WELTOUCH®

CY-210E

OPERATION MANUAL

AMADA®

OM1211277
CY-210E-E01-202306

Preface

Thank you for purchasing our product.

We have developed a low-priced constant-current resistance control featuring the powerful functions essential in our advanced technological age.

The 3-stage power-on function and upslope and downslope functions will be particularly helpful in various manufacturing fields.

- This operation manual describes the proper method of operation, as well as precautions for its use. If you have any questions concerning operation of the controller, read this operation manual.
- Read this operation manual carefully to ensure the proper use of all functions. Keep this operation manual in a safe place for future reference.
- After unpacking the weld control, first confirm that it is not broken and that all accessories are included. If any portion is broken or an accessory is missing, immediately notify your distributor or our sales representative.

Notice

(1) This manual may not be copied, in whole or in part, without our permission.
(2) The contents of this manual are subject to change without notice.
(3) If you have any questions concerning the contents of this manual or find any errors or omissions in it, please notify us.
(4) We will not be liable for problems caused by improper use of this product.

Contents

1. Special Notes

(1) Safety Precautions

Prior to use, read these "Safety Precautions" carefully to gain a full understanding of the proper method of use.

- **The precautions listed here are designed to ensure safe use and proactively prevent risks and damage to the user and other people.**
  All precautions are critical for safety.
  Please read them all.
- **The hazard signs have the following meanings:**

⚠ DANGER

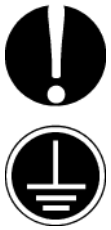
Indicates a **high risk of death** or serious injury if **precautions** are not correctly observed.

⚠ WARNING

Indicates a **risk of death** or serious injury if **precautions** are not correctly observed.

⚠ CAUTION

Indicates a **risk of physical** injury or damage to product if **precautions** are not correctly observed.

	**These symbols indicate "prohibition." They are warnings concerning actions out of the scope of the warranty of the product.**
	**These symbols indicate actions that operators must take.**
	**Each symbol with a triangle indicates a DANGER, WARNING, or CAUTION to the operator.**

⚠ DANGER

Do not touch the inside of the Controller unnecessarily.

Burns or electric shock may result. Do not touch the inside of the Controller other than for maintenance as described in the operation manual.
In the event of a problem, contact our serviceperson for internal inspection and repair.

Never disassemble, repair or modify the Controller.

These actions can cause electric shock and fire. Do not do anything other than the maintenance described in the operation manual.

Never burn, destroy, cut, crush or chemically decompose the Controller.

This product incorporates parts containing gallium arsenide (GaAs).

⚠ WARNING

Do not insert your fingers or hands between the electrodes.

When welding, keep your fingers and hands away from the electrodes.

Do not touch any welded part or electrode during welding or just after completion of welding.

The welded parts of a workpiece, electrodes, and the arm are very hot. Do not touch them; burns may result.

Ground the Controller.

If the Controller is not grounded, electric shock may result.

Do not expose to water or other liquid.

Exposing electrical components to water or other liquid may result in electric shock or short-circuiting.

Apply the specified supply voltage.

Application of a voltage outside the specified range may result in fire or electric shock.

Use only the specified cables.

Use of a cable of insufficient capacity may result in fire.

Do not damage the power cable or connecting cables.

Do not walk on, twist, or pull on any cable. The power cable and connecting cables may be broken, and that can cause electric shock and fire.

Do not use a damaged power cable, connecting cable or plug.

A damaged cable or a plug can cause electric shock, short circuits and fire. If any part needs to be repaired or replaced, consult us or your distributor.

Stop the operation if any trouble occurs.

Continuous operation after occurrence of a trouble such as burning smell, abnormal sound, abnormal heat, smoke, etc. can cause electric shock and fire. If such a trouble occurs, immediately consult us or your distributor.

Persons with pacemakers must stay clear of the welding machine.

A person who uses a pacemaker must not approach the welding machine or walk around the welding shop while the welding machine is in operation, without being permitted by his/her doctor. The welding machine generates a magnetic field and has effects on the operation of the pacemaker while it is turned on.

Protective gear must be worn.

Put on protective gear such as protective gloves, long-sleeve jacket, leather apron, etc. Spatters can burn the skin if they touch the skin.

Wear protective glasses.

If you look at the flash directly during welding, your eyes may be damaged. If any spatter gets in your eye, you may lose your eyesight.

⚠ CAUTION

Always use a terminal cover.

Touching the terminal block directly may result in electric shock. Be sure to fit the block with a cover.

Connect the cables securely.

Improper connection of a cable may result in fire or electric shock.

Use proper tools (wire strippers, pressure wire connectors, etc.) for terminal treatment of the connecting cables.

Do not cut the wire conductor; fire or electric shock may result.

Install the Controller on a firm and level surface.

If the Controller falls or drops, injury may result.

Do not place any container of water or other liquid on the Controller.

If water or other liquid spills, insulation will deteriorate, which may result in electrical leakage and/or fire.

Keep combustible matter away from the Controller.

Spatter may ignite combustible matter. If it is impossible to remove all combustible matter, cover it with non-combustible material.

Do not cover the Controller with a blanket, cloth, etc.

Do not cover the Controller with a blanket, cloth, etc. while it is in use. The cover may be overheated and burned.

Do not use this Controller for any purpose other than welding.

Use of this Controller in a manner other than specified can cause electric shock and fire.

Use ear protectors.

Loud noises can damage hearing.

Keep a fire extinguisher nearby.

Keep a fire extinguisher in the welding shop in case of fire.

Maintain and inspect the Controller periodically.

Maintain and inspect the Controller periodically, and repair any damage nearby before starting operation.

(2) Precautions for Handling

Install the Controller securely on a firm and level surface, to ensure that it will not fall.

Do not install the Controller in the following locations:
Damp areas (where the humidity is above 90%), areas where chemicals are handled, dusty areas, areas near a high noise source, areas where water may condense, areas exposed to large amounts of vibration or shock, and areas where temperatures are above 45°C or below 0°C

Clean the exterior of the Controller using a soft, dry cloth or one slightly dampened with water. If the Controller is very dirty, use diluted neutral detergent or alcohol. Do not use paint thinner, benzine, etc., as they may discolor or deform the Controller.

Do not insert a screw, coin, etc. into the Controller, as they may cause a malfunction.

Operate the Controller in accordance with the method described in this operation manual.

Press switches/buttons carefully by hand. Handling them roughly (using a screwdriver or the tip of pen) may result in a malfunction or failure.

Press switches/buttons one at a time. Pressing more than one switch/button at a time may result in a malfunction or failure.

(3) 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.

2. Features

This product is a constant/alternating-current resistance weld control with a 15-schedule setting function.
It is controlled by a microcomputer, allowing it to be applied to all types of welding. Due to the plating-layer treatment by the pre-stage current, heat treatment by the post-stage current, etc., splashing is prevented, the welding tip is protected from overheating, and an ideal welding current can be set.
In addition, this product can be applied to all types of spot-welding machines by selecting the secondary- or primary-current feedback constant-current control and source-voltage fluctuation compensation method. The required items can be set very simply and easily.
This product has a wide range of features, as explained below.

1) Indicates the welding current, schedule set No., set time, etc. with an LED

2) Stores up to 15 schedules according to the materials and thicknesses of the workpieces to be welded

3) Equipped with the 3-stage power-on system, and upslope and downslope functions

4) Supplies a stable welding current by the primary and secondary constant-current control method and source-voltage fluctuation compensation method

5) Has the welding mode applied to the high-tensile steel plate with a high initial resistance

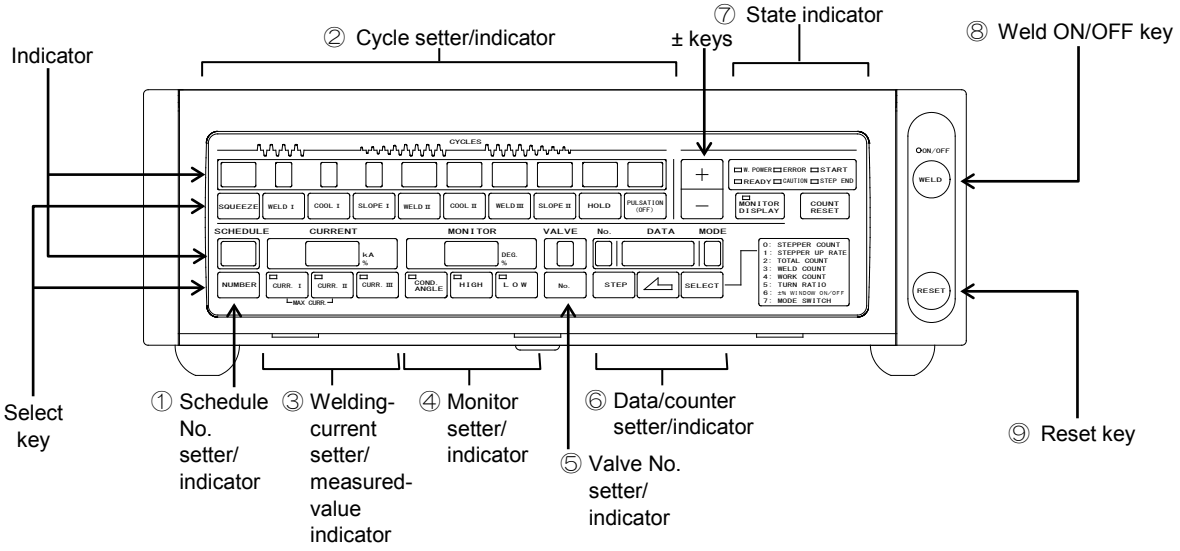
6) Includes functions for monitoring the current and conduction angle

7) Comes with a cover to protect the touch panel from oil mist

8) Has three counters to indicate the quantity of products and other information

3. Name and Function of Each Section

(1) Front Panel



Upper line: Indicator

Lower line: Select key and digit changeover key

① **Schedule No. setter/indicator [SCHEDULE]**
Calls a No. to input a schedule and indicates the schedule No.

② **Cycle setter/indicator [CYCLES]**
Sets and indicates the cycles of the weld sequence (Squeeze, Weld I, Cool I---). Lights up the currently executed item to indicate the state during operation.

③ **Welding-current setter/measured-value indicator [CURRENT]**
Sets the welding current (Weld I, Weld II, Weld III) and indicates the measured current.

④ **Monitor setter/indicator [MONITOR]**
Sets the upper and lower limits of the set current on High and Low to 0-49%, and monitors the current fluctuation.

⑤ **Valve No. setter/indicator [VALVE]**
Selects between two systems for a weld force valve.

⑥ **Data/Counter setter/indicator [MODE]**
Counts the total number of welds, number of welds for a workpiece, and total number of products, and sets and indicates various pieces of data such as the stepper setting of the welding current, error codes, etc.

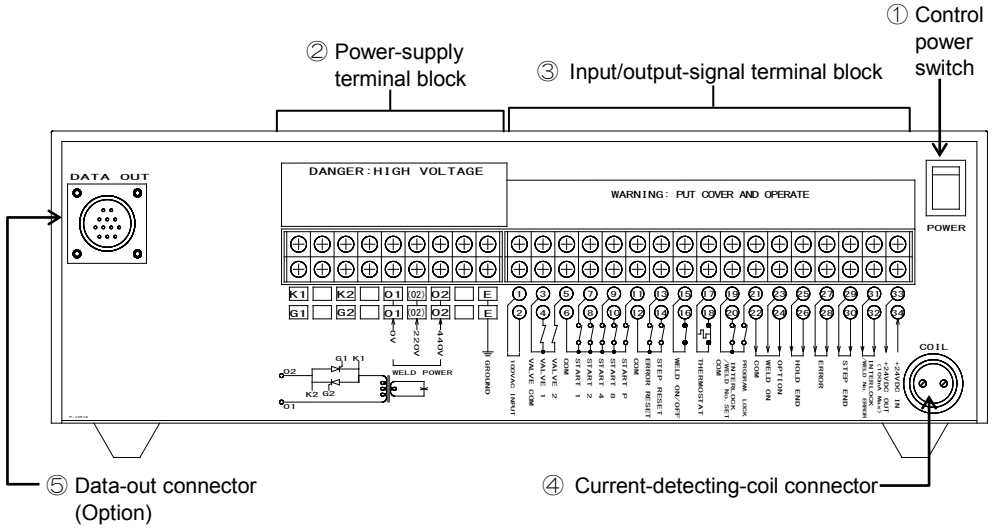
⑦ **State indicator**
Indicates the current state for confirmation.

⑧ **Weld ON/OFF key [WELD]**
Turns welding **on and off**. Each time this key is pressed, welding is turned **on** and **off** alternately. If this key is turned **on**, the **LED** at the upper left comes on; if this key is turned **off**, the LED goes off. Press and hold this key for at least 0.5 seconds to stop welding.
Even if this key is turned **on**, welding does not start if the weld ON/OFF signal [WELD ON/OFF] is turned off.

⑨ **Reset key [RESET]**
Functions as a release key in the event of a problem.

Note: This key cannot reset the counter.

(2) Rear Panel



① **Control power switch [POWER]**
Switch for supplying power to this product.

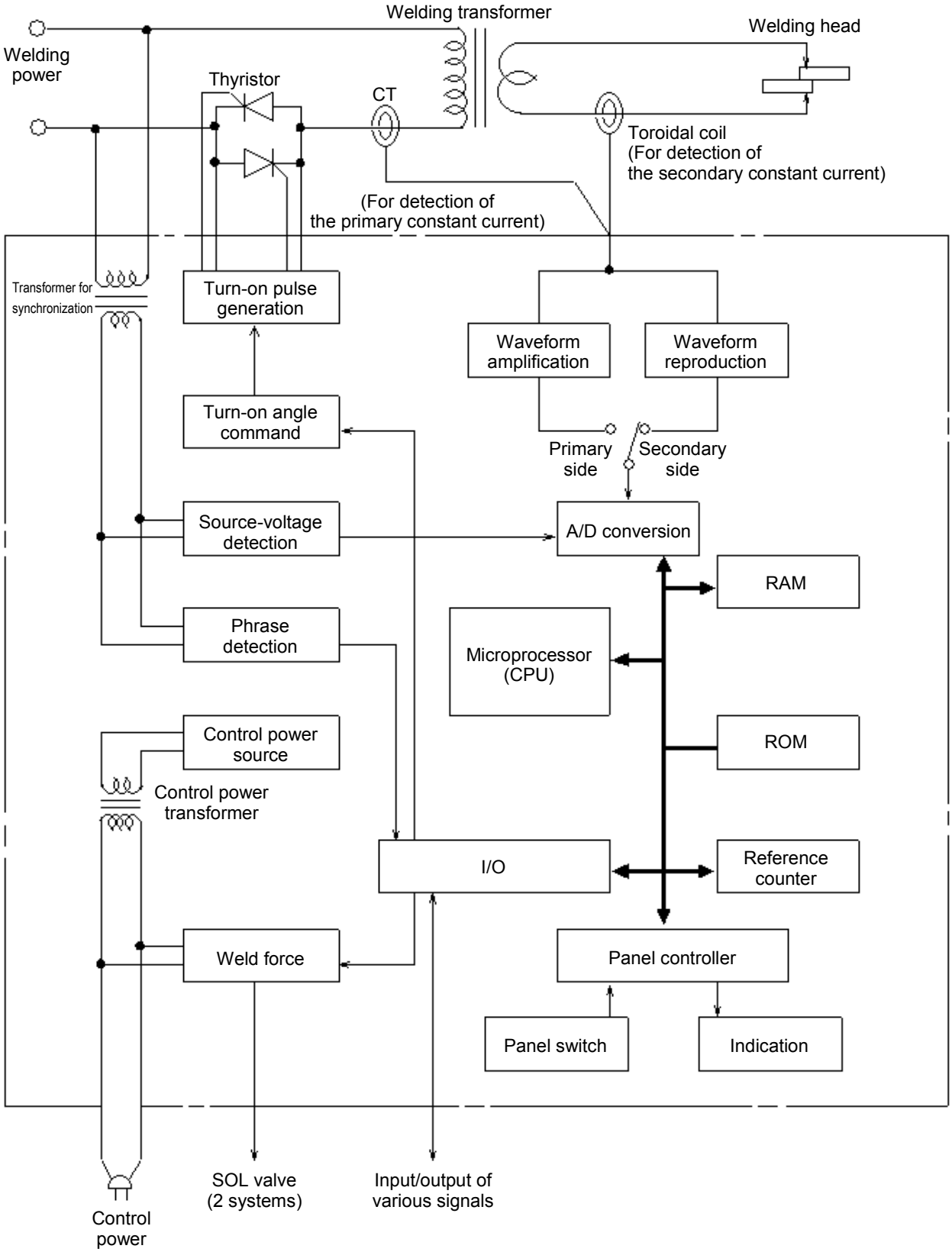
② **Power-supply terminal block**
Terminal block for connecting the power supply and the thyristor contactor. The terminal size is M3.5.

③ **Input/output-signal terminal block**
Terminal block for inputting the start signal and outputting an error signal, etc. The terminal size is M3.5.

④ **Current-detecting-coil connector [COIL]**
Connector for connecting the current-detecting coil (a toroidal coil or CT coil) in order to measure the welding current

⑤ **[DATA OUT] connector** (Option)
Connector for outputting data

(3) Internal Block Diagram

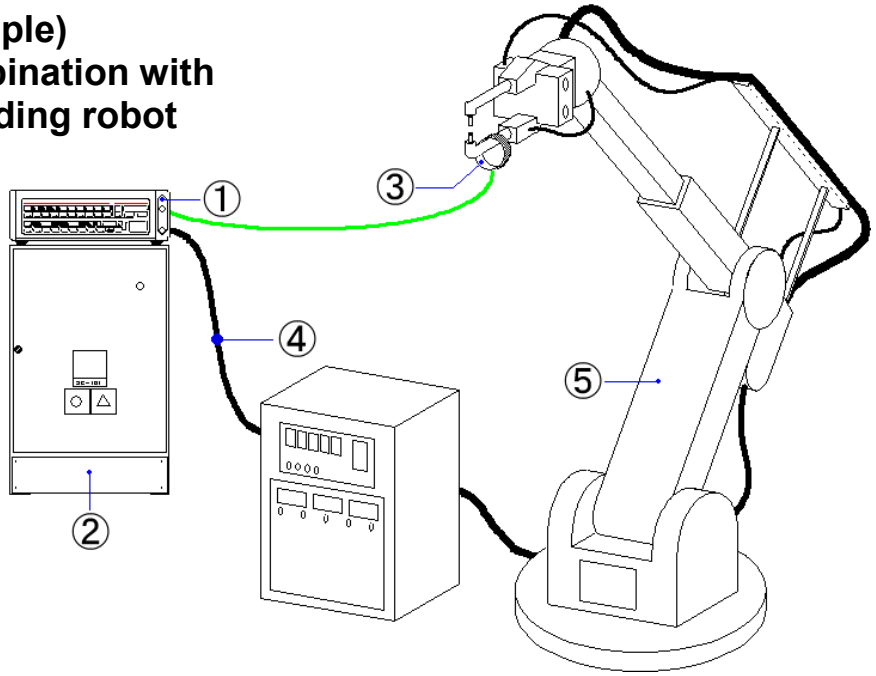


4. Connection

(1) Basic Configuration

1) The general system configuration is as follows:

Example)
Combination with a welding robot



① **CY-210E**

The body of the constant-current resistance welding control. Connect AC power to it.

② **Thyristor contactor** (Option)

Connects a welding power source to this device.

③ **Toroidal coil** (Option)

Installed to the arm of the welding head. This is unnecessary in the primary constant current control.

④ **Connecting cable**

Connects the controller to the welding-robot controller. Please provide separately

⑤ **Welding robot**

An articulated robot. Prepare it separately.

2) Precautions for installation

① Confirm that the control is installed (fixed) securely at the specified locations.

② Confirm the welding power source. The voltages for this device are indicated below the terminal block.

③ Ground the control securely.

(2) Connection of Power Source

1) Connect the power source to the power-supply terminal block mounted on the rear panel.

① Connect the thyristor contactor to the power-supply terminal block on the rear panel of **CY-210E**, as shown below.

② Securely connect each wire. Take care not to confuse the Nos. of the wires.

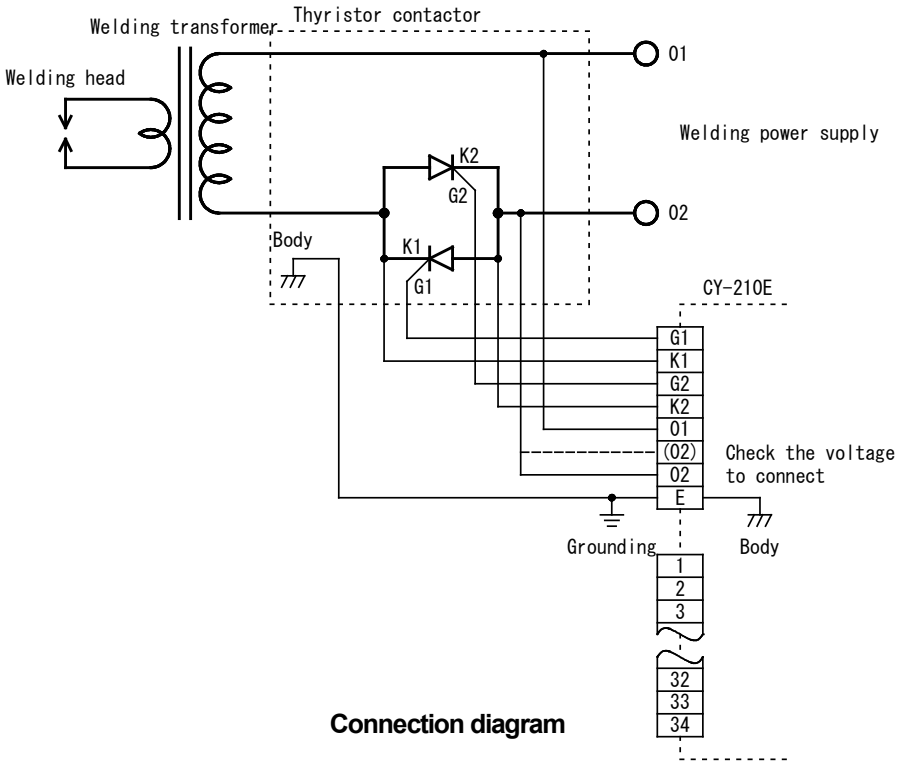
③ Connect 02/(02) to the terminal for the voltage being used.

[Caution]

The connection of 01, (02) or 02 is important for the operation of the thyristor. If it is connected improperly [if 01 and (02) or 02 are connected inversely], the thyristor cannot be conductive. It must therefore be connected properly and securely.
When no power-supply error is detected and the current does not flow even though the power is supplied correctly and **CY-210E** starts normally, make sure that 01 and (02) or 02 are not connected inversely.

④ Be sure to ground the control.
Ground the E terminal (grounding) of **CY-210E** in common with the grounding of the thyristor contactor.

Note: The thyristor contactor, welding transformer, welding head, and connecting cable are optional.



Connection diagram

(3) Installation Method for the Current-Detecting Coil

1) Installation Method for a Toroidal Coil

① Install the toroidal coil to the secondary side of the welding transformer.

If only one welding head is used, install the toroidal coil as shown below:

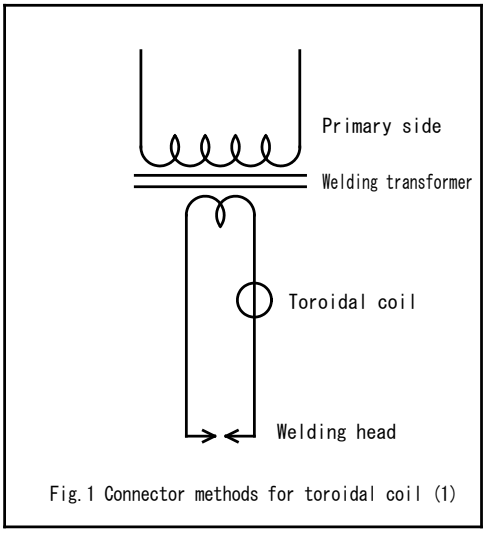


Fig. 1 Connector methods for toroidal coil (1)

If two or more welding heads are used, install the toroidal coil as shown below:

- When only one welding head welds at a time

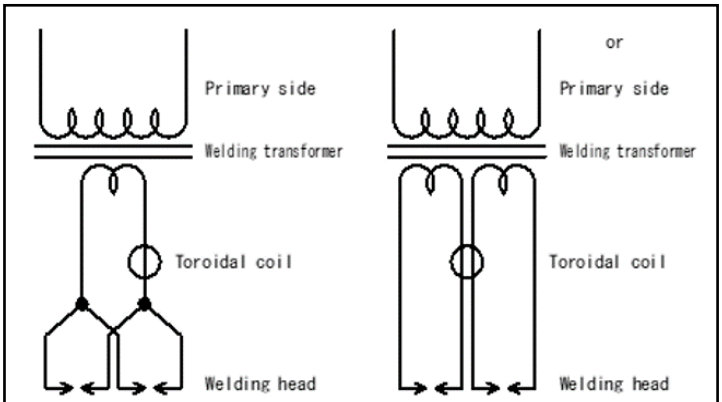


Fig. 2 Connector methods for toroidal coil (2)

- When two or more welding heads weld at a time

  The current of only one circuit is kept constant in this case.

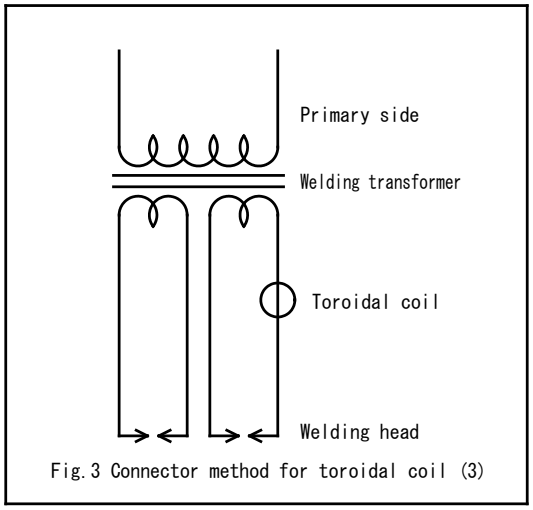


Fig. 3 Connector method for toroidal coil (3)

② Set dip switch DSW1-(2) to the OFF position (see page 4-7).

③ Precautions on installation of the toroidal coil

If the toroidal coil is broken in the constant-current control mode, no power-supply error is detected and the operation stops. A proper installation position must therefore be selected for the toroidal coil so that it will not be broken by the temperature rise of the conductor, mechanism motion, contact with a workpiece, or the like. In addition, secure the toroidal coil to the conductor using a band, etc. If the toroidal coil is wound onto the conductor as shown in Fig. 4-**A**, an error occurs. Accordingly, wind it as shown in Fig. 4-**B**.

Note: No power-supply error is detected in the source-voltage fluctuation compensation control mode.

Note: The thyristor contactor, welding transformer, welding head, and connecting cable are optional.

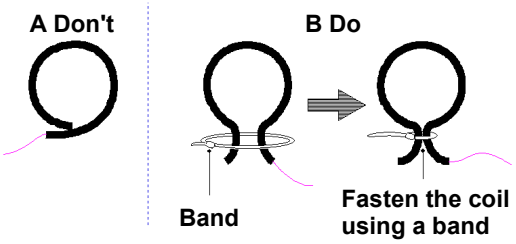


Fig. 4 Making a toroidal-coil loop

④ Checking for breakage and short-circuiting of the toroidal coil

Breakage of and shorts in the toroidal coil can be checked using a tester, as the toroidal coil has the internal resistance shown in Fig. 5.

(Keep in mind that the internal resistance changes depending on the type of toroidal coil.)

Toroidal coil	Internal resistance
MB-400L	35–65Ω
MB-45F	130–165Ω

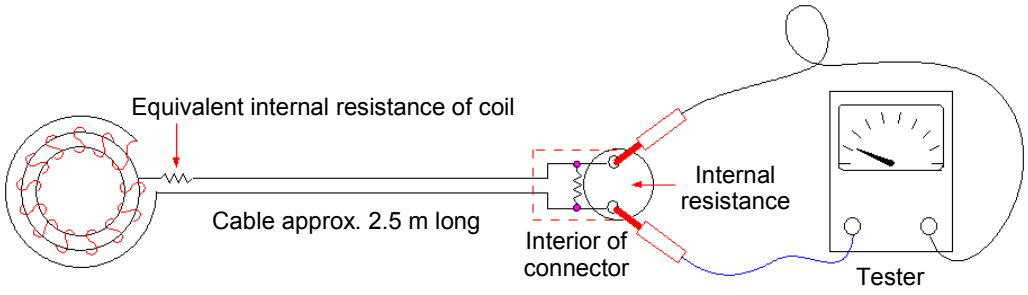


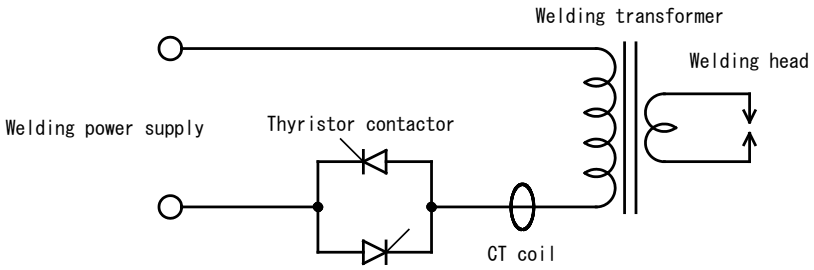
Fig. 5 Internal resistance of toroidal coil

[Caution]

The sensitivity of each toroidal coil is adjusted so that it will detect the current accurately. If the cable is cut halfway and extended, or if the connector is disassembled, the current cannot be kept constant. (When using the toroidal-coil remote, use a special extension cable.)

2) Installation Method for a CT Coil

① Install a CT coil to the primary side of the welding transformer.



② Set dip switch DSW1-(2) to the ON position (see page 4-7).

③ Precautions on use of a CT coil

Use a CT coil with a rated primary current of 600 A and a secondary current of 5 A. Connect a resistor of 0.2 Ω 10 W to its secondary side, then connect both ends to the **CY-210E** using special connector 14-2A (manufactured by KOMINE MUSEN ELECTRIC CORPORATION).

Note: The thyristor contactor, welding transformer, welding head, and connecting cable are optional.

Note: The model number of connector is subject to change without notice. Depending on the part to be changed, the mounting screw shape may change and a necessary tool may be different. For the latest parts information, contact a nearest sales office.

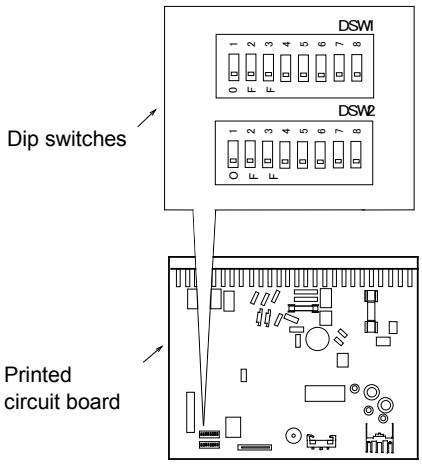
(4) Selecting of Functions

Functions are set using dip switches on the printed-circuit board.

[DANGER! High Voltage]

When removing the cover and setting the dip switches on the board, confirm that the welding power and control power are turned off to ensure safety.

1) Initial setting of dip switches



Factory default setting of dip switches DSW1

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

DSW2

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

(All are set to the OFF position.)

2) Functions set using dip switches

DSW		ON	OFF
DSW1	1	Source-voltage fluctuation compensation control	Constant-current control
	2	Primary-current feedback	Secondary-current feedback
	3	Output of power-on state signal (Flicker)	Output of power-on timing signal
	4	Parity check---ON	Parity check---OFF
	5	Self-holding of start signal at squeeze	Self-holding of start signal at weld start
	6	Re-power-on---ON	Re-power-on---OFF
	7	Output of holding-finish-signal pulse	Output of holding-finish-signal level
	8	When there is a problem with the current monitor, a holding finish signal is not output and welding cannot be started again.	When there is a problem with the current monitor, a holding finish signal is output and welding can be started again.
DSW2	1	Repeating function	Pulsation function
	2	Weld-count monitor function	Interlock function
	3	Start with schedule No. on panel	Start with external schedule No.
	4	4-schedule start	15-schedule start
	5	Output of data	No output of data
	6	1-cycle control	Half-cycle control
	7	Variable constant-current correction value	Fixed constant-current correction value
	8		Kept turned off

3) Explanation of functions of dip switches

① **DSW1-(1)**

- Selects the constant-current control or source-voltage fluctuation compensation control.
  OFF: Constant-current control
  ON: Source-voltage fluctuation compensation control

② **DWS1-(2)**

- In constant-current control mode (DSW1-(1): OFF)
  OFF: Constant-current control method with secondary-current feedback
  ON: Constant-current control method with primary-current feedback
- In source-voltage fluctuation compensation control mode (DSW1-(1): ON)
  OFF: Secondary-current feedback detection mode. By connecting a toroidal coil, the measured value of the welding current can be indicated and full-wave errors can be detected.
  ON: Primary-current feedback detection mode. By connecting a CT coil, the welding current can be measured and full-wave errors can be detected. When using the primary-current feedback detection mode, set the turn ratio of the transformer so that the current can be measured properly (see page 6-11).

③ **DSW1-(3)**

- Select the signal to be output to Pin 23 in the terminal block on the rear panel.
  OFF: Output of power-on timing signal
  ON: Output of flicker
  If this dip switch is set to OFF, the power-on timing signal is output after Weld I starts and continues to be output until Weld III finishes, regardless of the setting of Weld ON/OFF. If this dip switch is set to ON, the flicker signal is output only during power-on in Weld I, Weld II, and Weld III. The power-on timing signal and the flicker signal are output from the power-on signal [WELD ON].

④ **DSW1-(4)**

- Sets the start-signal parity-check function when the controller is started up in 15-schedule mode.
  OFF: Parity check will not be executed.
  ON: Parity check will be executed.
  If this dip switch is set to OFF, the parity check will not be executed. If it is set to ON, the parity check will be executed, and a start-input error signal (Error code [02]) will be output if a parity error is detected. Odd parity is checked. For details, see "(5) Input Method for Start Signals, 2)" on page 4-11.

⑤ **DSW1-(5)**

- Selects the self-holding timing for the start signal.
  OFF: Self-holding of start signal at weld start
  ON: Self-holding of start signal at squeeze
  If this dip switch is set to OFF, the start signal is held when the welding (Weld I) starts. If it is set to ON, the start signal is held when the initial weld force (Squeeze) starts.

⑥ **DSW1-(6)**

- Makes settings so that the power will or will not be supplied again when the lower current limit is detected or no current flows.
  OFF: Re-power-on---OFF
  ON: Re-power-on---ON
  If this dip switch is set to OFF, power is not supplied again. If it is set to ON, current increased by 5% is supplied (see 4) on page 5-7).
  Note: This does not apply in the source-voltage fluctuation compensation control mode.

⑦ **DSW1-(7)**

- Selects the length of time for which the holding finish signal is output.
  OFF: Output of holding-finish-signal level
  ON: Output of holding-finish-signal pulse
  If this dip switch is set to OFF, the holding finish signal is output for approximately 0.2 seconds or while the start signal is input. If this dip switch is set to ON, the holding finish signal [HOLD END] is output for 0.2 seconds.

⑧ **DSW1-(8)**

- Selects the action to be taken in the event of a current-monitor error.
  OFF: When there is a problem with the current monitor, a holding finish signal is output and welding can be started again.
  ON: When there is a problem with the current monitor, a holding finish signal is not output and welding cannot be started again.
  Note: This does not apply in the source-voltage fluctuation compensation control mode.

⑨ **DSW2-(1)**

- Selects the pulsation function or repeating function.
  OFF: Pulsation function
  ON: Repeating function
  If this dip switch is set to OFF, the pulsation function is selected and the [PULSATION (OFF)] key on the panel is used to set the number of pulsations (see 1) on page 5-4).
  If this dip switch is set to ON, the repeating function is selected and the [PULSATION (OFF)] key on the panel is used to set the off-time in the repeating mode (see 2) on page 5-5).

⑩ **DSW2-(2)**

- Selects the interlock function or weld-count monitor function.
  OFF: Interlock function
  ON: Weld-count monitor function
  If this dip switch is set to OFF, the interlock function is selected. In this case, the INTERLOCK/WELD No.SET is used to input the interlock signal [INTERLOCK], and the INTERLOCK/WELD No.ERROR is used to output the interlock signal [INTERLOCK] (see 3) on page 5-6).
  If this dip switch is set to ON, the weld-count monitor function is selected. In this case, the INTERLOCK/WELD No.SET is used to input the workpiece confirmation signal [WELD No.SET], and the INTERLOCK/WELD No.ERROR is used to output the weld-count error signal [WELD No.ERROR] (see 4) on page 5-7).

⑪ **DSW2-(3)**

- Selects a schedule No.
  OFF: Starts with external schedule No.
  ON: Starts with schedule No. on panel
  If this dip switch is set to OFF, a schedule No. is selected and operation starts upon the reception of start signal [START 1, 2, 4, and/or 8] from outside. If this dip switch is set to ON, operation starts upon reception of a start-signal No. selected using the panel. The schedule can be changed by pressing the SCHEDULE [NUMBER] key. External start signals are used only to start welding, and the schedule cannot be selected.

⑫ **DSW2-(4)**

- Selects start using 4-schedule start mode or 15-schedule start mode upon receiving an external start signal.
  OFF: 15-schedule start mode
  ON: 4-schedule start mode
  If this dip switch is set to OFF, 15 schedules made by combining start signals [START 1, 2, 4, and/or 8] are selected. If this dip switch is set to ON, the lowest-numbered start signal among 1, 2, 4, and 8 that is on 20 ms after the first start signal is turned on, is selected.

⑬ **DSW2-(5)**

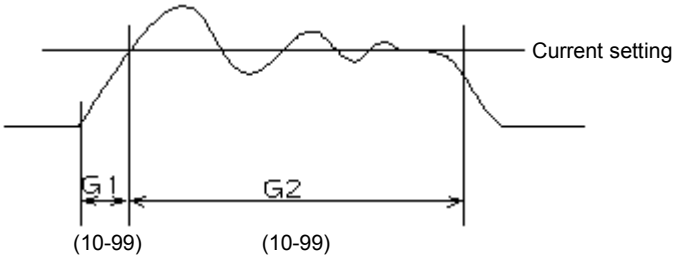
- Selects Data Out.
  OFF: Does not output data
  ON: Outputs data
  The data-out function is optional. Set this switch to the OFF position when the option is not provided.

⑭ **DSW2-(6)**

- Selects the control speed in constant-current control.
  OFF: Half-cycle
  ON: 1 cycle

⑮ **DSW2-(7)**

- Sets the correction value for the constant-current control, or sets it so that it is variable.
  OFF: Fixed constant-current correction value
  ON: Variable constant-current correction value
  This switch should normally be in the OFF position. When the weld control is used with a single-phase welding machine, the welding current rarely rises abnormally to overshoot or an extremely slow rise occurs. In this case, set this switch to the ON position, making the constant-current correction-value variable. When DSW2-(7) is set to ON, Modes Nos. 8 and 9 are selectable on the panel. Set the correction value for the initial rise (G1) in Mode No. 8 (a larger setting provides a larger amount of correction). Set the correction value for the initial rise (G2) in Mode No. 9 after the current exceeds the current setting (a larger setting provides a larger amount of correction). When there is a big difference between currents on the plus side and the minus side (the currents are not balanced), set DSW2-(6) to ON (1 cycle).



Shipped at G1 = 50, G2 = 50

(5) Input Method for Start Signals

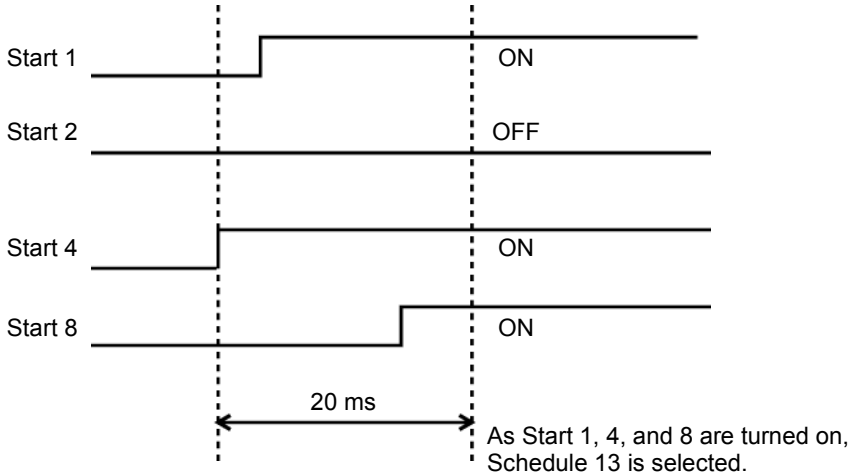
1) When the operation is started in the 15-schedule start mode and the parity check of the start signal is not performed (when DSW1-(4) is set to OFF).

Select up to 15 schedules by inputting the four signals of Start 1, Start 2, Start 4, and Start 8 in Binary Format.

Schedule	Start 1	Start 2	Start 4	Start 8
1	●			
2		●		
3	●	●		
4			●	
5	●		●	
6		●	●	
7	●	●	●	
8				●
9	●			●
10		●		●
11	●	●		●
12			●	●
13	●		●	●
14		●	●	●
15	●	●	●	●

● .....ON
Blank ....OFF

Timing chart for inputting the start signals (when selecting Schedule 13)



The schedule 20 ms after the first input of the start signals is selected.

2) When operation is started in the 15-schedule start mode and the parity check of the start signal is performed (when DSW1-(4) is set to ON)

Select up to 15 schedules by inputting the four signals of Start 1, Start 2, Start 4, and Start 8 in Binary Format and Start P (parity).

Schedule	Start 1	Start 2	Start 4	Start 8	Start P
1	●				
2		●			
3	●	●			●
4			●		
5	●		●		●
6		●	●		●
7	●	●	●		
8				●	
9	●			●	●
10		●		●	●
11	●	●		●	
12			●	●	●
13	●		●	●	
14		●	●	●	
15	●	●	●	●	●

● .....ON (Turn on so that the number of black points, including Start P, will be odd.)
Blank ....OFF

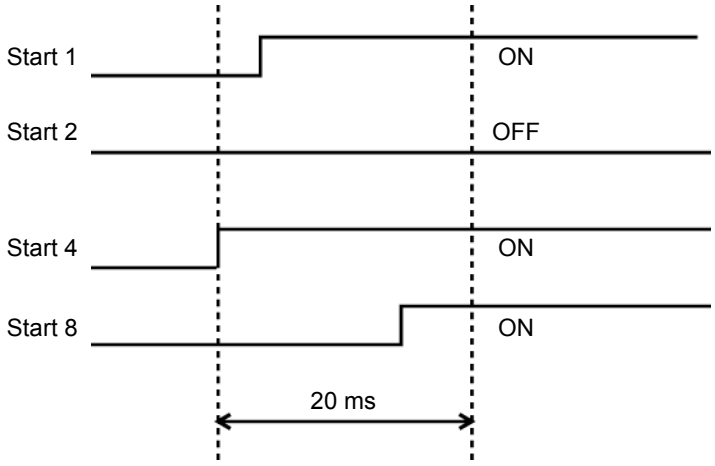
The odd parity is checked. At startup, combine the signals so that the number of signals of Start 1, Start 2, Start 4, Start 8, and Start P to be input will be odd. If the number of input signals is even, a start-signal error (Error code [02]) will be output.

3) When the operation is started in the 4-schedule start mode (DSW2-(4) is set to ON)

In the 4-schedule start mode, only one start signal is generally input; if two or more start signals are input simultaneously, the operation is as follows:

The start signal will be the signal with the smallest No. among those that are on 20 ms after the first start signal is turned on.

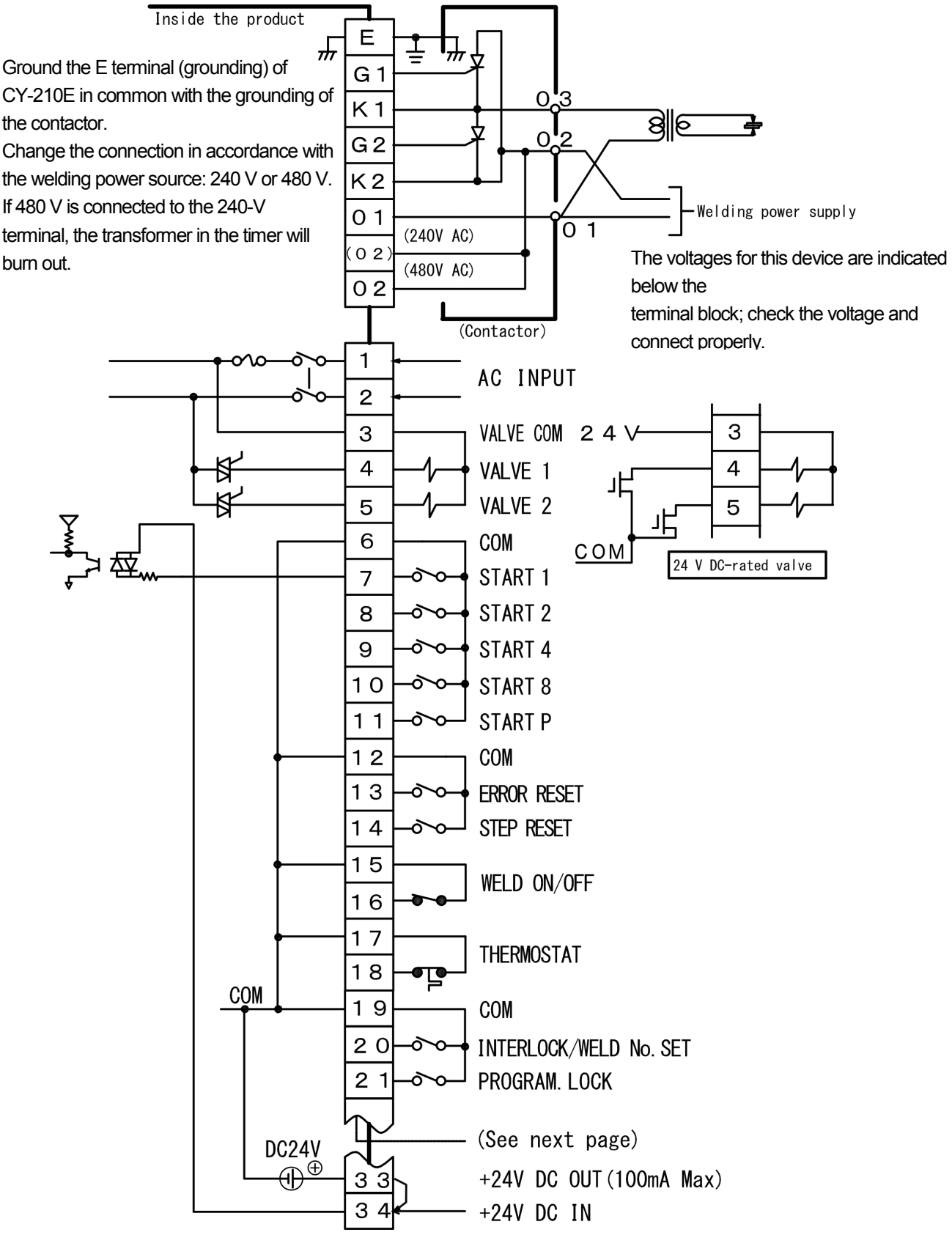
Example)

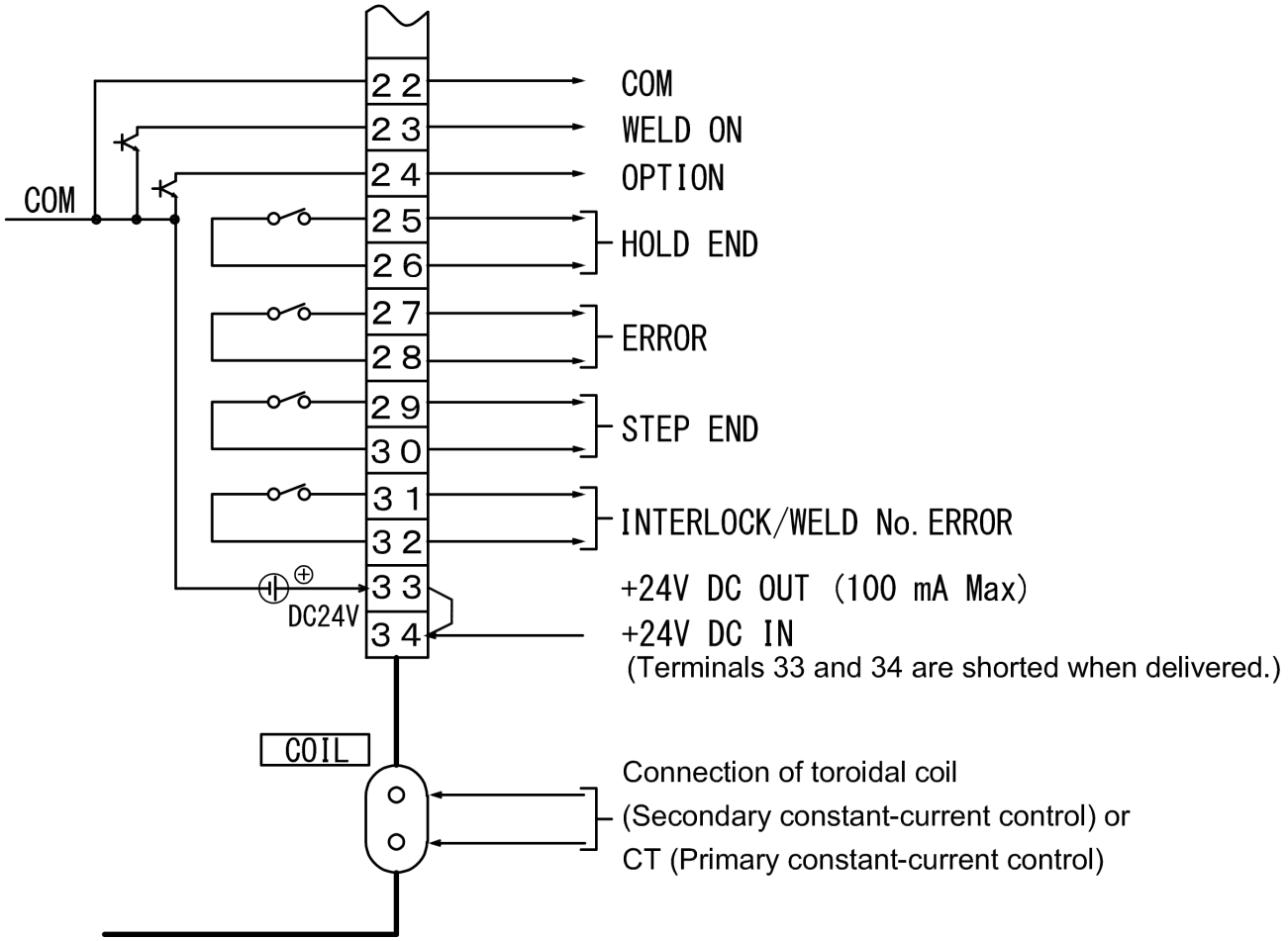


Start 1, Start 4 and Start 8 are on 20 ms after Start 4 is turned on.
Accordingly, Start 1, which has the lowest No., is selected.

5. Interface

(1) External Input and Output Signals





1) Explanation of external input and output signals

Name	Description
E	Ground the E terminal (grounding) in common with the grounding of the contactor.
G1,K1,G2,K2	Connect to each gate terminal of the contactor (thyristor).
O1,(O2),02	The voltage for this equipment are indicated on the terminal block seal, check the voltage and connect properly. O1-(O2) : 240V AC O1- O2 : 480V AC

(Note) Incorrect connection of 480VAC to (O2) may cause equipment failure.

Pin No.	Name	Description
1, 2	AC INPUT	Terminal for inputting control power supply. The voltage for this equipment are indicated on the terminal block seal, check the voltage and connect properly.
3	VALVE COM	Common terminal for valve output Output +24V when 24 V DC-rated valve is selected.

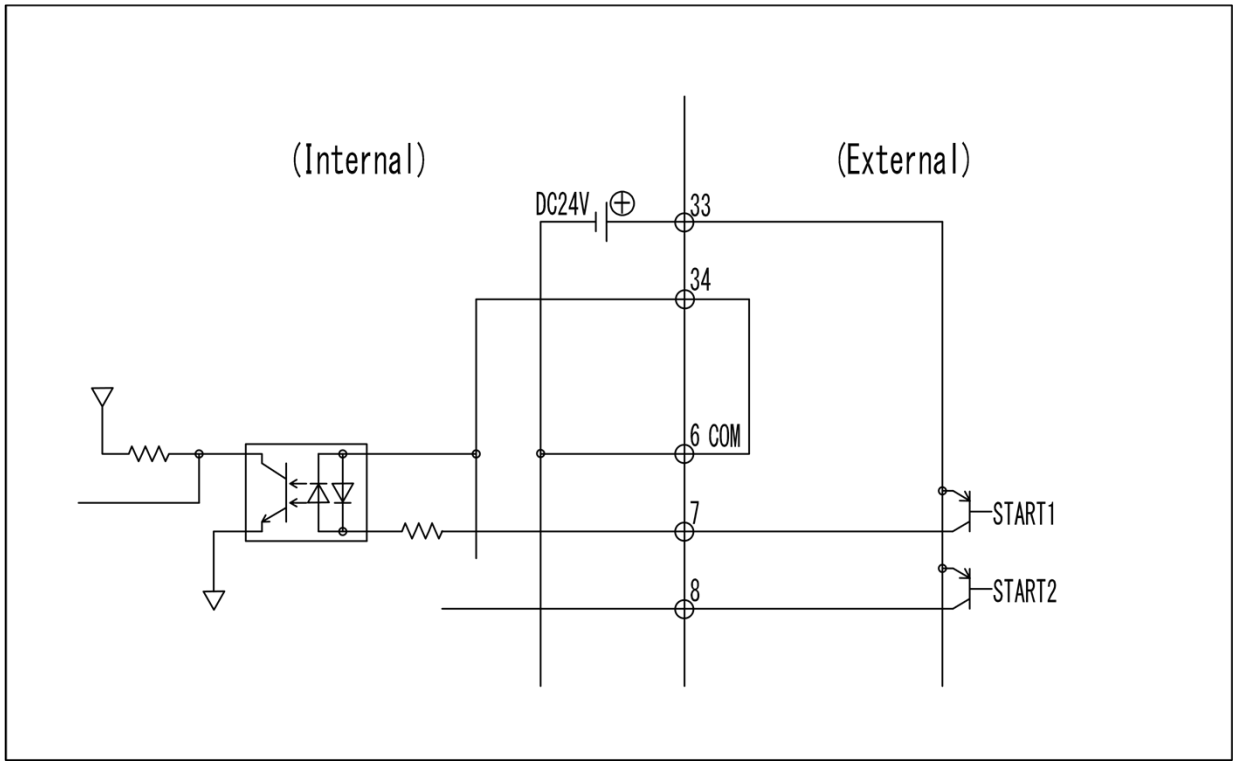
4,5	VALVE 1 VALVE 2	Outputs AC or DC 24V from the valve number (4: VALVE1, 5: VALVE2) selected from the start input until the end of HOLD.
6	COM	Common terminal. Connected to 0V side of the internal power supply (24V DC).
7 – 11	START 1, START 2, START 4, START 8, START P	・Schedule No. selection signal. ・Schedule No. from 1 to 15 can be selected, in the dip switch setting at shipment from the factory. So input in binary. ・By changing the dip switch settings, it is possible to start with 4 schedule, and start by selecting the schedule No. panel. For details, see "4. Connection (4) (3)Explanation of the functions of dip switches ⑪DSW2-(3)/⑫DSW2-(4)".
12	COM	Common terminal. Connected to 0V side of the internal power supply (24V DC).
13	ERROR RESET	ERROR RESET input terminal. If this is turned on, the error output is reset.
14	STEP RESET	STEP RESET input terminal. If this is turned on, the step completion output is turned off, and the system returns to the first step No.
15, 16	WELD ON/OFF	WELD ON/OFF input terminals If these are ON, welding is enabled; if they are OFF, welding is disabled. Shorted when shipped. Remove it according to the input signal connection method.
17, 18	THERMOSTAT	THERMOSTAT input terminals Connect to the thermostat in the transformer. If this is OFF, a thermostat error signal is output. Shorted when shipped. Remove it according to the input signal connection method.
19	COM	Common terminal. Connected to 0V side of the internal power supply (24V DC).
20	INTERLOCK /WELD No. SET	Interlock/workpiece confirmation input terminal. Interlock input signal when the interlock function is selected. Workpiece check input signal when weld-count monitor function is selected. Switching DSW2-(2) changes the operation. Refer to the time chart for details.
21	PROGRAM.LOCK	Terminal for input of PROGRAM LOCK signal If this is OFF, the weld schedule can be changed; if it is ON, the schedule cannot be changed.
22	COM	Common terminal. Connected to 0V side of the internal power supply (24V DC).

Pin No.	Name	Description
23	WELD ON	WELD ON output terminal (Open collector) The output signal depends on the position of internal dip switch DSW1-(3). When the dip switch DSW1-(3)is ON: The signal is output while the power is turned on (Weld I, II, III). Connect to the flicker device. When the dip switch DSW1-(3) is OFF: The signal is output output from the start of (WELD I) to the end of final (WELD III) (It is also output when welding is stopped.) *COOL is not output when DSW1-(3) is ON, and COOL is output when it is OFF.
24	OPTION	Optional output (Open collector)
25, 26	HOLD END	Terminals for output of the HOLD END signal Output upon completion of the hold time. (*)
27, 28	ERROR	Terminals for output of the ERROR signals Output when an error is made. (*)
29, 30	STEP END	Terminals for output of the STEP END signal Output upon completion of the last step. (*)
31, 32	INTERLOCK /WELD No. ERROR	Terminals for output of the INTERLOCK/WELD No. ERROR signals When the interlock function is selected, the interlock signal is output. When the weld-count monitor function is selected, the weld-count error signal is output. (*)
(*) Contact output terminal (contact rating DC24V 20mA) by semiconductor relay. CY-210D and earlier are relay contacts and have different specifications.		
33	+24 V DC OUT	+24V DC output terminal (dedicated for CY-210E) This terminal supplies +24V power to the input/output signal circuit. At shipment, it is compatible with NPN connection that uses the internal power supply by connecting to the 34th terminal (+24V input terminal) in advance. Remove the connection according to the application. Do not use this power supply for other purposes.
34	+24 V DC IN	+24V DC input terminal When connecting NPN, input +24V to pin 34. Use an external power supply, or PNP connections, remove the connect with pin 33. For PNP connection, connect the 0V (COM) side. In this case, indication and content are different.

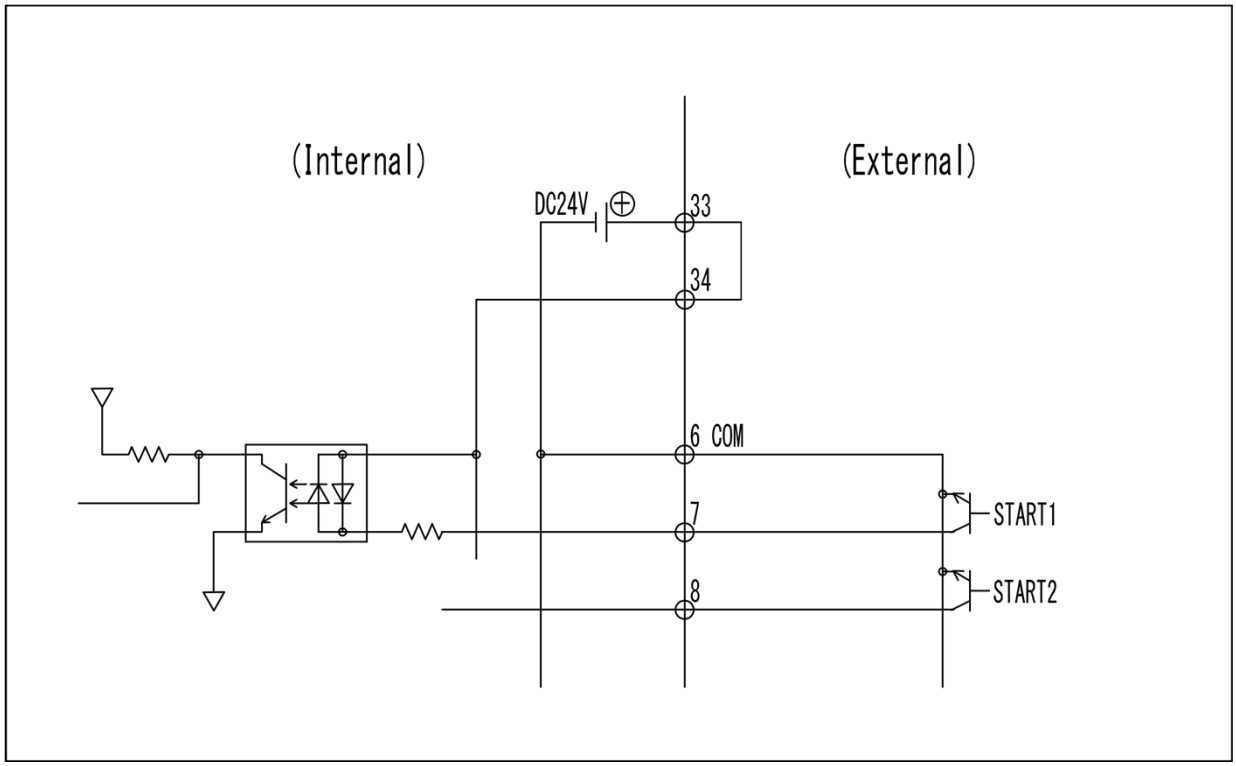
2) Connection of input signals

Wire according to the using PLC(programmable logic contoroller) to be used by referring to ① to ④ .
Since terminals 33 and 34 are short-circuited at shipment, remove the short-circuit wire in the cases of ①, ③, and ④.

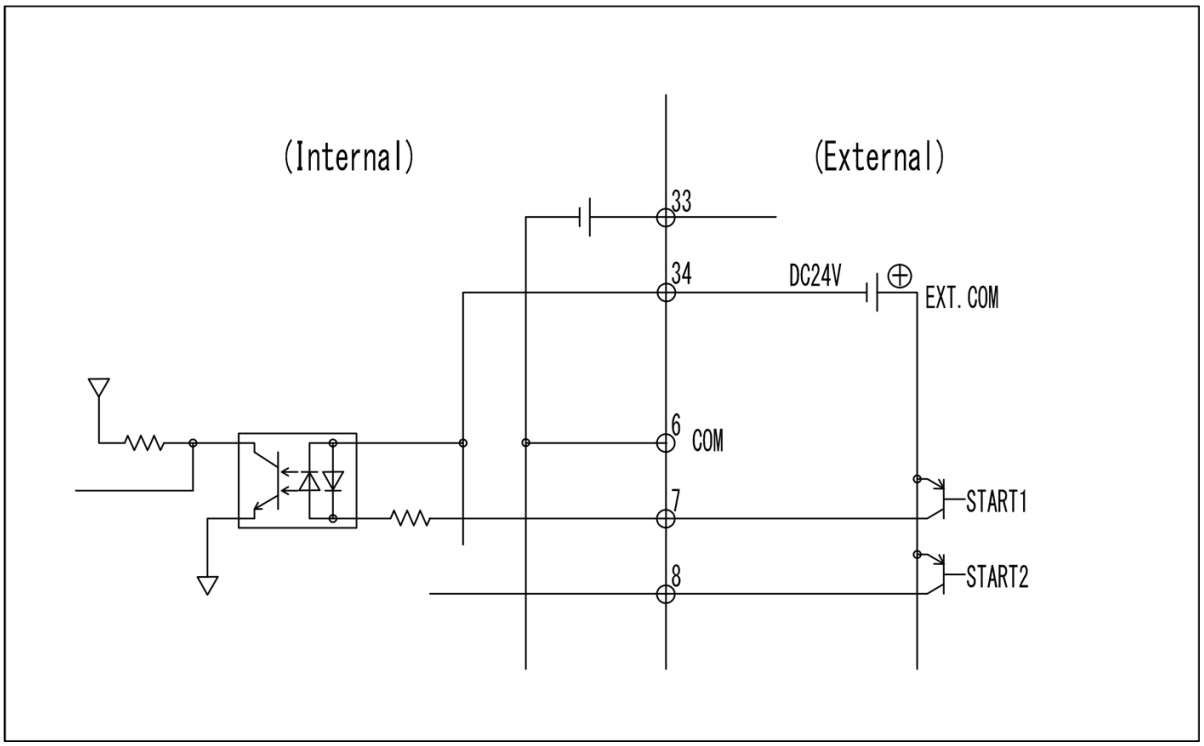
①When connecting to a PNP current output type PLC (when using an internal power supply)
Connect terminal 33 to the emitter side of the PLC and short circuit terminal 34 to the common terminal.



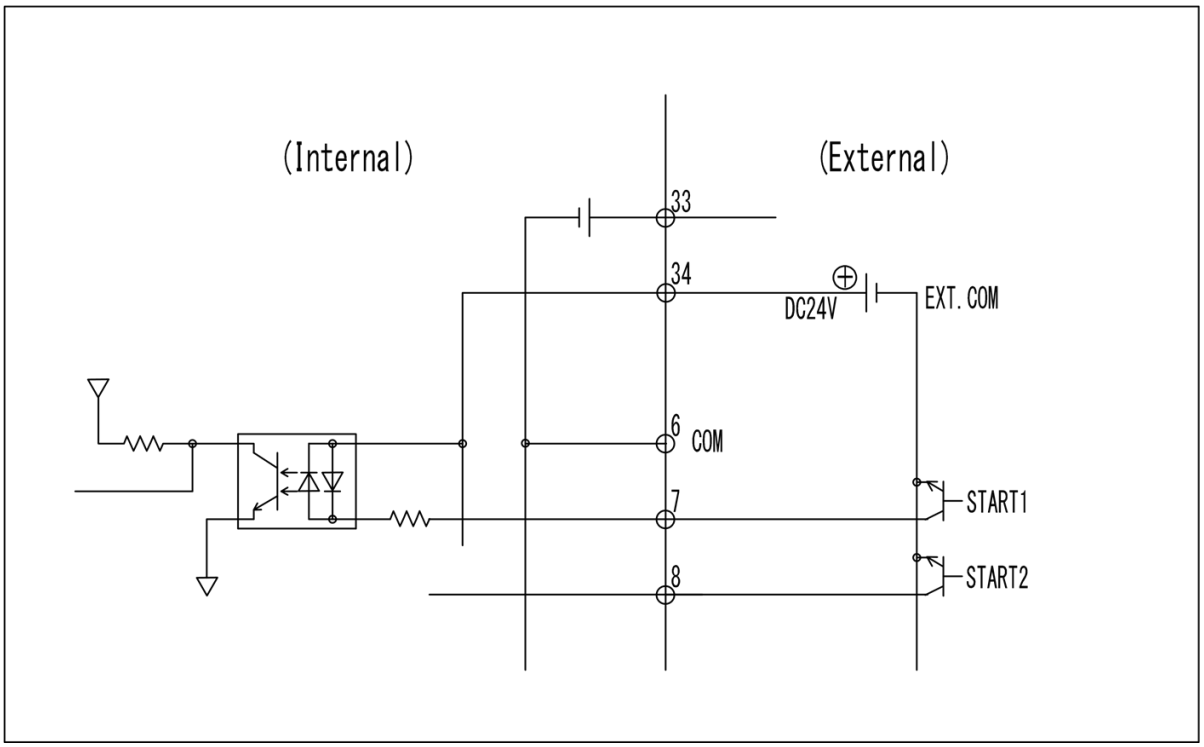
②When connecting to a device with NPN open collector output (when using an internal power supply), short terminals 33 and 34 and connect the emitter side of the PLC to the common terminal.



③When connecting to a PNP current output type device (when using an external power supply)
Connect the 0V side of the external power supply DC24V to terminal 34.

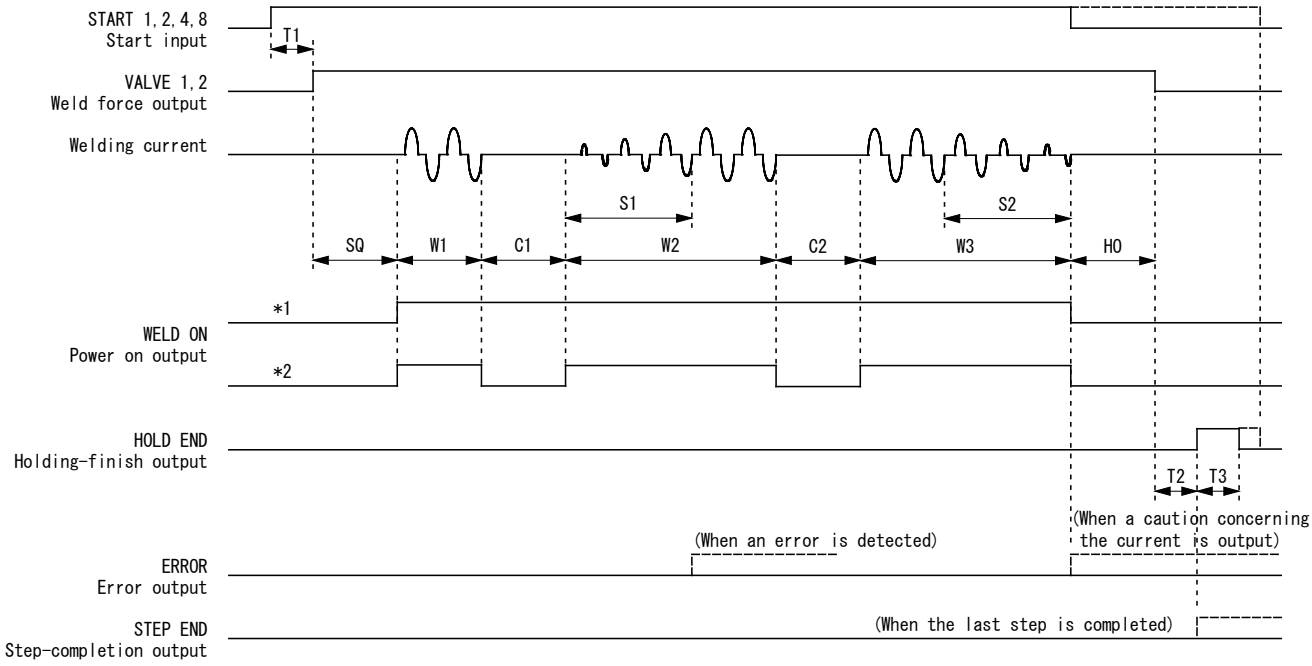


④When connecting to a device with NPN open collector output (when using an external power supply)
Input the + side of the external power supply DC24V to terminal 34.



(2) Timing Chart

1) Timing chart of basic operation



*1. When DSW1-(3) is off: Power-on timing output
*2. When DSW1-(3) is on: Flicker output

SQ:	Squeeze	S1:	Slope I (Up)	W3:	Weld III
W1:	Weld I	W2:	Weld II	S2:	Slope II (Down)
C1:	Cool I	C2:	Cool II	HO:	Hold

T1: Time from when the start signal [START1,2,4,8] is turned on (rising edge of the first input signal) until the valve signal [VALVE1,2] is turned on (60 ms max.)

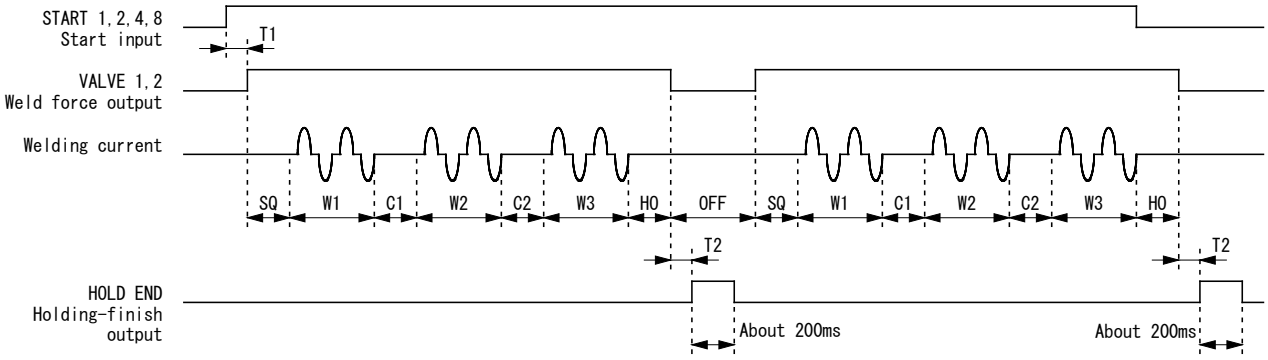
T2: Time from the Hold is finished until the holding finish signal [HOLD END] is turned on is 20 ms max.

T3: When DSW1-(7) is set to OFF (level output):
The ON time of the holding finish signal [HOLD END] is about 200 ms if the start signal [START1,2,4,8] is turned off before the Hold starts, or if it is turned off within about 200 ms after the Hold is finished.
Also, if the start signal [START1,2,4,8] is still on about 200 ms after the Hold is finished, the holding finish signal [HOLD END] is kept turned on until the start signal [START1,2,4,8] is turned off.

When DSW1-(7) is set to ON (pulse output):
The ON time of the holding finish signal [HOLD END] is about 200 ms.

If pulsation is set to 2 or higher, Cool II and Weld III are repeated the set number of pulsations (when DSW2-(1) is set to OFF).

2) Timing chart of repeating function operation (when DSW2-(1) is set to ON)



OFF: Off

T1: Time from when the start signal [START1,2,4,8] is turned on (rising edge of the first input signal) until the valve signal [VALVE1,2] is turned on (60 ms max.)

T2: Time from the Hold is finished until the holding finish signal [HOLD END] is turned on is 20 ms max.

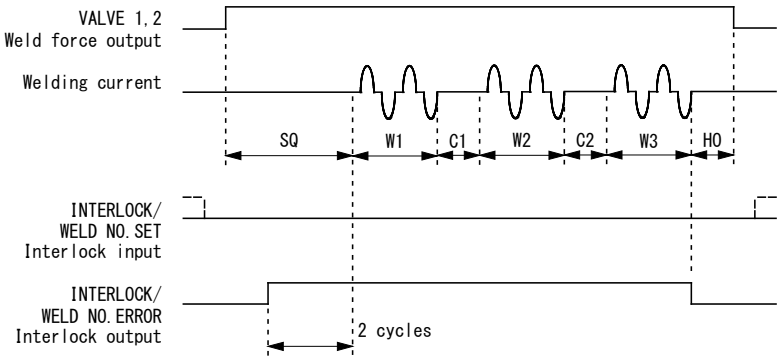
While the start signal [START1,2,4,8] is turned on, operation between Squeeze and Hold is repeated, being paused for the time set by the [PULSATION (OFF)] key.

If the total time between Squeeze and Off is shorter than the output time of the holding finish signal [HOLD END] (about 200 ms), the holding finish signal is output continuously.

3) Timing chart of interlock function operation (when DSW2-(2) is set to OFF)

When the welding is performed at the same timing, the voltage of the welding power supply decreases and the welding current fluctuates. In such a case, this function keeps the welding from being performed while the interlock input signal [**INTERLOCK**/WELD No.SET] is turned on.

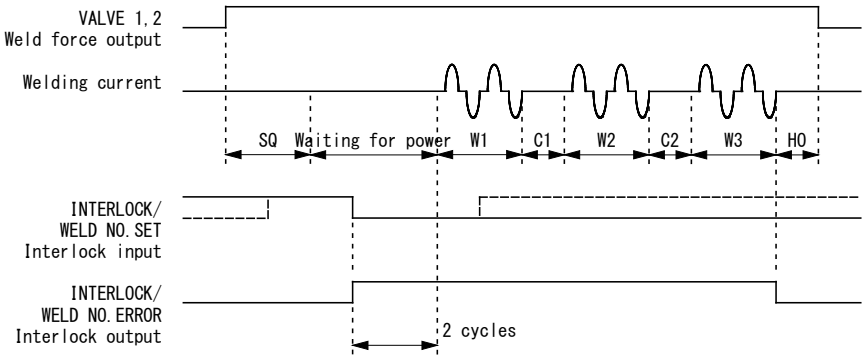
① When the interlock input signal [**INTERLOCK**/WELD No.SET] is turned off during Squeeze



a. The interlock output signal [INTERLOCK/**WELD No.ERROR**] is turned on two cycles before the power is turned on.

b. If Squeeze is set to 0 cycles, the interlock input signal [**INTERLOCK**/WELD No.SET] is turned on when the power is turned on. If Squeeze is set to below 2 cycles, the interlock output signal [**INTERLOCK**/WELD No.ERROR] is turned on from Squeeze starts.

② When the interlock input signal [**INTERLOCK**/WELD No.SET] is turned on during Squeeze

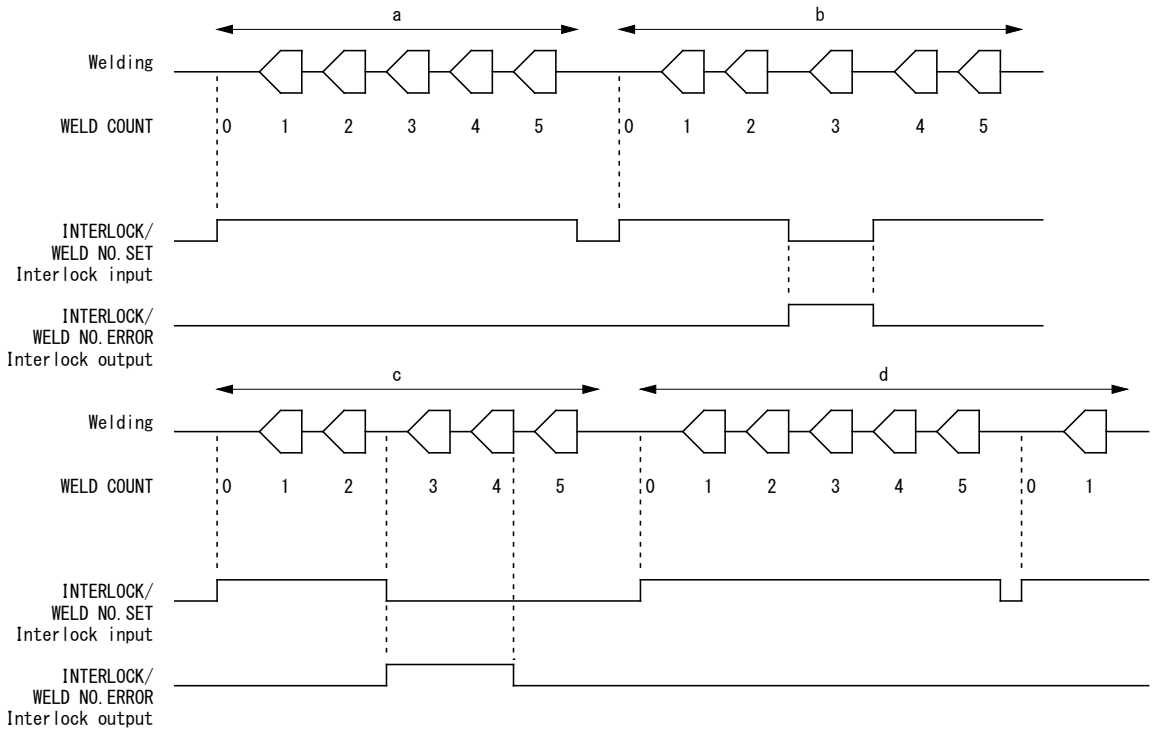


a. The operation stops during the wait for power in the squeeze state. The system waits, indicating the squeeze operation, until the interlock input signal [**INTERLOCK**/WELD No.SET] is turned off.

b. If the interlock is turned off while the system is waiting for power, the interlock output signal [**INTERLOCK**/WELD No.ERROR] is turned on, followed by the power.

4) Timing chart of weld counter function operation (when DSW2-(2) is set to ON)

(Example of counting of 4 welds)



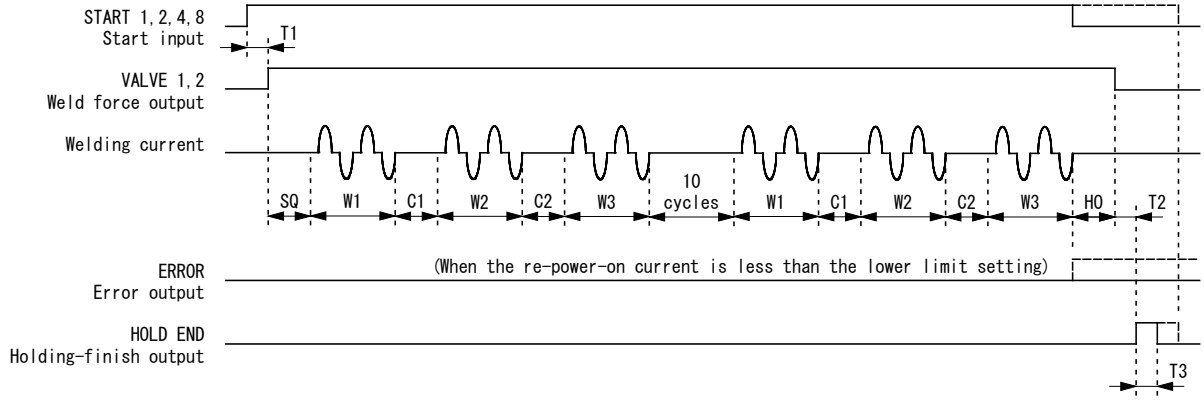
a. The number of welds is counted while the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] is turned on.

b. When the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] is turned off, the number counted is compared with the number set. If the former is less than the latter, the work-count error signal [INTERLOCK/**WELD No.ERROR**] is turned on.
When the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] is turned on again, the work-count error signal [INTERLOCK/**WELD No.ERROR**] is turned off.

c. When the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] is turned off, the number counted is compared with the number set. If the former is less than the latter, the work-count error signal [INTERLOCK/**WELD No.ERROR**] is turned on.
When an insufficient number of weld shots is performed, the work-count error signal [INTERLOCK/**WELD No.ERROR**] is turned off.

d. The number of welds is continuously counted after the number reaches the set count. When using the weld counter again, turn off the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] and turn it on again.

5) Timing chart of re-power-on function operation (when DSW1-(6) is set to ON)



T1: Time from when the start signal [START1,2,4,8] is turned on (rising edge of the first input signal) until the valve signal [VALVE1,2] is turned on (60 ms max.)

T2: Time from the Hold is finished until the holding finish signal [HOLD END] is turned on is 20 ms max.

T3: When DSW1-(7) is set to OFF (level output):
The ON time of the holding finish signal [HOLD END] is about 200 ms if the start signal [START1,2,4,8] is turned off before the Hold starts, or if it is turned off within about 200 ms after the Hold is finished.
Also, if the start signal [START1,2,4,8] is still on about 200 ms after the Hold is finished, the holding finish signal [HOLD END] is kept turned on until the start signal [START1,2,4,8] is turned off.

When DSW1-(7) is set to ON (pulse output):
The ON time of the holding finish signal [HOLD END] is about 200 ms.

a. The power is turned on again when the welding current is less than the lower limit setting, or when no power is supplied.

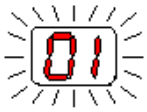
b. The re-power-on current is 5% higher than the set current. If the welding current is outside the upper and lower limits when the power is turned on again, a caution concerning the current is output.

6. Operation Method

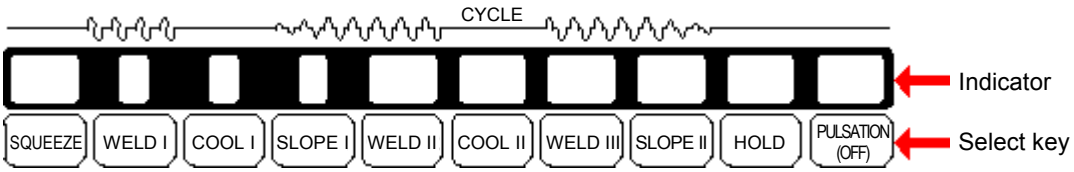
(1) Basic Operation

(1) Turn on the control power switch.

If the control power switch [POWER] on the rear is turned on, the control power is supplied to the device.
All LEDs light up for 2 to 3 seconds to indicate that self-diagnosis is being performed. If the result is normal, the LEDs indicate the set values.
If the result is an error, error code [01] blinks in the data indicator and an alarm sounds.



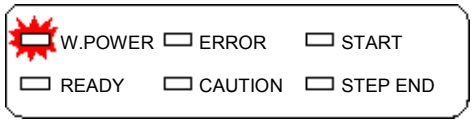
(2) Input the data for each set item.



The select keys are located under the indicator.
Press the select key for an item to be set; the settable digit will blink. If two digits are settable, they blink alternately each time the select key is pressed.

Input the data using the [+] / [–] keys. If either is pressed and held, the data increases (+) or decreases (-) continuously.

(3) Supply the welding power.



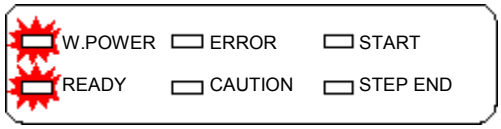
If the welding power is supplied, the red [W.POWER] LED lights up.

(4) Press the weld ON/OFF key to start welding.

If the weld ON/OFF key [WELD] at the upper right is pressed to start welding, the green LED at the upper left of the key lights up.

CAUTION

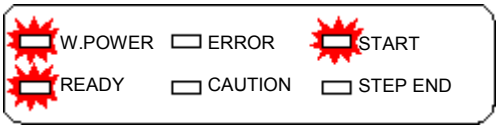
Do not turn on the control power switch [POWER] while pressing the weld ON/OFF key [WELD] on the front panel. In addition, do not turn on the weld ON/OFF key [WELD] within two seconds after the control power supply is turned on. If these procedures are not followed, all weld schedule data is initialized.



When welding is started, the green [READY] LED lights up (when the weld ON/OFF signal [WELD ON/OFF] is turned on).

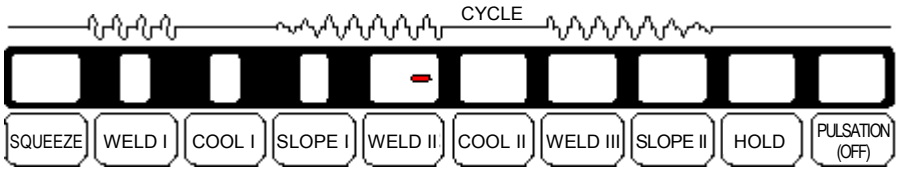
When stopping welding, press and hold the weld ON/OFF key [WELD] until the LED at the upper left of this key and the [READY] LED are turned off.

(5) Input the start signal to start welding.



If the start signal [START 1,2,4,8] is input, the red [START] LED lights up.

All indicators go out, and "-" lights up to indicate the currently executed process. The weld sequence is indicated clearly.



(Weld II is executed in this example.)

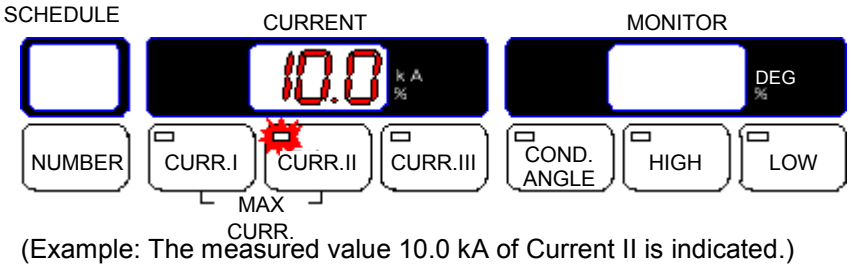
Note: Slope I and Slope II are not lit during execution, as they are included in Weld II and Weld III, respectively.

(6) Upon completion of welding, the measured value is indicated.

1) 

The green [MONITOR DISPLAY] LED lights up, and the measured value is indicated on the lower line.

The measured value of the item, the green LED of which is lit, is indicated on the indicator.

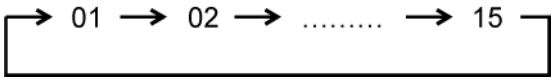


(Example: The measured value 10.0 kA of Current II is indicated.)

2) Press the select key of a measured value to be checked, and then press the [MONITOR DISPLAY] key; the measured value is indicated.

3) When the [MONITOR DISPLAY] LED lights up, if the SCHEDULE [NUMBER] key is pressed, the measured value of that schedule No. is indicated.

Each time the SCHEDULE [NUMBER] key is pressed, the schedule No. increases by 1. If the schedule No. reaches 15, it returns to 1.



(7) If a monitor error is detected, the red [CAUTION] LED lights up.

When a monitor error occurs, an error signal [ERROR] is output.

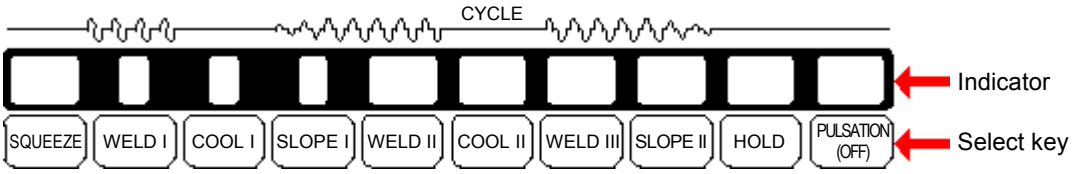
Press the [RESET] key or turn on an external error reset signal [ERROR RESET] in order to reset the error/caution signal output.

(2) Setting of Schedule Data

(1) Setting of Schedule No.

Press the [NUMBER] key so that a schedule No. can be input.
Use the [+] / [–] keys to select the schedule No. to be set.

(2) Setting of timer



1) Press the select key to select an item to be set; the settable digit blinks. If two digits are settable, they blink alternately each time the select key is pressed.

2) Use the [+] / [–] keys to set the number of cycles.

Item	Setting range	Remarks
Squeeze	00 - 99 cycles	
Weld I	0 - 9 cycles	
Cool I	0 - 9 cycles	
Slope I (upslope) Weld II	0 - 9 cycles 00 - 99 cycles	Slope I is included in Weld II.
Cool II	00 - 99 cycles	
Weld III Slope II (downslope)	00 - 99 cycles 00 - 99 cycles	Slope II is included in Weld III.
Hold	00 - 99 cycles	
OFF *1	00 - 99 cycles	Select either.
Pulsation *2	0 - 9 times	

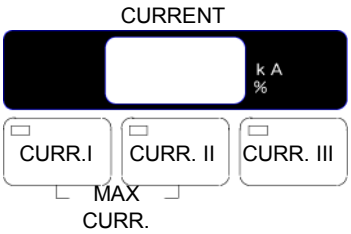
Up to 15 schedules can be set. It is convenient to record the set value in “9. Schedule Data Table.”

*1. If OFF (Repeating function) is selected (DSW2-(1) is set to ON) and the start signal [START 1,2,4,8] is input, the welding sequence is repeated continuously.
*2. If the pulsation function is selected (DSW2-(1) is set to OFF), Cool II and Weld III are repeated the set number of times.

Squeeze → Weld I → Cool I → Weld II → Cool II → Weld III → Hold
(Cool II → Weld III: Repeated the set number of times)

(3) Setting of maximum current

1) Press the VALVE [No.] key to enter the Valve No. setting mode. Use the [+] / [–] keys to set the valve No. First, input 1.

2) 

Press the [CURR.I] and [CURR.II] keys at the same time, then use the [+] / [–] keys to input the maximum welding current (maximum secondary current) for Valve No. 1.

3) Similarly, set the maximum current for Valve No. 2.
Setting range of max. current: 5-80 kA, 2 schedules
(One schedule for each Valve No.)
Setting the maximum short-circuit current of the welder to be used

[Caution]

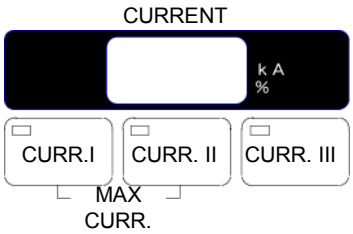
(1) Even if the primary current-feedback constant-current control method is selected, set the maximum secondary current. Set the maximum current so that it becomes within 50-1500 A converted to the primary current. If a value outside the range is set and the power is supplied, an error signal is output (Error code [03]).

Example) If the maximum current is 40 kA and the turn ratio of the transformer is 32, the primary current is as follows:
40 kA/32 = 1250 A —— Within the range, thus settable

If the maximum current is 40 kA and the turn ratio of the transformer is 25, the primary current is as follows:
40 kA/25 = 1600 A ——— Out of the range, thus unsettable

(2) Even if measuring the current using a toroidal coil or CT coil in the source-voltage fluctuation compensation control, set the maximum secondary current.

(4) Setting of the welding current



1) Press the [CURR.I], [CURR.II], or [CURR.III] key to enter the setting mode.

2) Use the [+] / [–] keys to input the welding current.
The welding current is limited as follows, however, depending on the control method.

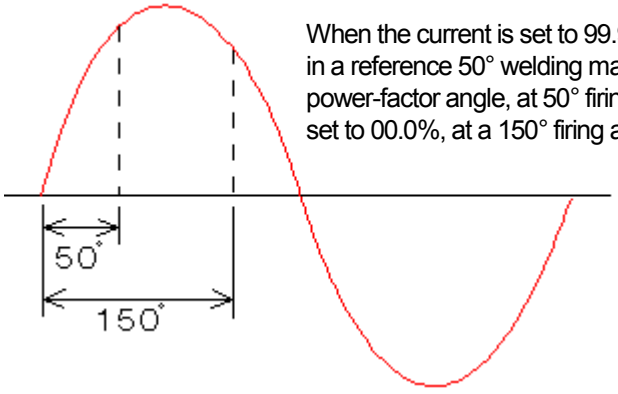
- **When the constant-current control method is used**
  Set the welding current in the range of 20% to 100% of the maximum current.

  Example:

Maximum current	Setting range
10 kA	2.0 kA - 10.0 kA
40 kA	8.0 kA - 40.0 kA
80 kA	16.0 kA - 80.0 kA

If the welding current is set out of the above range, it cannot be controlled at a constant current.

- **When the source-voltage fluctuation compensation control is used**
  Set the current as a %.



When the current is set to 99.9%, such a current as flows, in a reference 50° welding machine having a 50° power-factor angle, at 50° firing angle 150° will flow; when set to 00.0%, at a 150° firing angle.

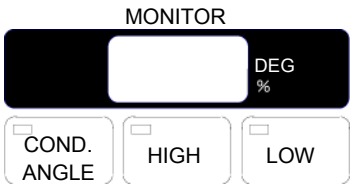
Firing angle	Setting
50°	99.9%
150°	00.0%

The current setting is expressed as a percentage with one decimal place, from 00.0% to 99.9%. The current depends on the specifications of the welder.

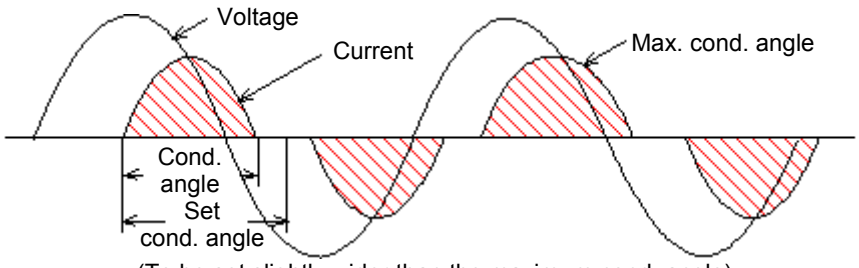
(3) Setting of Monitor

(1) Setting of conduction-angle monitor (Effective only in constant-current control mode)

1) Press the [COND.ANGLE] key to enter the setting mode.

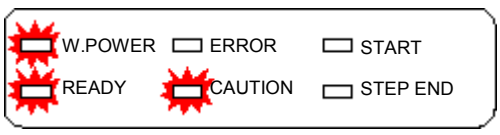


2) Use the [+] / [–] keys to set the conduction angle (1° to 180°). Set it slightly wider than the maximum weld conduction angle.



(To be set slightly wider than the maximum cond. angle)

If the actual weld conduction angle exceeds the set conduction angle, a conduction-angle error signal occurs, an error signal [ERROR] is output and the red [CAUTION] LED lights up. If the conduction angle is set to “000”, it will not be monitored.

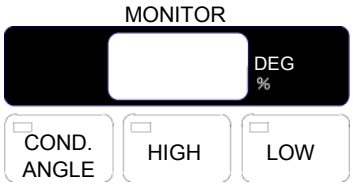


[Caution]

(1) If the source-voltage fluctuation compensation control method is used, the conduction angle cannot be monitored.

(2) If this control is used with a welder of the single-phase rectifier type, the conduction angle cannot be monitored. In such a case, set to “000”.

(2) Setting of current monitor (Effective only in constant-current control mode)



1) Press the [HIGH] key to enter the setting mode.

2) Use the [+] / [–] keys to set the upper limit of the current monitor (setting range: 0% to 49%).

3) Similarly, press the [LOW] key, then use the [+] / [–] keys to set the lower limit of the current monitor (setting range: 0% to 49%).

Example) If Current II is 10 kA, the High setting is 20%, and the Low setting is 10%, the setting range of the current monitor is between 9 kA and 12 kA.

The current monitor confirms that the average of the effective current value, excluding the first three cycles and slopes (I: Upslope; II: Downslope), is between the upper and lower limits.

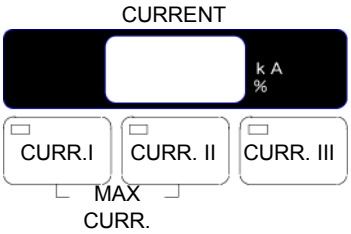
If the average effective current is out of the setting range of the current monitor (exceeds either limit), an error signal [ERROR] is output and the red [CAUTION] LED lights up.

At a setting of 0%, the current monitor does not function.

[Caution]

If the source-voltage fluctuation compensation control method is used, the upper and lower limits of the current monitor cannot be set.

(3) Indication of measured welding current



Upon completion of welding, the measured current is displayed on the welding-current setter/measured-value indicator.

It indicates the measured value of the current (I, II, or III) of the select key, the green LED at the upper left of which is lit.

When checking the measured value of another current, press its select key, then press the [MONITOR DISPLAY] key.

The indicated value is the average of the effective values of currents, excluding the first three cycles and slopes.

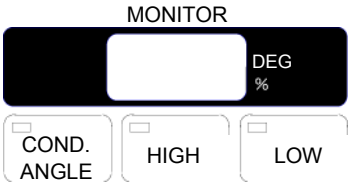
If the number of welding cycles is three or less, or shorter than slopes + 3 cycles (I: upslope, II: downslope), the effective current in the last cycle is indicated.

[Caution]

To display the measured value of welding current of the source-voltage fluctuation compensation control method is used, a toroidal coil or CT coil for current detection needs to be connected.

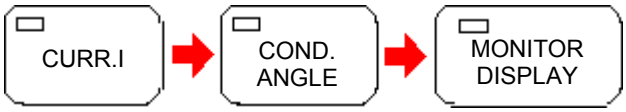
(4) Indication of conduction angle, and upper and lower limits of monitored currents

Upon completion of the weld cycle, the monitor indicates the conduction angle and the upper/lower limit of the monitored current.



1) Indication of conduction angle of Current I

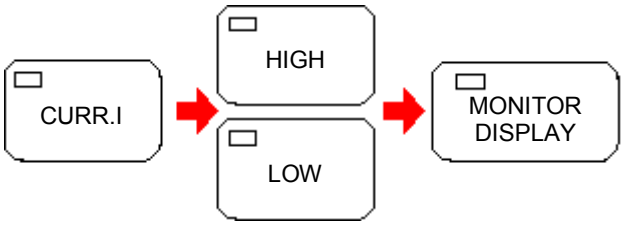
Press the [CURR.I] and [COND. ANGLE] keys, then press the [MONITOR DISPLAY] key. (Press the keys one by one.)



The measured values of the conduction angles of Current II and Current III can be indicated similarly.

2) Indication of upper and lower limits of the monitored current of Current I

Press the [CURR.I] and [HIGH] or [LOW] keys, then press the [MONITOR DISPLAY] key. (Press the keys one by one.)



If Current I is larger that the set value and the [HIGH] key is pressed, the deviation from the set value is indicated as a percent.

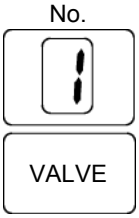
If Current I is less than the set value and the [LOW] key is pressed, the deviation from the set value is indicated as a percent. Current II and Current III are indicated similarly.

[Caution]

If the source-voltage fluctuation compensation control method is used, the conduction angle and upper and lower limits of the monitored currents cannot be indicated.

(5) Setting of Valve No.

The No. of a solenoid valve for welding can be set and indicated by the following method.



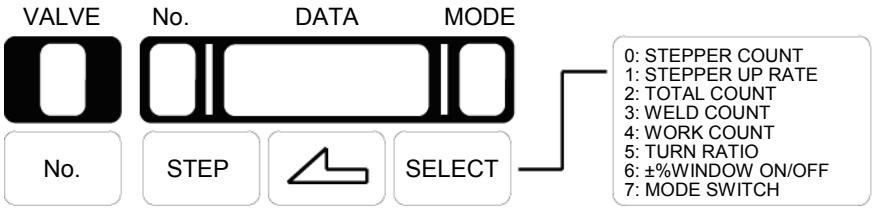
1) Press the VALVE [No.] key to enter the setting mode.

2) Use the [+] / [–] keys to input Valve No. 1 or 2.

One Valve No. is to be set for each schedule No.

(4) Setting by Mode No.

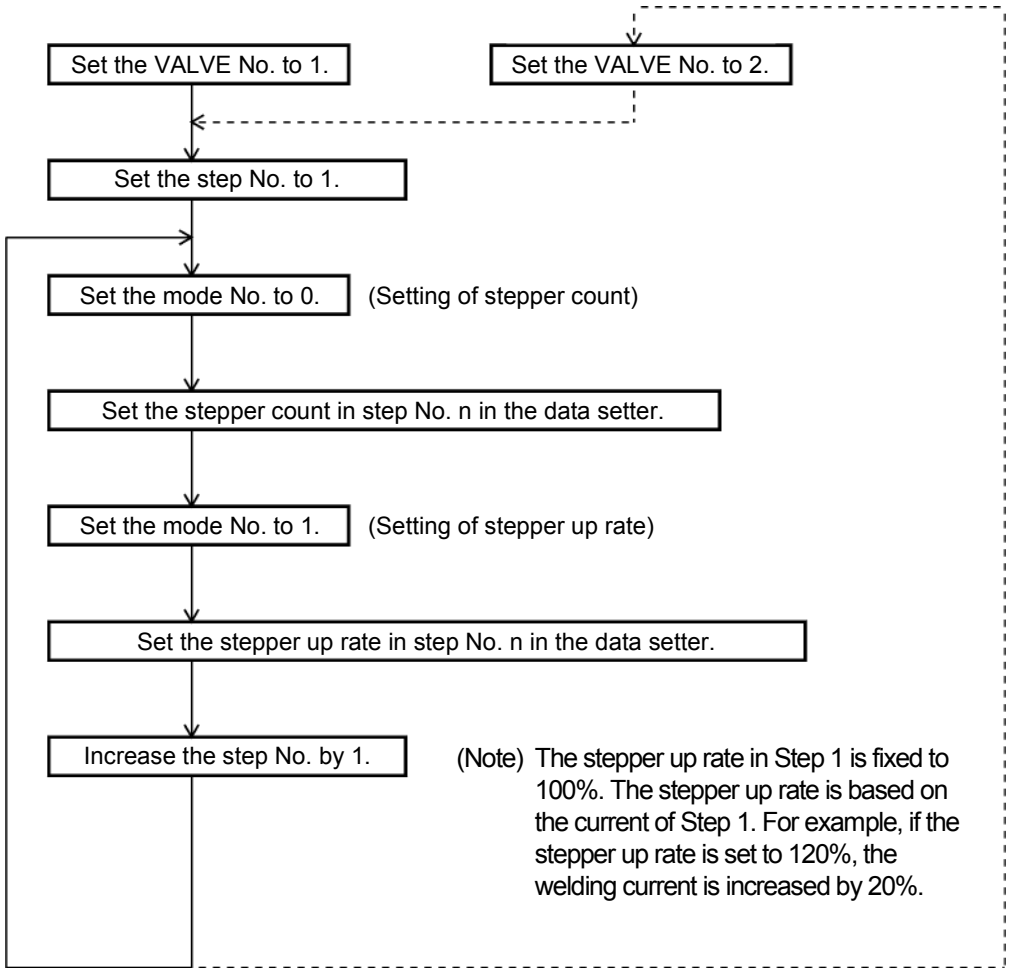
The setter/indicator of the data/counter are explained below.



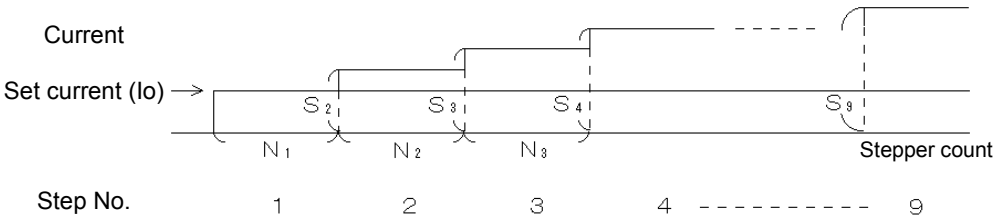
Press the [SELECT] key, and use the [+] / [–] keys to select the mode (0 to 7).
(If DSW2-(7) is set to ON, select a mode from 0 to 9.)
Use the ← key to select the digit of the data to be input. Input the value using the [+] / [–] keys.

(1) Mode 0,1: STEPPER up [0: STEPPER COUNT / 1: STEPPER UP RATE] (One schedule for each Valve No.: two schedules in total)
When the number of weld shots reaches the set value, the welding current can be increased or decreased.

1) Set method (n=Step No.)



(Note) The stepper up rate in Step 1 is fixed to 100%. The stepper up rate is based on the current of Step 1. For example, if the stepper up rate is set to 120%, the welding current is increased by 20%.



Ni: Stepper count (0-9999)
Si: Stepper-up rate (50-200%)

For example, if the set current is 8.0 kA, the step No. is 3, and the stepper up rate of stepper No. 3 is 105%, the welding current is as follows:

$$\text{Welding current} = \text{Set current (8.0 kA)} \times \frac{\text{Stepper up rate of step No. 3 (105)}}{100} = 8.4 \text{ kA}$$

2) Operation

If the number of weld counts for each step No. reaches the set values, the set No. is increased by 1 and the current is increased by the set stepper up rate.

When the last step is finished, the red [STEP END] LED end lights up and the step end signal [STEP END] is turned on. If the power is kept turned on, power is supplied according to the schedule of the last step No.

3) Reset method

If a step reset signal [STEP RESET] is turned on from outside, the system returns to Step No.1 and the step end signal [STEP END] is turned off. At this time, both Valve No. 1 and Valve No. 2 are reset.

If the [STEP] key is pressed and the step No. is decreased using the [+] / [–] keys, the step starts from the decreased step No. with the current setting for the step No., and the stepper counter starts from zero.

[Caution]

- If the step No. is set to 0, it is not increased. When using the step-up function, be sure to set the step No. to 1 or higher.
- When using the step-up function, take care when setting the current step-up ratio.
- If the current multiplied by the current stepper up rate exceeds the set maximum value, the current-stepper-up-rate error signal is output.

(2) Mode 2: Total counter [2: TOTAL COUNT] (1 schedule)

1) Setting method for preset value

Set the mode No. to 2. (Setting of total counter)

↓

Set the preset value of the total counter in the data setter.

2) Operation

If the total number of weld counts reaches the preset value, the monitor counter in the data indication area of the panel blinks, and an error signal [ERROR] is output.

Note: If the preset value is 0, the counter does not count.

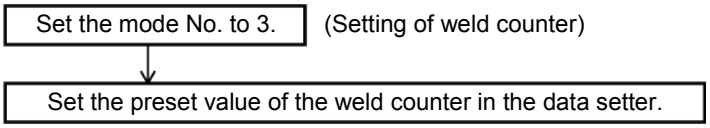
3) Reset method

Press the [SELECT] key, and set the mode to “2” using the [+] / [–] keys.

Press the [COUNT RESET] key; the total counter is reset.

(3) Mode 3: Weld counter [3: WELD COUNT] (1 schedule) This counter operates only while DSW2-(2) is set to ON.

1) Setting method for preset value



2) Operation

The weld shots are counted while the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] is turned on (i.e., a workpiece is set). When the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] is turned off (i.e., a workpiece is not set), if the number of weld counts is less than the preset value, the weld-count error signal [INTERLOCK/**WELD No.ERROR**] is output.

After the number of weld counts reaches the preset value, the weld shots are counted continuously. When using the weld counter again, turn off the workpiece confirmation signal [INTERLOCK/**WELD No.SET**], then turn it on again.

This counter is used to check for insufficiencies of the number of weld shots.

3) Reset method

Weld the insufficient number of weld shots, then the weld-count error signal [INTERLOCK/**WELD No.ERROR**] is turned off.

Turn on the workpiece confirmation signal [INTERLOCK/**WELD No.SET**] again.

(4) Mode 4: Work counter [4: WORK COUNT] (Used for monitoring only; cannot be preset)

1) Operation

If the weld count reaches the preset value, the work counter is increased by 1. The work counter cannot be preset. If the number of weld counts for one workpiece is set as the preset value of “Mode 3: Weld counter”, the value indicated by the work counter is the quantity of production.

[Caution]

This operates separately from the weld count which uses the workpiece confirmation signal [INTERLOCK/**WELD No.SET**].

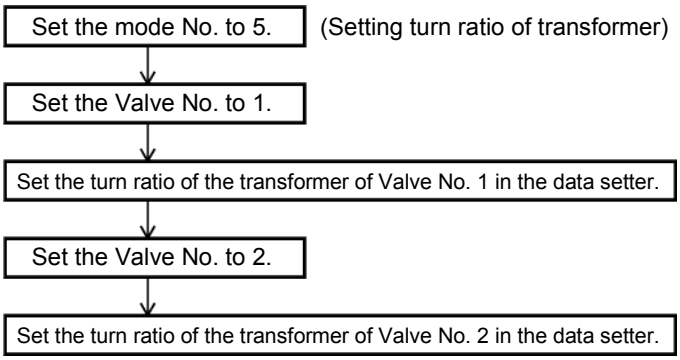
2) Reset method

Press the [SELECT] key, and then use the [+] / [–] keys to set the mode to “4.”

Press the [COUNT RESET] key; the work counter is reset.

(5) Mode 5: Setting the turn ratio of the transformer [5: TURN RATIO] (One setting for each Valve No.)

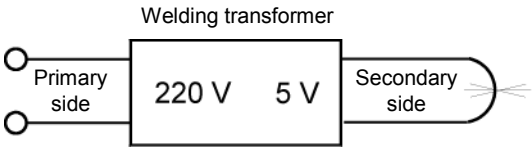
When the primary constant-current control is selected, set the turn ratio of the transformer to be used.



[Caution]

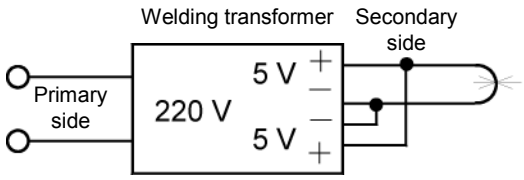
The turn ratio of the transformer is closely related to the setting of the maximum current. Set them in the following range:
50 ≤ Maximum current/Turn ratio of transformer ≤ 1500
If these factors are set out of this range and the power is turned on, an error signal (Error code [03]) is output.

- **When only one secondary output is provided:**



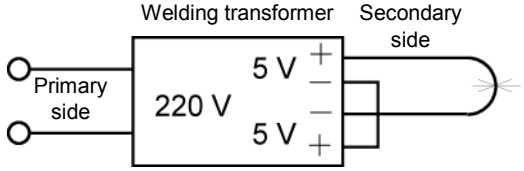
$$\text{Turn ratio} = \frac{\text{Primary input voltage}}{\text{Secondary output voltage}} = \frac{220}{5} = 44$$

- **When two secondary outputs are connected in parallel:**



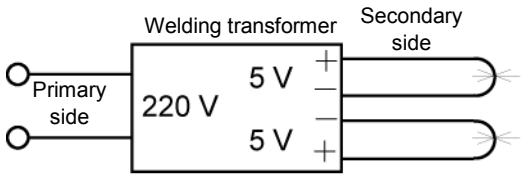
$$\text{Turn ratio} = \frac{\text{Primary input voltage}}{\text{Secondary output voltage}} = \frac{220}{5} = 44$$

- **When two secondary outputs are connected in series:**



$$\text{Turn ratio} = \frac{\text{Primary input voltage}}{\text{Secondary output voltage}} = \frac{220}{10} = 22$$

- **When two secondary outputs are used independently:**



$$\text{Turn ratio} \quad \frac{\text{Primary input voltage}}{\text{Secondary output voltage}} \times \frac{1}{\text{Number of secondary circuits}}$$

When two outputs are used simultaneously

$$\text{Turn ratio} = \frac{220}{5} \times \frac{1}{2} = 22$$

When only one output is used

$$\text{Turn ratio} = \frac{220}{5} \times \frac{1}{1} = 44$$

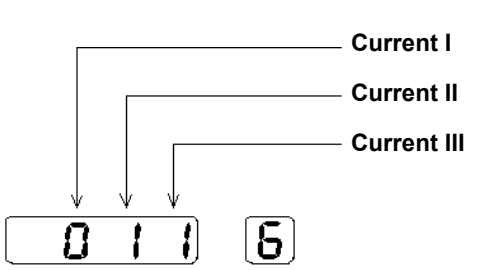
(6) Mode 6: Setting of ±% WINDOW ON/OFF [6: ±% WINDOW ON/OFF]

Determine if the upper and lower limits of the current monitor for Current I, Current II, Current III should be judged.

Set the mode No. to 6. (Setting of ±% WINDOW ON/OFF)

↓

Set ±% WINDOW ON/OFF in the data setter. (0: OFF, 1: ON)



- When the monitor is on
  If a current exceeds the High or Low set value, the red [CAUTION] LED lights up and an error signal [ERROR] is output.
- When the monitor is off
  Even if a current exceeds the High or Low set value, it is not judged.

[Caution]

If the source-voltage fluctuation compensation control method is used, the upper and lower limits of the monitored currents are not judged.

(7) Mode 7: Mode switch [7: MODE SWITCH]

Set the welding mode.

Set the mode No. to 7. (Setting of mode switch)

↓

Set the welding mode in the data setter.

Data: 0 Normal welding mode

The rise of current is the same as that of the conventional **CY-210E**.

The control method of Weld I to III (the constant-current control and the source-voltage fluctuation compensation control) depends on the setting of DSW1-(1).

Use this mode normally.

Data: 1 Welding mode for high-tension material (only when DSW1-(1) is set to OFF)

This is the mode for the quick rise of current applied to the high-tensile steel plate with a high initial resistance.

The control method of Weld I to III is the constant-current control.

This mode is suitable for welding of the high-tensile steel plate.

Data: 2 Welding mode in combination of the source-voltage fluctuation compensation control and the constant-current control (only when DSW1-(1) is set to OFF)

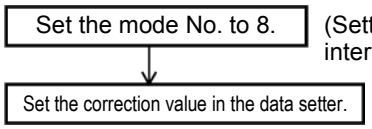
This is the mode for the quick rise of current applied to the high-tensile steel plate with a high initial resistance.

The control method of Weld I is the source-voltage fluctuation compensation control, and those of Weld I to III are the constant-current control.

This mode is suitable for welding of the color steel plate which is hard to flow the current at the beginning of the welding. The occurrence of the no-power-supply error can be minimized even if the current is hard to flow.

(8) Mode 8: Setting of constant-current correction value for Interval G1 (only when DSW2-(7) is set to ON)
Adjust the constant-current correction value when the control is connected to a welder of single-phrase rectifier type, and the welding current rises abnormally to overshoot or does not rise quickly. For details, see page 4-9.

1) Setting method for correction value



(Setting of a constant-current correction value for interval G1)

2) Correction value

Set the correction value to 50 normally; reduce it if the welding current rises abnormally to overshoot, and increase it if the welding current does not rise quickly.

(9) Mode 9: Setting of the constant-current correction value for Interval G2 (only when DSW2-(7) is set to ON)
Like Mode 8, Mode 9 sets a constant-current correction value for Interval G2. For details, see page 4-9.

(5) Setting of Maximum Current

Set the maximum current of the welder to be used. If it is unknown, set it by the following procedure.

① Maximum current: 10.0 kA
② Weld I, II: 0 ∿
③ Weld III: 1 ∿
④ Current III: Desired current (10.0 kA maximum)

Turn on the power. If the monitored value of Current III is below the desired current, reduce the maximum current setting; if the monitored value of Current III is over the desired current, increase the maximum current setting.
Repeat the above procedure until the monitored value of Current III is slightly lower than the preselected value of Current III.

(6) Current Calibration Method

Though the **CY-210E** is properly factory-adjusted, the control current may vary over time. The control-current value may also change due to a current sensor and its installation.
In such a case, the difference between controls used and the control current values can be adjusted using the properly calibrated Weld Checker, according to the following procedures.

(1) In secondary constant-current control mode
Adjust the I2.ADJ (VR2) knob on the controller so that the current setting on the panel is the same as the secondary current of the Weld Checker.

(2) In primary constant-current control mode
Input the turn ratio of the transformer to be used (see Setting by mode No. (5)).

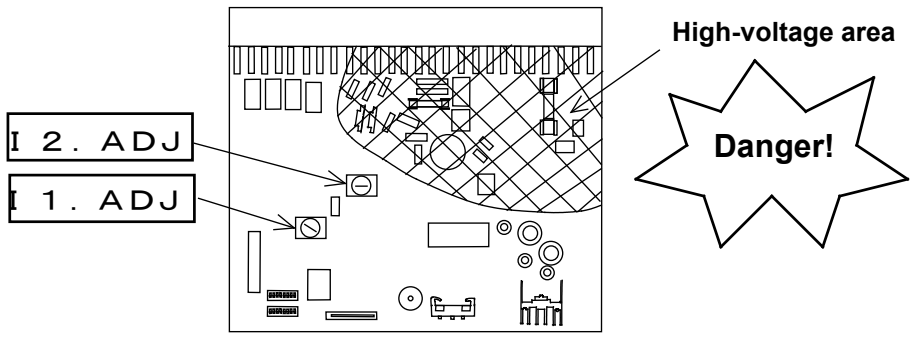
Turn on the power and change the turn ratio of the transformer so that the current setting on the panel is the same as the actual secondary current of the Weld Checker.

If the secondary current of the welder is larger than the current setting on the panel, set the turn ratio of the transformer higher.

If the current cannot be calibrated by adjusting the turn ratio of the transformer, calibrate it using the I1.ADJ (VR4) knob in the control.

[Danger!]

When calibrating the current, do not touch any part other than the adjustment knob. The welding power and control power are turned on, so be very careful not to touch the high-voltage area.



7. Maintenance

(1) Replacement of Fuses

The printed circuit board in this device has two fuses to protect the device. If one is blown, check for what caused it to blow, and replace it in accordance with the following procedure.
(Note) Both fuses use the same fuse, which is different from CY-210D and earlier.

Fuse	Model
φ5.2 500VAC 1A	0477001.MXP

[Warning]

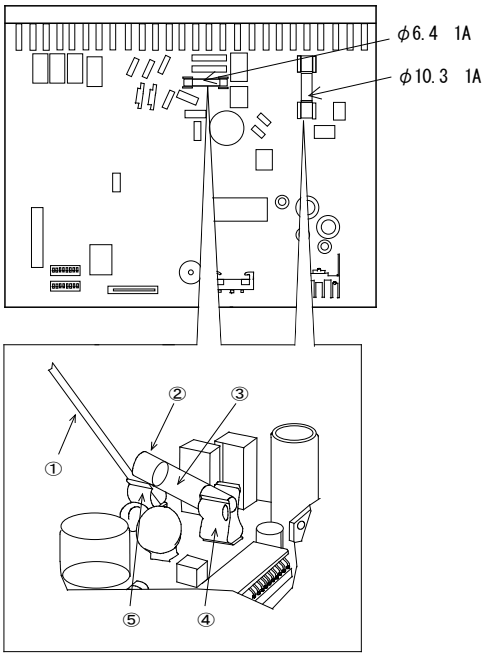
When replacing a fuse, be sure to turn off both the 240-V control power source and the 240-V or 480-V welding power source in order to prevent electric shock.

Replacement procedure for fuses

1) Insert a narrow screwdriver on the rear fuse holder (5) side, and pry the fuse up by using the screwdriver as a lever. Touch only the metallic part of the fuse with the screwdriver, in order to avoid breaking the glass part (3).

2) Place the metallic parts of the new fuse on the front (4) and rear (5) of the fuse holder, and push the glass part of the fuse in firmly with your thumb.

3) Confirm that the fuse is properly set in the fuse holder.



① Screwdriver
Use a narrow type.

② Fuse --- Metallic part

③ Fuse --- Glass part

④ Fuse holder --- Front side

⑤ Fuse holder --- Rear side

8. Specifications

(1) Standard Specifications

1) Welding power source: The voltage depends on the specification. See (2) Specification Chart.
220, 230, 240, 380 V AC -25% + 10%, 50/60 Hz
400, 415, 440, 460, 480 V AC -25% + 10%, 50/60 Hz
(The voltage is set at shipment.)

2) Control power source: The voltage depends on the specification. See (2) Specification Chart.
100, 120, 220, 230, 240 V AC
±20%, 50/60 Hz (The voltage is set at shipment.)

3) Control method: Primary- or secondary-current feedback constant-current control by phase control using a thyristor, or source-voltage fluctuation compensation control method

4) Constant-current control
   1) Control speed: Half-cycle (Secondary constant-current control)
   1 cycle (Primary constant-current control)
   2) Initial response speed: 2 cycles max. (In secondary constant-current control mode)
   Time from when the power is turned on until the current reaches the set current ±10%
   3) Current accuracy (Error from full scale)
      a. Welding power-source voltage fluctuation: ±2% for +10%/-15%
      b. Resistance load fluctuation: ±2% for ±15%
      c. Inductive load fluctuation: ±2% for ±15%

5) Source-voltage fluctuation compensation control
   1) Control Speed: 1 cycle
   2) Current accuracy (Error from full scale):
   ±3% for fluctuation of 10% in the welding power-source voltage

6) Number of schedules: 15

7) Valve output:
   1) System: Valve No. 1 or 2 can be selected for 15 schedules.
   2) Output voltage: Control voltage (1 A max.) or 24 V DC (0.6 A max.)
   The voltage depends on the specification. See (2) Specification Chart.

8) Setting of timers
   1) SQUEEZE time: 00-99 cycles, 15 schedules
   2) WELD I time: 0-9 cycles, 15 schedules
   3) COOL I time: 0-9 cycles, 15 schedules
   4) SLOPE I time (upslope included in WELD II time):
   0-9 cycles, 15 schedules

5) WELD II time: 00-99 cycles, 15 schedules

6) COOL II time: 00-99 cycles, 15 schedules

7) WELD III time: 00-99 cycles, 15 schedules

8) SLOPE II time (downslope included in WELD III time):
00-99 cycles, 15 schedules

9) HOLD time: 00-99 cycles, 15 schedules

10) OFF time in Repeating function:
00-99 cycles, 15 schedules

11) PULSATION 0-9 times, 15 schedules
Either 10) or 11) is selected in accordance with the selected function.

9) Maximum current setting range:
2 schedules (one schedule for each Valve No.)
Set to the maximum secondary current of the welder
Setting range: 5 - 80 kA

10) Current setting range: 15 schedules
1) Constant-current control mode

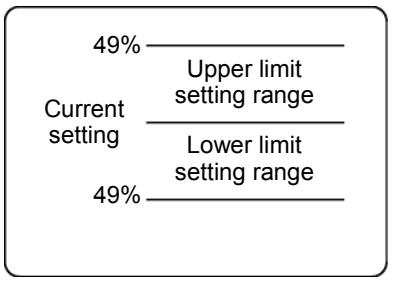
Current (CURR.) I, II, II: 20% - 100% of max. current setting

2) Source-voltage fluctuation compensation control mode

Current (CURR.) I, II, II: 00.0 - 99.9%

11) Primary-current control range: 50 - 1500 A

12) Current monitor
1) In constant-current control mode



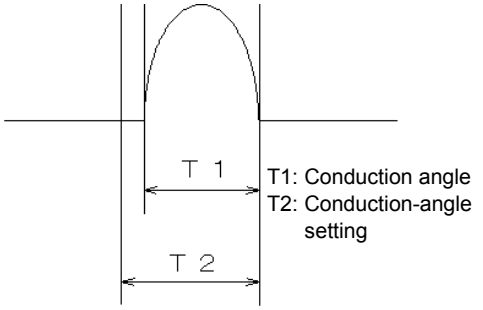
- Current monitor setting range
  Setting of upper limit: 0% – 49%, 15 schedules
  Setting of lower limit: 0% – 49%, 15 schedules
  (If set to 0%, the monitor is turned off.)
- Monitored value:
  Average effective value of currents, excluding the first three cycles and Slope I and II
- Judgment output:
  If the monitored current is out of the set range, the [CAUTION] LED lights up and an error signal [ERROR] is output.

2) In source-voltage fluctuation compensation control mode

When a toroidal coil or CT is used, if full waves are detected for four cycles or longer, the [CAUTION] LED lights up and an error signal [ERROR] is output.

13) Setting range of the maximum-conduction-angle monitor

1 - 180 degrees (if set to 0, the monitor is turned off), 15 schedules



If the monitored conduction angle exceeds the set angle, an error signal [ERROR] is output.
If the conduction angle is set to "000", the monitor does not check the conduction angle.
Note: The conduction-angle monitor does not work in the source-voltage fluctuation compensation control mode.
Note: This monitor cannot be used when the control is used for a welder of the single-phase rectifier type.

14) Setting range of the transformer turn ratio
   1) Valve 1: 1.0-199.9, 1 schedule
   2) Valve 2: 1.0-199.9, 1 schedule

15) Current stepper-up
   1) Preset
      a. Step No.: 1 - 9
      b. Step count: 0 - 9999, 2 schedules (One schedule for each Valve No.)
      c. Stepper-up rate: 50% - 200%, 2 schedules (One schedule for each Valve No.)
   2) Operation — If the number of weld counts of each step No. reaches the set value, the step No. is increased by 1. Upon completion of the last step, the step end signal [STEP END] is output. Power is then supplied according to the schedule of the last step No.
   3) Reset — Turn on the step reset signal [STEP RESET] from outside, or decrease the step No. from the last step No. shown on the panel.

16) Total counter
   1) Preset: — 0 - 9999, 1 schedule
   2) Operation — If the total number of total weld count reaches the preset value, the monitor counter on the panel blinks and the error signal [ERROR] is output.
   3) Reset — Set the mode No. on the panel to "2", and press the [COUNT RESET] key.

17) Weld counter
   1) Preset: — 0 - 99, 1 schedule
   2) Operation — The weld shots are counted while the workpiece confirmation signal [INTERLOCK/**WELD No. SET**] is turned on. When the workpiece confirmation signal [INTERLOCK/**WELD No. SET**] is turned off, if the number of weld shots is less than the preset value, the weld-count error signal [INTERLOCK/**WELD No.ERROR**] is output.
   3) Reset — Weld the insufficient number of weld shots, or turn on the workpiece confirmation signal [INTERLOCK/**WELD No. SET**] again.

18) Work counter
   1) Preset: — None
   2) Operation — If the weld count reaches the preset value, the work counter is increased by 1.
   3) Reset — Set the mode to “4” and press the [COUNT RESET] key.

19) Error outputs
To output an error signal [ERROR] when an error is detected or a “Check current” signal is indicated

No.	Contents	Detection	Operation		Reset		HOLD END output		Alarm output	Indication on panel	Remarks
1	Self-diagnosis error	When power is turned on	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 01 ON	
2	Start input error	When start signal is input	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 02 ON	During parity check only
3	Current-setting error	When start signal is input	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 03 ON	During constant-current control only
4	Current stepper-up ratio setting error	When start signal is input	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 04 ON	During stepper-up operation only
5	Thermostat error	When start signal is not input	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 05 ON	
6	Thyristor short-circuit error	During SQUEEZE, COOL I, COOL II, and HOLD	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 06 ON	With a toroidal or CT coil connected only in source-voltage fluctuation compensation mode
7	No-power-supply error	During WELD I, II and III	Cannot start		Reset error		Not turned on		ERROR	[ERROR] LED and error code 07 ON	- During constant-current control only - With 4 or more cycles set for welding current only
8	Current upper-and-lower-limit error	When WELD III ends	Can start	Cannot start	Reset error or restart	Reset error	Turned on	Not turned on	ERROR	[CAUTION] LED lights up	Only in constant-current control mode
9	Cond. angle error	When WELD III ends	Can start	Cannot start	Reset error or restart	Reset error	Turned on	Not turned on	ERROR	[CAUTION] LED lights up	Only in constant-current control mode
10	Full-wave error	When WELD III ends	Can start	Cannot start	Reset error or restart	Reset error	Turned on	Not turned on	ERROR	[CAUTION] LED lights up	Only in source-voltage fluctuation compensation control mode
11	Total counter- up	Upon completion of welding	Can start		Reset count		Turned on		ERROR	Monitored count blinks	
12	Insufficient weld count	When WELD No. SET input is turned off	Can start		Weld deficient weld shots		Turned on		WELD No. ERROR	[ERROR] LED lights up	
13	Step-up completion	Upon completion of welding	Can start		Reset step		Turned on		STEP END	[STEP END] LED lights up	

Note: The shaded items apply when DSW1-(8) is set to ON.

(**CY-210E** error detection list)

20) External input signals

1) PROGRAM.LOCK: If a closed-contact signal is input, programming is locked.

2) START 1,2,4,8,P: Five types of start signals - START 1, 2, 4, 8, and P (parity) - are available. A 4-bit input terminal is installed. Fifteen schedules can be selected using binary signals. In 15-schedule mode, parity check is available. Only odd parity can be checked, however. When using four schedules, use Schedules 1, 2, 4, and 8.

3) WELD ON/OFF: If a closed-contact signal is input, welding can start; if the contact is open, only sequential operation is executed.

4) THERMOSTAT: Connect to the thyristor thermostat.

5) STEP RESET: If a closed-contact signal is input, the step No. is returned to first step No.

6) ERROR RESET: If a closed-contact signal is input, the error alarm is reset. The contact outputs and LED that are turned on when the error occurred are turned off.

7) INTERLOCK/WELD No. SET (dip-switch-selectable):
If a closed-contact signal is input, the system waits for the power to be turned on when the interlock function is selected.

21) External output signals

1) HOLD END: Output for approximately 200 ms or until the start signal is turned off after the holding period (contact capacity: 110 V AC, 0.5 A)
Note: This contact signal is also output when welding is turned off.

2) ERROR: Output when an error occurs
(contact capacity: 110 V AC, 0.5 A)

3) STEP END: Output upon completion of last step in stepper-up operation mode
(contact capacity: 110 V AC, 0.5 A)

4) VALVE 1: Outputs the control power-source voltage or 24 V DC during the weld cycle

5) VALVE 2: Outputs the control power-source voltage or 24 V DC during the weld cycle

6) WELD ON: Output during Weld I, II, and III

7) INTERLOCK/WELD No. ERROR (dip-switch-selectable):
Output from 2 cycles before the power is turned on until the power is turned off, or when a weld-count error occurs (contact capacity: 110 V AC, 0.5 A)

22) Operating ambient temperature: 0-45°C

23) Power consumption: Control power --- 10 W max. (excluding valve output)

24) Dimensions and mass
122 mm (H) x 355 mm (W) x 250 mm (D), 4.5 kg

25) Accessories
Fuse (spare): 2 pc

(2) Specification Chart

Model No. CY-210E-	Control power source	Welding power source		Valve output	Data out function	Toroidal coil
00-00	100V	220V	440V	100V	Available	MB-400L or standard x1 coil
00-01	120V	240V	480V	24V DC	Available	
00-03	220V	220V	380V	220V	Available	
00-10	230V	230V	400V	24V DC	Available	

(3) Data Out Function (Option)

Data out function (option) is for outputting the monitor data via RS-485. As to whether the function is equipped on your device or not, see (2) Specification Chart.

1) Data out
Data is output when dip switch DSW2-(5) in the control is ON and DSW2-(1) is OFF (Pulsation).

1) Data transmission

Method:	Conforms to RS-485, asynchronous, without rigid procedure
Data transmission rate:	9600 bps
Data format:	Start bit 1 Data bit 8 Stop bit 1 Parity bit even

2) Connector

CY-210E side: NJC2012-RM (Nanaboshi Electric Mfg. Co., Ltd.)
Attached plug: NJC2012-PF (Nanaboshi Electric Mfg. Co., Ltd.)

Pin No.	Name of signal
1-4	Not connected
5	DATA (+)
6	DATA (-)
7-12	Not connected

Note: The model numbers of connectors are subject to change without notice. Depending on the part to be changed, the mounting screw shape may change and a necessary tool may be different. For the latest parts information, contact a nearest sales office.

3) Data structure

ASCII-code character strings

a. Monitor data

M : □ □ ___
Fixed ①
□ □ . □ ___ ② □ □ □ ___ ③ ± □ □ ___ ④
□ □ . □ ___ ⑤ □ □ □ ___ ⑥ ± □ □ ___ ⑦
□ □ . □ ___ ⑧ □ □ □ ___ ⑨ ± □ □ ___ ⑩
□ □ . □ ___ ⑧ □ □ □ ___ ⑨ ± □ □ 「CR」 ⑩

Starts with “M:”. Space code “20H” between each piece of data. Ends with CR code “0DH”.

①: Start No.
②: Monitor the current value of WELD 1.
③: Monitor the conduction angle of WELD 1.
④: Deviation of the WELD 1 current. If the current is larger than the current setting, “+” is displayed; if the current is smaller than the setting, “-” is displayed.
⑤: Monitor the current value of WELD 2.
⑥: Monitor the conduction angle of WELD 2.
⑦: Deviation of the WELD 2 current. If the current is larger than the current setting, “+” is displayed; if the current is smaller than the setting, “-” is displayed.
⑧: Monitor the current value of WELD 3.
⑨: Monitor the conduction angle of WELD 3.
⑩: Deviation of the WELD 3 current. If the current is larger than the current setting, “+” is displayed; if the current is smaller than the setting, “-” is displayed.

Note: In pulsation mode, WELD 3 data indicates the number of pulsations.

b. Error data

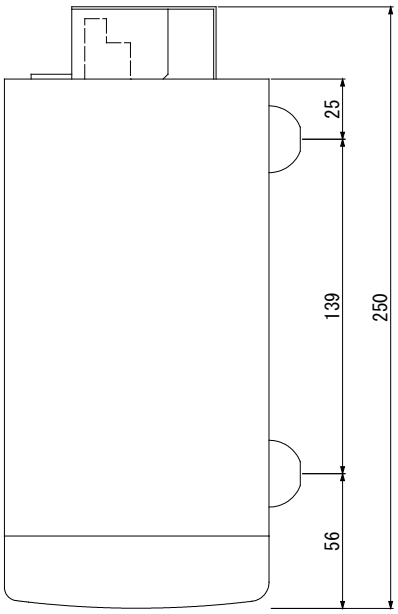
E : □ □ □ □ 「CR」

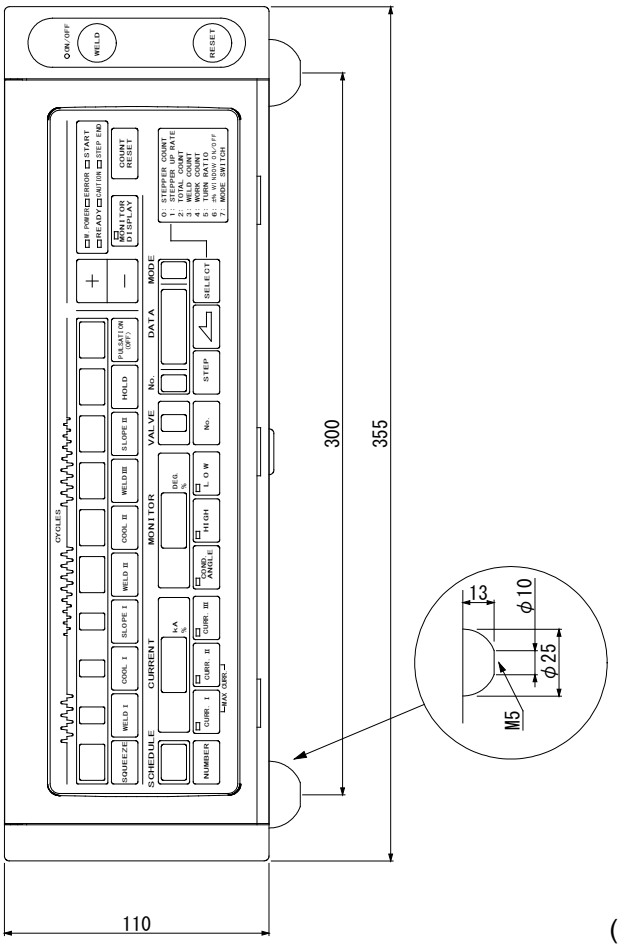
Fixed

Starts with “E:”. Error codes consist of two fixed digits, and a space code is inserted between two or more error codes. Ends with CR code “0DH”.

Code	Contents	Code	Contents
01	Self-diagnosis error	08	Upper/lower-current-limit error
02	Start input error	09	Conduction-angle error
03	Current-setting error	10	Full-wave error
04	Current stepper-up rate-setting error	11	Total count up
05	Thermostat error	12	Insufficient weld count
06	Thyristor short-circuit error	13	Stepper-up completion
07	No-power-supply error		

(4) Outline Drawing





(Unit: mm)

9. Schedule Data Table

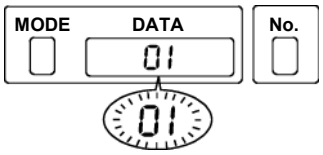
No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Valve No.															
Squeeze															
Weld I															
Cool I															
Slope I (Up)															
Weld II															
Cool II															
Weld III															
Slope II (Down)															
Hold															
Pulsation/OFF															
Current I															
Current II															
Current III															
Cond. angle monitor setting															
+% monitor setting (High)															
-% monitor setting (Low)															

Current monitor 0: OFF; 1: ON	Weld I	Weld II	Weld III

No.		Valve 1	Valve 2
Max. current			
Turn ratio of transformer			
Step 1	Count		
Step 2	Count		
	Stepper-up rate		
Step 3	Count		
	Stepper-up rate		
Step 4	Count		
	Stepper-up rate		
Step 5	Count		
	Stepper-up rate		
Step 6	Count		
	Stepper-up rate		
Step 7	Count		
	Stepper-up rate		
Step 8	Count		
	Stepper-up rate		
Step 9	Count		
	Stepper-up rate		

Total counter	
Weld counter	
Mode switch	

10. Error Indication and Countermeasures



Each error code blinks in the “DATA” area on the panel.

Error Code	Contents	Countermeasures
01	Self-diagnosis error	Schedule data is different from the time of programming. Check all settings. If it appears again after initialization, repair is required. Please contact us.
02	Start input error	A parity check error of the start input was detected. Check the external programmable controller, start input cable, etc.
03	Current-setting error	The current setting exceeds the maximum current setting. Lower the former to below the latter. If the primary constant-current control is selected, confirm the following relationship: $\frac{\text{Max. current setting}}{\text{Turn ratio of transformer}} \leq 1500\ \text{A}$
04	Current stepper-up-rate setting error	For the stepper tip, confirm the following relationship: Max. current setting $\geq$ current setting x ($\frac{\text{Stepper - up rate}}{100}$)
05	Thermostat error	The thermostat signal [THERMOSTAT] is turned off. Check the thermostat and cooling-water temperature for the contactor.
06	Thyristor shot-circuit error	Thyristor is shorted. Check it.
07	No-power supply error	Current is not detected. Check the following: (1) See if enough force is applied to the electrode. (2) Check the current-detecting coil (toroidal coil or CT) for breakage. (3) Check the current-detecting coil connector for disconnection. (4) Confirm that the squeeze is set long sufficiently. (Set it longer than stroke time of the electrode.) (5) Confirm that the maximum current is not set too large. (6) Confirm that the connections to 01 and (02) or 02 are correctly done. This error is not detected if the welding current is set at 3 cycles or less. Check the above points once again if no current flows with the welding current set at 3 cycles or less.