.H-MODE	This signal is output synchronously with the H-MODE signal of the optional input/output. (*3)
35.MID POINT (*4)	This signal is output synchronously with the MID POINT signal of the optional head controller. (*3)

*1: The conditions that the READY signal is not output are as follows.
- When an error occurs.
- During the welding sequence.
- When the START input (operation panel and external input) is closed.
- The WELD STOP of the external input is closed.

- The SCH signal is not input when “4. (6) ① (c) SCH & Torch select by I/O” is set to ON.

*2: When “4. (6) ① (a) NG judgment error” is set to ON and the welding result is LOST, “E05 Weld error” and “E10 LOST error” occur and the 06. LOST is output. In this case, the 06. LOST output is turned off when the “RESET” operation is performed.

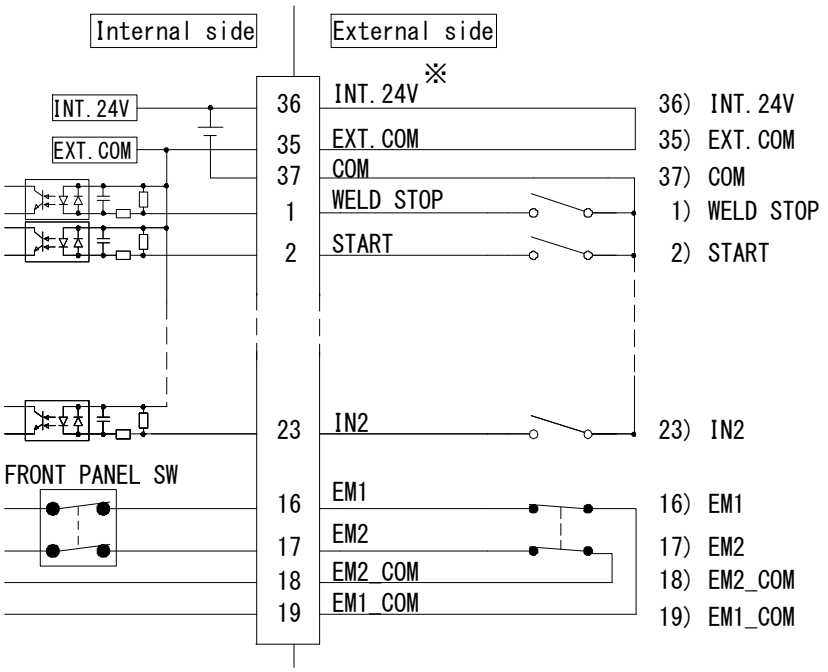
*3: Can be output from the output connector of this product by setting each signal of the optional touch start head controller to user output.

*4: Applied by a combination of the foot switch cable 2 (SK-1202978) and the software version of the head controller V00-03A or later. The touch start head passes without stopping at the mid-point, the MID POINT output time becomes 1 ms or less.

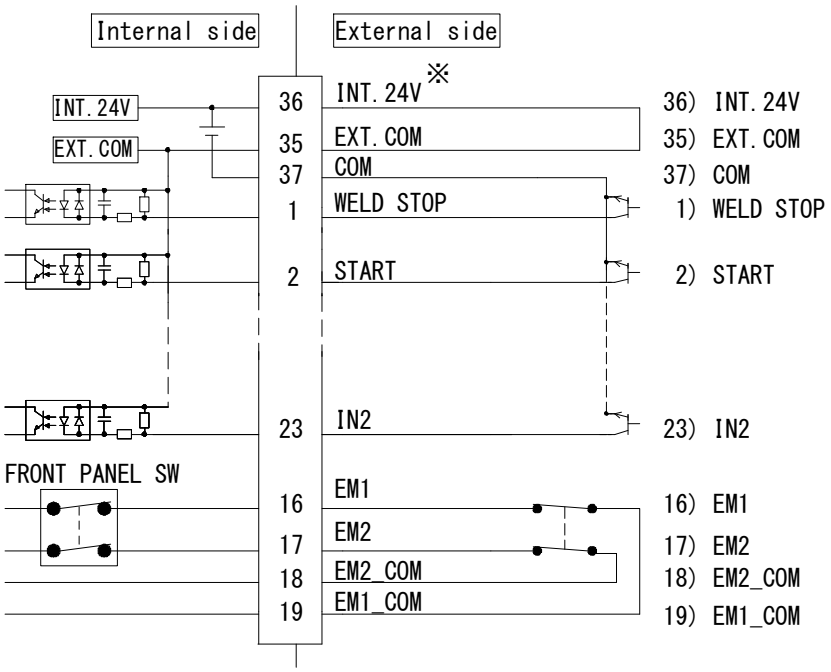
*5: As the timing chart in 6. (7) ④, the H-ST1 output (user signal) is output for the time set in “START signal input decision delay time.”

(3) -4. Input signal connecting method

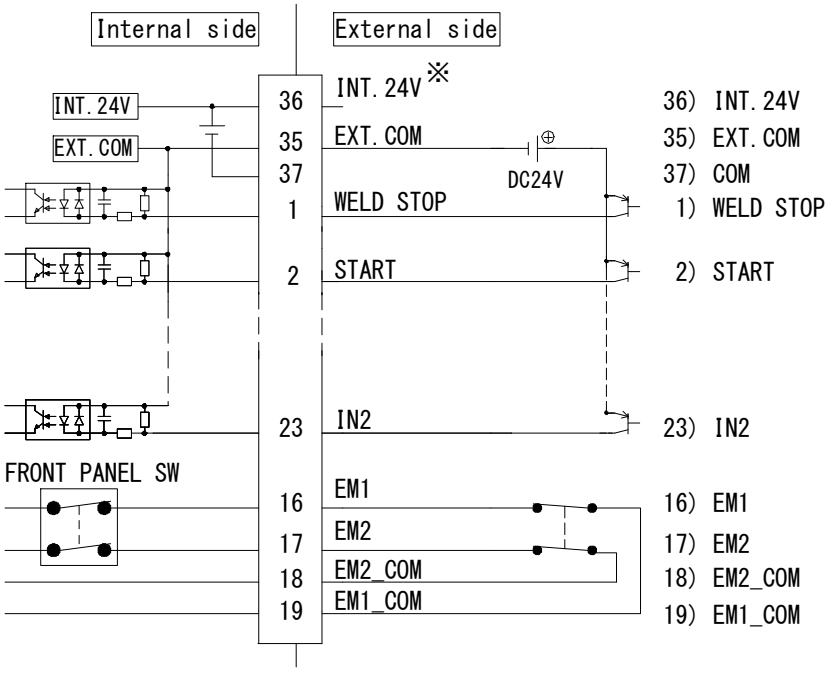
① For connecting to the contact input device (when the internal power supply is used)
Connect terminal No.35 and terminal No.36.



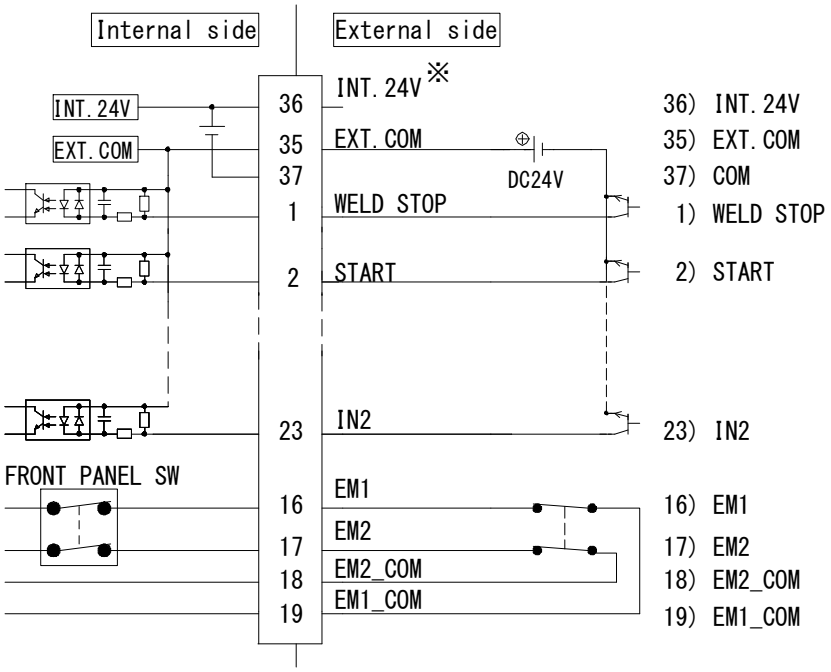
② For connecting to the NPN open collector output (when the internal power supply is used)
Connect terminal No.35 and terminal No.36.



③ For connecting to the PNP open collector output device (when the external power supply is used)
Connect the minus side of the external power supply of 24 V DC to terminal No.35.



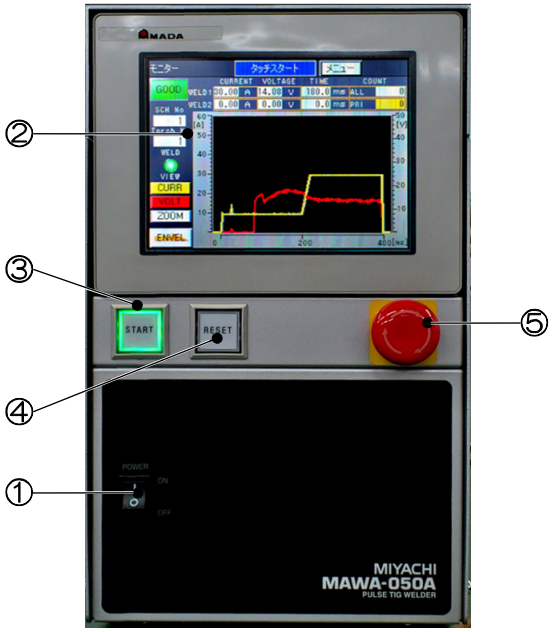
④ For connecting to the NPN open collector output device (when the external power supply is used)
Connect the plus side of the external power supply of 24 V DC to terminal No.35.



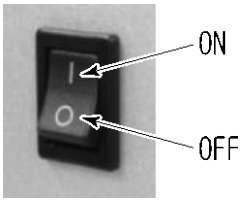
3. Operating Unit

(1) Front Panel

IMPORTANT
● Operate the switches and touch panel display carefully by hand. If they are operated violently or by using a screwdriver or pen point, this will result in damage. ● Operate each of the switches and touch panel display once a time. If multiple switches are operated at the same time, this will result in a failure. ● Operate switches on touch panel display about once in a second. If operated a plurality of times in a second, this will result in a malfunction or an erroneous display.



① Main power switch
Power is supplied by setting this switch to the ON side (“I” side). The power supply is shut off by setting it to the OFF side (“O” side).



② Touch panel display
This displays condition settings, monitor values, error codes, and messages that are used for the welding power supply.

③ START button (with a green LED incorporated)
When “CYLINDER” is set for the Torch drive type, this button LED lights (in green) when welding is ready. When the START key of the panel is made effective on the Switch select screen, welding is started by pressing this button while it lights. (Refer to “4. (6) Switch Select Screen.”)
When“MOTOR” is set for the Torch drive type, this button LED does not light even when welding is ready since the welding starts by the initial current start signal (H-ST1) of the option input/output connector. (Refer to “2. (3)-1-3 Option input/output connector.”)

④ RESET button (with an orange LED incorporated)
This button LED lights (in orange) when an error occurs. The error will be cleared by pressing this button after removing the cause of the error, and then the button LED goes out.

⑤ Emergency stop button
The welding power supply can be put to an emergency stop by pressing this button.
There are two ways to release the emergency stop, pulling operation and rotating operation.

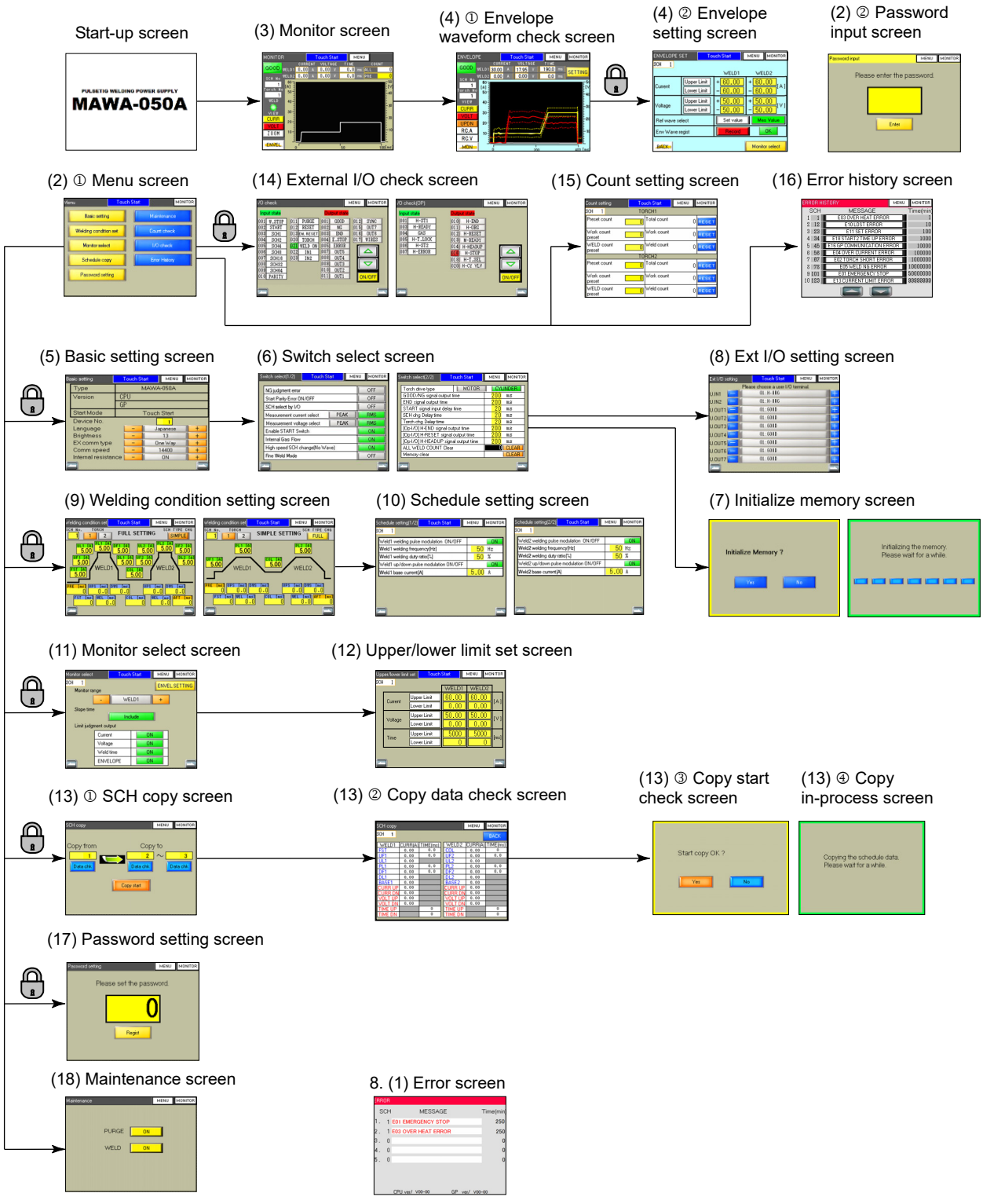
Pulling operation

Rotating operation

4. Explanation of Screens

(1) Screen Structure

The screen structure of **MAWA-050A** is as shown below.



Remarks

- Each of the switches provided in the upper right of each screen is used to go to the Menu screen or Monitor screen.

  MENU Switch to go to the Menu screen MONITOR Switch to go to the Monitor screen

  To go to the Monitor log screen, however, the LOG switch provided in the upper right of the Monitor screen is used.

- The switches provided in the left and right sides under the screen are used for a screen movement in the same category.

   Screen return switch  Screen feed switch

- An input set value in each setting screen becomes effective when a switch to go to another screen (MENU, MONITOR,  , or ) is pressed and the screen is changed over.

  If the power supply is turned off before the screen is changed over, the input set value becomes invalid.

- To go to a screen with the mark of  when the password is effective (Refer to “4. (17).”), it is necessary to input the password.

IMPORTANT

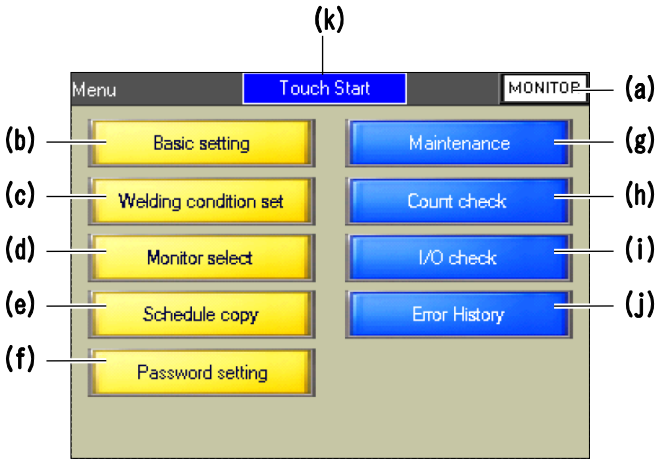
- Pressing a switch to go to another screen (MONITOR,  , or ) starts transferring setting data to the control board, and the screen is changed over when it is complete. If the power supply is turned off while the setting data is being transferred, the setting data may be destroyed. Do not turn off the power supply at least 2 seconds after the screen is changed over when pressing a switch to go to another screen (MONITOR,  , or ). If the setting data is destroyed, each setting data will be initialized (Refer to “4. (19).”).

(2) Menu Screen

① Menu screen

On the Menu screen, each function is displayed as a menu. The operator can go to the desired screen by pressing each switch.

To display the Menu screen, press MENU provided in the upper right part of each screen.



(a) Switch to go to the Monitor screen
Used to go to the Monitor screen.

(b) Basic setting
Used to go to the Basic setting screen.

(c) Welding condition set
Used to go to the Welding condition setting screen.

(d) Monitor select
Used to go to the Monitor select screen.

(e) Schedule copy
Used to go to the SCH copy screen.

(f) Password setting
Used to go to the Password setting screen.

(g) Maintenance
Used to go to the Maintenance screen.

(h) Count check
Used to go to the Count setting screen.

(i) I/O check
Used to go to the External I/O check screen.

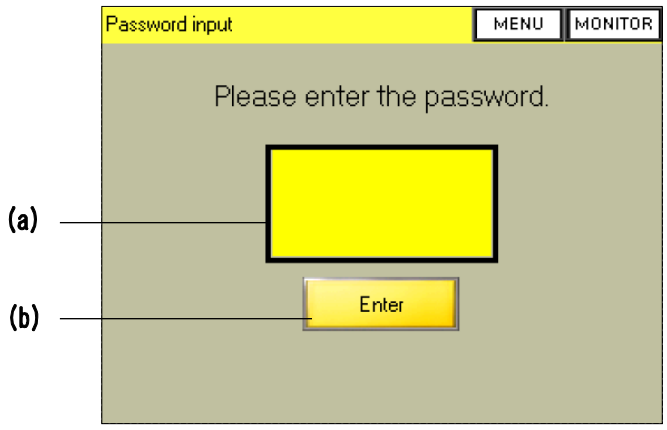
(j) Error History
Used to go to the Error history screen.

(k) Start mode display
The currently selected start mode “Touch Start” or “HV. Start” is displayed. This is displayed in the upper part of each screen.

Remarks

- When the password is made effective, the Password input screen is displayed by pressing the yellow switch.

② Password input screen
The Password input screen is display by pressing the switch which is used to go to the screen of (Refer to “4. (1).”). After the registered password is input, the operator can go to the required screen.
If the screen of is displayed by inputting the password after the power supply is turned on, the Password input screen will not be displayed in going to the screen of after that. It is possible to go to the screen without the password.
If “Enter” is pressed or the power supply is turned on again on the Password setting screen (Refer to 4. (17).), the Password input screen can be displayed again in going to the screen of .



(a) Password input area
The ten-key pad is displayed by touching this area. Then, input the password.

(b) Enter
The password registered in the main unit is verified by pressing this switch after entering the password. When the verification result is correct, it is possible to go to the requested screen. If the result is incorrect, “Password is different.” is displayed and the operator cannot go to another screen.

Remarks

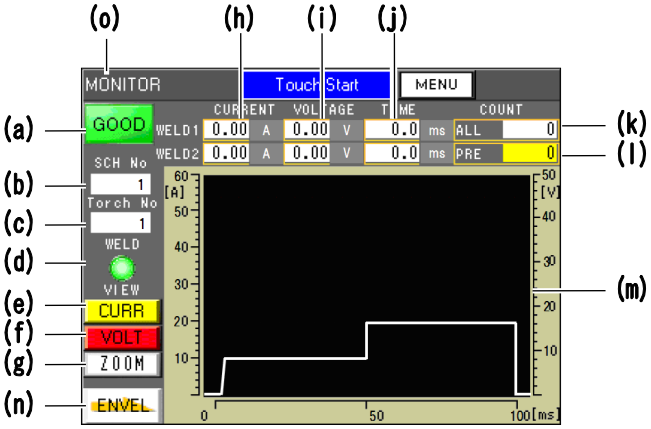
- If the registered password is forgotten, make contact with us for information.

(3) Monitor Screen

To perform welding, display this screen. A welding result with the last welding condition No. is displayed.

In the status where this screen is displayed, welding is enabled and the READY signal is output.

To display the Monitor screen, press MONITOR in the upper right part of each screen. Then, you can go to another screen directly.



(a) Welding result display

After the end of welding, the welding result judgment is displayed.

Normal	GOOD: Lights in green.
Error	NG: Lights in red. When the monitor value is out of the upper/lower limit judgment or out of the envelope range, the judgment results in NG.
Misfire	LOST: Lights in red. When the initial current cannot be detected or a short-circuit (contact) between a workpiece and the electrode cannot be recognized, the judgment is made as a misfire.

* At the initial power ON time, the lamp does not light.

(b) SCH No

The last welding ON condition No. is displayed.

(c) Torch No

The last welding ON torch No. is displayed.

(d) WELD

The welding current output ON/OFF status is displayed. (ON: Lights in green, OFF: Does not light in green)

For the welding current output ON/OFF, refer to “4. (18) Maintenance Screen.”

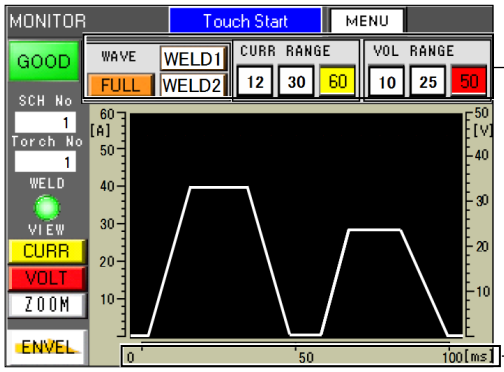
For the connection of welding current output, refer to the terminal No.21 WELD ON in “2. (3)-2-1. Input connector.” When WELD is set to OFF on the Maintenance screen in 4. (18), the welding current is not output even if the WELD ON terminal is closed.

To output the welding current, set WELD to ON on the Maintenance screen and open the WELD ON terminal.

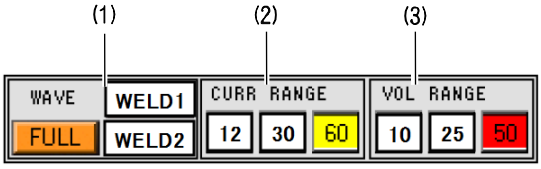
(e) CURR
The current waveform display (yellow lamp ON) or non-display (white lamp ON) can be selected.

(f) VOLT
The voltage waveform display (red lamp ON) or non-display (white lamp ON) can be selected.

(g) ZOOM
The wave operating window for a waveform display change is opened.
If this switch is pressed when the window is opened, the window can be closed.



Waveform operating window



(1) WAVE
The welding range for a waveform display can be selected.

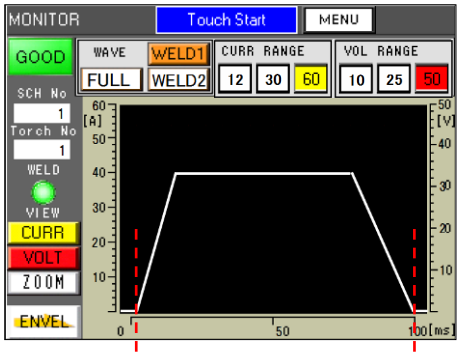
WELD1	The waveform display can be selected within the WELD1 welding range. The WELD1 waveform is displayed in the center of the graph in a magnified form.
WELD2	The waveform display can be selected within the WELD2 welding range. The WELD2 waveform is displayed in the center of the graph in a magnified form.
FULL	The full welding range is displayed.

Caution

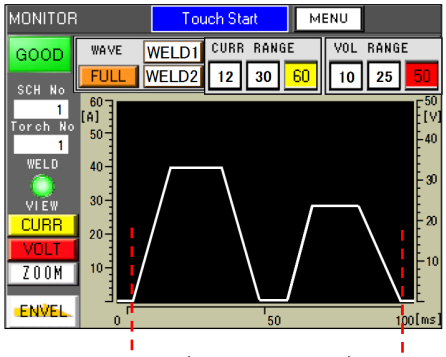
- The ZOOM function is effective only for displaying the waveform after welding. When the “4. (6) ① (c) SCH & Torch select by I/O” is set to “ON” and the ZOOM switch is pressed, the previously-displayed last welding waveform is cleared. To magnify the welding waveform displayed after welding, change the condition by external I/O after magnifying display.

Remarks

- There is a difference in the waveform display range between when the “WELD1” and “WELD2” magnified display is selected and when “FULL” is selected. In the time display in the lower part of the graph, each weld time of “WELD1” and “WELD2” is displayed when the magnified display is selected. In the time display in the left/right part at waveform magnification, the left numeric value represents a start point of welding waveform, the center value represents the medium position of welding waveform, and the right numeric value represents the end point of welding waveform. When “FULL” is selected, the entire weld time (including the initial current section and cooling section) is displayed.



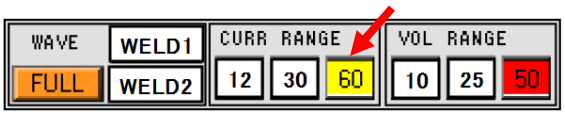
Display range at magnification



FULL display range

(2) CURR RANGE [A]

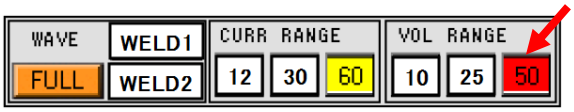
The display range of current waveform can be changed.
It can be selected among 60 [A], 30 [A] and 12 [A].



The selected current range is displayed. (Yellow lamp ON)

(3) VOL RANGE [V]

The display range of voltage waveform can be changed.
It can be selected among 50 [V], 25 [V] and 10 [V].



The selected voltage range is displayed. (Red lamp ON)

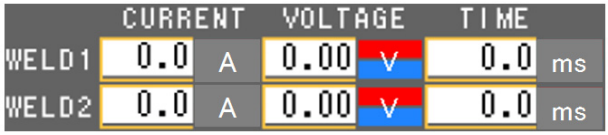
(h) CURRENT

The monitor values of WELD1 and WELD2 welding currents are displayed. The unit is [A]. The displayed value is PEAK (maximum value) or RMS (effective value). For selection of a display value, refer to “4. (6) (d) Measurement current select.” If the upper/lower limit judgment for the monitor value of welding current value results in NG, the background color of the unit is changed.

Red	When the monitor value exceeds the upper limit value (Set value on the Upper/lower limit set screen in 4. (12))
Blue	When the monitor value is lower than the lower limit value (Set value on the Upper/lower limit set screen in 4. (12))

(i) VOLTAGE

The monitor values of WELD1 and WELD2 welding voltages are displayed. The unit is [V]. The displayed value is PEAK (maximum value or RMS (effective value). For selection of a display value, refer to “4. (6) (e) Measurement voltage select.” If the upper/lower limit judgment for the monitor value of welding voltage value results in NG, the background color of the unit is changed.



Red	When the monitor value exceeds the upper limit value (Set value on the Upper/lower limit set screen in 4. (12))
Blue	When the monitor value is lower than the lower limit value (Set value on the Upper/lower limit set screen in 4. (12))

(j) TIME

The WELD1 and WELD2 weld times are displayed. The unit is [ms].
When the “Slope time” item of the Monitor selection screen is set to “Exclude”, only the time of pulse current section is displayed. For the “Slope” item, refer to “4. (11) (c) Slope time.” The initial current time and the cooling time are displayed at the reference waveform set on the Welding condition setting screen, but the initial current time and the cooling time are not included in the displayed time in TIME. When the upper/lower limit judgment of the weld time results in NG, the background color of the unit is changed.
(Screen display when the upper/lower limit judgment is NG)

Red	When the monitor value exceeds the upper limit value (Set value on the Upper/lower limit set screen in 4. (12))
Blue	When the monitor value is lower than the lower limit value (Set value on the Upper/lower limit set screen in 4. (12))

(k) ALL COUNT

Becomes valid when any value other than 0 is set to PRE COUNT. At each welding, +1 is added regardless of the welding judgment (GOOD/NG/LOST) (for all SCHs). For clearing a counter value, refer to “4. (6) ② (j) ALL WELD COUNT Clear.”

(l) PRE COUNT

When this switch is touched, PRE COUNT can be set. The setting range is 0 ~ 999999. If the ALL COUNT value exceeds the PRE COUNT value, “E06 End of counter reached” occurs. If the set value is 0, the ALL COUNT function becomes invalid.

(m) Waveform display area

The welding monitor waveform based on the last welding condition No. and the reference waveform created from the data set on the Welding condition setting

screen are displayed. Even if the “Slope time” item of the Monitor select screen is set to “Exclude”, the waveform including the slope is displayed.

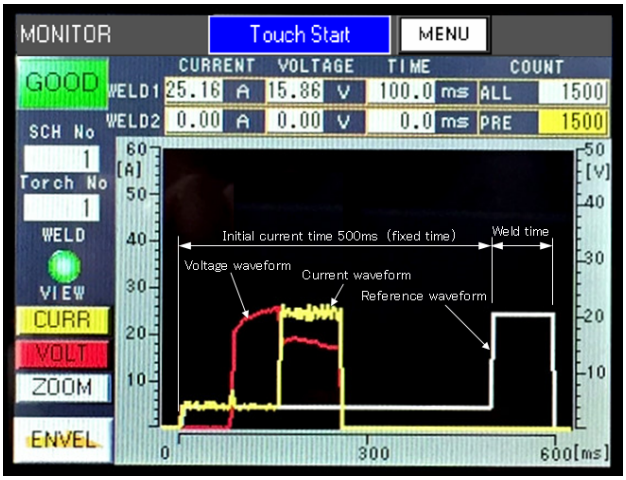
Reference waveform	While line
Current waveform	Yellow line
Voltage waveform	Red line

* When the welding monitor value is “0”, no waveform is displayed.

* When modulation is set, the modulation ON/OFF waveform is not displayed on the reference waveform. The welding monitor waveform may be different from the actual waveform because of data sampling and modulation frequency.

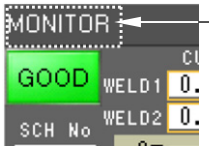
* Only when the drive setting of the touch start is “MOTOR”, and the initial current time is set to 0 ms, the auto mode or fine weld mode can be selected.
  At this time, the initial current time of the reference waveform on the Monitor screen is displayed by adding the fixed time 500 ms (*1). Set conditions such as moving speed and moving distance of the torch head so that the torch head can move to the main welding start position within 500 ms.
  If the main welding start signal H-ST2 is not input from the torch head controller within 500 ms, “E18 Start2 - time limit exceeded” will occur.
  Since the current and voltage monitor waveform is displayed in the actual time, it is displayed in front of the set current waveform.

*1: In the auto mode or fine weld mode, the initial current time of the reference waveform on the Monitor screen is fixed to 500 ms since the initial current time fluctuates depending on the torch head rising speed or the moving distance and the initial current time cannot be known before welding.



(n) ENVEL
Used to go to the Envelope screen.

(o) Waveform display
The waveform can be displayed by pressing the portion close to the “MONITOR” display in the upper left part of the screen. Even if the setting of “4. (6) (h) High speed SCH change (No Wave)” is made effective, the waveform is displayed. To check the waveform at welding NG, press this switch.

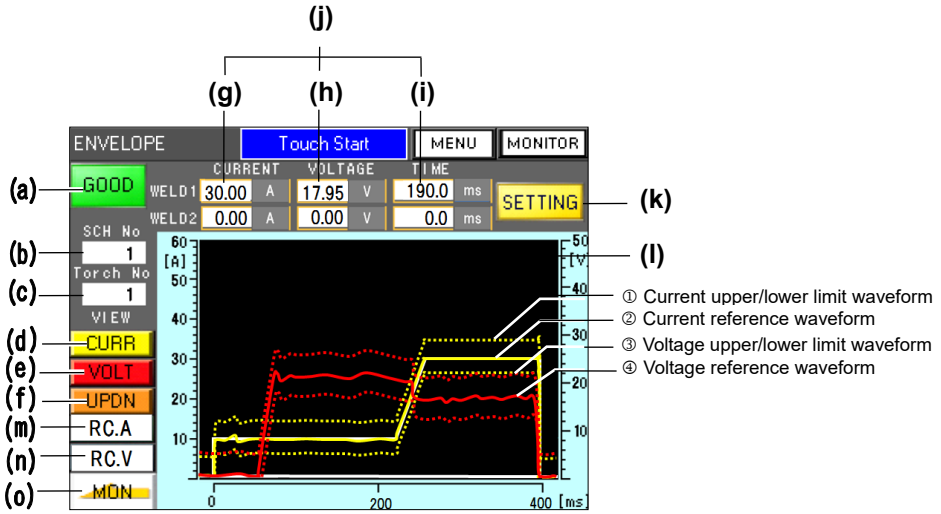


Waveform display switch area

(4) Envelope Screen

To make the envelope function effective, turn on “ENVELOPE” in 4. (11) (d) of the Monitor select screen. In this screen, the current reference waveform/voltage reference waveforms are obtained for each condition No. and the upper/lower limit value from the reference waveform is set as waveform data. There are two screens, namely, Envelope waveform check screen for a waveform check and Envelope setting screen to set the upper/lower limit value for the waveform.

① Envelope waveform check screen



* The full welding range is displayed on the Envelope waveform check screen.

(a) Welding result display
At the end of welding, the welding result judgment is displayed.

Normal	GOOD: Lights in green.
Error	NG: Lights in red. When the monitor value is out of the upper/lower limit judgment range, the judgment result in NG.
Misfire	LOST: Lights in red. When the initial current cannot be detected or when a short-circuit (contact) between a workpiece and the electrode cannot be recognized, the judgment results in a misfire.

(b) SCH No
The condition number being set is displayed.

(c) Torch No
The torch No. of the last welding execution is displayed.

(d) CURR
The display (yellow lamp ON) or non-display (white lamp ON) of current waveform can be selected. [Initial status: Display]

(e) VOLT
The display (red lamp ON) or non-display (white lamp ON) of voltage waveform can be selected. [Initial status: Not Display]

(f) UPDN

The upper/lower limit waveform set on the Envelope setting screen is displayed in a dotted line.

When CURR is made effective and UPDN is pressed, the upper/lower limit waveform of the current is displayed.

When VOLT is made effective and UPDN is pressed, the upper/lower limit waveform of the voltage is displayed.

* It is necessary to turn on “ENVELOPE” in 4. (11) (d) of the Monitor select screen.

(g) CURRENT

The monitor values of the WELD1/WELD2 welding current are displayed. The unit is [A].

The displayed value is PEAK (maximum value) or RMS (effective value). For selecting a display value, refer to “4. (6) (d) Measurement current select.” If the upper/lower limit judgment of the monitor value of the welding current value results in NG and if the envelope judgment results in NG, the background color of the unit is changed.

(h) VOLTAGE

The monitor values of the WELD1/WELD2 welding voltage are displayed. The unit is [V].

The displayed value is PEAK (maximum value) or RMS (effective value). For selecting a display value, refer to “4. (6) (d) Measurement voltage select.” If the upper/lower limit judgment of the monitor value of the welding voltage value results in NG and if the envelope judgment results in NG, the background color of the unit is changed.

(i) TIME

The WELD1/WELD2 weld time is displayed. The unit is [ms].

When the “Slope time” of the Monitor select screen is set to “Exclude”, only the time of the pulse current section is displayed. For the “Slope time” item, refer to 4. (11) (c) Slope time.” If the upper/lower limit judgment of the weld time results in NG, the background color of the unit is changed.

(j) Screen display when the upper/lower limit judgment is NG

Red	When the monitor value exceeds the upper limit value (Set value on 4. (12) Upper/Lower Limit Set Screen)
Blue	When the monitor value is lower the lower limit value (Set value on 4. (12) Upper/Lower Limit Set Screen)
Orange	When the monitor value exceeds the upper limit of envelope (Set value on 4. (4) Envelope Screen)
Purple	When the monitor value is lower than the lower limit of envelope (Set value on 4. (4) Envelope Screen)

(k) SETTING
The envelop setting screen (Refer to ② Envelope setting screen.) for setting the upper/lower limit value of envelope is displayed.

(l) Waveform display area
After welding is performed on this screen, the welding waveform and the envelope waveform created from the upper/lower limit value set on the Envelope setting screen (Refer to ② Envelope setting screen.) are displayed.
The upper/lower limit waveform is displayed in a dotted line.

Current waveform	Reference waveform	Yellow solid line
	Upper/lower limit waveform	Yellow dotted line
Voltage waveform	Reference waveform	Red solid line
	Upper/lower limit waveform	Red dotted line

Caution

- The upper/lower limit waveform (dotted line) also displays the range of the initial current (FST) and the cooling time current (COL), but the envelope judgment only covers the range of WELD1 and WELD2.

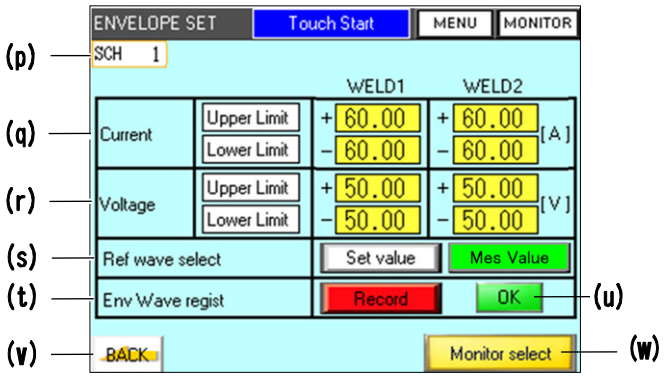
(m) RC.A
The reference current waveform registered on the Envelope setting screen is displayed. (The upper/lower limit waveform of current-voltage is not displayed.)

(n) RC.V
The reference voltage waveform registered on the Envelope setting screen is displayed. (The upper/lower limit waveform of current-voltage is not displayed.)

(o) MON
The Monitor screen is displayed.

② Envelope setting screen

This screen is used to decide and register the upper/lower limit value, reference waveform format, and envelope waveform to create an envelope waveform.



(p) SCH

The condition No. being set is displayed.

(q) Current

The upper limit value and lower limit value to be used for current envelope judgment can be set as relative values for the registered waveforms of the first welding (WELD1) and second welding (WELD2).

The input range is 0 ~ 60.0 [A].

Remarks

- For setting of welding conditions without slope, an overshoot is likely to occur for the set current value, and the judgment result is likely to be NG when the upper limit value of the current is low. To make it GOOD, set it to the welding condition with slope or set the upper limit value of the current higher to prevent an overshoot waveform.

(r) Voltage

The upper limit value and lower limit value to be used for voltage envelope judgment can be set as relative values for the first welding (WELD1) and second welding (WELD2).

The input range is 0 ~ 50.0 [V].

Remarks

- For setting of welding conditions without slope, an overshoot is likely to occur for the set current value, and the judgment result is likely to be NG when the upper limit value of the current is low. To make it GOOD, set it to the welding condition with slope or set the upper limit value of the current higher to prevent an overshoot waveform.

(s) Ref wave select
The reference current waveform can be selected from the following 2 types and the selected switch lights in green.

- Mes value
  Measurement value obtained by a power ON operation on the Envelope waveform check screen (Refer to “4. (4) ① Envelope waveform check screen.”).
- Set value
  Set value created from the current waveform data set on the Welding condition setting screen (Refer to “4. (9) Welding Condition Setting Screen.”).
  However, the reference voltage waveform is only “Mes Value.”

Caution

- When “MOTOR” is set for the Torch drive type and auto mode (including the fine weld mode) is set, select “Mes value” for the reference waveform. This is why the set time and the monitor time of the initial current time are different.

(t) Env Wave regist
Resistance welding is performed on the Envelope waveform check screen (Refer to “4. (4) ① Envelope waveform check screen.”) and “Record” is pressed in the status where the envelope waveform is created, the envelope waveform data is saved into the condition No. parameter being set.

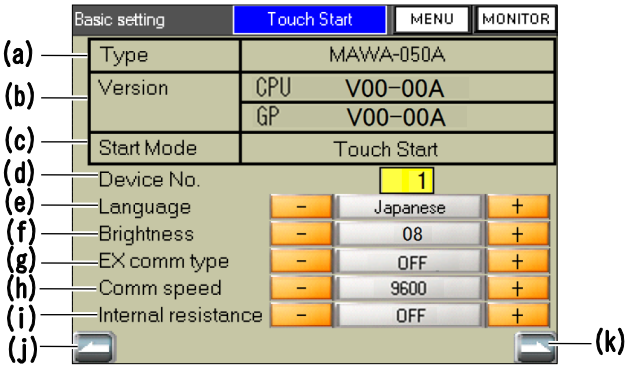
(u) Envelope waveform registration status display
It is displayed that the envelope waveform is registered in the condition No. being set. After “Record” is pressed and the waveform is successfully saved, “OK” is displayed. When it is unsuccessful, “NG” is displayed. If the waveform is not saved, “NON” is displayed.

(v) BACK
The Envelope waveform check screen is displayed.

(w) Monitor select
The Monitor select screen is displayed.

(5) Basic Setting Screen

This screen is used to display and set the information on the welding power supply.



(a) Type
The type of the welding power supply is displayed.

(b) Version
The program version of the main unit control unit and the program version of the touch panel of **MAWA-050A** are displayed.

(c) Start Mode
The control mode at a start of welding is displayed.

(d) Device No.
Enter the recognition No. of the welding power supply in use.
When multiple welding power supplies are used, enter “1” for the first unit, “2” for the second unit, and “3” for the third unit, respectively. These are used for recognition of device. This device No. can be set up to “31.”
[Initial value: 1]

(e) Language
The panel display language can be selected among “Japanese”, “English”, “Korean”, “Chinese (Simplified)” and “German.”
[Initial value: English]

(f) Brightness
The panel brightness can be adjusted. The setting range is 01 (dark) ~ 15 (bright).
[Initial value: 08]

(g) EX comm type
The communication mode with external devices can be selected.

OFF	Communication with external devices is not performed.
One Way	One-way communication is performed.
Two Way	Two-way communication is performed.

[Initial value: OFF]

(h) Comm speed
A communication speed with external communication devices can be selected.

9600	Performs communication at 9600 bps.
14400	Performs communication at 14400 bps.
19600	Performs communication at 19600 bps.
38400	Performs communication at 38400 bps.

[Initial value: 9600]

(i) Internal resistance
It can be selected whether the resistor incorporated in **MAWA-050A** is used as a terminator for external communication. Refer to “7. (3) External Communication Function – Configuration.”
[Initial value: OFF]

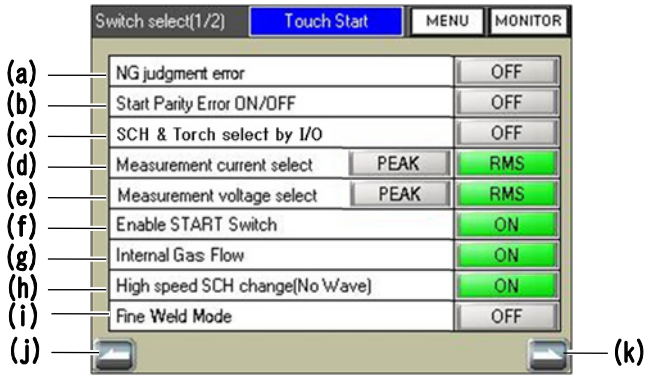
(j) Screen return switch
Used to go to the External I/O setting screen.

(k) Screen feed switch
Used to go to the Switch select screen (1/2).

(6) Switch Select Screen

This screen is not used to set welding conditions for each schedule but is used to perform common detail settings. There 2 pages, namely, Switch select screen (1/2) and Switch select screen (2/2).

① Switch select screen (1/2)



(a) NG judgment error
It is possible to select whether when the monitor judgment results in “NG”, this is judged as an error status. The Error screen is displayed in an error status, and the next START is not accepted unless the “RESET” operation is performed.
[Initial value: OFF]

(b) Start Parity Error ON/OFF
When selecting a schedule by using an external input, this can select whether the PARITY input signal is included or not. (Refer to PARITY in “2. (3)-1-1. Input connector.”)
[Initial value: OFF]

(c) SCH & Torch select by I/O
This can select whether the condition No. and torch changeover by external I/O is made effective or not.
At ON, set the condition No. by the SCH select terminals of the external I/O. (Refer to “6. (8) Schedule Changeover” and “(10) Condition No. and SCH Select Terminals.”)
[Initial value: OFF]

(d) Measurement current select
Regarding the welding current monitor value to be displayed on the Monitor screen and the measurement current value to make an upper/lower limit judgment.
This can select either “PEAK” (maximum value) or “RMS” (effective value).
[Initial value: RMS]

(e) Measurement voltage select
Regarding the welding voltage monitor value to be displayed on the Monitor screen and the measurement voltage value to make an upper/lower limit judgment.
This can select either “PEAK” (maximum value) or “RMS” (effective value).
[Initial value: RMS]

(f) Enable START Switch
At “ON”, the “START button” on the front panel is enabled.
[Initial value: ON]

(g) Internal Gas Flow
This can select whether a gas flow operation is automatically controlled or not. At “ON”, the solenoid valve is turned on/off in conjunction with the pre-flow/after-flow time set on the Welding condition setting screen. However, when there is an input from input terminal 4: GAS of “2. (3)-1-3 Option input/output connector” or input terminal 11: PURGE of “2. (3)-1-1 Input connector”, a gas flow operation is performed regardless of on/off setting.
[Initial value: ON]

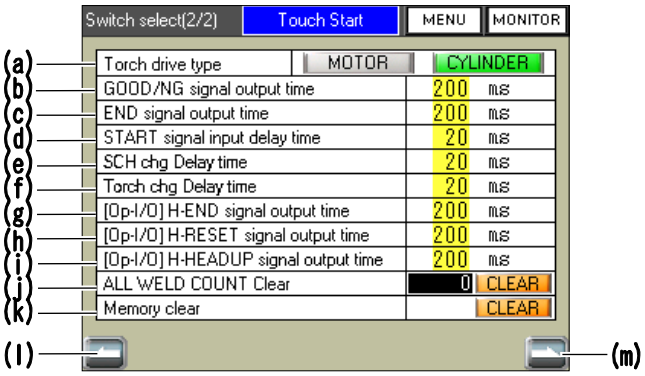
(h) High speed SCH change (No Wave)
By hiding the waveform, the processing time for displaying the waveform is shorten and conditions can be switched smoothly.
At ON, no waveform is displayed on the Monitor screen. The welding interval can be shortened by omitting the waveform display process. At ON, the waveform can be checked by pressing the waveform display switch in 4. (3) (o).
[Initial value: OFF]

(i) Fine Weld Mode
This can select whether the fine weld mode is used or not.
At ON, the fine weld mode is selected. At OFF, the auto mode is selected.
The fine weld mode / auto mode is the special welding mode when the torch drive type is “MOTOR” and the initial current time FST is set to 0.
In the fine weld mode, the torch head moves down and it stops when the electrode and the workpiece make contact, and the head starts moving up performing the main welding immediately after the torch head moves up (no initial welding). This mode is effective when welding a minute workpiece melted completely by the initial current or shortening the weld time.
In the auto mode, the main welding performed when the head reaches the welding point (main welding).
In the time axis of the waveform display for fine weld mode / auto mode, the initial current time is fixed to 500 ms max. and the waveform is displayed on the Monitor screen with the time obtained by adding the main welding time.
[Initial value: OFF]

(j) Screen return switch
Used to go to the Basic setting screen.

(k) Screen feed switch
Used to go to the Switch select screen (2/2).

② Switch selection screen (2/2)

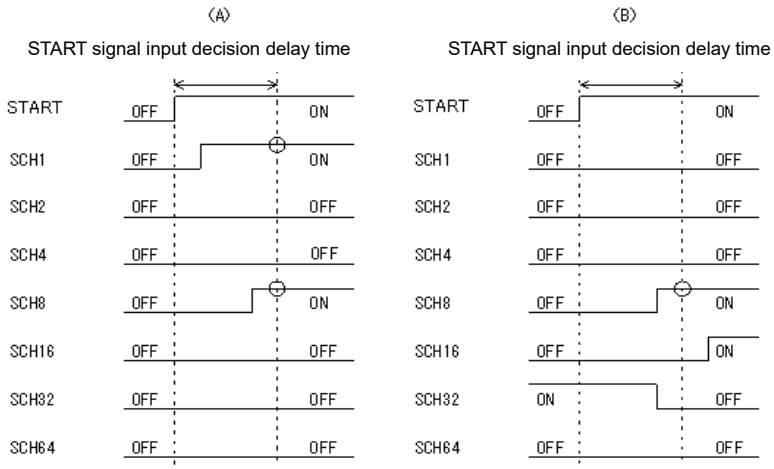


(a) Torch drive type
Regarding the motive power to operate the torch, either “MOTOR” or “CYLINDER” can be selected. Perform this setting according to your torch.
[Initial value: MOTOR]

(b) GOOD/NG signal output time
After the end of all the welding sequence, the GOOD/NG signal output time can be set. The setting range is 1 ~ 200 [ms]. The upper/lower limit judgment of the monitor value is also output with this setting.
[Initial value: 200 ms]

(c) END signal output time
After the end of all the welding sequence, the END signal output time can be set. The setting range is 1 ~ 200 [ms]. [Initial value: 200 ms]

(d) START signal input delay time
Sets the time to determine the condition after the START signal is input.
If the START signal is input over the set time, the welding sequence is started.
The condition No. for welding is determined by the SCH (1 ~ 64) signal at the time when the set time is elapsed. The setting range is 1 ~ 200 [ms]. [Initial value: 20 ms]
Also, if the START signal is turned off in the time set in this item after a START signal input, the welding sequence is not started.



In Figure (A), since condition No. 1 and No. 8 are ON, welding is performed by condition No. 9. In Figure (B), since only condition No. 8 is ON, welding is performed by condition No. 8. Condition signals 16 and 32 are invalid because they are OFF at the decision of conditions.

(e) SCH chg Delay time
Sets the time to determine the SCH No. after the SCH changeover signal is input. The SCH No. is determined by the SCH (1 ~ 64) signal is input for the set time or more.
Even if the SART signal is input within the time set in this item after external inputs SCH1 ~ SCH64 are changed, the START signal is not accepted. Refer to the timing chart in “6. (8) Schedule Changeover.” The setting range is 1 ~ 200 [ms]. [Initial value: 20 ms]

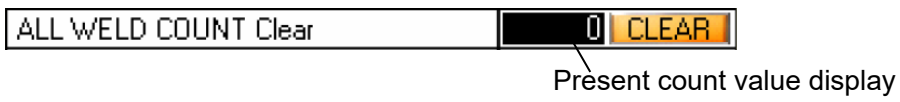
(f) Torch chg Delay time
Even if the SART signal is input within the time set in this item after external inputs TORCH1 and TORCH2 are changed, the START signal is not accepted.
The setting range is 1 ~ 200 [ms]. [Initial value: 20 ms]

(g) [Op-IO] H-END signal output time
The output time of the H-END output signal can be set. The setting range is 1 ~ 200 [ms]. [Initial value: 200 ms]

(h) [Op-IO] H-RESET signal output time
The output time of the H-RESET output signal can be set. The setting range is 1 ~ 200 [ms]. [Initial value: 200 ms]

(i) [Op-IO] H-HEAD UP signal output time
The output time of the H-HEAD UP output signal can be set. The setting range is 1 ~ 200 [ms]. [Initial value: 200 ms]

(j) ALL WELD COUNT Clear
The value of the “ALL COUNT” on the Monitor screen is cleared by pressing “CLEAR.” After completion of this clearing, the present count value is displayed as “0.” For the “ALL COUNT” item, refer to “4. (3) (k) ALL COUNT.”



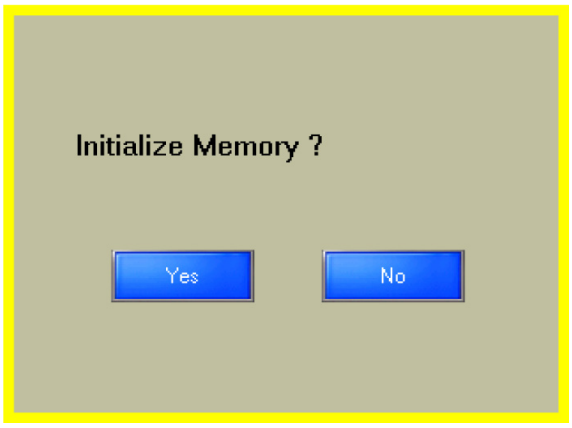
(k) Memory clear
The Initialize memory screen is displayed by pressing “CLEAR.”
For details, refer to “(7) Initialize Memory Screen.”

(l) Screen return switch
Used to go to the Switch select screen (1/2).

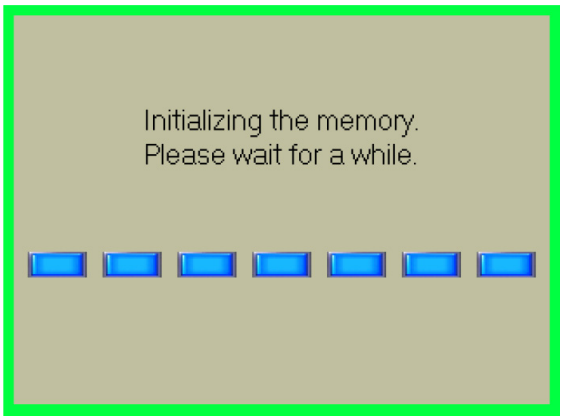
(m) Screen feed switch
Used to go to the External I/O setting screen.

(7) Initialize Memory Screen

This screen is used to initialize the memory so that all the setting conditions of the welding power supply may be reset to the set values provided at delivery from the factory. This screen can be displayed by pressing “CLEAR” in the “Memory clear” item on the Switch select screen (2/2).



Yes	Executes initialization. Displays the Initializing memory screen during initialization.
No	Goes back to the Switch setting screen without execution of initialization.



Initializing memory screen

This screen is displayed during memory initialization. After completion of initialization, the Switch select screen (2/2) is displayed again.

* During memory initialization, do not turn off the power supply.

(8) Ext I/O Setting Screen

Set inputs IN1/IN2 and outputs OUT1 ~ OUT7 of external input/output signals.
Select them by “+” and “-.” The display is changed in the following order.

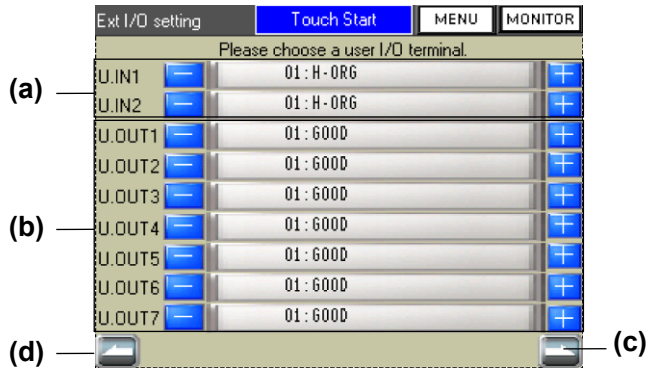
User input terminals

01.GAS FLOW	02.H-ORG	03.H-HEAD UP

User output terminals

01.GOOD	02.NG	03.END
04.ERROR	05.READY	06.LOST
07.WEL1 LOWER CURRENT	08.WEL1 UPPER CURRENT	09.WEL1 LOWER VOLTAGE
10.WEL1 UPPER VOLTAGE	11.WEL1 LOWER TIME	12.WEL1 UPPER TIME
13.WEL1 LOWER ENVELOPE CUR	14.WEL1 UPPER ENVELOPE CUR	15.WEL1 LOWER ENVELOPE VLT
16.WEL1 UPPER ENVELOPE VLT	17.WEL2 LOWER CURRENT	18.WEL2 UPPER CURRENT
19.WEL2 LOWER VOLTAGE	20.WEL2 UPPER VOLTAGE	21.WEL2 LOWER TIME
22.WEL2 UPPER TIME	23.WEL2 LOWER ENVELOPE CUR	24.WEL2 UPPER ENVELOPE CUR
25.WEL2 LOWER ENVELOPE VLT	26.WEL2 UPPER ENVELOPE VLT	27.SYNC.OUT
28.WIRE START	29.H-READY	30.H-ST1
31.H-ST2	32.H-ERROR	33.H-HEAD UP
34.H-MODE	35.MID POINT	

For the contents of each input/output signal, refer to “2. (3)-3. External input/output signal table.”



(a) User input terminal
A signal to be allocated to user input terminal 1/2 can be selected. When the setting is “User input terminal”, no input signal exists.

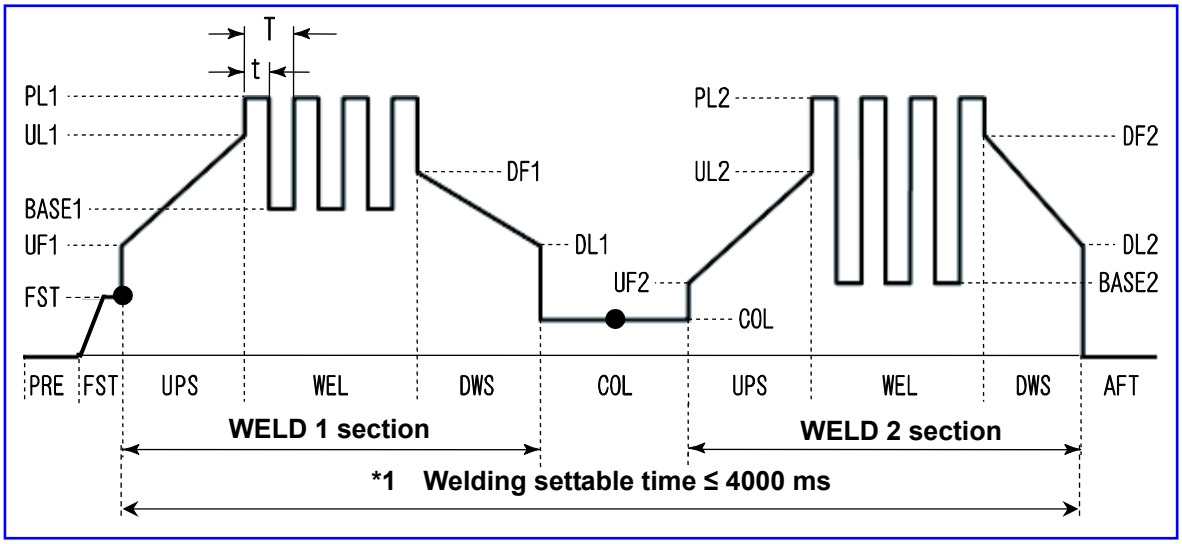
(b) User output terminal
A signal to be output from user output terminals 1 ~ 7 can be selected. When the setting is “User output terminal”, no output signal exists.

(c) Screen feed switch
The Basic setting screen is displayed.

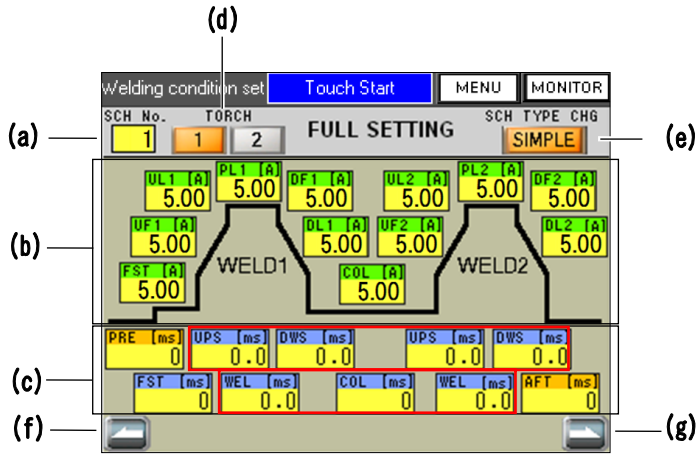
(d) Screen return switch
The Switch select screen (2/2) is displayed.

(9) Welding Condition Setting Screen

This welding power supply permits setting up to 127 types of welding condition.
In this screen, the welding condition No., weld time length, welding current magnitude, etc. are set. There are two setting screens, namely, FULL SETTING screen in which all the detail condition settings can be set by operator himself and SIMPLE SETTING screen in which conditions can be input easily.



① FULL SETTING screen



*1 Settable time is [WELD1 section set time] + [COL set time] + [WELD2 section set time] ≤ 4000 [ms]. (The total set time in a red frame cannot be over 4000 ms.)

(a) SCH No.
Select a welding condition to be set among Nos. 1 ~ 127. Usually, select No. from 1 in order.
When the “SCH & Torch select by I/O” item of the Switch select screen (1/2) is set to “OFF”, the condition No. to be used for welding is equal to the condition No. that is set here.

(b) Current

Each peak current value at welding can be set independently. The settable range is 5.00 ~ 9.99 [A] (in units of 0.01 [A]) and 10.0 ~ 50.0 [A] (in units of 0.1 [A]).
For the details of each item, refer to the following table.

WELD1	FST (*2)	Initial current [Initial value: 5.00 A]
	UF1 (*2)	Up-slope initial current [Initial value: 5.00 A]
	UL1	Up-slope final current [Initial value: 5.00 A]
	PL1	Pulse current [Initial value: 5.00 A]
	DF1	Down-slope initial current [Initial value: 5.00 A]
	DL1	Down-slope final current [Initial value: 5.00 A]
COL		Cooling time current [Initial value: 5.00 A]
WELD2	UF2	Up-slope initial current [Initial value: 5.00 A]
	UL2	Up-slope final current [Initial value: 5.00 A]
	PL2	Pulse current [Initial value: 5.00 A]
	DF2	Down-slope initial current [Initial value: 5.00 A]
	DL2	Down-slope final current [Initial value: 5.00 A]

*2 For welding very small workpieces, only FST and UF1 of WELD1 can be set from 1.00 A of the minimum current set value. However, the initial value is 5.00 A.

Remarks

- If the value less than the effective digits for the current set value is input, it is rounded off when the screen is switched from the Welding condition setting screen to the Monitor screen to establish the set value. For example, when “10.55” A is input, the effective digits for 10 A or more is 0.1 A, the set value is automatically corrected to “10.5” A when the screen is switched from the Welding condition setting screen to the Monitor screen.

(c) Time

Each operating time at welding can be set individually.
For the details of each item, refer to the following table.

Name	Item	Setting range	Initial value
PRE	Pre-flow time (pre-welding gas output time)	0 ~ 9999 [ms]	0 ms
FST	Initial current time (*3)	0 ~ 999 [ms]	0 ms
UPS	Up-slope time (*4) (*5)	0 ~ 99.9 [ms] (in units of 0.1 [ms]) 100 ~ 999 [ms] (in unit of 1 [ms])	0 ms
WEL	Main welding time (*4) (*5)	0 ~ 99.9 [ms] (in units of 0.1 [ms]) 100 ~ 999 [ms] (in unit of 1 [ms])	0 ms
DWS	Down-slope time (*4) (*5)	0 ~ 99.9 [ms] (in units of 0.1 [ms]) 00 ~ 999 [ms] (in unit of 1 [ms])	0 ms
COL	Cooling time (*3)	0 ~ 1000 [ms]	0 ms
AFT	After-flow time (post-welding gas output time)	0 ~ 9999 [ms]	0 ms

*3 Setting to 0 ms becomes the auto mode or fine weld mode. Setting to 1 to 999 ms becomes the normal mode. (Refer to 5. (6)-2 Operations.)

*4 Settable time cannot be over 4000 [ms] as shown below:
[WELD1 section set time] + [COL set time] + [WELD2 section set time] ≤ 4000 [ms]

*5 All of UPS, WEL and DWS of the WELD1 section is set to 0, WELD2 cannot be operated correctly. Only WELD2 setting cannot be performed. “E11 Weld parameter error” will occur.

Remarks

- If the value less than the effective digits for the time set value is input, it is rounded off when the screen is switched from the Welding condition setting screen to the Monitor screen to establish the set value. For example, when “100.5” ms is input, the effective digits for 100 ms or more is 1 ms, the set value is automatically corrected to “100” ms when the screen is switched from the Welding condition setting screen to the Monitor screen.

(d) TORCH

Select a torch No. to be used from TORCH 1 or TORCH 2.
When the “SCH & Torch select by I/O” in 4. (6) ① (c) in the Switch select (1/2) screen is set to ON, the external input takes priority.
TORCH 1 and TORCH 2 can be switched by connecting the optional torch selector.
[Initial value: TORCH1]

(e) SCH TYPE CHG

When this switch is depressed for about a second, the welding condition setting mode is changed over to the SIMPLE mode.
The SIMPLE SETTING screen is displayed.
[Initial value: SIMPLE]

(f) Screen feed switch

The Schedule setting screen (2/2) is displayed.

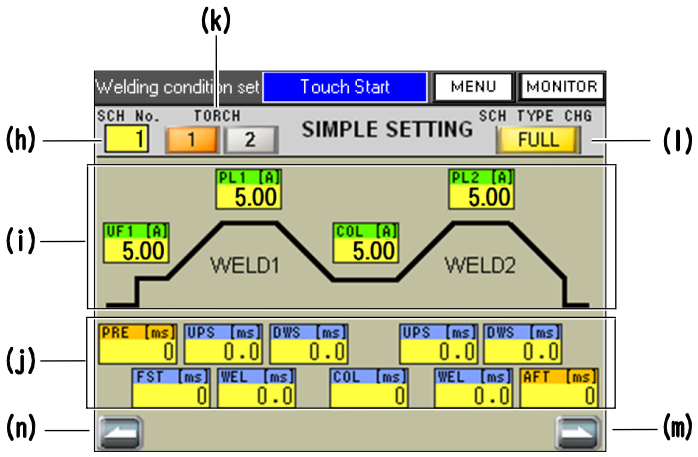
(g) Screen return switch

The Schedule setting screen (1/2) is displayed.

② SIMPLE SETTING screen

This screen permits settings easily because the number of current setting items is less than the FULL SETTING screen.

When you go to the SIMPLE SETTING screen after setting conditions on the FULL SETTING screen and then display the Monitor screen, the set values of slope UL1 and DF1 of WELD1 automatically change into the same set current value of PL1 and the set values of slope UL2 and DF2 of WELD2 automatically change into the same set current value of PL2.



(h) SCH No.

Select a welding condition to be set among Nos. 1 ~ 127. Usually, select No. from 1 in order. When the “SCH & Torch select by I/O” item of the Switch select screen (1/2) is set to “OFF”, the condition No. to be used for welding is equal to the condition No. that is set here. When set to “ON”, set the condition No. by the SCH select terminals of the external I/O. (Refer to “6. (8) Schedule Changeover” and “(10) Condition No. and SCH Select Terminals.”)

(i) Current

Each peak current value at welding cab be set independently. The settable range is 5.00 ~ 9.99 [A] (in units of 0.01 [A]) and 10.0 ~ 50.0 [A] (in units of 0.1 [A]). For details of each item, refer to (b) Current of ① FULL SETTING screen.

(j) Time

Each operating time at welding can be set individually.

For the details of each item, refer to (c) Time of ① FULL SETTING screen.

(k) TORCH

Select a torch No. to be used from TORCH 1 or TORCH 2.

When the “SCH & Torch select by I/O” in 4. (6) ① (c) in the Switch select (1/2) screen is set to ON, the external input takes priority.

TORCH 1 and TORCH 2 can be switched by connecting the optional torch selector.

(l) SCH TYPE CHG

When this switch is depressed for about a second, the welding condition setting mode is changed over to the FULL mode. The FULL SETTING screen is displayed.

(m) Screen feed switch

The Schedule setting screen (2/2) is displayed.

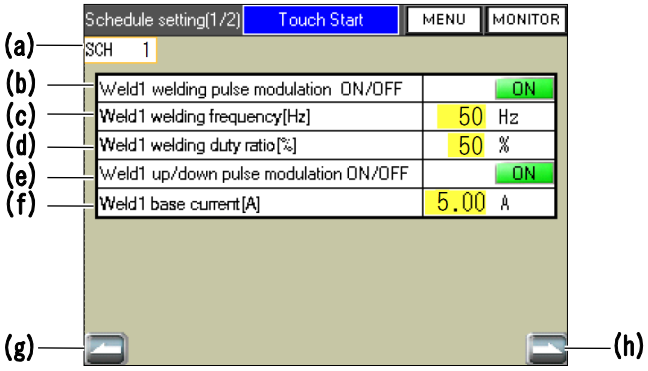
(n) Screen return switch

The Schedule setting screen (1/2) is displayed.

(10) Schedule Setting Screen

This screen is mainly used to set the pulse modulation of welding current. The welding current is determined by the data set in the welding condition settings and the data set on this screen. There are two types setting screens, namely, Schedule setting screen (1/2) to set the first welding and Schedule setting screen (2/2) to set the second welding.

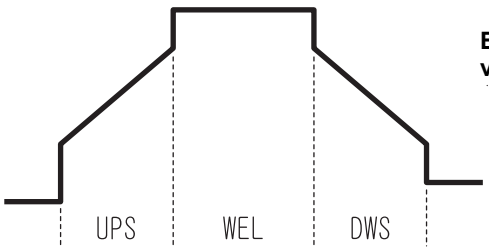
① Schedule setting screen (1/2)



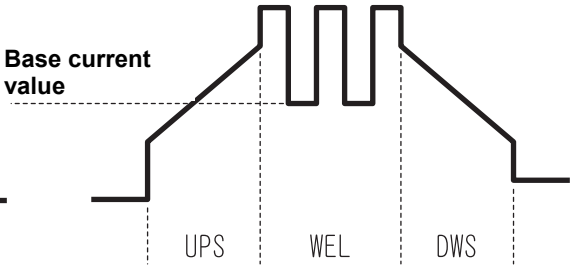
(a) SCH
The currently selected condition No. is displayed.

(b) Weld1 welding pulse modulation ON/OFF
Select whether to apply the pulse modulation to the first welding current.
[Initial value: OFF]

Waveform sample at pulse modulation OFF



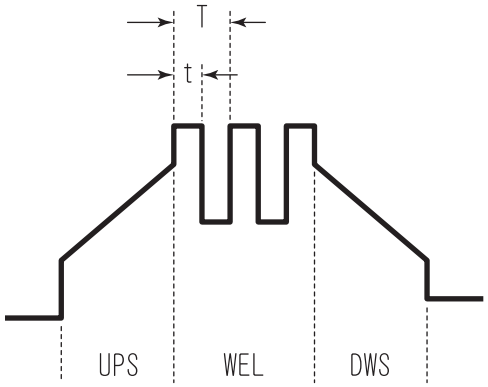
Waveform sample at pulse modulation ON



(c) Weld1 welding frequency [Hz]
Set the modulation frequency of the first welding pulse.
The setting range is 1 ~ 3000 [Hz].
This setting is also applied to the pulse modulation frequency of up-slope and down-slope.
[Initial value: 1 [Hz]]

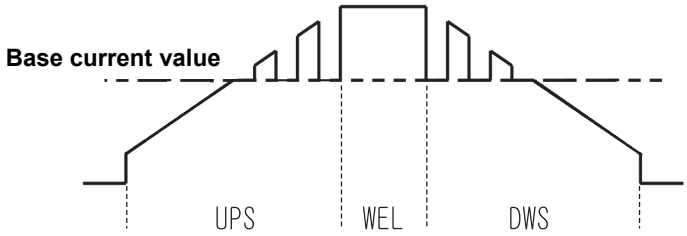
(d) Weld1 welding duty ratio [%]
Set the duty ratio of welding pulse. The setting range is 10 ~ 90 [%].
This setting is also applied to the pulse modulation of up-slope and down-slope.
[Initial value: 50 [%]]

Modulation duty ratio = t/T x 100 [%]



(e) Weld1 up/down pulse modulation ON/OFF
Select whether to apply pulse modulation to the welding current in the UPS (up-slope) and DWS (down-slope) sections of the first welding.
[Initial value: OFF]

Waveform sample when the UPS/DWS pulse modulation is applied.



(f) Weld1 base current [A]
In the effective section of pulse modulation, modulation is performed by using the set value as the minimum current value. When the base current value is higher than the welding current value, modulation is not performed. The setting range is 1.00 ~ 9.99 [A] (in units of 0.01 [A]) and 10.0 ~ 50.0 [A] (in units of 0.1 [A]). (*1)
[Initial value: 5.00 [A]]

*1 For welding very small workpieces, only FST and UF1 of WELD1 can be set from 1.00 A of the minimum current set value. However, the initial value is 5.00 A.

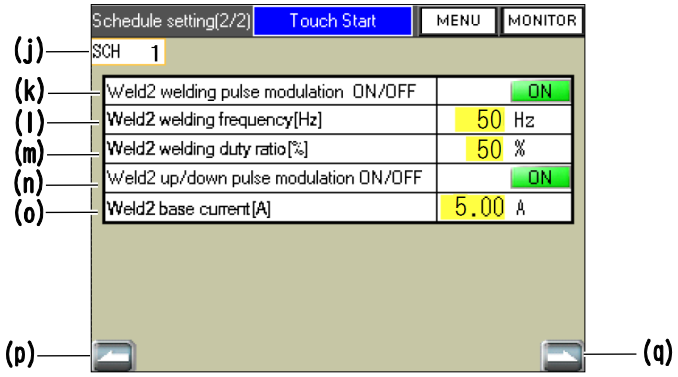
Remarks

- If the value less than the effective digits for the current set value is input, it is rounded off when the screen is switched from the Welding condition setting screen to the Monitor screen to establish the set value. For example, when “10.55” A is input, the effective digits for 10 A or more is 0.1 A, the set value is automatically corrected to “10.5” A when the screen is switched from the Welding condition setting screen to the Monitor screen.

(g) Screen return switch
The Welding condition setting screen is displayed.

(h) Screen return switch
The Schedule setting screen (2/2) is displayed.

② Schedule setting screen (2/2)



(j) SCH
The currently selected condition No. is displayed.

(k) Weld2 welding pulse modulation ON/OFF
Select whether to apply the pulse modulation to the second welding current.
[Initial value: OFF]

(l) Weld2 welding frequency [Hz]
Set the modulation frequency of the second welding pulse.
The setting range is 1 ~ 3000 [Hz].
This setting is also applied to the pulse modulation frequency of up-slope and down-slope. [Initial value: 1 [Hz]]

(m) Weld2 welding duty ratio [%]
Set the duty ratio of welding pulse. The setting range is 10 ~ 90 [%].
This setting is also applied to the pulse modulation of up-slope and down-slope.
[Initial value: 50 [%]]

(n) Weld2 up/down pulse modulation ON/OFF
Select whether to apply pulse modulation to the welding current in the UPS (up-slope) and DWS (down-slope) section of the second welding.
[Initial value: OFF]

(o) Weld2 base current [A]
In the effective section of pulse modulation, modulation is performed by using the set value as the minimum current value. When the base current value is higher than the welding current value, modulation is not performed. The setting range is 5.00 ~ 9.99 [A] (in units of 0.01 [A]) and 10.0 ~ 50.0 [A] (in units of 0.1 [A]).
[Initial value: 5.00 [A]]

Remarks

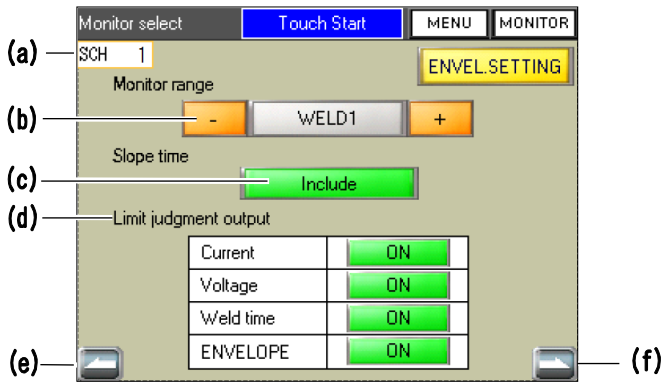
- If the value less than the effective digits for the current set value is input, it is rounded off when the screen is switched from the Welding condition setting screen to the Monitor screen to establish the set value. For example, when “10.55” A is input, the effective digits for 10 A or more is 0.1 A, the set value is automatically corrected to “10.5” A when the screen is switched from the Welding condition setting screen to the Monitor screen.

(p) Screen return switch
The Welding condition setting screen (1/2) is displayed.

(q) Screen feed switch
The Welding condition setting screen is displayed.

(11) Monitor Select Screen

This screen is used to set the data to be obtained at welding and the data to make an upper/lower limit judgment. This setting can be performed for each condition No.

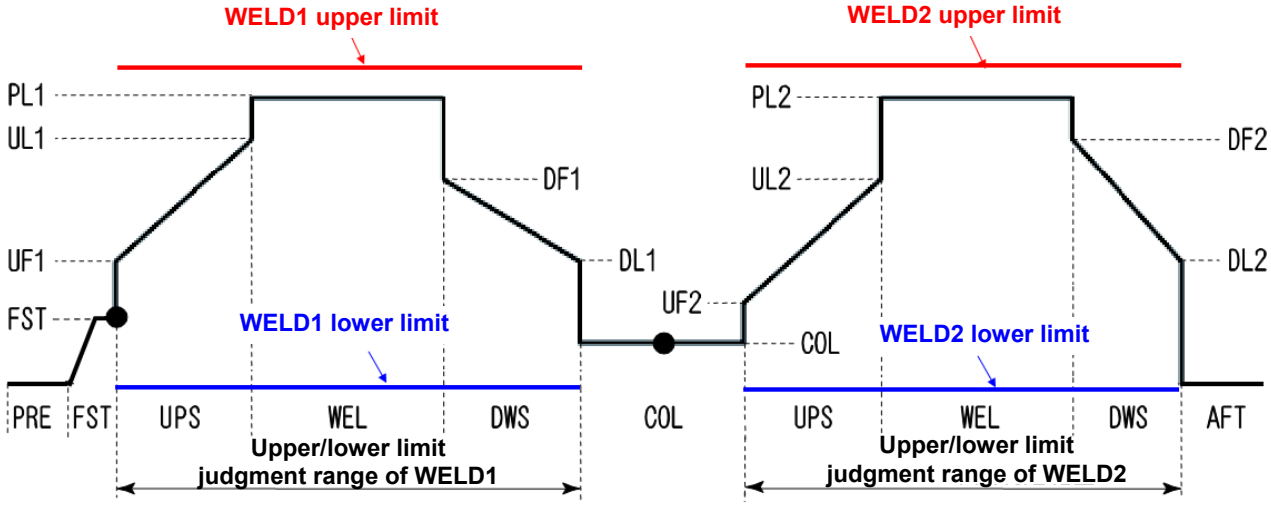


(a) SCH
The currently selected condition No. is displayed.

(b) Monitor range
Set a range to make an upper/lower limit judgment of monitor value.
One of “WELD1+WELD2”, “WELD1” and “WELD2” can be selected.
The threshold value of upper/lower limit judgment can be set individually for WELD1 and WELD2 on the Upper/lower limit set screen.

WELD1+WELD2	An upper/lower limit judgment is performed in both ranges of WELD1 and WELD2.
WELD1	An upper/lower limit judgment is performed only for the range of WELD1 but not performed for the range of WELD2.
WELD2	An upper/lower limit judgment is performed only for the range of WELD2 but not performed for the range of WELD1.

[Initial value: WELD1+WELD2]



(c) Slope time

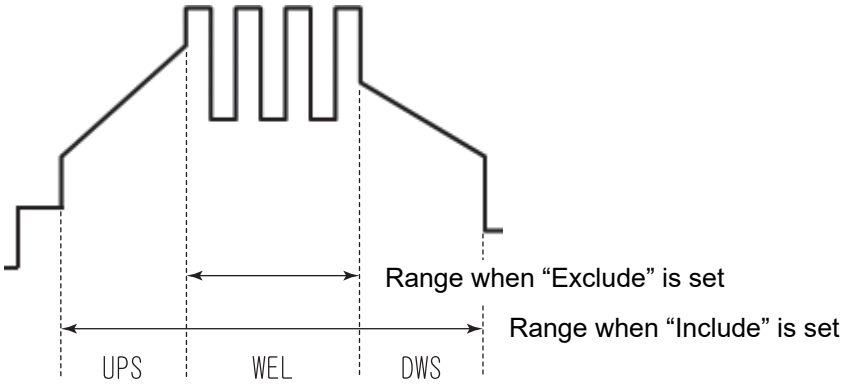
Set whether to include the up-slope (UPS) section and down-slope (DWS) section in the upper/lower limit judgment.

However, the upper/lower limit judgment of weld time is performed for the ranges of up-slope and down-slope.

If “Exclude” is set, only the pulse current time (WEL) is displayed in the “TIME” item of the Monitor screen. Regarding the welding waveform, a waveform including the slope section is displayed regardless of this setting.

Include	Both acquisition of monitor value and upper/lower limit judgment are performed in the range including the up-slope (UPS) and down-slope (DWS).
Exclude	Both acquisition of monitor value and upper/lower limit judgment are performed only in the pulse current section (WEL).

[Initial value: Exclude]



(d) Limit judgment output

Set the item to make an upper/lower limit judgment. If the upper/lower limit is exceeded in the item that is set to “ON”, it results in welding ng, causing an error.

It can be set whether to make a judgment for each item of current, voltage, time and envelope.

ON	An upper/lower limit judgment is performed.
OFF	An upper/lower limit judgment is not performed.

[Initial value: OFF]

(e) Screen return switch

The Upper/lower limit setting screen is displayed.

(f) Screen feed switch

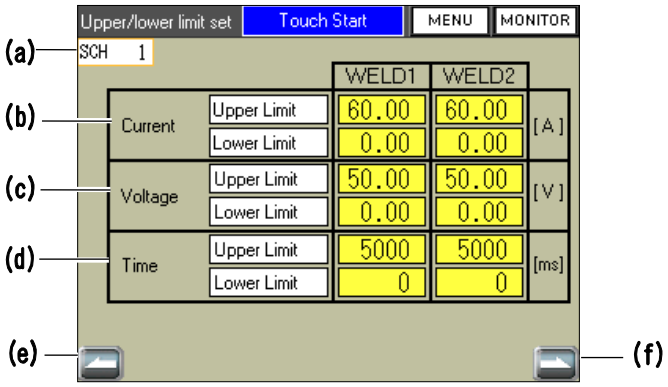
The Upper/lower limit setting screen is displayed.

(g) ENVEL SETTING switch

The Envelope setting screen to set the upper/lower limit values of envelope is displayed.

(12) Upper/Lower Limit Set Screen

This screen is used to set a threshold value for welding OK/NG judgment from the monitor value set to PEAK or RMS in 4. (6) (d) and (e). This setting can be performed for each condition No. An OK/NG judgment by waveform is performed on the Envelope setting screen. (Refer to "4. (4) Envelope Screen.")



(a) SCH
The currently selected condition No. is displayed.

(b) Current
Regarding the upper limit value and lower limit value to be used for upper/lower limit judgment of current, each absolute value of the first welding (WELD1) and second welding (WELD2) can be set.
The input range is 0.00 ~ 60.00 [A]. [Initial value: (Upper Limit) 60.00, (Lower Limit) 0.00 [A]]

(c) Voltage
Regarding the upper limit value and lower limit value to be used for upper/lower limit judgment of voltage, each absolute value of the first welding (WELD1) and second welding (WELD2) can be set.
The input range is 0.00 ~ 50.00 [V]. [Initial value: (Upper Limit) 50.00, (Lower Limit) 0.00 [V]]

(d) Time
Regarding the upper limit value and lower limit value to be used for upper/lower limit judgment of time, each absolute value of the first welding (WELD1) and second welding (WELD2) can be set.
The input range is 0 ~ 5000 [ms]. [Initial value: (Upper Limit) 5000, (Lower Limit) 0 [ms]]

(e) Screen return switch
The Monitor select screen is displayed.

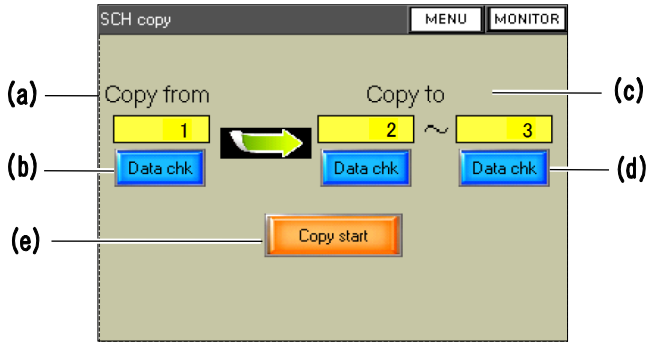
(f) Screen feed switch
The Monitor select screen is displayed.

(13) SCH Copy Screen

This screen is used to copy the condition setting data to an optional condition No. Copying can be performed for multiple condition numbers.

The SCH copy screen is classified into 4 types, namely, ① SCH copy screen, ② Copy data check screen, ③ Copy start check screen, and ④ Copy in-process screen.

① SCH copy screen



(a) Copy from
Enter the condition No. of the copy source data. The setting range is 1 ~ 127.

(b) Data chk (copy source No.)
The screen moves to ② Copy data check screen by pressing this switch and the input setting data of “copy source No.” can be checked.

(c) Copy to
Enter the condition No. to copy the data of the condition No. input in “Copy from (Copy source No.).” Specify the copying range in the left/right input field.

Example 1) To perform copying to condition Nos. 100 ~ 120, enter “100” and “120” in the two input fields. (It does not matter even if either number of the left/right input field is larger than the other.)

Example 2) To copy data to condition No. 99, enter “99” into the two input fields.

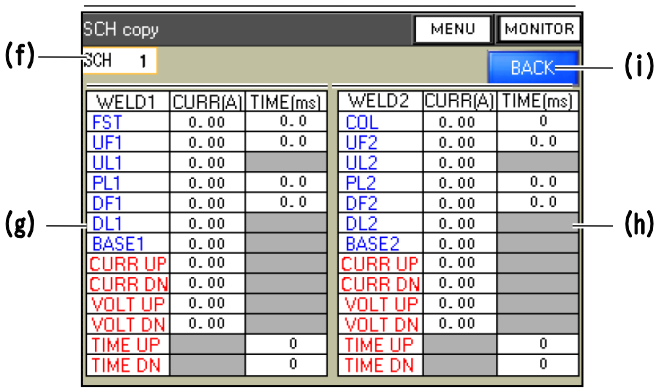
(d) Data chk (copy destination No.)
The setting data currently registered in the input “copy destination No.” can be checked by pressing this switch. Go to ② Copy data check screen.

(e) Copy start
The Copy start check screen of ③ is displayed by pressing this switch.
After making sure that the input “Copy from (Copy source No.)” and “Copy to (Copy destination No.)” are correct, press this switch.

② Copy data check screen

This screen is used to check the copy source data and copy destination data.

It is possible to check the current, time and upper/lower limit value of an optional condition No.



WELD1	CURR(A)	TIME(ms)
FST	0.00	0.0
UF1	0.00	0.0
UL1	0.00	
PL1	0.00	0.0
DF1	0.00	0.0
DL1	0.00	
BASE1	0.00	
CURR UP	0.00	
CURR DN	0.00	
VOLT UP	0.00	
VOLT DN	0.00	
TIME UP		0
TIME DN		0

WELD2	CURR(A)	TIME(ms)
COL	0.00	0
UF2	0.00	0.0
UL2	0.00	
PL2	0.00	0.0
DF2	0.00	0.0
DL2	0.00	
BASE2	0.00	
CURR UP	0.00	
CURR DN	0.00	
VOLT UP	0.00	
VOLT DN	0.00	
TIME UP		0
TIME DN		0

(f) SCH

The condition No. of the displayed data is displayed.

(g) WELD1 data display area

The WELD1 (first welding) data is displayed.

(h) WELD2 data display area

The WELD2 (second welding) data is displayed.

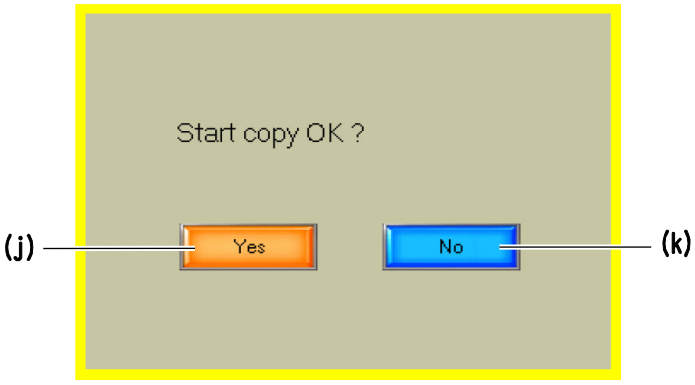
Items of WELD1/WELD2 data display area

FST	Initial current/initial current time
UF1, UF2	Up-slope initial current/up-slope time
UL1, UL2	Up-slope final current
PL1, PL2	Pulse current/main welding time
DF1, DF2	Down-slope initial current/down-slope time
DL1, DL2	Down-slope final current
BASE1, BASE2	Modulation base current
COL	Cooling in-time current
CURR UP	Current upper limit value
CURR DN	Current lower limit value
VOLT UP	Voltage upper limit value
VOLT DN	Voltage lower limit value
TIME UP	Time upper limit value
TIME DN	Time lower limit value

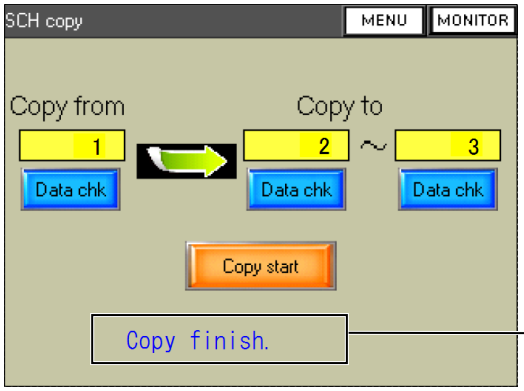
(i) BACK

① The SCH copy screen reappears.

③ Copy start check screen
This is the final check screen to start a condition copying.

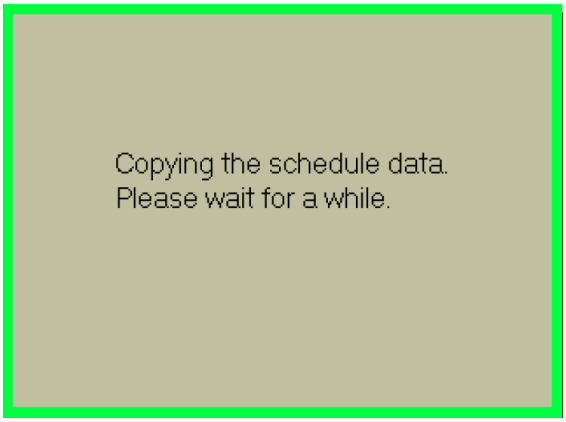


(j) Yes
The condition copy is started. During the condition copy, the Copy in-process screen of ④ is displayed. After the copy is normally terminated, the SCH copy screen of ① appears and the copy completion notice “Copy finish.” is displayed.



(k) No
No condition copy is performed and the SCH copy screen of ① reappears.

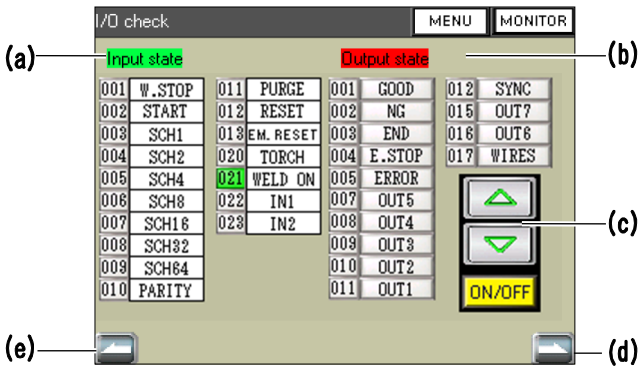
④ Copy in-process screen
This screen is displayed continuously while a condition copy is executed.
After the end of the copy, the SCH copy screen of ① appears.



(14) External I/O Check Screen

This screen is used to check the external input/output signal status.
In the case of an ON signal, the terminal No. portion lights. When the signal is OFF, the display lamp goes out. The input/output status screen is classified into the “I/O check” screen and the “I/O check (option)” screen.

① I/O check screen



(a) Input state
The input signal status is displayed.

Terminal 1	W.STOP
Terminal 2	START
Terminal 3	SCH1
Terminal 4	SCH2
Terminal 5	SCH4
Terminal 6	SCH8
Terminal 7	SCH16
Terminal 8	SCH32

Terminal 9	SCH64
Terminal 10	PARITY
Terminal 11	PURGE
Terminal 12	RESET
Terminal 13	EM.RESET
Terminal 20	TORCH
Terminal 21	WELD ON
Terminal 22	IN1
Terminal 23	IN2

(b) Output state
The output terminal status is displayed.

Terminal 1	GOOD
Terminal 2	NG
Terminal 3	END
Terminal 4	E.STOP
Terminal 5	ERROR
Terminal 7	OUT5
Terminal 8	OUT4

Terminal 9	OUT3
Terminal 10	OUT2
Terminal 11	OUT1
Terminal 12	SYNC
Terminal 15	OUT7
Terminal 16	OUT6
Terminal 17	WIRES

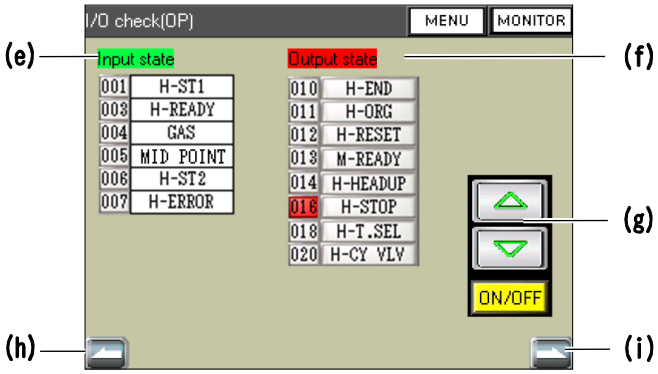
(c) Output signal operating switch
Used to turn on/off output signals.

Select a signal for selecting ON/OFF by "△" and "▽" to select a "ON/OFF" status.

(d) Screen feed switch
The I/O check (OP) screen is displayed.

(e) Screen return switch
The I/O check (OP) screen reappears.

② I/O check (OP) screen
This screen is used to operate the input/output signals to be used when the optional servo motor type welding head or torch selector is used.



(e) Option input terminal state
The input signal status is displayed.

Terminal 1	H-ST1
Terminal 3	H-READY
Terminal 4	GAS
Terminal 5	MID POINT
Terminal 6	H-ST2
Terminal 7	H-ERROR

(f) Option output terminal state
The output signal status is displayed.

Terminal 10	H-END
Terminal 11	H-ORG
Terminal 12	H-RESET
Terminal 13	M-READY
Terminal 14	H-HEADUP

Terminal 16	H-STOP
Terminal 18	H-T.SEL
Terminal 20	H-CY VLV
Terminal 22	H-MODE

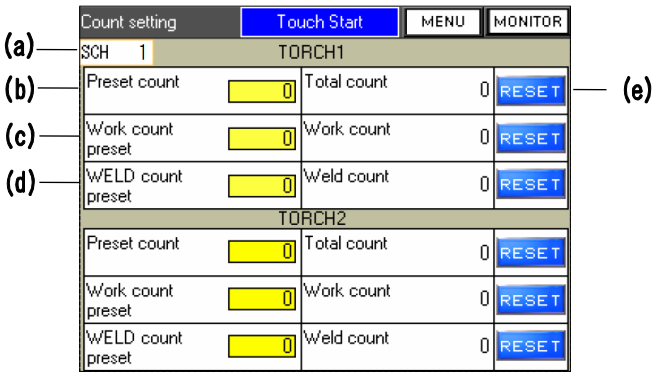
(g) Output signal operating switch
Used to turn on/off output signals. For details, refer to (c) Output signal operating switch of the I/O check screen of ①.

(h) Screen return switch
The External I/O check screen reappears.

(i) Screen feed switch
The External I/O check screen is displayed.

(15) Count Setting Screen

This screen is used to control and check the number of welding times and the amount of production. Each count value of TORCH1 and TORCH2 can be set and checked for each number.



(a) SCH
The condition No. being set is displayed.

(b) Preset count/Total count
Enabled when a value is input in “Preset.” The value increased +1 each at execution of welding is displayed in “Total count.”
(The setting range is 0 ~ 999999 [Initial value: 0]. Disabled when “0” is set.)
When enabled, this count is performed regardless of the welding result.
When “Preset count” < “Total count”, “E19 Torch1 - end of counter reached” / “E20 Torch2 - end of counter reached” occurs. When an error occurs, a count error will occur again at the following welding until the count value is reset.

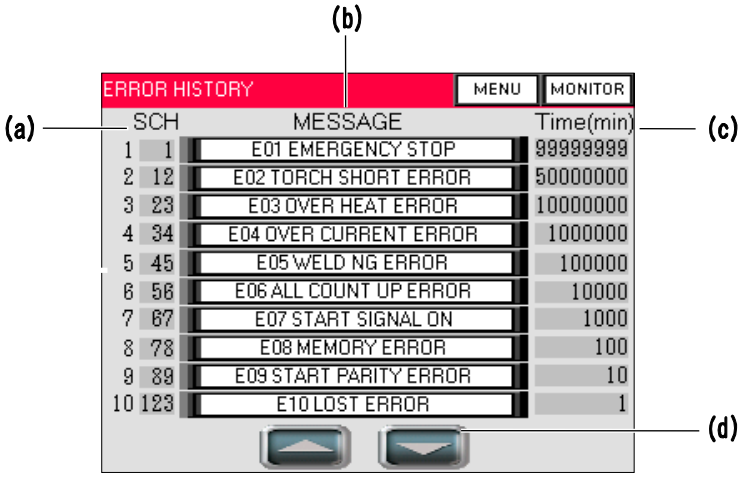
(c) Work count preset/Work count
Enabled when a value is input in “Work count preset.” When “Weld count” value is equal to “WELD count preset” value, the count is increased +1 and is displayed as “Work count.”
(The setting range is 0 ~ 60000 [Initial value: 0]. Disabled when “0” is set.)
* When the “Weld count” is disabled, this count is not performed.
When “Work count preset” < “Work count”, “E19 Torch1 - end of counter reached” / “E20 Torch2 - end of counter reached” will occur. When an error occurs, a count error will occur again at the following welding until the count value is reset.

(d) WELD count preset/Weld count
Enabled when a value is input in “WELD count preset.” The value increased +1 each at execution of welding is displayed in “Weld count.”
(The setting range is 0 ~ 255 [Initial value: 0]. Disabled when “0” is set.)
When the “Weld count” value reaches the “WELD count preset” value, the “Work count” value is increased +1 and the “Weld count” value is reset.

(e) RESET
Used to reset each count value of “Total count”, “Work count” and “Weld count.”

(16) Error History Screen

This screen is used to check the errors that were caused in the past. The number of errors that can be stored is 120. The older errors exceeding this number will be deleted in order for updating.



(a) SCH
The condition No. at occurrence of an error is displayed. If no error is found, “0” is displayed.

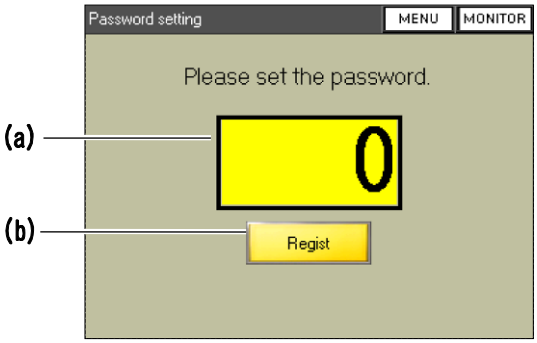
(b) MESSAGE
The error code and error message of each error that occurred are displayed.

(c) Time (min)
The time (in minute) of error occurrence after the welding power supply was turned on is displayed.

(d) Page feed switch
The error history page can be changed. This change is made for 10 errors each.

(17) Password Setting Screen

In this welding power supply, it can be protected to go to a specific setting screen by entering a password. The following screen is used to set a password and select the validity/invalidity of the password.

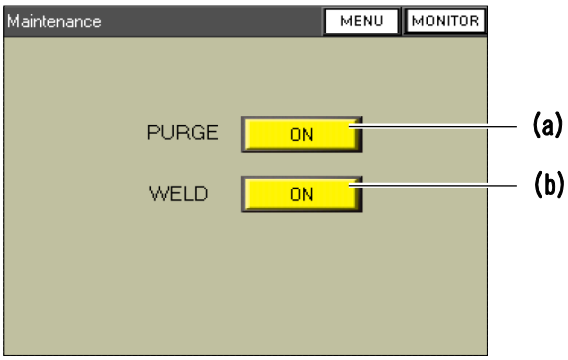


(a) Password input area (4-digit number max.)
The ten-key pad is displayed by touching this area. Enter a password to be registered by using a 4-digit number. Enter a numeric value except “0.”
[Initial value: 0 (password invalidated)]

(b) Regist
The input password can be registered by pressing this switch after entering the password. If the operator goes to a screen without pressing this switch, the entered password will be invalided.
After completion of registration, “Password was registered.” Is displayed on the screen. The password is required to go to a screen with a mark of .
When the password input is “0”, “Password was canceled.” is displayed.
If the password input is omitted to go to another screen after registration of the password, it is possible to go to every screen without the password hereafter until the power supply is turned on again. To validate the password again, press “Regist” on this screen.

(18) Maintenance Screen

Display this screen to perform maintenance of the welding power supply. To make a gas flow rate check, the gas can be turned on and off by manual operation. To check the sequence operation without causing the welding current to flow, it can be set that the welding current output is turned on/off.



(a) PURGE ON/OFF
The gas can be turned on and off by manual operation.
In 15 seconds after pressing this switch, the gas is turned off automatically.

(b) WELD ON/OFF
Used to turn on/off the welding current output.
The initial status is an ON status (welding current output status).
The ON/OFF status is displayed on the Monitor screen.
(Refer to “4. (3) Monitor Screen.”)
[Initial value: ON]

(19) Set Values of Each Screen at Delivery from the Factory

The following table shows initial set values of each screen at delivery from the factory. When the memory was initialized on the Switch select screen, these initial values are provided.

Screen	Parameter	Initial value
Basic setting screen	Device No.	1
	Language selection	English
	Brightness adjustment	08
	EX comm type	OFF
	Communication speed	9600
	Internal resistance	OFF
Switch select screen	NG judgment error	OFF
	Start parity error ON/OFF	OFF
	SCH & Torch select by I/O	OFF
	Measurement current select	RMS
	Measurement voltage select	RMS
	Enable START switch	ON
	Internal Gas Flow	ON
	High speed SCH change (No Wave)	OFF
	Fine Weld Mode	OFF
	Torch drive type	MOTOR
	GOOD/NG signal output time	200 [ms]
	END signal output time	200 [ms]
	START signal input delay time	20 [ms]
	SCH changeover delay time	20 [ms]
	TORCH changeover delay time	20 [ms]
	H-END output time	200 [ms]
	H-RESET output time	200 [ms]
	H-HEAD UP output time	200 [ms]
	ALL-WELD count	0
External I/O setting screen	User input terminal 1	00: Not selected
	User input terminal 2	00: Not selected
	User output terminal 1	06: LOST
	User output terminal 2	05: READY
	User output terminal 3	03: END
	User output terminal 4	07: WEL1 LOWER CURRENT
	User output terminal 5	08: WEL1 UPPER CURRENT
	User output terminal 6	17: WEL2 LOWER CURRENT
	User output terminal 7	18: WEL2 UPPER CURRENT

Screen	Parameter	Initial value
Welding condition setting screen (all of conditions Nos. 1 ~ 127)	SCH No. (condition No.)	1
	TORCH	1
	SCH TYPE CHG (condition setting mode)	FULL
	FST (current value)	5.00 [A]
	UF1 (current value)	5.00 [A]
	UL1 (current value)	5.00 [A]
	PL1 (current value)	5.00 [A]
	DF1 (current value)	5.00 [A]
	DL1 (current value)	5.00 [A]
	COL (current value)	5.00 [A]
	UF2 (current value)	5.00 [A]
	UL2 (current value)	5.00 [A]
	PL2 (current value)	5.00 [A]
	DF2 (current value)	5.00 [A]
	DL2 (current value)	5.00 [A]
	PRE (time)	0 [ms]
	FST (time)	0.0 [ms]
	UPS1 (time)	0.0 [ms]
	WEL1 (time)	0.0 [ms]
	DWS1 (time)	0.0 [ms]
	COL (time)	0 [ms]
	UPS2 (time)	0.0 [ms]
	WEL2 (time)	0.0 [ms]
	DWS2 (time)	0.0 [ms]
	AFT (time)	0 [ms]
Schedule setting screen (all of condition Nos. 1 ~ 127)	Weld1 welding pulse modulation ON/OFF	OFF
	Weld1 welding frequency [Hz]	1 [Hz]
	Weld1 welding duty ratio [%]	50 [%]
	Weld1 up/down pulse modulation ON/OFF	OFF
	Weld1 base current [A]	5.00 [A]
	Weld2 welding pulse modulation ON/OFF	OFF
	Weld2 welding frequency [Hz]	1 [Hz]
	Weld2 welding duty ratio [%]	50 [%]
	Weld2 up/down pulse modulation ON/OFF	OFF
	Weld2 base current [A]	5.00 [A]

Screen	Parameter			Initial value
Monitor select screen (all of condition Nos. 1 ~ 127)	Monitor value measuring range			WELD1+WELD2
	Slope time			Exclude
	Upper/lower limit judgment output		Current value	OFF
			Voltage value	OFF
			Weld time	OFF
			Envelope	OFF
Upper/lower limit set screen (all of condition Nos. 1 ~ 127)	Current value	Upper limit value	WELD1	60.00 [A]
			WELD2	60.00 [A]
		Lower limit value	WELD1	0.00 [A]
			WELD2	0.00 [A]
	Voltage value	Upper limit value	WELD1	50.00 [V]
			WELD2	50.00 [V]
		Lower limit value	WELD1	0.00 [V]
			WELD2	0.00 [V]
	Time	Upper limit value	WELD1	5000 [ms]
			WELD2	5000 [ms]
		Lower limit value	WELD1	0 [ms]
			WELD2	0 [ms]
Password setting screen	Password			0 (No password setting)
Count setting screen	TORCH1	Preset count		0
		Work count preset		0
		WELD count preset		0
		Total count		0
		Work count		0
		Weld count		0
	TORCH2	Preset count		0
		Work count preset		0
		WELD count preset		0
		Total count		0
		Work count		0
		Weld count		0

5. Welding

⚠ WARNING

- Do not measure the voltage by connecting a general voltmeter or oscilloscope to the output terminal or between torch and base material. A high voltage of the start circuit is applied to the output terminal. The measuring person may receive an electric shock or the measuring apparatus may be damaged.

IMPORTANT

- Use the welding power supply without exceeding the maximum duty cycle. (Refer to “1. (3)-3 Duty cycle graph.”) Using the welding power supply exceeding the maximum duty cycle will result in “E03 Overheat error.”

(1) Pre-Start Inspection

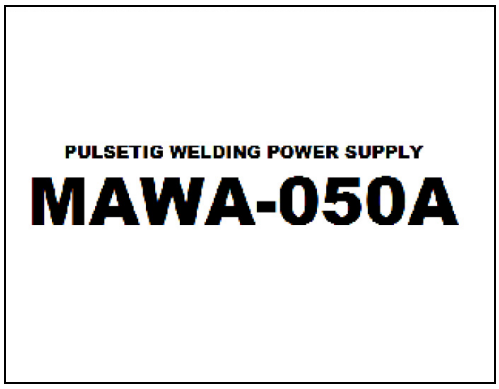
In the following, the pre-start inspection will be described.

Execute the following inspection items before starting welding daily. For the details of the inspection items, refer to “9. (1) Pre-Start Inspection.”

- Cable inspection
- Torch inspection
- Argon gas inspection

(2) Turning on the Power Supply

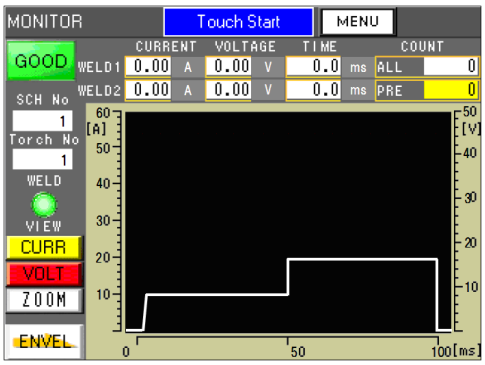
Turning on the power supply will be described below.



Start-up screen

1. Turn on the source power supply on the factory side.

2. Turn ON (to the “I” side) the “Main power switch” on the front panel.
   The start-up screen is displayed and then the Monitor screen is displayed on the touch panel display.



Monitor screen

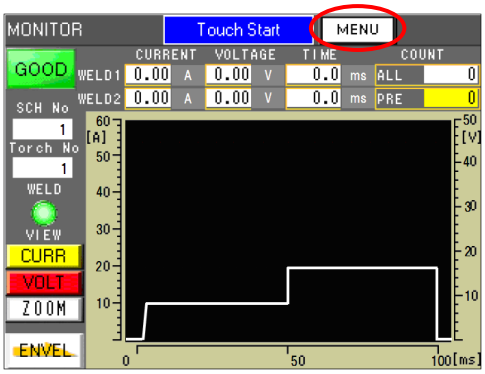
On the Monitor screen, the welding result, welding monitor waveform, welding condition No., etc. are displayed. For details, refer to “4. (3) Monitor Screen.”

(3) Basic Function Setting

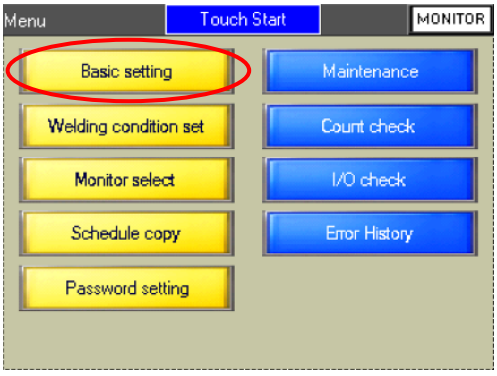
The basic function setting of the welding power supply will be described below.
Set the following basic setting items of the welding power supply on the Basic setting screen.

- Device No.
- Communication type and communication speed
- Display language selection
- Screen brightness

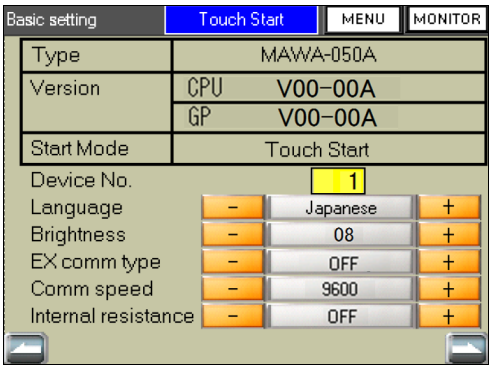
① Displaying the Basic setting screen



1. Press MENU in the upper right part of the screen.
   The Menu screen is displayed.



2. Press “Basic setting” on the Menu screen.
   The Basic setting screen is displayed.



For the details of the Basic setting screen, refer to “4. (5) Basic Setting Screen.”

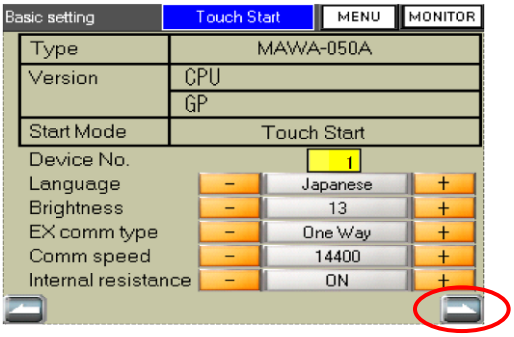
(3) -1. Common detail item setting

The detail setting of the welding power supply functions will be described below.
Set the detail items that are common to each welding condition on the Switch select screen.

Remarks

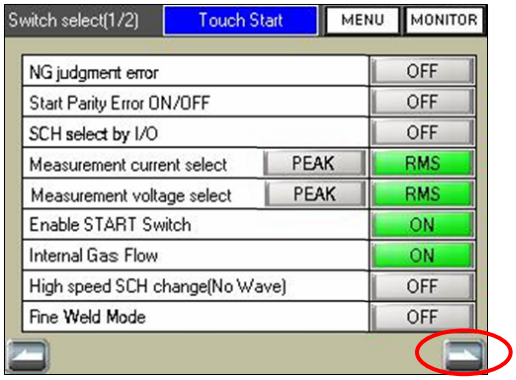
- The Switch select screen consists of 2 pages.

① Displaying the Switch select screen



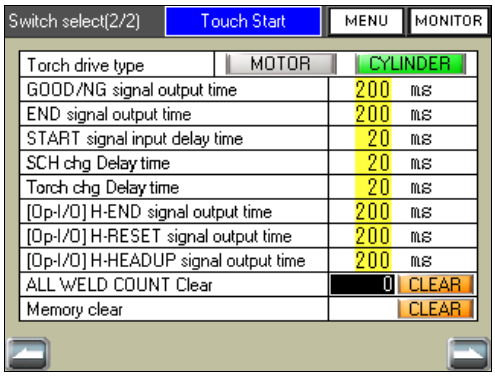
1. Press  on the Basic setting screen.

   The Switch select screen (1/2) is displayed.



For the details of the Switch select screen (1/2), refer to “4. (6) ① Switch select screen (1/2).”

Press  on the Switch select screen (1/2), and the Switch select screen (2/2) will be displayed.



For the details of the Switch select screen (2/2), refer to “4. (6) ② Switch select screen (2/2).”

(4) Welding Condition Setting

(4) -1. Registering the welding conditions

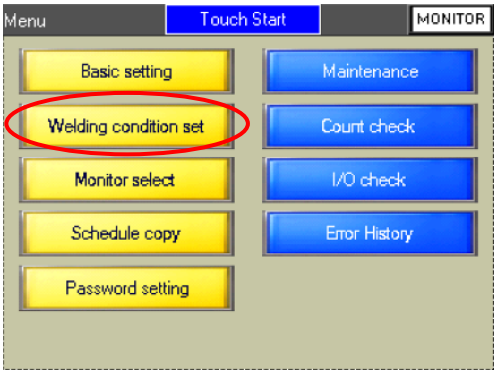
Registering the welding conditions will be described below.

In **MAWA-050A**, up to 127 types of the welding condition can be registered. Register the welding conditions on the Welding conditions setting screen.

Remarks

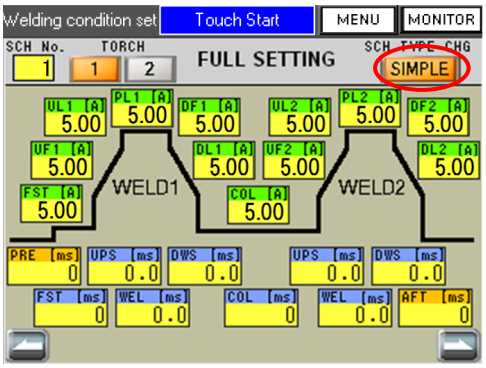
- The welding condition setting screen consists of 2 types.
  - FULL SETTING screen: Every setting item can be set.
  - SIMPLE SETTING screen: A small number of setting items can be set easily.

① Displaying the Welding condition setting screen



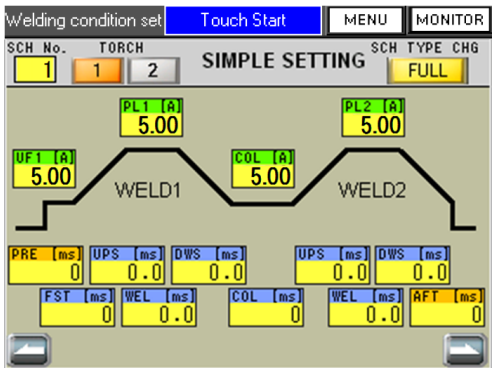
1. Press MENU in the upper right part of the screen.
   The Menu screen is displayed.

2. On the Menu screen, press “Welding condition set” on the Menu screen.
   The FULL SETTING screen of the Welding condition setting screen is displayed.



For the details of the FULL SETTING screen, refer to “4. (9) ① FULL SETTING screen.”

Depress SIMPLE for about a sencond on the FULL SETTING screen, and the SIMPLE SETTING screen will be displayed.



For the details of the SIMPLE SETTING screen, refer to “4. (9) ② SIMPLE SETTING screen.”

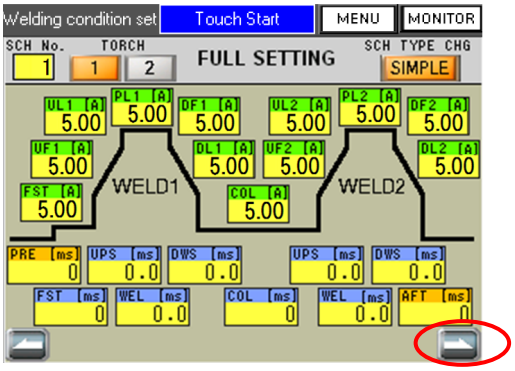
(4) -2. Welding current pulse modulation setting

The welding current pulse modulation setting will be described below.
Perform this welding current pulse modulation setting on the Schedule setting screen.

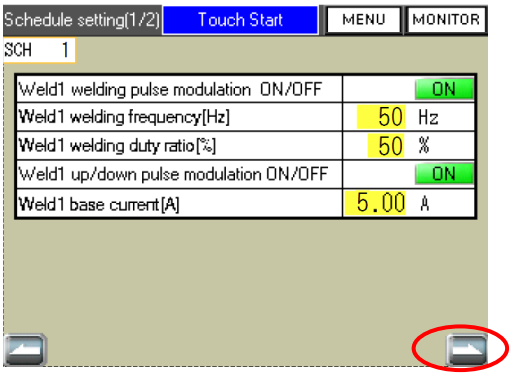
Remarks

- The welding current is determined from the set data on the Welding condition setting screen and the set data on the Schedule setting screen.
- The Schedule setting screen consists of 2 pages.
  - Schedule setting screen (1/2): The first welding pulse modulation can be set.
  - Schedule setting screen (2/2): The second welding pulse modulation can be set.

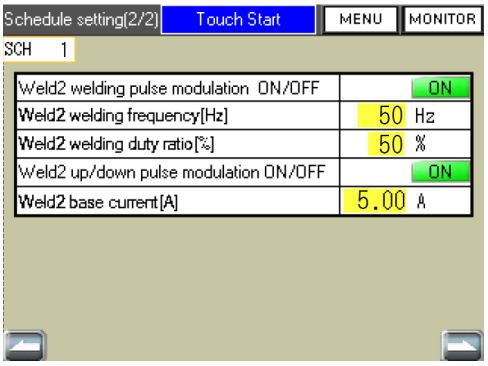
① Displaying the Schedule setting screen



1. Press on the Welding condition setting screen.
   The Schedule setting screen (1/2) is displayed.



For the details of the Schedule setting screen (1/2), refer to “4. (10) ① Schedule setting screen (1/2).”
The Schedule setting screen (2/2) is displayed by pressing on the Schedule setting screen (1/2).



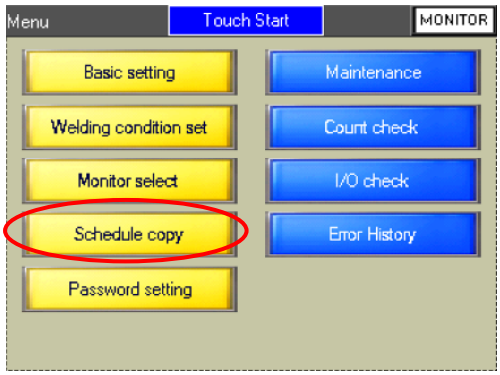
For the details of the Schedule setting screen (2/2), refer to “4. (10) ② Schedule setting screen (2/2).”

(4) -3. Welding condition copy

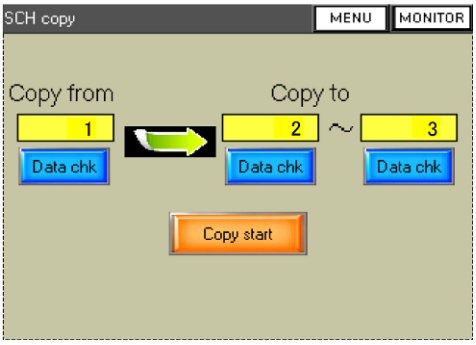
Copying the welding conditions will be described below.

The contents of the welding condition setting can be copied into the welding conditions of different condition Nos. Copy the welding conditions on the SCH copy screen.

① Displaying the SCH copy screen



1. Press MENU in the upper right of the screen. The Menu screen is displayed.
2. Press “Schedule copy” on the Menu screen. The SCH copy screen is displayed.



For the details of copying the welding conditions, refer to “4. (13) SCH Copy Screen.”

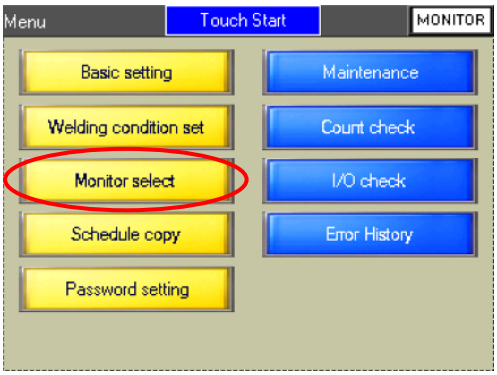
(5) Monitor Function Setting

(5) -1. Monitor item setting

The monitor item setting is described below.

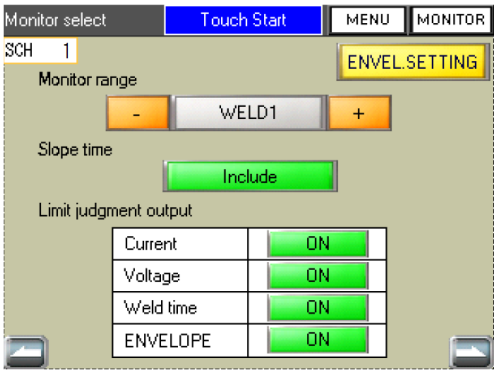
MAWA-050A judges whether the welding is OK or NG from the monitor value and the set upper/lower limit value. Set the upper/lower limit judging range and target items for the OK/NG judgment on the Monitor select screen.

① Displaying the Monitor select screen



1. Press MENU in the upper right part of the screen. The Menu screen is displayed.

2. Press “Monitor select” on the Menu screen. The Monitor select screen is displayed.



For the details of the Monitor select screen, refer to “4. (11) Monitor Select Screen.”

(5) -2. Upper/lower limit value setting

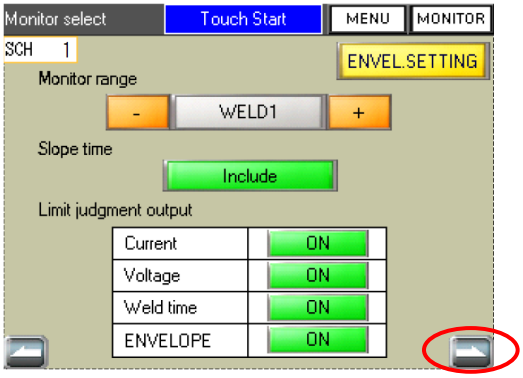
The upper/lower limit value setting will be described below.

Set the upper/lower limit value to be used for a welding OK/NG judgment on the Upper/lower limit set screen.

Remarks

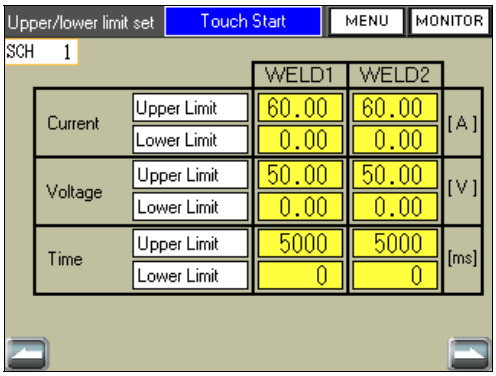
- For the upper/lower limit value setting to be used for OK/NG judgment using the envelope waveform, refer to “4. (4) ② Envelope setting screen.”

① Displaying the Upper/lower limit set screen



1. Press  on the Monitor select screen.

   The Upper/lower limit set screen is displayed.



For the details of the Upper/lower limit set screen, refer to “4. (12) Upper/Lower Limit Set Screen.”

(6) Touch Start

(6) -1. Overview

The touch start function of this welding power supply is used to perform arc welding by causing the initial current to flow in the status where the electrode is in contact with a workpiece and keeping the distance from the arc discharge gap. This is provided with such advantages as shown below.

- It is not necessary to apply a high voltage to cause a dielectric breakdown of the air.
- An arc discharge is started by touch. This does not cause LOST easily.
- An arc discharge is started by touch. The welding points can be easily specified.
- No high voltage is generated. This can reduce noise effects.

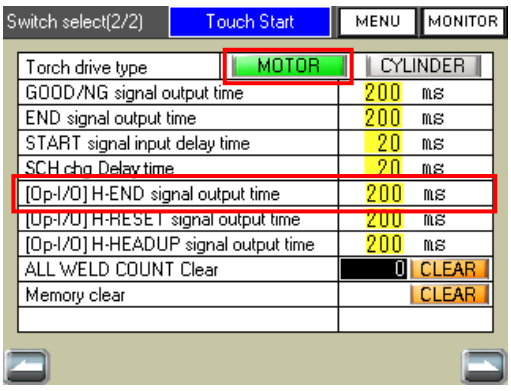
(6) -2. Operations

To drive the torch by the touch start head (**MH-TL01A**), the touch start has three operation modes; “normal mode”, “auto mode” and “fine weld mode.”

Features of each mode are as follows.

	Initial current time setting	Initial current monitor time	Main welding start timing	Advantage	Disadvantage
Normal mode	FST [ms] > 0	Set time	At the end of the initial current time after the head reaches the main welding position	The welding setting waveform and the monitor waveform are displayed in the same time series.	The initial current time setting matched to the head rising speed is necessary.
Auto mode	FST [ms] = 0	Fixed to 500 ms *1	Immediately after the head reaches the main welding position *2	The initial current time setting is unnecessary.	The welding setting waveform and the monitor waveform cannot be displayed in the same time series.
Fine weld mode	FST [ms] = 0	Fixed to 500 ms *1	When the head moves up from the initial current position and the electrode touch sensor is turned OFF. *2	The weld time during the head moves up is shortened.	The welding setting waveform and the monitor waveform cannot be displayed in the same time series.

To drive the torch by the touch start head (**MH-TL01A**), set the Torch drive type to MOTOR and the pulse output time of the END output to 200 ms.

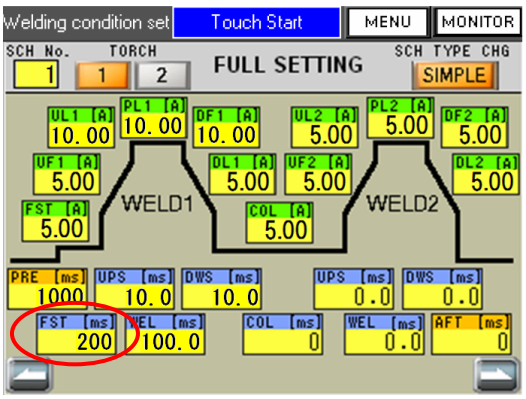


*1: For the initial current monitor time, refer to “4. (3) (m) Waveform display area.”

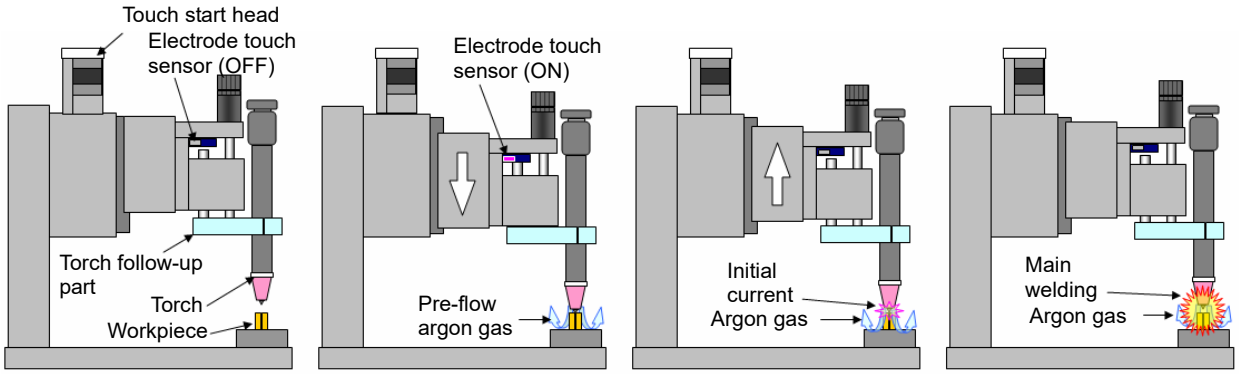
*2: For the main welding current start timing, refer to timing charts in 6. (1), 6. (2) and 6. (3).

(6) -2-1. Normal mode operation

The normal mode is applied when the initial current time FST (ms) on the Welding condition setting screen is set to 1 to 999 (ms).



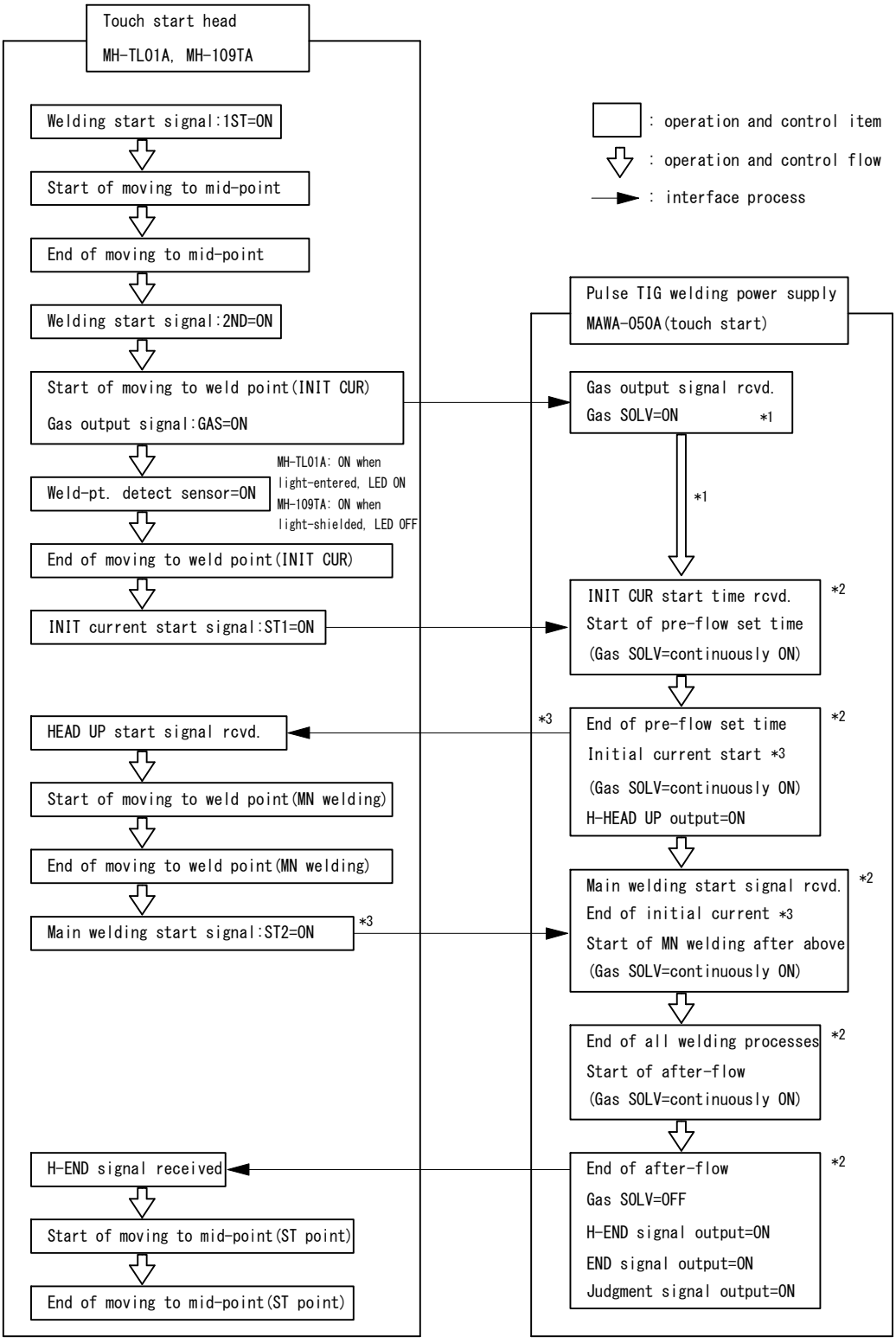
Example of the normal mode setting on the Welding condition setting screen



Head is a standby state at the start position.	Start signal ON: Head moves to workpiece surface from the standby position Pre-flow: Argon gas output ON After electrode and workpiece make contact, torch follow-up part moves up. After that, electrode touch sensor is turned ON. After that, Head stops.	After Head stops, it moves up to the main welding position. While Head moves up, the initial current is applied. Head stops at the main welding position.	After the end of the initial current time (FST), the main welding is done for the set time. After-flow: Argon gas output ON Start signal OFF: Head returns to the standby position.

Operation summary of the normal mode

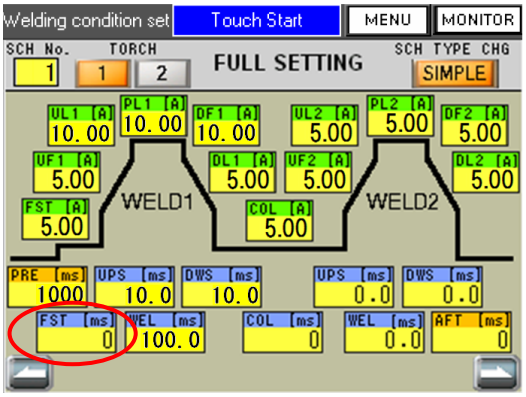
Operation and control flow of the normal mode



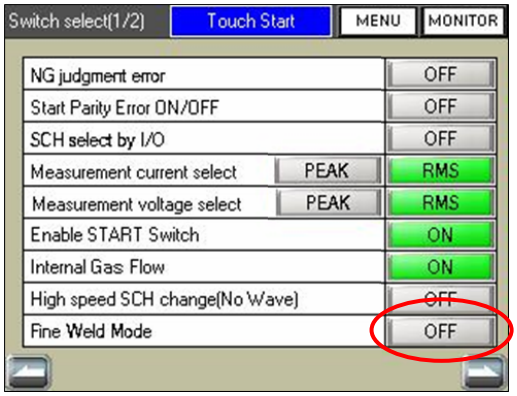
*1: Gas flow time excluding the welding condition
*2: Operation and control contents of welding condition settings
*3: Set the initial current time (FST) longer than the time from when the initial current starts to when head main welding start signal:ST2 is turned ON.
[Reference setting] When the distance between head weld point (initial current) and weld point (main welding) is 1.0 mm and the moving speed setting is 1 (= 40 mm/s), the initial current time (FST) is set to 180 ms. If the time shorter than this is set, the ST2 time error may occur.
[Recommended setting] Setting the initial current time (FST) to 0 ms selects the auto mode, and the main welding starts simultaneously with the completion of moving to the weld point (main welding).

(6) -2-2. Auto mode operation

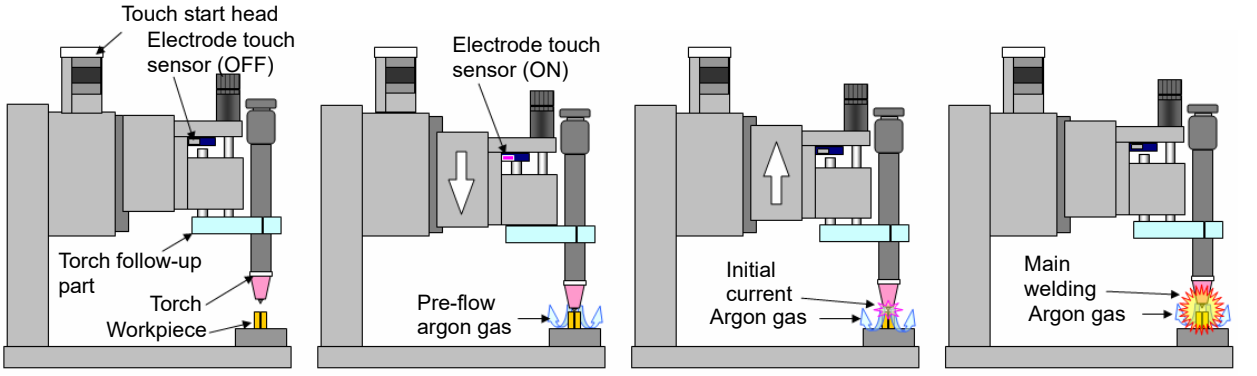
The auto mode is applied when the initial current time FST (ms) on the Welding condition setting screen is set to 0 (ms) and the Fine Weld Mode on the Switch select screen (1/2) is set to “OFF.”



Example of the auto mode setting on the Welding condition setting screen



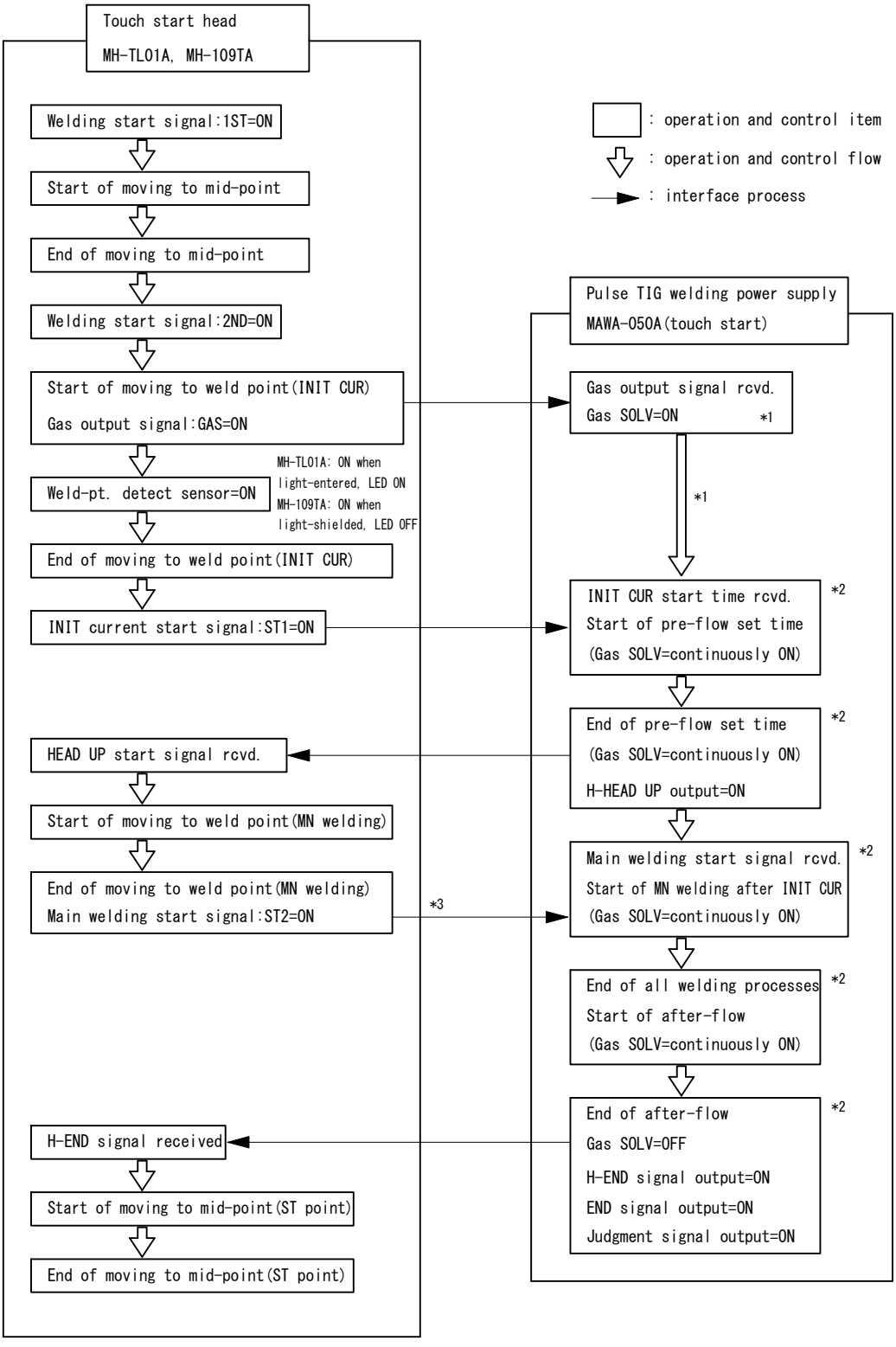
Example of the normal mode setting on the Switch select screen



Head is a standby state at the start position.	Start signal ON: Head moves to workpiece surface from the standby position Pre-flow: Argon gas output ON After electrode and workpiece make contact, torch follow-up part moves up. After that, electrode touch sensor is turned ON. After that, Head stops.	After Head stops, it moves up to the main welding position. While Head moves up, the initial current is applied. Head stops at the main welding position.	After the end of the initial current time (FST), the main welding is done for the set time. After-flow: Argon gas output ON Start signal OFF: Head returns to the standby position.

Operation summary of the auto mode

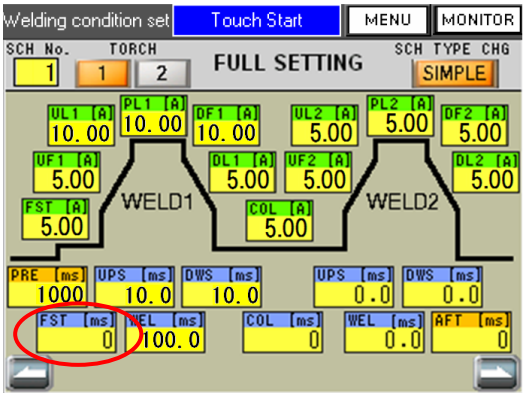
Operation and control flow of the auto mode



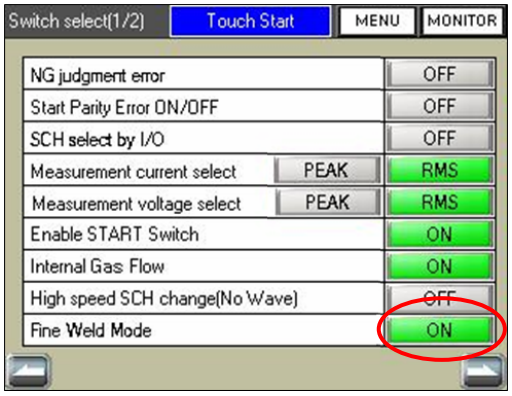
*1: Gas flow time excluding the welding condition
*2: Operation and control contents of welding condition settings
*3: When the initial current time (FST) is set to 0 ms and the fine weld mode is set to OFF, the main welding starts simultaneously with the completion of moving to the weld point (main welding).

(6) -2-3. Fine weld operation

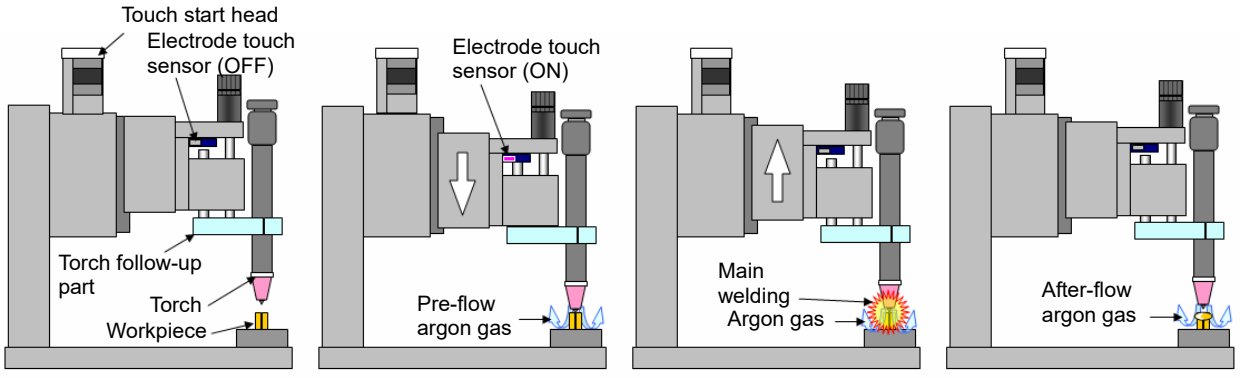
The fine weld mode is applied when the initial current time FST (ms) on the Welding condition setting screen is set to 0 (ms) and the Fine Weld Mode on the Switch select screen (1/2) is set to “ON.”



Example of the fine weld mode setting on the Welding condition setting screen



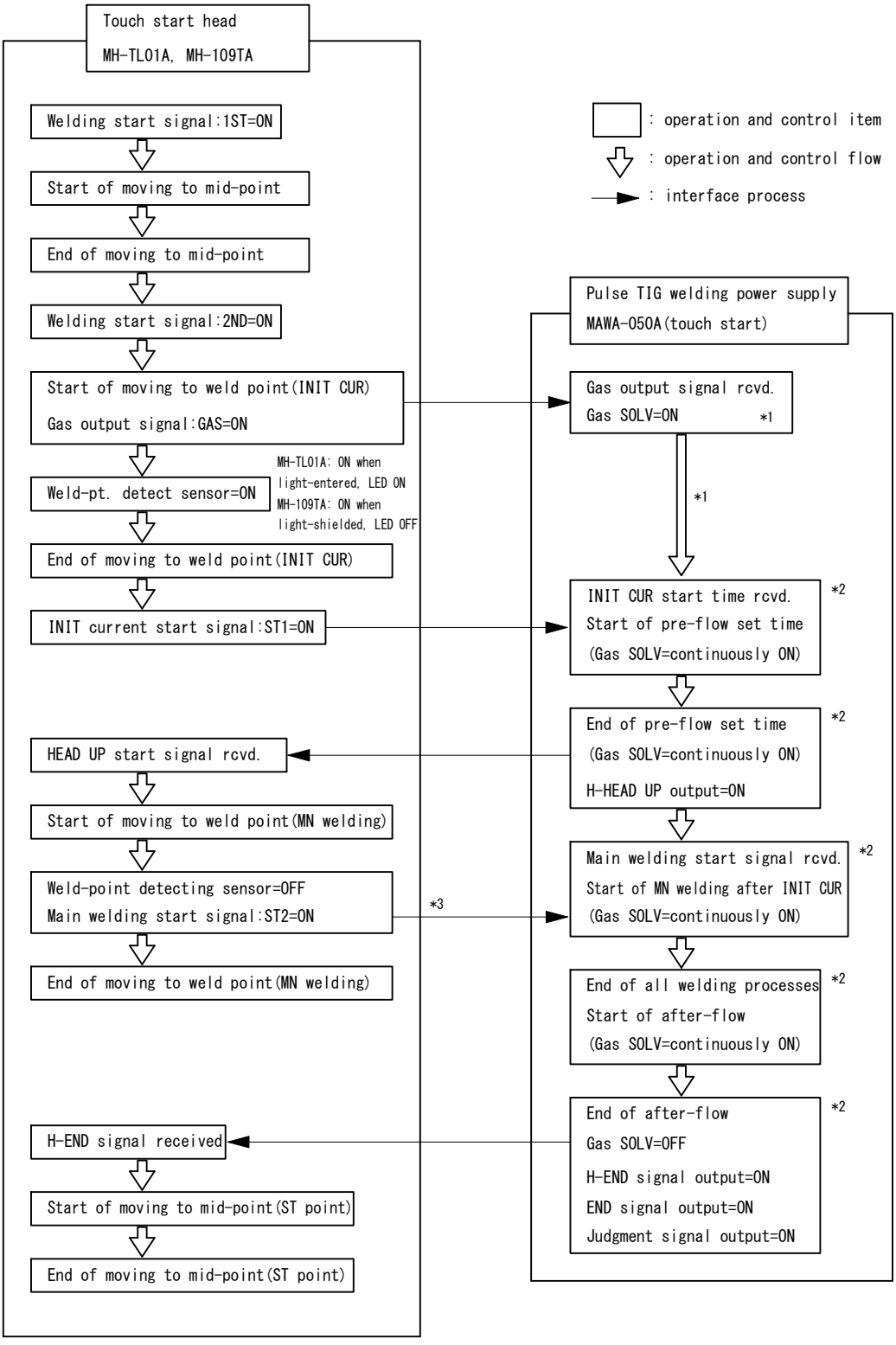
Example of the fine weld mode setting on the Switch select screen



Head is a standby state at the start position.	Start signal ON: Head moves to workpiece surface from the standby position Pre-flow: Argon gas output ON After electrode and workpiece make contact, torch follow-up part moves up. After that, electrode touch sensor is turned ON. After that, Head stops.	After Head stops, it moves up to the main welding position. After torch follow-up sensor moves down, electrode touch senor is turned OFF. <u>After that, the main welding starts. While Head moves up, the main welding is done for the set time.</u>	Head stops at the main welding position. After-flow: Argon gas output ON Start signal OFF: Head returns to the standby position.

Operation summary of the fine weld mode

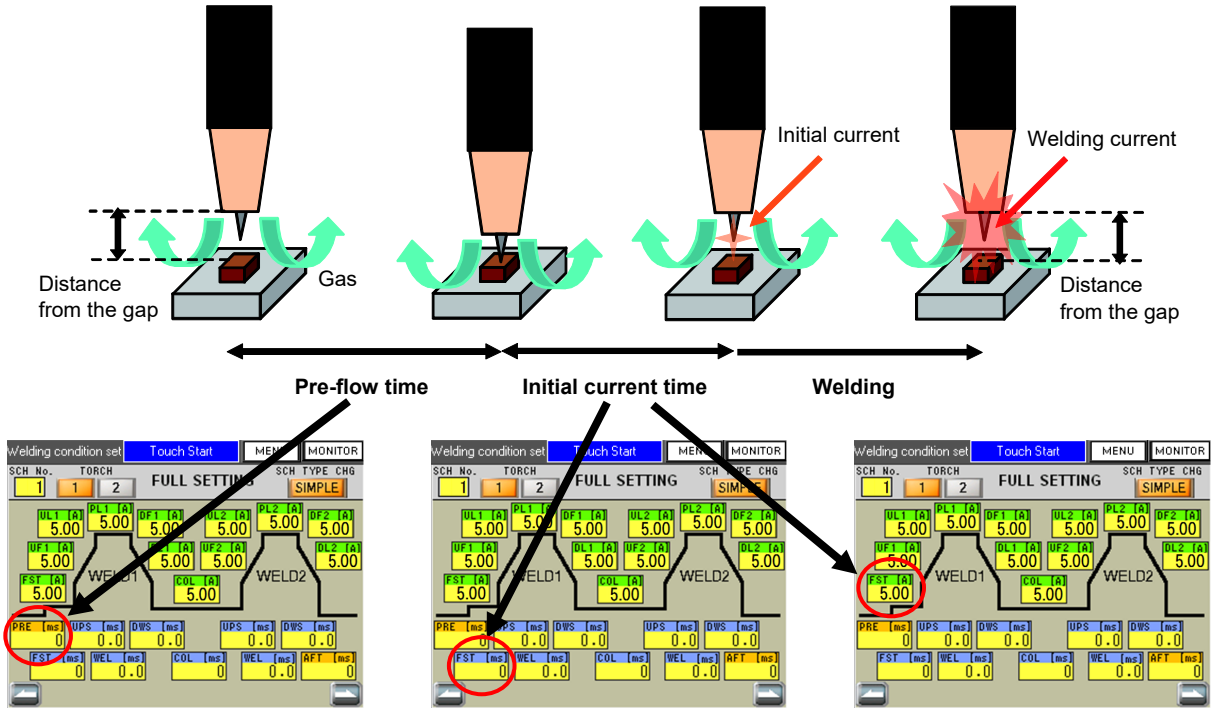
Operation and control flow of the fine weld mode



*1: Gas flow time excluding the welding condition
*2: Operation and control contents of welding condition settings
*3: When the initial current time (FST) is set to 0 ms and the fine weld mode is set to ON, after moving from the weld point (initial current), the main welding starts at the same time the weld-point detecting sensor is turned off (electrode is detached from workpiece).

(6) -3. Adjustment

After a start, the head goes down outputting gas for the pre-flow time. After the end of the pre-flow time, the head goes up outputting the initial current for the initial current time. After the end of the initial current time, welding is started. Adjust the initial current time so that LOST may not occur and the welding current may not be affected greatly. For the initial current time, set a time until the distance from the gap is stopped at the head go-up end. Adjust the initial current time in consideration of the automatic machine status.



① PRE [ms]: Pre-flow time setting

② FST [ms]: Initial current time setting

③ FST [A]: Initial current setting

Adjust items ①, ② and ③ and the distance from the gap to obtain the optimum conditions.

Remarks

- If the air type welding head is used when the touch start is selected, the pre-flow time is used as the head go-down time. Only when the “Gas flow control” item on the Switch select screen (1/2) is set to “ON”, the gas switch valve is closed. If this is set to “OFF”, this gas switch valve is not operated. When the servo motor type welding head (**MH-TL01A**) is used, gas is operated by the GAS output signal from the head controller regardless of the welding power supply setting.

(6) -4. Start using an external input/output signal

A start using an external input/output signal will be described below.

When the welding power supply is in the READY status, the welding current output can be started from the device connected to the outside.

For the details of connection and signals, refer to “2. (3) Interface” and “6. Timing Chart.”

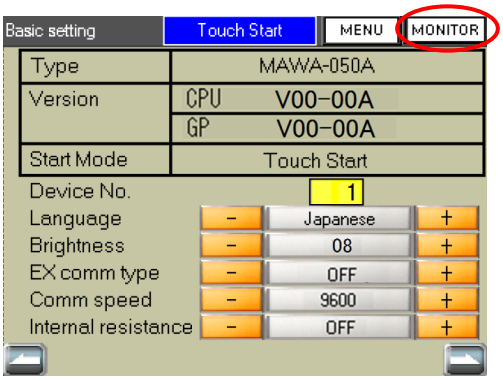
(7) Preparation for Starting Welding

The preparation to be made before a start of welding will be described below.
To perform welding, display the Monitor screen on the touch panel display.

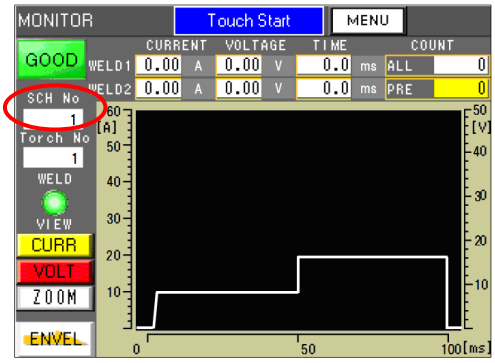
Remarks

- When the Monitor screen is displayed, welding is enabled and the READY signal is output. The conditions that the READY signal is not output are as follows.
  - When an error occurs.
  - During the welding sequence.
  - When the START input (operation panel and external input) is closed.
  - The WELD STOP of the external input is closed.
  - The SCH signal is not input when “4. (6) ① (c) SCH & Torch select by I/O” is set to ON.

① Displaying the Monitor screen



1. Press MONITOR in the upper right part of the screen.
   The Monitor screen is displayed.



2. Make sure that condition No. in which welding conditions are set is set in the “SCH No” item on the Monitor screen. To select SCH by external I/O, this display is updated after the end of welding.

(8) Checking and Registering the Envelope Waveform Data

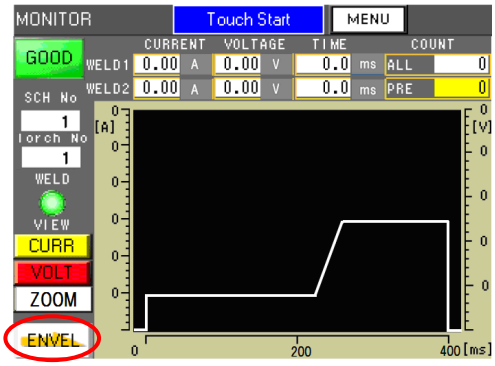
Checking and registering the envelope waveform data will be described below.

The Envelope screen is displayed by pressing ENVEL on the Monitor screen. On the Envelope screen, the envelope waveform created from the resistance waveform and upper/lower limit value can be checked and also the envelope waveform can be registered.

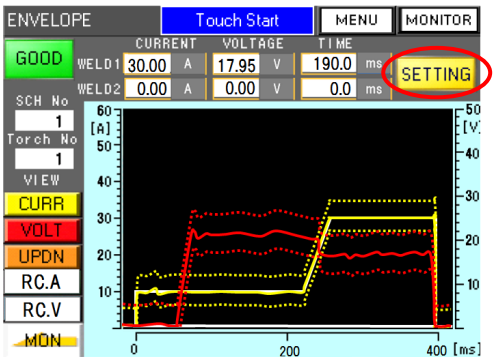
Remarks

- The Envelope screen consists of 2 types.
  - Envelope waveform check screen: This screen permits checking the envelope waveform created by the welding waveform and upper/lower limit value.
  - Envelope setting screen: This screen permits selecting the reference waveform, setting the upper/lower limit value, and registering the envelope waveform.

① Displaying the Envelope screen

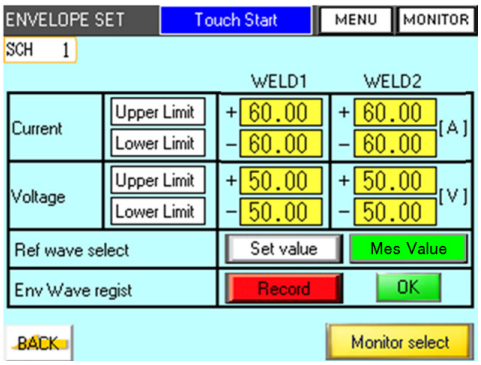


1. Press ENVEL on the Monitor screen.
   The Envelope waveform screen is displayed.



For the details of the Envelope waveform check screen, refer to “4. (4) ① Envelope waveform check screen.”

The Envelope setting screen is displayed by pressing SETTING on the Envelope waveform check screen.



For the details of the Envelope setting screen, refer to “4. (4) ② Envelope setting screen.”

(9) Shutting off the Power Supply

Shutting off the power supply will be described below.

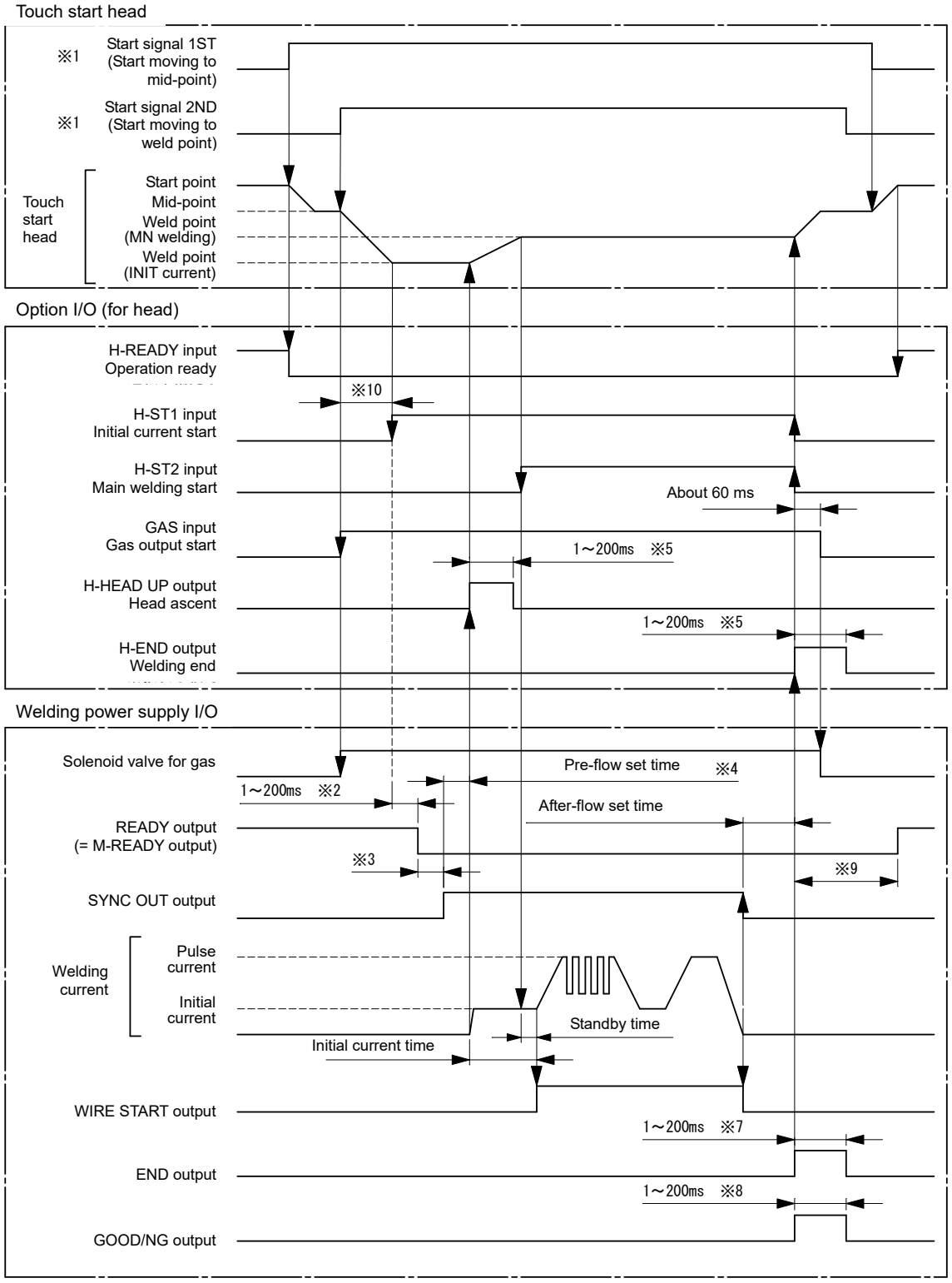
1. Set the “Main power switch” on the front panel to “OFF” (“O” side).
   The power supply is shut off.

2. Turn off the source power supply on the factory side.

6. Timing Chart

(1) Touch Start (when the normal mode is set)

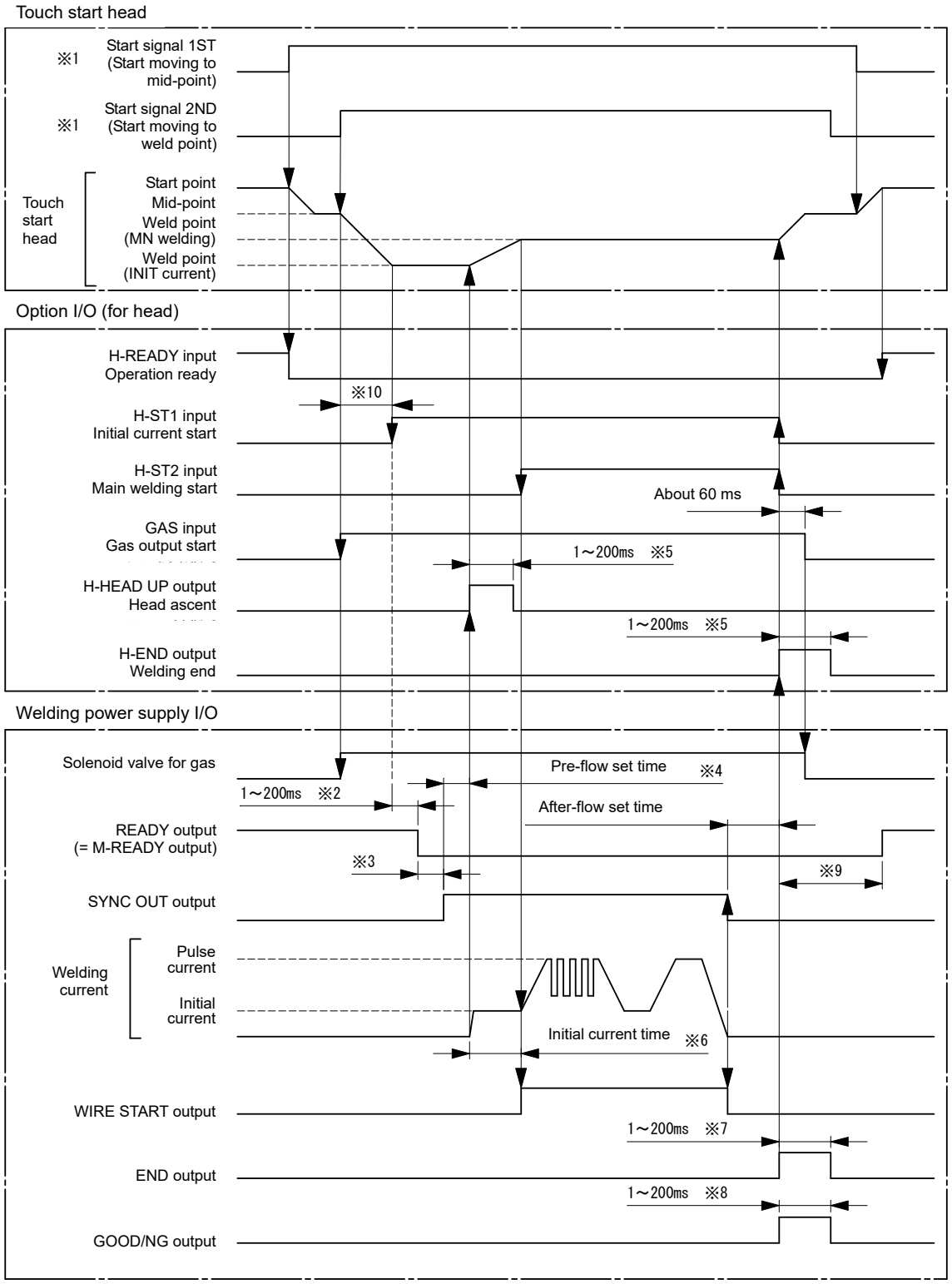
The following is a timing chart for the case where the optional touch start head is used and the normal mode is set. Refer to 5. (6) for the normal mode.



*1 The start signals 1ST and 2ND are used for welding start.
*2 Start signal 1ST decision delay time. Refer to “4. (6) ② (d) START signal input decision delay time.”
*3 Welding data creating time. About 60 ms for the first condition change or about 30 ms for the second or later change.
*4 After the initial current start signal H-ST1 is input, the initial current is started after the lapse of the pre-flow set time.
*5 Set H-HEAD UP and H-END signals’ output times to 200 ms. Refer to “4. (6) ② (g) [Op-IO] H-END signal output time” and “(i) [Op-IO] H-HEAD UP signal output time.”
*6 Set the initial current time longer than the time when the head moves to weld point (main welding). If shorter than the moving time to weld point (main welding), the H-ST2 signal is not input by the end of the initial welding, and therefore the ST2 time error occurs.
[Example setting] When the head moving distance is 2 mm (= 1 mm of pull-up height + 1 mm of head follow-up moving height) and head pull-up speed setting is 1 (= 40 mm/s), the standard initial current time setting becomes 180 ms (about 100 ms of head controller processing time + about 50 ms of head moving time + about 30 ms of standby time).
*7 Set value of “END signal output time.” Refer to “4. (6) ② (c) END signal output time.”
*8 Set value of “GOOD/NG signal output time.” Refer to “4. (6) ② (b) GOOD/NG signal output time.”
*9 It becomes about 1300 ms when the High speed SCH change (No Wave) in 4. (6) ① (h) is OFF and about 100 ms when it is ON. However, when the END signal output time or the GOOD/NG signal output time is 100 ms or longer, it is made the same as OFF of the longer set time. Also, it takes about 1700 ms when the current flows when ENVELOPE in the Limit output judgment on the Monitor select screen is ON. Refer to ENVELOPE of “4. (11) (d) Limit judgment output.”
*10 If the WELD STOP signal is input before the H-ST1 signal is input, the READY signal is turned OFF and the welding power supply does not receive the H-ST1 signal during that period. Therefore, since welding does not start and the END signal is not output, the head remain stopped at weld point (initial current). To clear the state, you need to turn the head controller off and then back on or operate the emergency stop for the welding power supply and then reset.

(2) Touch Start (when the auto mode is set)

The following is a timing chart for the case where the optional touch start head is used and the auto mode is set. Refer to 5. (6) for the auto mode.

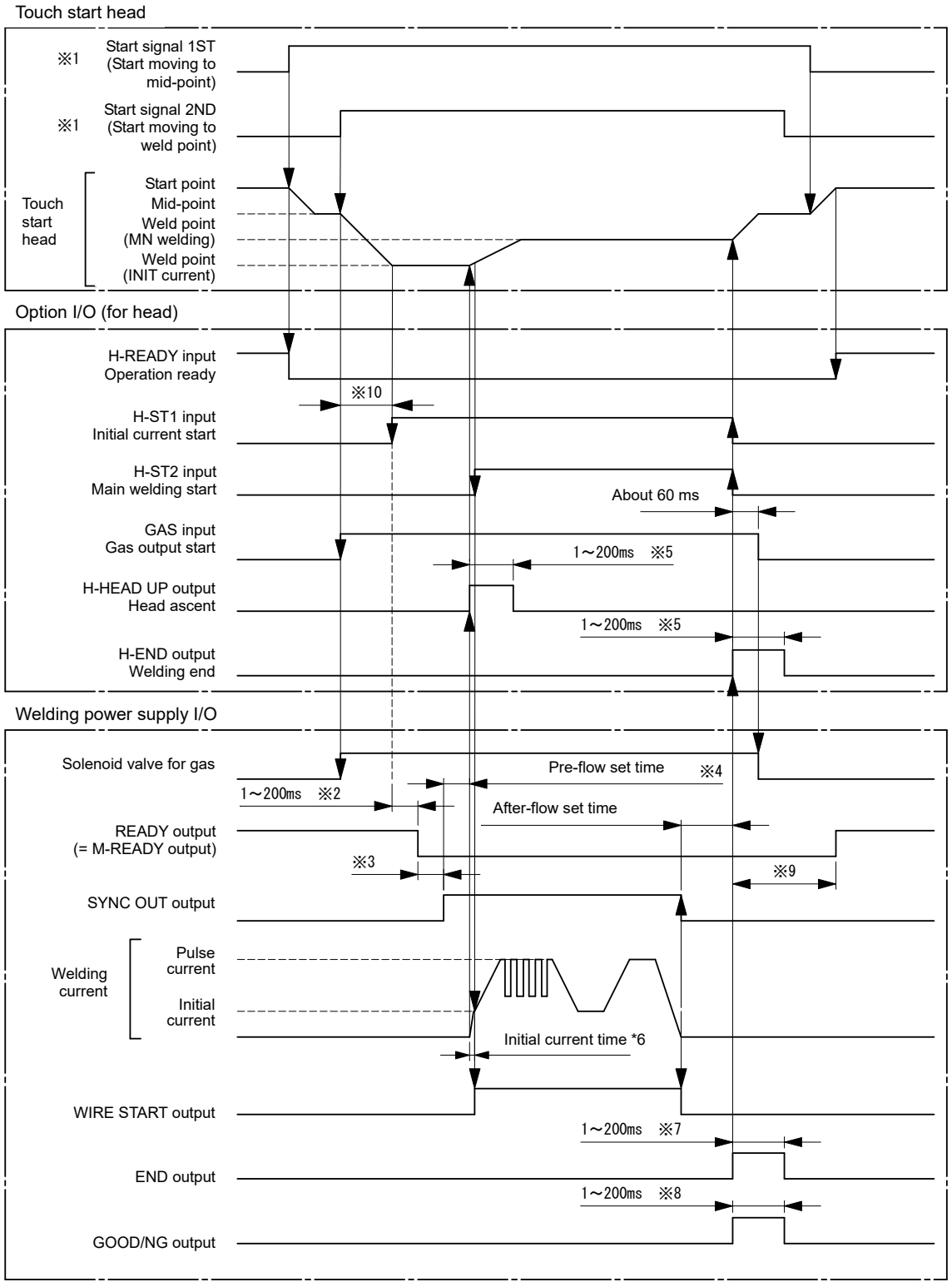


*1 The start signals 1ST and 2ND are used for welding start.
*2 Start signal 1ST decision delay time. Refer to “4. (6) ② (d) START signal input decision delay time.”
*3 Welding data creating time. About 60 ms for the first condition change or about 30 ms for the second or later change.
*4 After the initial current start signal H-ST1 is input, the initial current is started after the lapse of the pre-flow set time.

*5 Set H-HEAD UP and H-END signals' output times to 200 ms. Refer to "4. (6) ② (g) [Op-IO] H-END signal output time" and "(i) [Op-IO] H-HEAD UP signal output time."
*6 When the auto mode is set, the initial current time is the time when the head moves to weld point (main welding). However, when the time when the head moves to weld point (main welding) becomes 500 ms or longer, the ST2 time error occurs. Adjust the head moving distance and speed so that the moving time becomes within 500 ms.
*7 Set value of "END signal output time." Refer to "4. (6) ② (c) END signal output time."
*8 Set value of "GOOD/NG signal output time." Refer to "4. (6) ② (b) GOOD/NG signal output time."
*9 It becomes about 1300 ms when the High speed SCH change (No Wave) in 4. (6) ① (h) is OFF and about 100 ms when it is ON. However, when the END signal output time or the GOOD/NG signal output time is 100 ms or longer, it is made the same as OFF of the longer set time. Also, it takes about 1700 ms when the current flows when ENVELOPE in the Limit output judgment on the Monitor select screen is ON. Refer to ENVELOPE of "4. (11) (d) Limit judgment output."
*10 If the WELD STOP signal is input before the H-ST1 signal is input, the READY signal is turned OFF and the welding power supply does not receive the H-ST1 signal during that period. Therefore, since welding does not start and the END signal is not output, the head remain stopped at weld point (initial current). To clear the state, you need to turn the head controller off and then back on or operate the emergency stop for the welding power supply and then reset.

(3) Touch Start (when the fine weld mode is set)

The following is a timing chart for the case where the optional touch start head is used and the fine weld mode is set. Refer to 5. (6) for the fine weld mode.

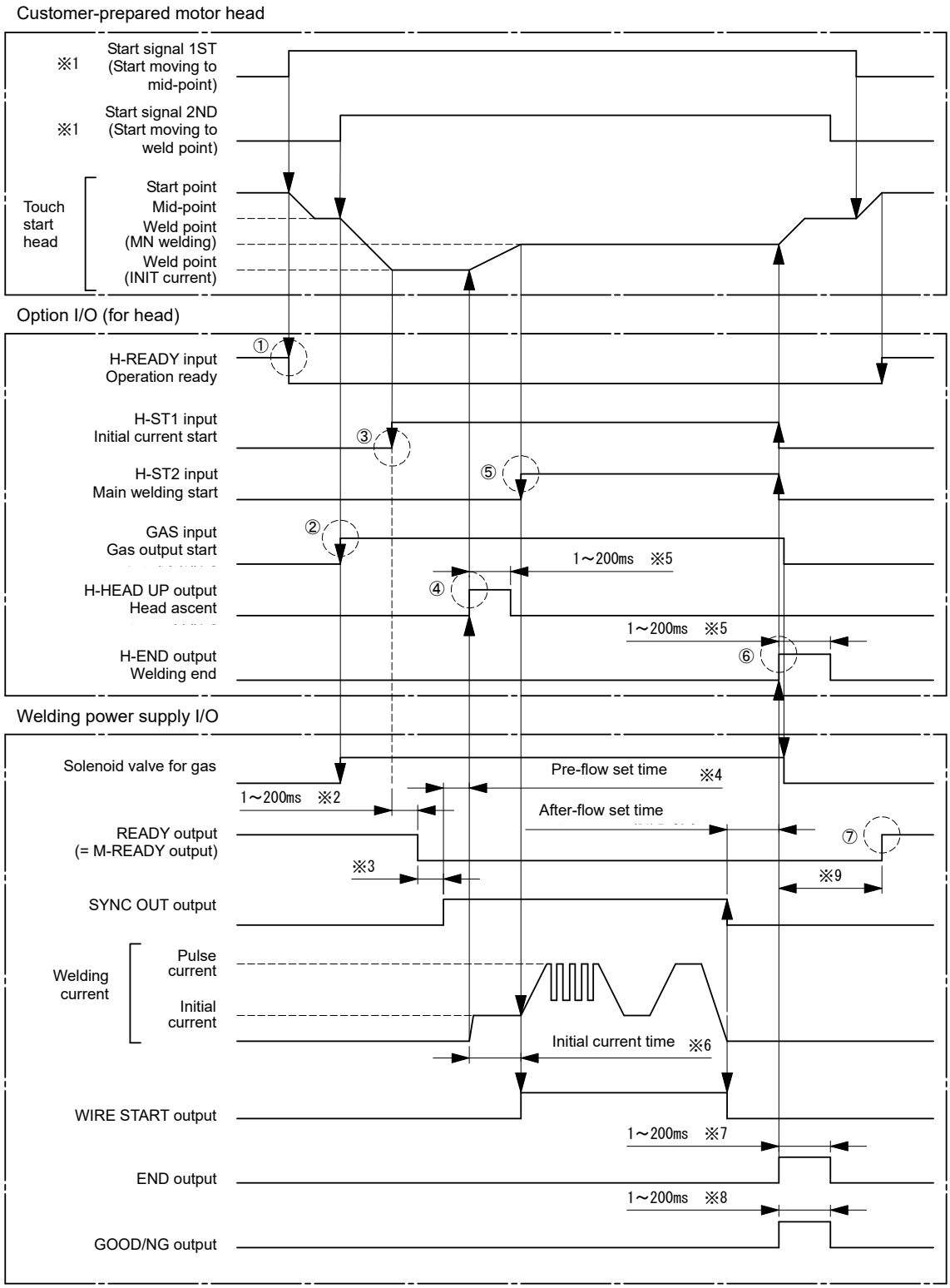


*1 The start signals 1ST and 2ND are used for welding start.
*2 Start signal 1ST decision delay time. Refer to "4. (6) ② (d) START signal input decision delay time."
*3 Welding data creating time. About 60 ms for the first condition change or about 30 ms for the second or later change.
*4 After the initial current start signal H-ST1 is input, the initial current is started after the lapse of the pre-flow set time.

*5 Set H-HEAD UP and H-END signals' output times to 200 ms. Refer to "4. (6) ② (g) [Op-IO] H-END signal output time" and "(i) [Op-IO] H-HEAD UP signal output time."
*6 When the fine weld mode is set, the initial current time is the time from when the head starts moving to weld point (main welding) to when the electrode tip is detached (10 to 20 ms).
*7 Set value of "END signal output time." Refer to "4. (6) ② (c) END signal output time."
*8 Set value of "GOOD/NG signal output time." Refer to "4. (6) ② (b) GOOD/NG signal output time."
*9 It becomes about 1300 ms when the High speed SCH change (No Wave) in 4. (6) ① (h) is OFF and about 100 ms when it is ON. However, when the END signal output time or the GOOD/NG signal output time is 100 ms or longer, it is made the same as OFF of the longer set time. Also, it takes about 1700 ms when the current flows when ENVELOPE in the Limit output judgment on the Monitor select screen is ON. Refer to ENVELOPE of "4. (11) (d) Limit judgment output."
*10 If the WELD STOP signal is input before the H-ST1 signal is input, the READY signal is turned OFF and the welding power supply does not receive the H-ST1 signal during that period. Therefore, since welding does not start and the END signal is not output, the head remain stopped at weld point (initial current). To clear the state, you need to turn the head controller off and then back on or operate the emergency stop for the welding power supply and then reset.

(4) Touch Start (when the customer-prepared motor head is used)

The following is a timing chart example for the case where the customer-prepared motor head is used.



① When the head is moved from start point, turn off the H-READY signal.

② When the head is moved from mid-point to weld point (initial current), turn on the GAS signal of option input/output connector (or the PURGE signal of option input/output connector) to turn on the solenoid valve for (argon) gas. When the H-END signal is turned on, turn off the GAS signal (or the PURGE signal) to turn off the solenoid valve for gas.

③ After the head is moved to weld-point (initial current), turn on the initial current start signal H-ST1.

④ After the H-HEAD UP signal is turned on after the lapse of the pre-flow set time, start moving the head to weld-point (main welding).

⑤ After the head is moved to weld-point (main welding), turn on the start signal (H-ST2). When the initial current time setting (FST) is set to 1 to 999 ms (= normal mode), **MAWA-050A** starts main welding after the initial current time is completed. When the initial current time setting (FST) is set to 0 ms, the auto mode is set if the H-ST2 signal is turned on immediately after the head reaches the main welding position. The fine weld mode is set if the H-ST2 signal is turned on at the time the electrode is detached from the workpiece. Refer to 6. (3) and 6. (4).

⑥ After every welding control is completed, the H-END signal is output. When the H-END signal is turned on, move the head to mid-point.

⑦ After the end of welding, the READY signal is output when the monitor judgment of welding is completed. Enter the next welding start signal after checking output of the READY signal.

*1 The start signals 1ST and 2ND of the customer-prepared motor head are used for welding start.

*2 Start signal 1ST decision delay time. Refer to “4. (6) ② (d) START signal input decision delay time.”

*3 Welding data creating time. About 60 ms for the first condition change or about 30 ms for the second or later change.

*4 After the initial current start signal H-ST1 is input, the initial current is started after the lapse of the pre-flow set time.

*5 The H-HEAD UP and H-END signals’ output times can be set to 1 to 200 ms according to the controller of the customer-prepared motor head. Refer to “4. (6) ② (g) [Op-IO] H-END signal output time” and “(i) [Op-IO] H-HEAD UP signal output time.”

*6 When setting the initial current time to 1 to 999 ms, set it longer than the time when the head moves to weld point (main welding). If shorter than the moving time to weld point (main welding), the H-ST2 signal is not input by the end of the initial welding, and therefore the ST2 time error occurs.

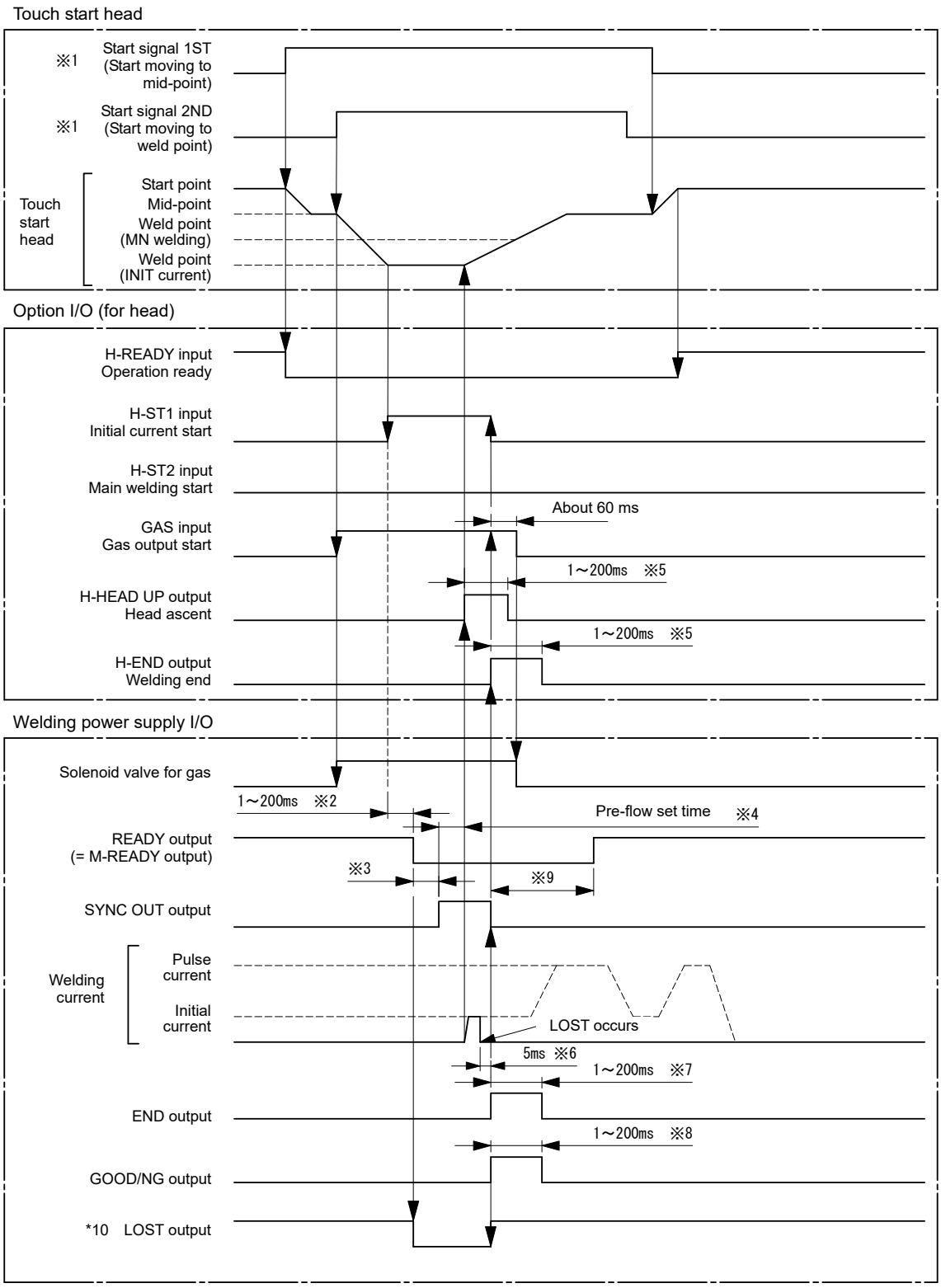
*7 “END signal output time” can be set according to the customer’s controller. Refer to “4. (6) ② (c) END signal output time.”

*8 “GOOD/NG signal output time” can be set according to the customer’s controller. Refer to “4. (6) ② (b) GOOD/NG signal output time.”

*9 It becomes about 1300 ms when the High speed SCH change (No Wave) in 4. (6) ① (h) is OFF and about 100 ms when it is ON. However, when the END signal output time or the GOOD/NG signal output time is 100 ms or longer, it is made the same as OFF of the longer set time. Also, it takes about 1700 ms when the current flows when ENVELOPE in the Limit output judgment on the Monitor select screen is ON. Refer to ENVELOPE of “4. (11) (d) Limit judgment output.”

(5) Touch Start (at occurrence of LOST)

The following is a timing chart for the case where the arc stops in the process of welding.

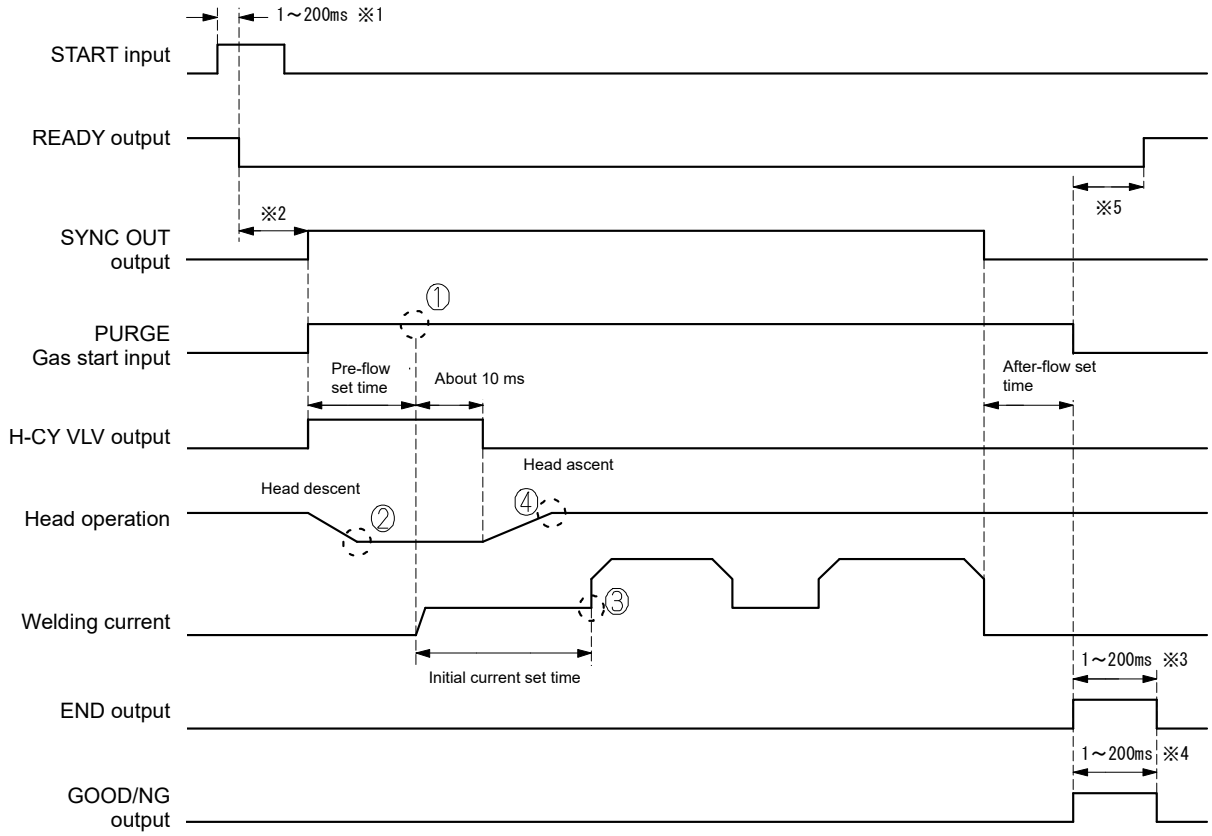


*1 When using the optional touch start head, the start signals 1ST and 2ND are used for welding start.
*2 Start signal 1ST decision delay time. Refer to “4. (6) ② (d) START signal input decision delay time.”
*3 Welding data creating time. About 60 ms for the first condition change or about 30 ms for the second or later change.
*4 After the initial current start signal H-ST1 is input, the initial current is started after the lapse of the pre-flow set time.

*5 When using the optional touch start head, set H-HEAD UP and H-END signals' output times to 200 ms. Refer to "4. (6) ② (g) [Op-IO] H-END signal output time" and "(i) [Op-IO] H-HEAD UP signal output time."
*6 When the welding current value stays 0 A for 5 ms after the welding start, it is considered as LOST and the welding control is stopped, and then the END signal is output.
*7 Set value of "END signal output time." Refer to "4. (6) ② (c) END signal output time."
*8 Set value of "GOOD/NG signal output time." Refer to "4. (6) ② (b) GOOD/NG signal output time."
*9 It becomes about 1300 ms when the High speed SCH change (No Wave) in 4. (6) ① (h) is OFF and about 100 ms when it is ON. However, when the END signal output time or the GOOD/NG signal output time is 100 ms or longer, it is made the same as OFF of the longer set time. Also, it takes about 1700 ms when the current flows when ENVELOPE in the Limit output judgment on the Monitor select screen is ON. Refer to ENVELOPE of "4. (11) (d) Limit judgment output."
*10 The LOST output is turned on at the time of the END output after the occurrence of LOST and kept until the next welding starts.

(6) Touch Start (air type welding head)

The following is a timing chart for the case where the air type welding head is used.



*1 Start signal 1ST decision delay time. Refer to "4. (6) ② (d) START signal input decision delay time."

*2 Welding data creating time. About 60 ms for the first condition change or about 30 ms for the second or later change.

*3 Set value of "END signal output time." Refer to "4. (6) ② (c) END signal output time."

*4 Set value of "GOOD/NG signal output time." Refer to "4. (6) ② (b) GOOD/NG signal output time."

*5 It becomes about 1300 ms when the High speed SCH change (No Wave) in 4. (6) ① (h) is OFF and about 100 ms when it is ON. However, when the END signal output time or the GOOD/NG signal output time is 100 ms or longer, it is made the same as OFF of the longer set time. Also, it takes about 1700 ms when the current flows when ENVELOPE in the Limit output judgment on the Monitor select screen is ON. Refer to ENVELOPE of "4. (11) (d) Limit judgment output."

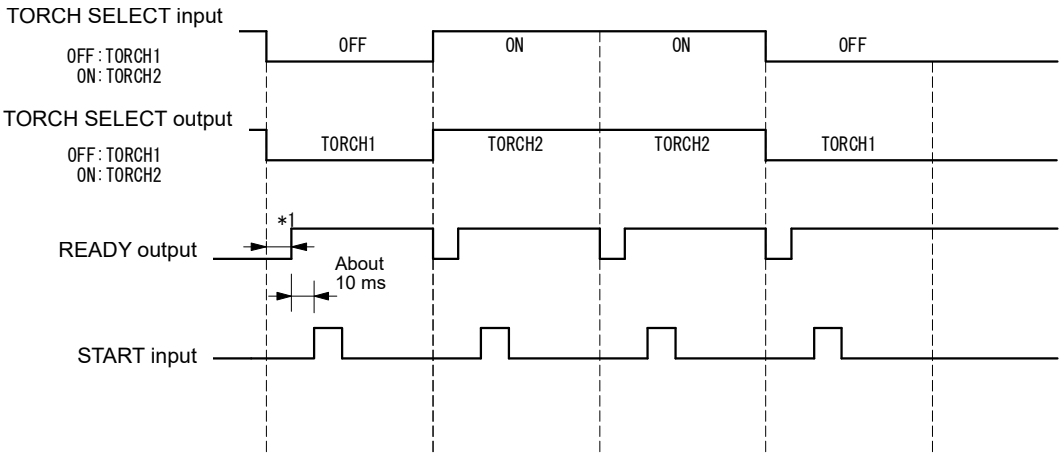
Remarks

Connect the H-CY VLV output signal (Refer to "2. (2)-8 Connection with the torch head for touch start.") of the option I/O connector on the rear panel to the solenoid valve of the air type welding head.

Set the pre-flow time, initial current time and initial current according to the head descent/ascent time, distance between electrode and workpiece, production tact, etc. so that conditioning may be performed. (In the case shown in the above figure, the timing of ① of the pre-flow time can be shortened up to the timing of ②. And the timing of ③ of the initial current time can be shortened up to the timing of ④.)

(7) Torch Changeover

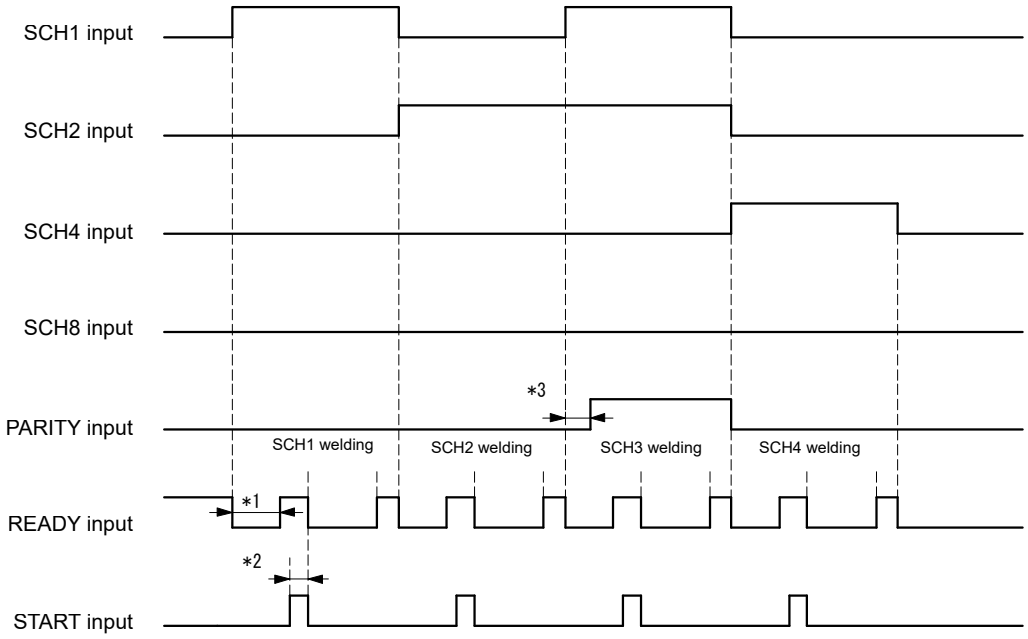
The following is a timing chart for the case where the torch is changed over.



*1 The time from a changeover of TORCH No. to the validation of the READY signal varies depending on the set value of “TORCH change delay time.” Refer to “4. (6) Switch Select Screen.”
TORCH No. is decided according to the TORCH input status after the lapse of the set time of “TORCH change delay time.” In the example shown in the above figure, the case of changing the torch in the sequence of 1 → 2 → 1. Before the START signal is turned on, TORCH1 and TORCH2 are decided. After the READY signal is checked, the START signal is turned on. When the TORCH signal is ON, TORCH2 is selected and the TORCH SELECT output is turned on.
If the START signal is turned on unless READY is validated, the message of “E07 START SIGNAL ON ERROR” is displayed.

(8) Schedule Changeover

The following is a timing chart for the case where the schedule is changed over.



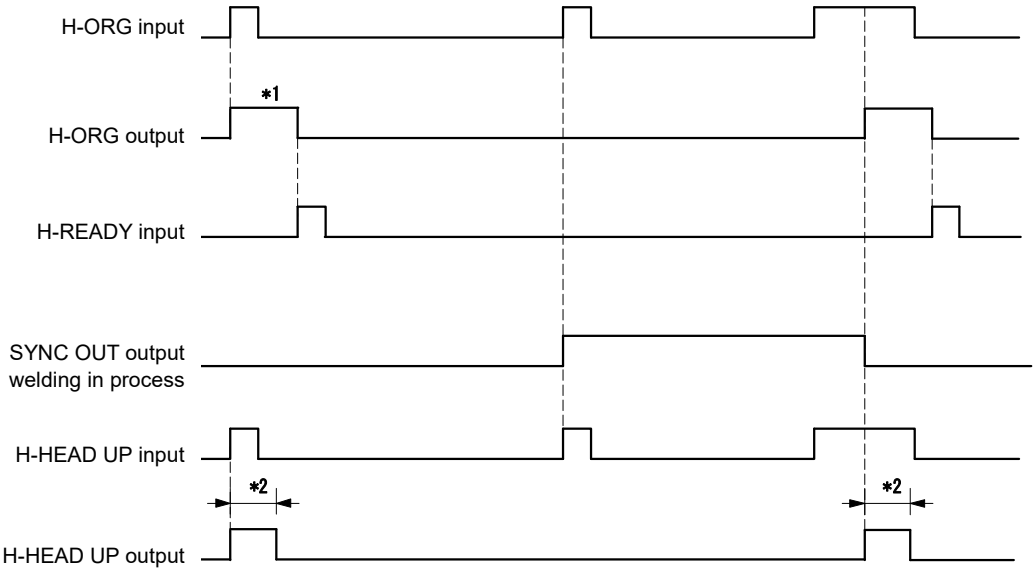
*1 The time from a SCH No. changeover to the validation of the READY signal varies depending on the setting of the SCH changeover delay time (Refer to 4. (6).).
After the lapse of the SCH changeover delay time, SCH No. is decided finally and welding data is created. The time required to create welding data becomes longer in proportion to the set time of First welding + Second welding. It is about 1 ms at the minimum weld time: 1 ms and about 340 ms at the maximum weld time: 4 s. From these contents, the time from the end of SCH signal operation to READY signal ON becomes SCH changeover delay time (1 ~ 200 ms) + Welding data creating time (1 ~ 340 ms).
The example shown in the above figure shows a case of SCH No. changeover in the sequence of 1 → 2 → 3 → 4.

*2 START signal input decision delay time. Refer to “4. (6) ② (m) START signal input delay time.”

*3 Operate the PARITY signal until the START signal is input.
The use/no use of the PARITY signal can be set in the “Start parity error ON/OFF” item after displaying the Switch select screen from the Basic setting screen. Refer to “4. (6) Switch Select Screen.”

(9) Option Input/Output Signals

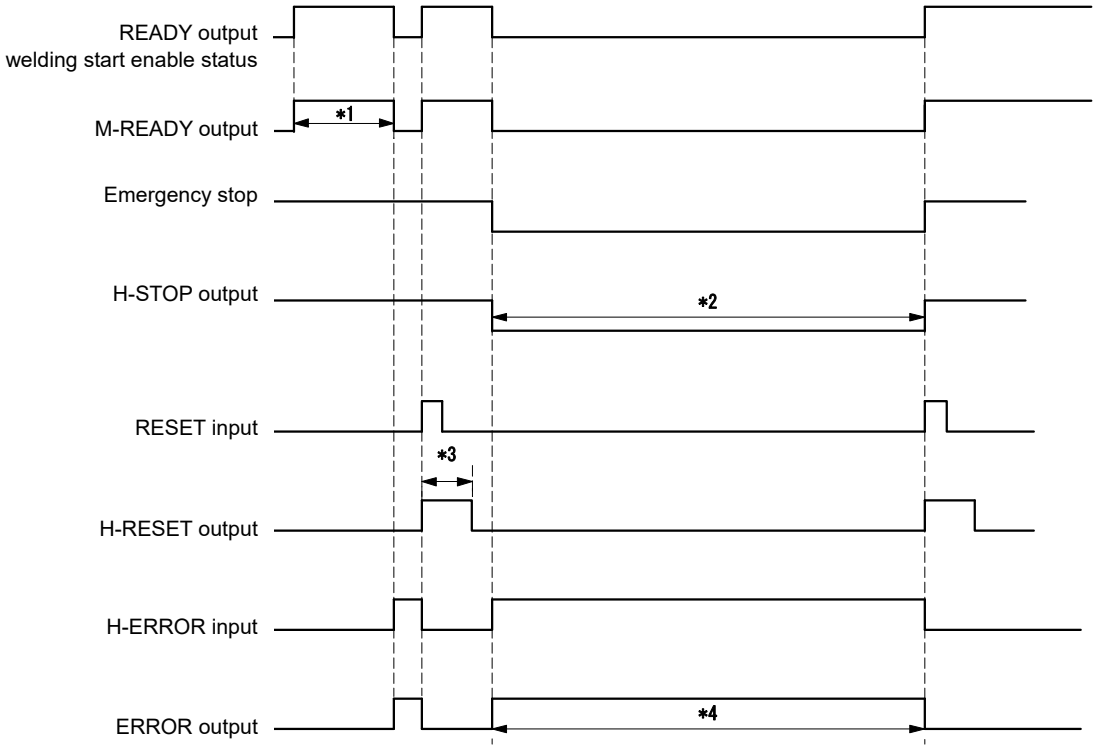
The following is a timing chart for option input/output signals (H-ORG and H-HEAD UP).



*1 After **MAWA-050A** receives an H-ORG input signal, it outputs an H-ORG output signal. (During welding, the H-ORG signal input is not accepted.) The H-ORG output signal is continuously output until the H-READY signal is received.

*2 After **MAWA-050A** receives an H-HEAD UP input signal, it outputs an H-HEAD UP output signal. (During welding, the H-HEAD UP signal input is not accepted.) The H-HEAD UP output signal is continuously output for the set time of “H-HEAD UP signal output time.”
Refer to ”4. (6) Switch Select Screen.”

The following a timing chart for option input/output signals (M-READY, H-STOP and H-RESET).



*1 The M-READY signal is output when **MAWA-050A** is ready for welding.

*2 When **MAWA-050A** is in an emergency stop status, the H-STOP signal output is turned off. (b contact) The STOP signal is output after the emergency stop status is cleared.

*3 When **MAWA-050A** receives the RESET input signal, it outputs the H-RESET output signal. The H-RESET signal is output for the set time of “H-RESET signal output time.”
Refer to “4. (6) Switch Select Screen.”

*4 When **MAWA-050A** receives the H-ERROR signal, it outputs the ERROR signal, being put into an alarm status.

(10) Condition No. and SCH Select Terminals

○: Closed Blank: Open

Signal name / SCH No	SCH1	SCH2	SCH4	SCH8	SCH16	SCH32	SCH64	PARITY
1	○							
2		○						
3	○	○						○
4			○					
5	○		○					○
6		○	○					○
7	○	○	○					
8				○				
9	○			○				○
10		○		○				○
11	○	○		○				
12			○	○				○
13	○		○	○				
14		○	○	○				
15	○	○	○	○				○
16					○			
17	○				○			○
18		○			○			○
19	○	○			○			
20			○		○			○
21	○		○		○			
22		○	○		○			
23	○	○	○		○			○
24				○	○			○
25	○			○	○			
26		○		○	○			
27	○	○		○	○			○
28			○	○	○			
29	○		○	○	○			○
30		○	○	○	○			○
31	○	○	○	○	○			
32						○		
33	○					○		○
34		○				○		○
35	○	○				○		

Signal name / SCH No	SCH1	SCH2	SCH4	SCH8	SCH16	SCH32	SCH64	PARITY
36			○			○		○
37	○		○			○		
38		○	○			○		
39	○	○	○			○		○
40				○		○		○
41	○			○		○		
42		○		○		○		
43	○	○		○		○		○
44			○	○		○		
45	○		○	○		○		○
46		○	○	○		○		○
47	○	○	○	○		○		
48					○	○		○
49	○				○	○		
50		○			○	○		
51	○	○			○	○		○
52			○		○	○		
53	○		○		○	○		○
54		○	○		○	○		○
55	○	○	○		○	○		
56				○	○	○		
57	○			○	○	○		○
58		○		○	○	○		○
59	○	○		○	○	○		
60			○	○	○	○		○
61	○		○	○	○	○		
62		○	○	○	○	○		
63	○	○	○	○	○	○		○
64							○	
65	○						○	○
66		○					○	○
67	○	○					○	
68			○				○	○
69	○		○				○	
70		○	○				○	

Signal name / SCH No	SCH1	SCH2	SCH4	SCH8	SCH16	SCH32	SCH64	PARITY
71	○	○	○				○	○
72				○			○	○
73	○			○			○	
74		○		○			○	
75	○	○		○			○	○
76			○	○			○	
77	○		○	○			○	○
78		○	○	○			○	○
79	○	○	○	○			○	
80					○		○	○
81	○				○		○	
82		○			○		○	
83	○	○			○		○	○
84			○		○		○	
85	○		○		○		○	○
86		○	○		○		○	○
87	○	○	○		○		○	
88				○	○		○	
89	○			○	○		○	○
90		○		○	○		○	○
91	○	○		○	○		○	
92			○	○	○		○	○
93	○		○	○	○		○	
94		○	○	○	○		○	
95	○	○	○	○	○		○	○
96						○	○	○
97	○					○	○	
98		○				○	○	
99	○	○				○	○	○
100			○			○	○	
101	○		○			○	○	○
102		○	○			○	○	○
103	○	○	○			○	○	
104				○		○	○	
105	○			○		○	○	○

Signal name / SCH No	SCH1	SCH2	SCH4	SCH8	SCH16	SCH32	SCH64	PARITY
106		○		○		○	○	○
107	○	○		○		○	○	
108			○	○		○	○	○
109	○		○	○		○	○	
110		○	○	○		○	○	
111	○	○	○	○		○	○	○
112					○	○	○	
113	○				○	○	○	○
114		○			○	○	○	○
115	○	○			○	○	○	
116			○		○	○	○	○
117	○		○		○	○	○	
118		○	○		○	○	○	
119	○	○	○		○	○	○	○
120				○	○	○	○	○
121	○			○	○	○	○	
122		○		○	○	○	○	
123	○	○		○	○	○	○	○
124			○	○	○	○	○	
125	○		○	○	○	○	○	○
126		○	○	○	○	○	○	○
127	○	○	○	○	○	○	○	

○ …. Input signal ON

A fault due to wire breakage of the condition select signal line can be detected by parity input signal. Set this signal so that the total of closed condition select signal lines and closed PARITY signal lines may be an odd number at all times. (Start parity error ON/OFF: ON setting)

7. External Communication Function

(1) Overview

If the communication connector (D-Sub 9-pin, female) on the rear panel is used, conditions can be set and monitor data and various statuses can be read out from an externally connected PC.

① Explanation of communication connector (D-Sub 9-pin, female) signals

RS-485

Terminal name	Explanation
6 RS+	RS485 differential signal +
9 RS-	RS485 differential signal –

(2) Data Transfer

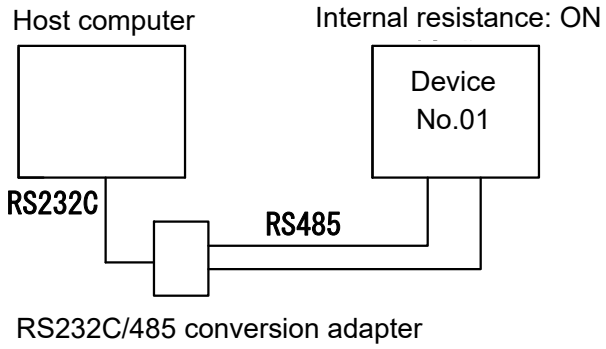
Item	Contents
Communication type	RS-485, asynchronous, half-duplex
Communication speed	Select one of the following speeds on the Basic setting screen. 9600, 14400, 19200 and 38400 bps
Data format	Start bit: 1, Data bit: 8, Stop bit: 1, Parity: Even number
Character code	ASCII
Check sum data	None
Connector	D-Sub 9-pin Pin arrangement, 6: RS+, 9: RS-

Caution

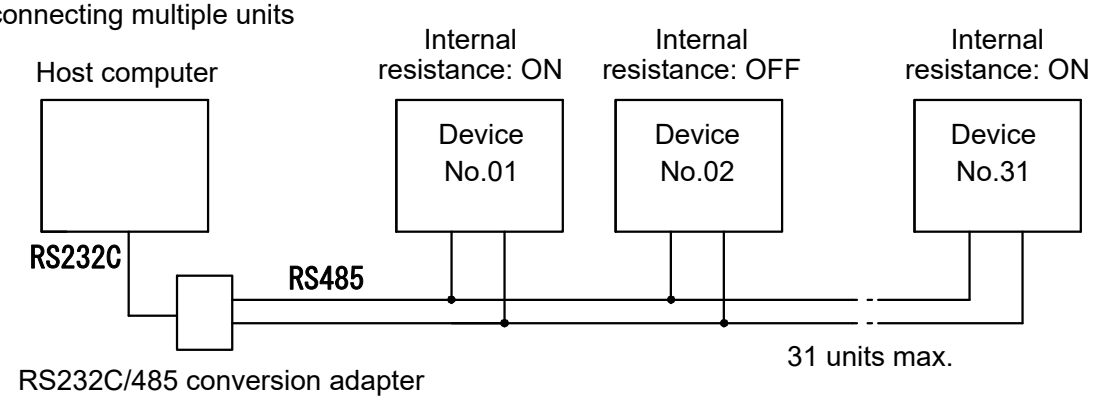
- There is a difference between numerical data read by the external communication function and numerical display on the touch panel display.
  For numerical data read by the external communication function, zeros are padded to display the specified number of digits (zero padding).
  For numerical display on the touch panel display, leading zeros less than the specified number of digits are replaced with space to make it easy to see (zero suppression).

(3) Configuration

① For connecting only one unit



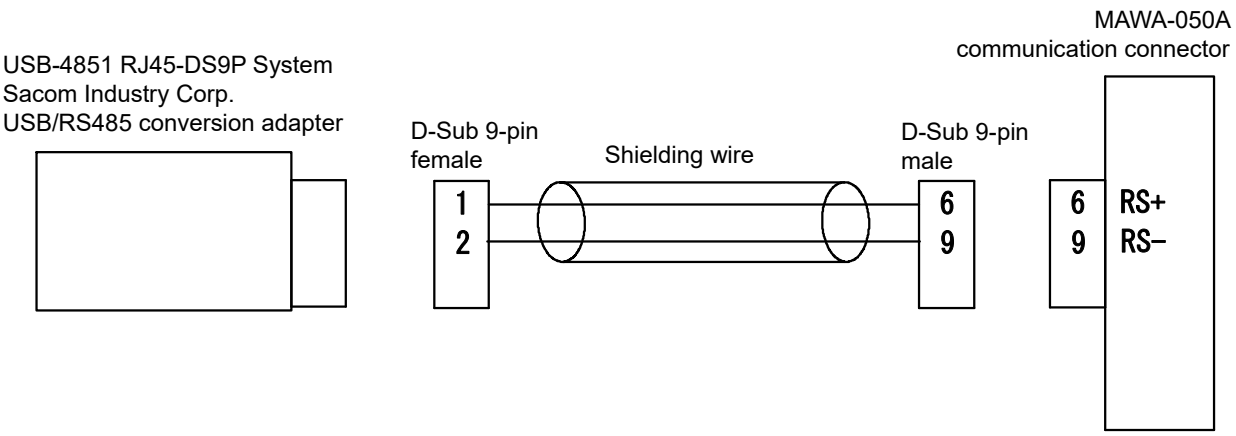
② For connecting multiple units



Remarks

- When a single host computer controls multiple units, register device No. for each device. Set the device No. on the Basic setting screen. Regarding the internal resistance use setting, set the terminator of communication line to ON. (Refer to “4. (5) Basic Setting Screen.”)
- Do not set the same device No. In the one-way communication mode, perform setting so that multiple units may not transmit data at the same time. Otherwise, data collision will be caused to the communication line, resulting in an abnormal operation.
- The RS-232C/RS-485 conversion cable and connection cable are not attached to the welding power supply. Please prepare them by the customer.

③ For connecting with the USB/RS485 conversion adapter (System Sacom Industry Corp.)



Caution

- To avoid malfunction caused by noise, keep the USB/RS485 conversion adapter more than 1 m apart from the welding power supply and torch.

(4) Protocol

① One-way communication mode

(1) Monitor data (Monitor data is transmitted at each end of communication.)

Data strings

!01 001 S10: 01, 01, 015.0, 01.00, 1111.0, 020.0, 02.00, 2222.2, 100000, 111111,
A B C D E F G H I J K L M

22222, 222 [CR][LF]
N O

Item	Contents	Character string	Range
A	Device No.	nn	01 ~ 31
B	Condition No.	nnn	001 ~ 127
C	Command No.	nnn:	Fixed to S10
D	Torch No.	nn,	Fixed to 01
E	Welding result	nn,	01: GOOD 02: NG 03: LOST
F	WELD1 current	nnnn.n,	000.0 ~ 999.9 (A)
G	WELD1 voltage	nn.nn,	00.00 ~ 99.99 (V)
H	WELD1 time	nnnn.n,	0000.0 ~ 9999.0 (ms)
I	WELD2 current	nnn.n,	000.0 ~ 999.9 (A)
J	WELD2 voltage	nn.nn,	00.00 ~ 99.99 (V)
K	WELD2 time	nnnn.n,	0000.0 ~ 9999.0 (ms)
L	ALL COUNT	nnnnnn,	000000 ~ 999999
M	TORCH 1 total count	nnnnnn,	000000 ~ 999999
N	TORCH 1 workpiece count	nnnnn,	00000 ~ 60000
O	TORCH 1 WELD count value	nnn	000 ~ 255

(2) Error data

Data strings

!01 001 S07:E03,04, 12, 15, 17, 19, 22, 24 [CR][LF]
A B C D E F G H I J K

A	Device No.	Fixed 2 digits of 01 ~ 31
B	Condition No.	Fixed 3 digits of 001 ~ 127
C	Command No.	Fixed 3 digits of S07
D (*1)	Error code 1	Fixed 3 digits of E01 ~ E28
E (*1)	Error code 2	Fixed 2 digits of 01 ~ 28
F (*1)	Error code 3	Fixed 2 digits of 01 ~ 28
G (*1)	Error code 4	Fixed 2 digits of 01 ~ 28
H (*1)	Error code 5	Fixed 2 digits of 01 ~ 28
I (*1)	Error code 6	Fixed 2 digits of 01 ~ 28
J (*1)	Error code 7	Fixed 2 digits of 01 ~ 28
K (*1)	Error code 8	Fixed 2 digits of 01 ~ 28

*1: Up to 8 error codes are used. When one error exists, E ~ K are omitted.
For error codes, refer to “8. (2) Error Messages.” E is attached to only Error code 1.

*2: When an error is detected, the error code will be transmitted.

② Both-way communication mode

Error read	Code: # Device No. R Condition No. S Command No. *

Example: Every error data that occurred is read by the specified device No.01.

Host side

#	ID1	ID2	R	SH1	SH2	SH3	S	CC1	CC2	*	CR	LF
	0	1		0	0	0		0	7			

This product

!	ID1	ID2	SH1	SH2	SH3	S	CC1	CC2	:	Data	CR	LF
	0	1	*	*	*		0	7	:	E18,E19		

1) At reading, condition No. 000 is used fixedly for SH1, SH2 and SH3.
   At a reply, the condition No. of the last welding is used for SH1, SH2 and SH3.
2) Command No.07 is used fixedly for CC1 and CC2.
3) When there is no error data, the reply data is “E00.”

Error reset	Code: # Device No. W Condition No. S Command No. Data

Example: The error of the specified device No.01 is reset.

Host side

#	ID1	ID2	W	SH1	SH2	SH3	S	CC1	CC2	:	Data	CR	LF
	0	1		0	0	0		0	7	:	E00		

This product

!	ID1	ID2	SH1	SH2	SH3	S	CC1	CC2	:	Data	CR	LF
	0	1	*	*	*		0	7	:	E00		

1) At reading, condition No. 000 is used fixedly for SH1, SH2 and SH3.
   At a reply, the condition No. of the last welding is used for SH1, SH2 and SH3.
2) Command No.07 is used fixedly for CC1 and CC2.
3) For confirmation, “E00” (the state of no error data) is sent back as data.

Data read	Code: # Device No. R Condition No. S Command No. *

Example: All the contents of data specified by command “01” of device No. “008” of the specified device No.01 are read.

Host side

#	ID1	ID2	R	SH1	SH2	SH3	S	CC1	CC2	*	CR	LF
	0	1		0	0	8		0	1			

This product

	0 1 0 0 8 0 1 :											
!	ID1	ID2	SH1	SH2	SH3	S	CC1	CC2	:	Data	CR	LF

1) At reading, condition No. for SH1, SH2 and SH3.
   Fixed 3 digits (SH1 = Hundredth digit, SH2 = Tenth digit, SH3 = Unit digit)
   However, Condition 000 is used fixedly for Commands 06, 10 ~ 14.
   At a reply, Condition 000 is used fixedly for Command 06.
   For other Conditions, the condition No. of the last welding is used.
2) Command No. for CC1 and CC2
   Fixed 2 digits (CC1 = Tenth digit, CC2 = Unit digit)
3) For the data sequence for one condition for each command No., refer to “7. (5) Data Code Table.”

Data write	Code: # Device No. W Condition No. S Command No. Data

Example: The contents of data specified by Command “01” of Condition No. “008” of the specified device No. 01 are saved for one condition.

Host side

#	ID1	ID2	W	SH1	SH2	SH3	S	CC1	CC2	:	Data	CR	LF
	0	1		0	0	8		0	1	:			

This product

	0 1 0 0 8 0 1 :											
!	ID1	ID2	SH1	SH2	SH3	S	CC1	CC2	:	Data	CR	LF

The data for one condition is divided by “,”.

1) Condition No. for SH1, SH2 and SH3
   Fixed 3 digits (SH1 = Hundredth digit, SH2 = Tenth digit, SH1 = Unit digit)
   However, Condition 000 is used fixedly for Command 06.
2) Command No. for CC1 and CC2
   Fixed 2 digits (CC1 = Tenth digit, CC2 = Unit digit)
3) For the data order for each screen No., refer to “7. (5) Data Code Table.”
4) For confirmation, the saved data is sent back as check data. If data exceeding the range is saved, the data precedent to writing is sent back as it is.
5) At a data write operation, the touch panel display is updated.
6) After that, it takes about 1 second max. to save data into the internal memory. Be careful about the above when save operations are performed continuously.

(5) Data Code Table

① Command 01 (condition data) Data for each condition No. (Condition No.: 001 ~ 127)

Item	Contents	Character string	Range
1	Torch No.	nn,	01: TORCH 1 02: TORCH 2
2	Condition setting mode	nn,	01: FULL setting mode 02: SIMPLE setting mode
3	Initial current value (*1)	nn.nn,	05.00 ~ 09.99 (A) (in units of 0.01 A) 10.00 ~ 50.00 (A) (in units of 0.10 A) *1: Range for initial current value and WELD1 up-slope initial current 01.00 ~ 09.99 (A) (in units of 0.01 A)
4	WELD1 up-slope initial current (*1)		
5	WELD1 up-slope final current		
6	WELD1 main welding current		
7	WELD1 down-slope initial current		
8	WELD1 down-slope final current		
9	Cooling in-process current value		
10	WELD2 up-slope initial current		
11	WELD2 up-slope final current		
12	WELD2 main welding current		
13	WELD2 down-slope initial current		
14	WELD2 down-slope final current		
15	Pre-flow time	nnnn,	0000 ~ 9999 (ms)
16	Initial current time	nnn,	000 ~ 999 (ms)
17	WELD1 up-slope time	nnn.n,	000.0 ~ 099.9 (ms) (in units of 0.1 ms) 100.0 ~ 999.0 (ms) (in unit of 1 ms)
18	WELD1 main welding time		
19	WELD1 down-slope time		
20	Cooling time	nnnn,	0000 ~ 1000 (ms)
21	WELD2 up-slope time	nnn.n,	000.0 ~ 099.9 (ms) (in units of 0.1 ms) 100.0 ~ 999.0 (ms) (in unit of 1 ms)
22	WELD2 main welding time		
23	WELD2 down-slope time		
24	After-flow time	nnnn,	0000 ~ 9999 (ms)
25	WELD1 pulse modulation ON/OFF	n,	0: OFF 1: ON
26	WELD1 modulation frequency	nnnn,	0000 ~ 3000 (Hz)
27	WELD1 modulation duty ratio	nnn,	10 ~ 90 (%)
28	WELD1 slope section modulation ON/OFF	n,	0: OFF 1: ON
29	WELD1 base current value	nn.nn,	01.00 ~ 09.99 (A) (in units of 0.01 A) 10.00 ~ 50.00 (A) (in units of 0.10 A)
30	WELD2 pulse modulation ON/OFF	n,	0: OFF 1: ON

Item	Contents	Character string	Range
31	WELD2 modulation frequency	nnnn,	0000 ~ 3000 (Hz)
32	WELD2 modulation duty ratio	nnn,	10 ~ 90 (%)
33	WELD2 slope section modulation ON/OFF	n,	0: OFF 1: ON
34	WELD2 base current value	nn.nn	05.00 ~ 09.99 (A) (in units of 0.01 A) 10.00 ~ 50.00 (A) (in units of 0.10 A)

② Command 02 (upper/lower limit setting) Data or each condition No. (Condition No.: 001 ~ 127)

Item	Contents	Character string	Range
1	WELD1 current value upper limit	nn.nn,	00.00 ~ 60.00 (A)
2	WELD1 current value lower limit	nn.nn,	
3	WELD1 voltage value upper limit	nn.nn,	00.00 ~ 50.00 (V)
4	WELD1 voltage value lower limit	nn.nn,	
5	WELD1 weld time upper limit	nnnn,	0000 ~ 5000 (ms)
6	WELD1 weld time lower limit	nnnn,	
7	WELD2 current value upper limit	nn.nn,	00.00 ~ 60.00 (A)
8	WELD2 current value lower limit	nn.nn,	
9	WELD2 voltage value upper limit	nn.nn,	00.00 ~ 50.00 (V)
10	WELD2 voltage value lower limit	nn.nn,	
11	WELD2 weld time upper limit	nnnn,	0000 ~ 5000 (ms)
12	WELD2 weld time lower limit	nnnn	

③ Command 3 (monitor item setting) Data for each condition No. (Condition No.: 001 ~ 127)

Item	Contents	Character string	Range
1	Monitor value measuring range	n,	0: WELD1 + WELD2 1: WELD1 only 2: WELD2 only
2	Whether the slope time is included in the monitor	n,	0: Exclude 1: Include
3	Current value upper/lower limit judgment output	n,	0: OFF 1: ON
4	Voltage value upper/lower limit judgment output	n,	0: OFF 1: ON
5	Weld time upper/lower limit judgment output	n,	0: OFF 1: ON
6	Envelope upper/lower limit judgment output	n	0: OFF 1: ON

④ Command 04 (envelope data) Data for each condition No. (Condition No.: 001 ~ 127)

Item	Contents	Character string	Range
1	Reference waveform selection	n,	1: Set value 2: Measured value
2	Envelope WELD1 current value upper limit	nn.nn,	00.00 ~ 60.00 (A)
3	Envelope WELD1 current value lower limit	nn.nn,	
4	Envelope WELD1 voltage value upper limit	nn.nn,	00.00 ~ 50.00 (V)
5	Envelope WELD1 voltage value lower limit	nn.nn,	
6	Envelope WELD2 current value upper limit	nn.nn,	00.00 ~ 60.00 (A)
7	Envelope WELD2 current value lower limit	nn.nn,	
8	Envelope WELD2 voltage value upper limit	nn.nn,	00.00 ~ 50.00 (V)
9	Envelope WELD2 voltage value lower limit	nn.nn	

Remarks

Data of “Env Wave regist” (envelope waveform registration) cannot be written.

⑤ Command 05 (production count data) Data for each condition No. (Condition No.: 001 ~ 127)

Item	Contents	Character string	Range
1	TORCH 1 preset count set value	nnnnnn,	000000 ~ 999999
2	TORCH 1 workpiece count set value	nnnnn,	00000 ~ 60000
3	TORCH 1 WELD count set value	nnn,	000 ~ 255
4	TORCH 2 preset count set value	nnnnnn,	000000 ~ 999999
5	TORCH 2 workpiece count set value	nnnnn,	00000 ~ 60000
6	TORCH 2 WELD count set value	nnn	000 ~ 255

⑥ Command 06 (basic setting data) Common data (Condition No.: fixed to 000)

Item	Contents	Character string	Range
1 (*1)	Power supply model	nnnnnnnnn,	MAWA-050A
2 (*1)	CPU software version	Vnn-nnn,	V**-***
3 (*1)	GP panel software version	Vnn-nnn,	V**-***
4 (*1)	Stat mode	n,	1: Touch start 2: High-voltage start
5 (*1)	Device No.	nn,	01 ~ 31
6 (*1)	External communication type	n,	0: OFF (External communication is not performed.) 1: One-way communication 2: Two-way communication
7 (*1)	External communication speed	n,	0: 9600 1: 14400 2: 19200 3: 38400
8 (*1)	Internal resistance	n,	0: OFF 1: ON
9	Language selection	n,	1: Japanese 2: English 3: Korean 4: Chinese (simplified characters) 5: German
10	Panel brightness adjustment	nn,	01 ~ 15 (15 is the brightest.)
11	NG judgment error	n,	0: OFF 1: ON
12	Start parity error ON/OFF	n,	0: OFF 1: ON
13	SCH & Torch select by I/O	n,	0: OFF 1: ON
14	Measurement current select	n,	1: PEAK 2: RMS
15	Measurement voltage select	n,	1: PEAK 2: RMS
16	Enable START Switch	n,	0: OFF 1: ON
17	Internal Gas Flow	n,	0: OFF 1: ON
18	High speed SCH change	n,	0: OFF 1: ON
19	Fine Weld Mode	n,	0: OFF 1: ON
20	Torch driving type	n,	1: MOTOR 2: CYLINDER
21	WELD ON	n,	0: OFF 1: ON
22	GOOD/NG signal output time	nnn,	001 ~ 200 (ms)
23	END signal output time	nnn,	001 ~ 200 (ms)
24	START signal input decision delay time	nnn,	001 ~ 200 (ms)
25	SCH changeover delay time	nnn,	001 ~ 200 (ms)
26	TORCH changeover delay time	nnn,	001 ~ 200 (ms)
27	H-END	nnn,	001 ~ 200 (ms)

Item	Contents	Character string	Range
28	H-RESET	nnn,	001 ~ 200 (ms)
29	H-HEAD UP	nnn,	001 ~ 200 (ms)
30	User input terminal 1	nn,	00: No input setting 01: GAS FLOW 02: H-ORG 03: H-HEAD UP
31	User input terminal 2	nn,	
32	User output terminal 1	nn,	00: No output setting 01: GOOD 02: NG 03: END 04: ERROR 05: READY 06: LOST 07: WEL1 LOWER CURRENT 08: WEL1 UPPER CURRENT 09: WEL1 LOWER VOLTAGE 10: WEL1 UPPER VOLTAGE 11: WEL1 LOWER TIME 12: WEL1 UPPER TIME 13: WEL1 LOWER ENVELOPE CUR 14: WEL1 UPPER ENVELOPE CUR 15: WEL1 LOWER ENVELOPE VLT 16: WEL1 UPPER ENVELOPE VLT 17: WEL2 LOWER CURRENT 18: WEL2 UPPER CURRENT 19: WEL2 LOWER VOLTAGE 20: WEL2 UPPER VOLTAGE 21: WEL2 LOWER TIME 22: WEL2 UPPER TIME 23: WEL2 LOWER ENVELOPE CUR 24: WEL2 UPPER ENVELOPE CUR 25: WEL2 LOWER ENVELOPE VLT 26: WEL2 UPPER ENVELOPE VLT 27: SYNC.OUT 28: WIRE START 29: H-READY 30: H-ST1 31: H-ST2 32: H-ERROR 33: H-HEAD UP 34: H-MODE 35: MID POINT
33	User output terminal 2	nn,	
34	User output terminal 3	nn,	
35	User output terminal 4	nn,	
36	User output terminal 5	nn,	
37	User output terminal 6	nn,	
38	User output terminal 7	nn	

*1: When writing data, do not input write inhibit items No. 1 to 8 and input data from item No. 9 (language selection).

Ex.) Example data writing of command 06

#01W001S06:1,07,0,0,0,2,2,1,1,0,0,2,1,020,020,020,020,020,200,200,020,00,00,29,00,00,00,00,00,00[CR][LF]

↑

Item No. 9 (language selection)

⑦ Command 07 (error data) Common data (Condition No.: 000)

- Error data check (data reading only: MAWA-050A → Host computer)

Item	Contents	Character string	Range
1	Error code 1	nnn,	E01 ~ E28
2	Error code 2	nn,	01 ~ 28
3	Error code 3	nn,	01 ~ 28
4	Error code 4	nn,	01 ~ 28
5	Error code 5	nn,	01 ~ 28
6	Error code 6	nn,	01 ~ 28
7	Error code 7	nn,	01 ~ 28
8	Error code 8	nn	01 ~ 28

Up to 8 error codes can be used. When the number of errors is 1, items 2 ~ 8 will be omitted.
For error codes, refer to “8. (2) Error Messages.”

- Error reset (data writing only)

Item	Contents	Character string	Range
1	Error reset	nnn	E00

As reply data, “00” (the status of no error data) is sent back.

⑧ Command 10 (welding result) Common data (Condition No.: 000)

- Welding result check (data reading only: MAWA-050A → Host computer)
  Welding result data by the latest welding conditions is read.

Item	Contents	Character string	Range
1	Torch No.	nn,	01 ~ 02
2	Welding result	nn,	01: GOOD 02: NG 03: LOST
3	WELD1 current	nn.nn,	00.00 ~ 99.00 (A)
4	WELD1 voltage	nn.nn,	00.00 ~ 99.99 (V)
5	WELD1 time	nnnn.n,	0000.0 ~ 9999.0 (ms)
6	WELD2 current	nn.nn,	00.00 ~ 99.00 (A)
7	WELD2 voltage	nn.nn,	00.00 ~ 99.99 (V)
8	WELD2 time	nnnn.n,	0000.0 ~ 9999.0 (ms)
9	ALL COUNT	nnnnnn,	000000 ~ 999999
10	TORCH 1 preset count	nnnnnn,	000000 ~ 999999
11	TORCH 1 workpiece count	nnnnn,	00000 ~ 60000
12	TORCH 1 weld count	nnn,	000 ~ 255
13	TORCH 2 preset count	nnnnnn,	000000 ~ 999999
14	TORCH 2 workpiece count	nnnnn,	00000 ~ 60000
15	TORCH 2 weld count	nnn	000 ~ 255

⑨ Command 11 (current waveform data check) Common data (Condition No.: 000)

- Resistance welding current waveform check (data reading only: MAWA-050A → Host computer) Up to 202 points of current waveform data are transmitted with line feeds. (Line feeds are not inserted after Interval of acquisition and Number of monitor display waveform data.)

Item	Contents	Character string	Range
1	Interval of acquisition	nnnn,	0000 ~ 1350
2	Number of monitor display waveform data	nnn,	000 ~ 202
3	Current waveform data point 1	nn.nn	00.00 ~ 50.00 (A)
			
204	Current waveform data point 202 (Max.)	nn.nn	00.00 ~ 50.00 (A)

Caution

Since the weld time varies according to the head moving time even under the same welding conditions in the auto mode (including the fine weld mode), Interval of acquisition and Number of waveform data also vary.

⑩ Command 12 (voltage waveform data check) Common data (Condition No.: 000)

- Resistance welding voltage waveform check (data reading only: MAWA-050A → Host computer) Up to 202 points of voltage waveform data are transmitted with line feeds. (Line feeds are not inserted after Interval of acquisition and Number of monitor display waveform data.)

Item	Contents	Character string	Range
1	Interval of acquisition	nnnn,	0000 ~ 1350
2	Number of monitor display waveform data	nnn,	000 ~ 202
3	Voltage waveform data point 1	nn.nn	00.00 ~ 50.00 (V)
			
204	Voltage waveform data point 202 (Max.)	nn.nn	00.00 ~ 50.00 (V)

Caution

Since the weld time varies according to the head moving time even under the same welding conditions in the auto mode (including the fine weld mode), Interval of acquisition and Number of waveform data also vary.

⑪ Command 13 (current waveform data acquisition) Common data (Condition No.: 000)

- Resistance welding current check (data reading only: MAWA-050A → Host computer)
  Up to 6002 points of current waveform data are transmitted with line feeds. (Line feeds are not inserted after Interval of acquisition and Number of waveform data.)

Item	Contents	Character string	Range
1	Interval of acquisition	nn,	00 ~ 45
2	Number of waveform data	nnnn,	0000 ~ 6002
3	Current waveform data point 1	nn.nn	00.00 ~ 99.99 (A)
	↓		
6004	Current waveform data point 6002 (Max.)	nn.nn	00.00 ~ 99.99 (A)

Remarks

The picked up at a certain interval (Item 1: at intervals of acquisition) for a waveform display of the obtained monitor data of current is transmitted by commands 13.

Data points are created by individually obtaining current monitor values of WELD1/WELD2 at intervals of 22.22 μs. Since the number of decimal places indivisible by 22.22 μs is rounded off, the total number of data points may be different depending on the set time of WELD1/WELD2.

Caution

Since the weld time varies according to the head moving time even under the same welding conditions in the auto mode (including the fine weld mode), Interval of acquisition and Number of waveform data also vary.

⑫ Command 14 (voltage waveform data acquisition) Common data (Condition No.: 000)

- Resistance welding voltage check (data reading only: MAWA-050A → Host computer)
  Up to 6002 points of voltage waveform data are transmitted with line feeds. (Line feeds are not inserted after Interval of acquisition and Number of waveform data.)

Item	Contents	Character string	Range
1	Interval of acquisition	nn,	00 ~ 45
2	Number of waveform data	nnnn,	0000 ~ 6002
3	Voltage waveform data point 1	nn.nn	00.00 ~ 99.99 (V)
	↓		
6004	Voltage waveform data point 6002 (Max.)	nn.nn	00.00 ~ 99.99 (V)

Remarks

The picked up at a certain interval (Item 1: at intervals of acquisition) for a waveform display of the obtained monitor data of voltage is transmitted by commands 14.

Data points are created by individually obtaining voltage monitor values of WELD1/WELD2 at intervals of 22.22 μs. Since the number of decimal places indivisible by 22.22 μs is rounded off, the

total number of data points may be different depending on the set time of WELD1/WELD2.

Caution

Since the weld time varies according to the head moving time even under the same welding conditions in the auto mode (including the fine weld mode), Interval of acquisition and Number of waveform data also vary.

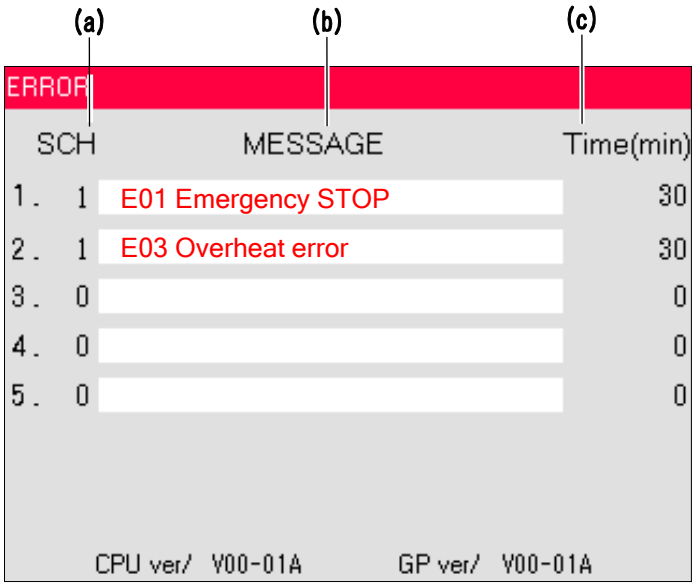
8. Troubleshooting

(1) Error Screen

When an error occurs in the welding power supply, the Error screen will be displayed on the touch panel display. The error code, error message, condition No. at occurrence of the error, and error occurrence time after turning on the welding power supply are displayed.

After removing the cause of the error, press the “RESET” button on the front panel or enter the “RESET” signal. Then, a recovery can be made from the error status. If the cause of the error is not removed, the Error screen will be displayed again.

If an error display is disabled because communication with the touch panel display cannot be performed, the buzzer of the welding power supply sounds continuously. Turn on the power supply again.



(a) SCH
The condition No. selected at occurrence of an error is displayed.

(b) MESSAGE
The error code of the current error and an error message are displayed in red characters.

(c) Time (min)
The minutes elapsed after the power supply of the welding power supply is turned on at occurrence of an error are displayed.

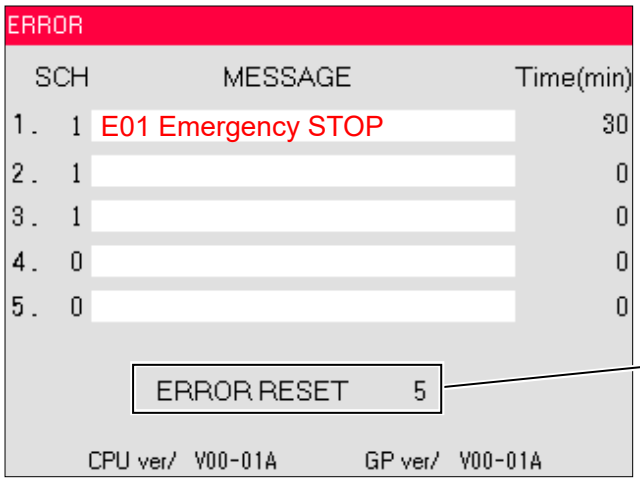
(2) Error Messages

Error code	Error message	Cause	Time of detection	Corrective measure
E01	Emergency STOP	The emergency stop signal was input.	At all times	Check the emergency stop input. * The emergency stop error will be cleared in 6 seconds after pressing the RESET button after an emergency stop contact short-circuit. The Error screen is displayed continuously for 6 seconds. (*1)
E03	Overheat error	The inside of the welding power supply was overheated.	At all times	Check the installation state and the ambient temperature. Reduce the duty cycle for operation. * The error cannot be cleared until the internal thermostat is restored.
E04	Over current error	The primary-side overcurrent is detected.	During welding	If the status cannot be improved even after resetting or turning on the power supply again, make contact with us.
E05	Weld error	The setting of “NG judgment error” is “ON” and the upper/lower limit setting of each monitor was out of the range.	Immediately after welding	Check the welding material, equipment status, each condition, etc. When “WELD” the on the Monitor screen is ON or the WELD ON signal of I/O is OFF, the welding output is not performed.
E06	End of counter reached	“ALL COUNT” reached the count of “PRE COUNT.”	Immediately after welding	Reset “ALL COUNT” to zero or set “PRE COUNT” again.
E07	Start signal already on	The power supply was turned on while the START signal was input.	At power ON	Check the START signal connection.
E08	Flashdrive error	Since the power is turned on during the data transfer from the panel unit to the control board, an error occurred in the memory data.	At all times	When the memory error occurs, the setting is initialized to the factory setting. If the status cannot be improved, there is a possibility that a component may be faulty. Make contact with us.
E09	Start parity error	The total of closed condition selection signal lines and PARITY signal lines was not an odd number.	Before welding	Set “Start parity error ON/OFF” to “OFF” or set the total of closed wires to an odd number.

Error code	Error message	Cause	Time of detection	Corrective measure
E10	LOST error	The arc discharge was not performed or the weld time is over 5 ms shorter than the total setting time of welding conditions.	At a start of welding	Perform maintenance and adjustment referring to “8. (4) Check Items when LOST Error Has Occurred.” * This is displayed when “E05 Weld error” occurs.
E11	Weld parameter error	The welding conditions were set out of the specified setting range.	At all times	Set the welding conditions again within the setting range. (Refer to *1, 2, 4, and 5 in “4. (9) Welding Condition Setting Screen.”)
E12	CPU error	The welding power supply was faulty.	At all times	If this error occurs after a restart, repairing is required. Make contact with us.
E13	Current limit error	The current monitor value was out of the set allowable range.	Immediately after welding	Execute maintenance for the electrode and workpieces. * This is displayed when “E05 Weld error” occurs.
E14	Voltage limit error	The voltage monitor value was out of the set allowable range.	Immediately after welding	Execute maintenance for the electrode and workpieces. * This is displayed when “E05 Weld error” occurs.
E15	Time limit error	The time monitor value was out of the set allowable range.	Immediately after welding	Execute maintenance for the electrode and workpieces. * This is displayed when “E05 Weld error” occurs.
E16	GP communi-cation error	An error occurred in the communication between the panel unit and the main unit.	At all times	Check the connection cable when extending the panel unit. If the error cannot be cleared, there is a possibility of any component failure. Make contact with us.
E17	Start1 - time limit exceeded	The H-ST2 signal (main welding start) is turned on simultaneously or before the H-ST1 signal (initial current start).	At a start of welding	Turn on the H-ST1 signal before the H-ST2 signal.
E18	Start2 - time limit exceeded	Initial current time: 1 to 999 ms The H-ST2 signal (main welding start) is not turned on within the initial current time after the H-ST1 signal (initial current start) is turned on. Initial current time: 0 ms The H-ST2 signal (main welding start) is not turned on within 500 ms after the H-ST1 signal (initial current start) is turned on.	At a start of welding	Turn on the H-ST2 signal within the initial current time after the H-ST1 signal is turned on. Turn on the H-ST2 signal within 500 ms after the H-ST1 signal is turned on.
E19	Torch1 - end of counter reached	“TOTAL COUNT” reached the count of “PRESET.”	At an operation before welding	Reset “TOTAL COUNT” to zero or set “PRESET” again.

Error code	Error message	Cause	Time of detection	Corrective measure
E20	Torch2 - end of counter reached	“TOTAL COUNT” reached the count of “PRESET.”	At an operation before welding	Reset “TOTAL COUNT” to zero or set “PRESET” again.
E21	EXT COMM error	Something in the external communication data is incorrect and the communication process was terminated abnormally.	At all times	Make a connection check or review the communication setting and the setting range of the welding conditions.
E22	FeRAM error	The data reading/writing from FeRAM was not terminated normally.	At all times	If this error occurs after a restart, repairing is required. Make contact with us.
E23	E-Stop not reset	An error occurred in the internal circuit.	At all times	Check whether the “Emergency stop” button is kept in a pushed status. If the status cannot be improved, there is a possibility of any component failure. Make contact with us.
E24	Charge time error	The charging time setting was faulty.	At an operation before welding	If this error occurs after a restart, repairing is required. Make contact with us.
E25	Gas flow error	When setting the user input terminals IN1 and IN2 to GAS FLOW, the input is turned to OFF.	At a start of welding	Check the connection and setting of flow sensor and the residual quantity of gas.
E26	Watchdog error	An error occurred in the microcomputer of the main unit.	At all times	If this error occurs after a restart, repairing is required. Make contact with us.
E28	Torch head error	The H-ERROR signal (motor controller error) was input.	At all times	Check the H-ERROR signal of optional I/O. Check whether an error occurs in the torch head.

*1 It takes 6 seconds to make a recovery from the emergency stop status. The time up to the recovery is displayed on the Error screen.



(3) Error other than Above

If the buzzer of the main unit sounds intermittently as “bleep, bleep, bleep”, make contact with us.

(4) Check Items when LOST Error Has Occurred

When an arc discharge (*1) does not occur at the time of welding start or welding modulation, etc. and a welding is not performed as preset, it is called LOST (= misfire).

When LOST has occurred, check the following items:

① Ground connection of workpiece

Confirm that the welding workpiece and the grounding terminal of the welding power supply is surely connected. When a ground connection is poor, LOST occurs.

[Reference case]

When a ground connection was performed by clamping the welding workpiece, the contact failure caused by contamination on the contact surface of workpiece and clamp occurred and the LOST error frequently occurred.

By removing contamination on the contact surface of clamp as a measure, the occurrence of the LOST error was improved.

② Flow rate setting of argon gas

When the welding current value of welding condition settings is set to approx. 15 A or lower and the flow rate of argon gas is high, LOST occurs.

[Reference case]

When 5 A of initial current value, 10 A of pulse current value and 5 L/min of argon gas flow rate were set, the LOST error frequently occurred when the electrode was detached from the workpiece at the time of initial current or at the time of occurrence of the creeping-up (*2).

By changing the flow rate of argon gas to approx. 0.5 to 1.0 L/min according to the welding current value as a measure, the occurrence of the LOST error was improved.

③ Consumption and contamination of electrode tip

When argon gas is not supplied at welding, the consumption of electrode tip becomes large and the electrode tip is coated with oxide and insulated, and therefore LOST occurs.

[Reference case]

When a welding was performed without supplying argon gas, the consumption of electrode tip became large and the electrode tip was coated blackly with oxide and insulated, and therefore the touch start function became disabled and the LOST error frequently occurred.

By supplying argon gas according to the welding condition as a measure, the occurrence of the LOST error was improved.

*1: “Arc discharge” is a kind of plasma and a discharging style sustained by thermionic emission of electrons from the high-temperature electrodes. Since an arc conducts electricity, electricity flows through an arc once an arc is generated. Due to an oxide of electrode or ions and electrons of argon gas surrounding the electrodes by high-temperature heat generation at that time, an arc is generated and an arc discharge is put in a stable state.

*2: “Creeping-up” means that the position of arc discharge moves from the electrode tip to the side

surface of electrode where an oxide exists, an arc discharge is performed with the creeping-up, and current and voltage are put are an unstable state.
When the welding current value is 15 A or less and the flow rate of argon gas is high, the temperature of electrode is low and the ionization of argon gas surrounding the electrodes does not proceed. Therefore, an arc discharge is performed with the creeping-up of an arc on the side surface of electrode where an oxide exists. When an oxide on the electrode surface is used for an arc discharge due to the creeping-up and removed from the surface of electrode, LOST occurs. By adjusting the flow rate of argon gas less and taking in air surrounding the electrodes as a measure against this, an oxide is produced at the electrode tip. Due to ions and electrons of the oxide, an arc is generated and an arc discharge is put in a stable state.

9. Maintenance

⚠ WARNING

- For maintenance inspection and cleaning, stop the electric supply and turn off the power supply on the factory side except the case where no electric power is required. Put a notice of “Under inspecting operation” for other workers. If the charging part is touched carelessly, this may result in an electric shock.

(1) Pre-Start Inspection

The pre-start inspection will be described below.

Before starting welding daily, execute the following inspection.

(1) -1. Cable inspection

Check whether the following cables are securely connected and are not damaged. If any of them is damaged, replace the damaged cable.

- Torch cable
- Grounding cable
- Input cable
- Other connection cables
  - Input/output signal cable
  - Data communication cable

(1) -2. Torch inspection

Check the end of the torch for abrasion. If it is worn away, polish it.

If the end of the torch is dirty, clean it.

(1) -3. Argon gas inspection

Tube inspection

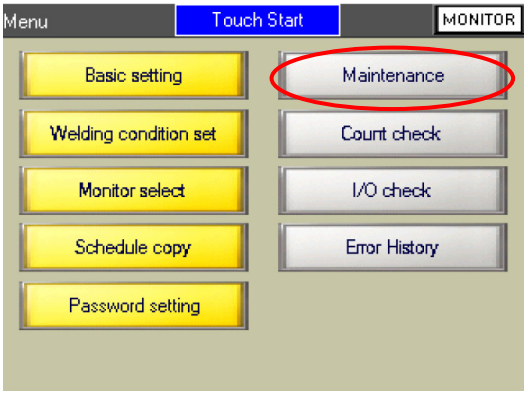
Make sure that the argon gas tube is securely connected without causing any gas leakage. Check whether the tube is not damaged. If the tube is damaged, replace it.

Flow rate inspection

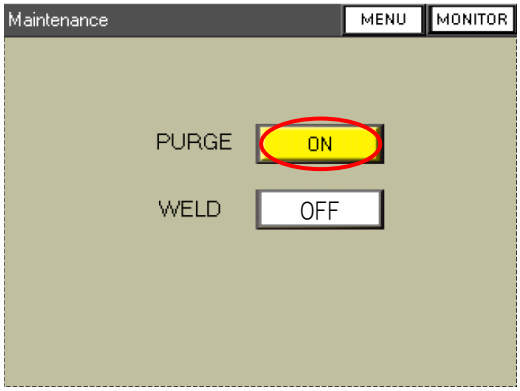
Check whether the argon gas flow rate is 0.5 L/min or more. For this flow rate check, cause argon gas to flow manually according to the following procedure.

1. When the Monitor screen is displayed on the touch panel display after the power supply is turned on, press MENU in the upper right part of the screen.
   The Menu screen will be displayed.

2. Press “Maintenance” on the Menu screen. The Maintenance screen is displayed.



3. Press “PURGE OFF” on the Maintenance screen.
“PURGE ON” is displayed and argon gas flows for about 15 seconds. After the argon gas flow is stopped, “PURGE OFF” is automatically displayed again.



If the flow rate is insufficient, check the argon gas pressure and the residual quantity.

(2) Periodic Maintenance

(2) -1. Monthly maintenance

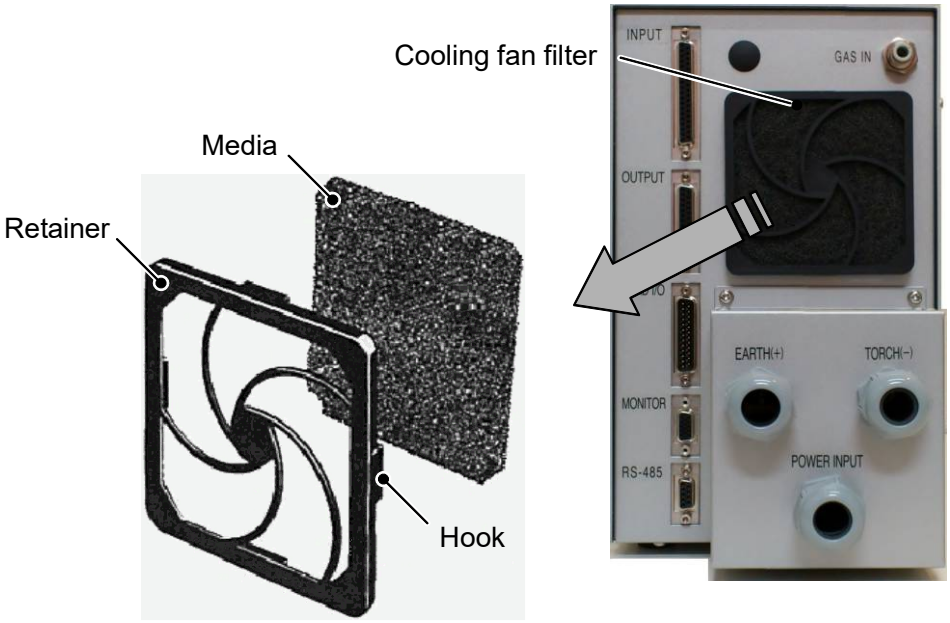
(2) -1-1. Cleaning the cooling fan filter

IMPORTANT
● When the filter used in the cooling fan of the rear panel is dirty, the air flow will be deteriorated and the internal temperature of the welding power supply will go up, thereby causing a failure.

How to clean the cooling fan filter will be described below.

Check the cooling fan filter for dirt once a month. If the cooling fan filter is dirty, clean it according to the following procedure.

1. Remove the hooks (at 4 positions) of the retainer and then remove the retainer and media from the cooling fan filter of the rear panel.



2. Wash the media with a liquid diluted with a neutral cleaner.

3. After drying the media completely, install the media and retainer.

Replacing the media

If the media of the cooling fan filter is very dirty, replace the media.

Replacement media	
Manufacturer	OMRON Corporation
Product name	Media
Model	R87F-FL90-M90 (1 set: 5-media set)