

**MOTOR-DRIVEN RESISTANCE WELDING HEAD**

**MH-D24B**

# **OPERATION MANUAL**



Thank you for purchasing our Motor-Driven Resistance Welding Head **MH-D24B**.

- This operation manual explains its method of operation and precautions for use.
- Before using, read this operation manual carefully; after reading, save it in a proper place where you can easily access.

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# 1. Special Precautions

## (1) Safety Precautions

Before using, read "Safety Precautions" carefully to understand the correct method of use.

- These precautions are shown for safe use of our products and for prevention of damage or injury to operators or others. Be sure to read each of them, since all of them are important for safety.
- The meaning of the words and symbols is as follows.

### **DANGER**

Denotes operations and practices that may imminently result in serious injury or loss of life if not correctly followed.

### **WARNING**

Denotes operations and practices that may result in serious injury or loss of life if not correctly followed.

### **CAUTION**

Denotes operations and practices that may result in personal injury or damage to the equipment if not correctly followed.



These symbols denote "prohibition". They are warnings about actions out of the scope of the warranty of the product.



These symbols denote actions which operators must take.



Each symbol with a triangle denotes that the content gives notice of DANGER, WARNING or CAUTION to the operator.

## **DANGER**



### **Never disassemble, repair or modify the Welding Head**

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 Welding Head**

This product incorporates parts containing gallium arsenide (GaAs).

# WARNING

**Do not put your hands between the electrodes**

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

**Do not touch any welded part or electrodes during welding and just after welding finished**

The welded part of a workpiece, electrodes and electrode holder are very hot. Do not touch them; otherwise you may be burnt.

**Apply the specified power supply**

Application of a voltage out of the specified range can cause fire and electric shock.

**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.

**Wear protective glasses**

If you look at the surface flash and expulsion directly during welding, your eyes may be damaged.

# CAUTION



## **Do not splash water on the Welding Head**

Water splashed over the electric parts can cause electric shock and short circuits.



## **Use proper tools (wire strippers, pressure wire connectors, etc) for termination of the connecting cables**

Do not cut the conductor of wire. A flaw on it can cause fire and electric shock.



## **Do not damage the power cable and connecting cables**

Do not tread on, twist or tense any cable. The power cable and connecting cables may be broken, and that can cause electric shock and fire. When you need any repair or replacement, consult us or your distributor.



## **Connect the specified cables securely**

Cables of insufficient current-carrying capacities and loose connections can cause fire and electric shock.



## **Install the Welding Head on firm, level surface.**

If the Welding Head falls or drops, injury may result.



## **Keep combustible matter away from the welding machine.**

Surface flash and expulsion can ignite combustible matter. If it is impossible to remove all combustible matter, cover them with non-combustible material.



## **Do not cover the Welding Head with a blanket, cloth, etc.**

If such a cover is used, it may be heated and burn.



## **Keep a fire extinguisher nearby.**

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



## **Maintain and inspect the Welding Head periodically.**

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



## **Protective gear must be worn**

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



## **Do not use this Welding Head for purposes other than welding**

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

## (2) Precautions for Handling

- Do not install this Welding Head in the following:
  - Damp places where humidity is 90% or higher,
  - Dusty places,
  - Places where chemicals are handled,
  - Places near a high-frequency noise source,
  - Hot or cold places where temperatures are above 40°C or below 0°C, and
  - Places where water will be condensed.
- Clean the outside of the Welding Head with a soft, dry cloth or one wet with a little water. If it is very dirty, use diluted neutral detergent or alcohol. Do not use paint thinner, benzine, etc., since they can discolor or deform the Welding Head.
- Do not put anything other than a workpiece, e.g., a tool, a screw, etc., between the electrodes. It can cause serious trouble.
- Do not put a screw, a coin, etc., in the Welding Head, since they can cause a malfunction.
- Operate the Welding Head according to the method described in this operation manual.
- Operate the button carefully by hand. If it is operated roughly or with the tip of a screwdriver, a pen, etc., this will cause malfunction or damage.

## (3) On Disposal

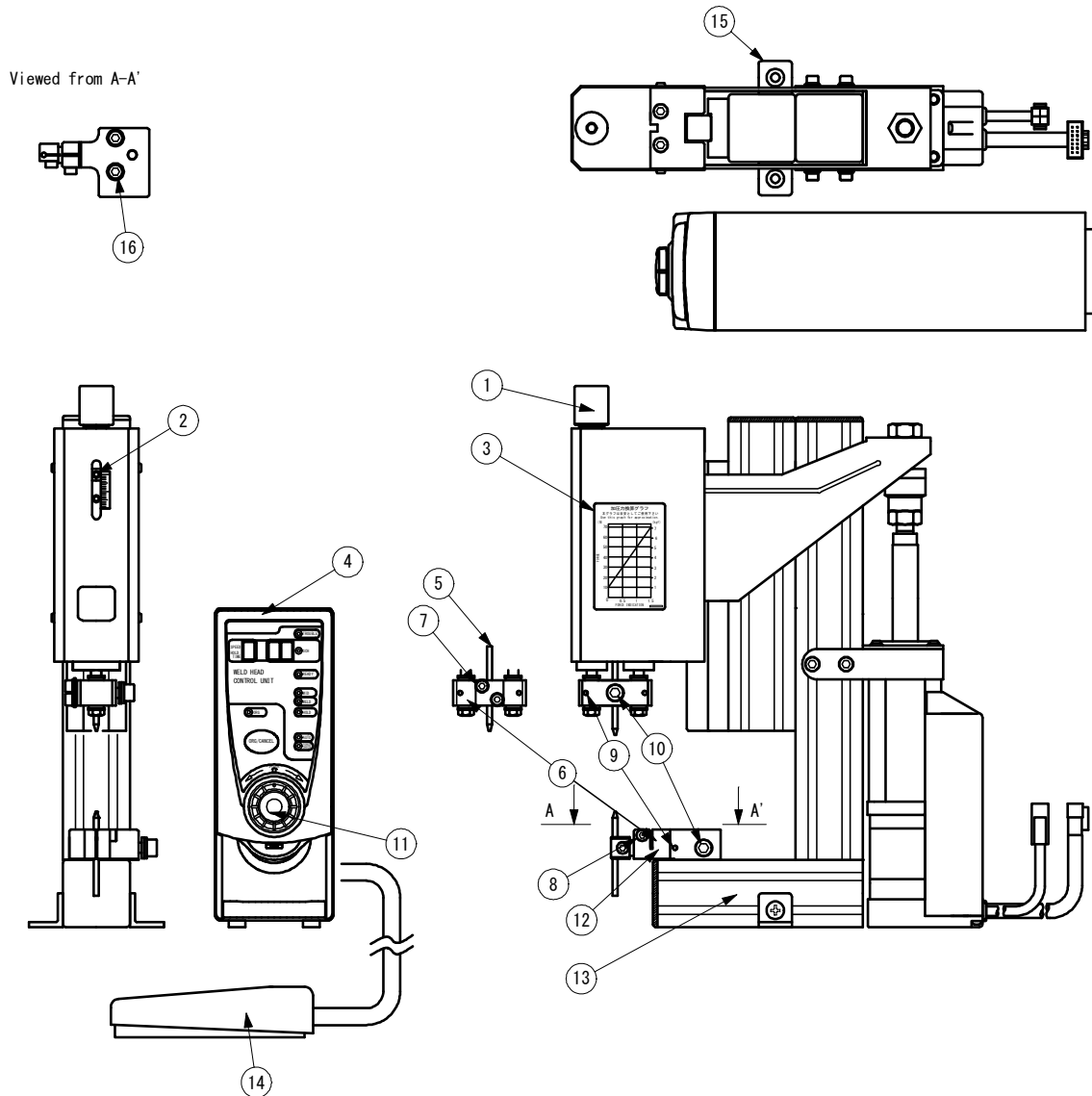
This product incorporates parts containing gallium arsenide (GaAs). At the time of disposal, separate it from general industrial waste or domestic waste and carry out the disposal in accordance with applicable laws and regulations.

## 2. Features

- Since this Welding Head is motor driven, the piping for air actuation is not needed, enabling an easy installation.
- Owing to motor-driven mechanism, stable electrode force is always obtained even if the electrode opening changes. Also, you don't need to adjust the electrode opening finely when replacing electrode.  
The electrode force is 10 to 70 N (1.0 to 7.0 kgf).
- The Head with load cell displays the electrode force at welding on the color LCD by the built-in load cell. The display can be selected from N and kgf.  
Also, you can output a signal when the electrode force reaches the setting and do welding by connecting an optional cable.  
RS-232C, BCD data output, analog output, and RS-485 are available as options of the indicator.
- The Head with load cell can judge that the electrode force is OK or NG by using the comparing display function of indicator.
- The Head with load cell can output the welding start signal from the indicator when the electrode force reaches the specified value for the workpiece to be weld.  
**CAUTION** When starting welding by using the output from the indicator, the judgment that the electrode force is OK or NG cannot be done by using the comparing function.
- You can fit the electrode-force speed to suit your welding work as it is adjustable in four steps; the electrode-up/down speed, in eight steps.
- Thirty-one welding schedules are selectable; they are selectable externally.
- The electrode moves down fast from the start point (stand-by position) to the mid-point (middle-stop position); then slowly to contact the workpiece.  
Very little shock deforms the workpieces less and extends the electrode life.  
The start point and the mid-point are adjustable arbitrarily.
- The electrode moves up and down between the mid-point and workpiece for continuous welding. This reduces the weld cycle time as the electrode doesn't need to return to the start point every time it welds.
- During welding, the workpieces expands and shrinks. This Welding Head employs a spring so that the electrode can follow-up the deformation of the workpiece fast, which reduces the surface flash.
- The dedicated controller easily sets the electrode position and speed.

### 3. Name and Functions of Each Section

#### (1) Head



- ① **Weld Force Adjustment Knob**  
Adjusts the electrode force.
- ② **Lock Screw**  
Locks the Weld Force Adjustment Knob.
- ③ **Weld Force Conversion Graph**  
Shows an approximate electrode force for your weld force adjustment.
- ④ **Controller**  
Controls the movement of the Welding Head.



⑤ **Electrode**

For spot welding. Material is CrCu.

⑥ **Electrode Holder**

Clamps the Electrode.

**ATTENTION**

Should a metal object, such as a screwdriver and wire, contact the **Electrode** or the **Electrode Holder** during operation, the object may be welded to the Welding Head. Before starting work, be sure to remove all metal objects from around the equipment.

⑦ **Electrode-Fixing Screw (M4)**

Secures the Electrode to the Electrode Holder.

⑧ **Holder-Mounting Screw (M4)**

Mounts the Electrode Holder to the Holder.

⑨ **Volt-Sensing-Cable-Connecting Screw**

Connects the Volt-Sensing Cable (sold separately).

⑩ **Secondary-Cable-Fixing Screw (M6)**

Connects the Secondary Cable.

⑪ **Operating Button**

For operating the Controller. This button can be not only pressed but also turned like a dial.

⑫ **Holder**

For fixing the Electrode Holder.

**ATTENTION**

Should a metal object, such as a screwdriver and wire, contact the **Holder** during operation, the object may be welded to the Welding Head. Before starting work, be sure to remove all metal objects from around the equipment.

⑬ **Base**

For the Welding Head.

⑭ **Footswitch**

Operates the Welding Head. This is a 2-stage footswitch.

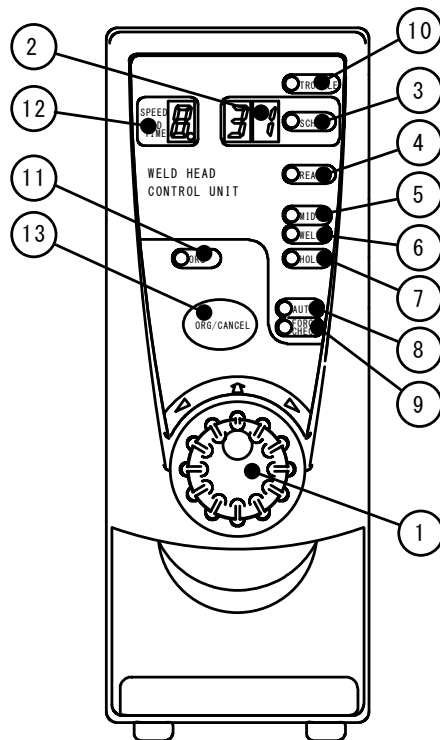
⑮ **Head-Fixing Bracket**

For fixing the Welding Head to the workbench. Two (2) brackets provided.  
 $\phi$  5.5 mm mounting hole diameter (M5 countersink).

⑯ **Holder-Fixing Screw (M5)**

For fixing the lower Holder to the Base.

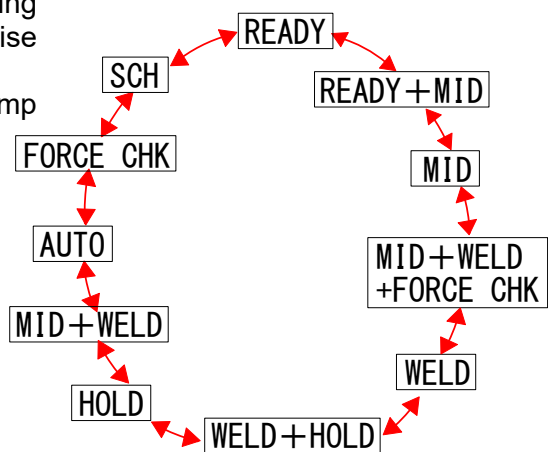
## (2) Controller Front



### ① Operation Button

Operate the Welding Head by turning the button clockwise/counterclockwise or pressing it.

By turning the button, the lamp illumination changes as shown:



See the list below for ② to ⑪

| Lamp                       | When illuminated,   | When blinking,   |
|----------------------------|---|--|
| ② [SCH (Schedule)] Display | Schedule Nos. are displayed.<br>(31 combinations of Electrode position, Speed and Hold Time can be registered as Schedule.) | When power supply is applied, zero "0" blinks.<br>When trouble occurs, fault code is displayed.<br>Schedule No. is being changed.<br>Weld force is being measured. |
| ③ [SCH] Lamp               | Operation button is selecting a function.   | Schedule No. is being changed.   |
| ④ [READY] Lamp             | Electrode is at Start Point and completed for work.<br>Operation button is selecting a function.                            | Start Point is being changed.  |
| ⑤ [MID] Lamp               | Electrode is at Mid-Point.<br>Operation button is selecting a function.   | Mid-Point is being changed.  |
| ⑥ [Weld] Lamp              | Electrode is at Weld Point.<br>Operation button is selecting a function.  | Lowest point (Downstop Point) is being changed.  |
| ⑦ [Hold] Lamp              | Operation button is selecting a function.   | Hold Time is being changed.  |
| ⑧ [AUTO] Lamp              | Operation button is selecting a function.   | Auto-function is setting electrode position and movement.  |
| ⑨ [FORCE CHK] Lamp         | Operation button is selecting a function.   | Weld force is being measured.  |
| ⑩ [TROUBLE] Lamp           | Trouble is occurring.   |  |
| ⑪ [ORG] Lamp               | The [ORG] Lamp is in no use.  |  |

## ② [SPEED HOLD TIME] Display

Indicate the “electrode speed” and “HOLD Time after the application of weld force is completed”. The larger number indicates the faster electrode speed and the longer HOLD Time.

And the lamp lights up simultaneously with other lamps as follows:

| Lamp   | When illuminated,   | When blinking,   |
|--|---|--|
| ④ [READY] Lamp and<br>⑤ [MID] Lamp and<br>⑫ [SPEED HOLD TIME] Display                          | Operation button is selecting a function. ([SPEED HOLD TIME] Display does not light up.)<br>-----<br>Electrode is moving between Start Point and Mid-Point. | Electrode speed between Start Point and Mid-Point is being set.  |
| ⑤ [MID] Lamp and<br>⑥ [WELD] Lamp and<br>⑫ [SPEED HOLD TIME] Display                           | Operation button is selecting a function. ([SPEED HOLD TIME] Display does not light up.)<br>-----<br>Electrode is moving from Weld Point to Mid-Point.      | Electrode speed from Weld Point to Mid-Point is being set.   |
| ⑤ [MID] Lamp and<br>⑥ [WELD] Lamp and<br>⑨ [FORCE CHK] Lamp and<br>⑫ [SPEED HOLD TIME] Display | Operation button is selecting a function. ([SPEED HOLD TIME] Display does not light up.)<br>-----<br>Electrode is moving from Mid-Point to Weld Point.      | Electrode speed from Mid-Point to Weld Point is being set.   |
| ⑥ [WELD] Lamp and<br>⑦ [HOLD] Lamp and<br>⑫ [SPEED HOLD TIME] Display                          | Operation button is selecting a function. ([SPEED HOLD TIME] Display does not light up.)  | The desired time for which the additional weld force is exerted on after applying the weld force at Weld Point is being set. |
| ⑦ [HOLD] Lamp and<br>⑫ [SPEED HOLD TIME] Display   | Operation button is selecting a function. ([SPEED HOLD TIME] Display does not light up.)  | Hold Time is being set.  |
| ⑫ [SPEED HOLD TIME] Display  | In case of Movement Mode 1, electrode position is at Start Point and the Display shows “A” when setting is not performed.                                   |  |

## ⑬ [ORG/CANCEL] Button

The Button interrupts the operation of setting.

### (3) Controller Rear

① **[MOTOR CONTROL] Connector**

It is a connector for controlling a motor to drive the electrode.

② **I/O Connector**

It is for input/output of signals.

③ **Connector for Weld Force detecting Sensor**

It is for inputting the weld force signal of the welding head.

④ **Power Switch**

It is a switch for turning on/off power supply of 100 to 240 V AC.

⑤ **Fuse Holder**

It contains a fuse.

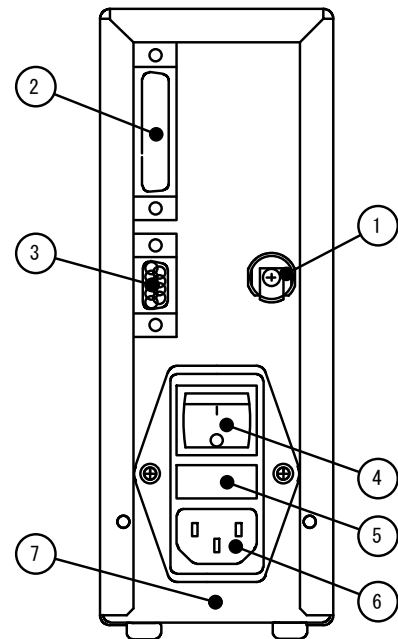
|             |  |
|-------------|--|
| Fuse Rating | 250 V, 1 A, 5 mm dia. 20 mm length (Delay melting and high breaking capacity type) |
|-------------|--|

⑥ **Connector for Power Supply Cable**

It connects a power supply cable (separately sold) to the power supply of 100 to 240 V AC.

⑦ **Ground Terminal**

Use the ground terminal when you can not take a ground by using a power supply cable with a ground wire (separately sold).



## 4. Installation and Connection

Before using your Welding Head, install it according to the following procedures.

### CAUTION



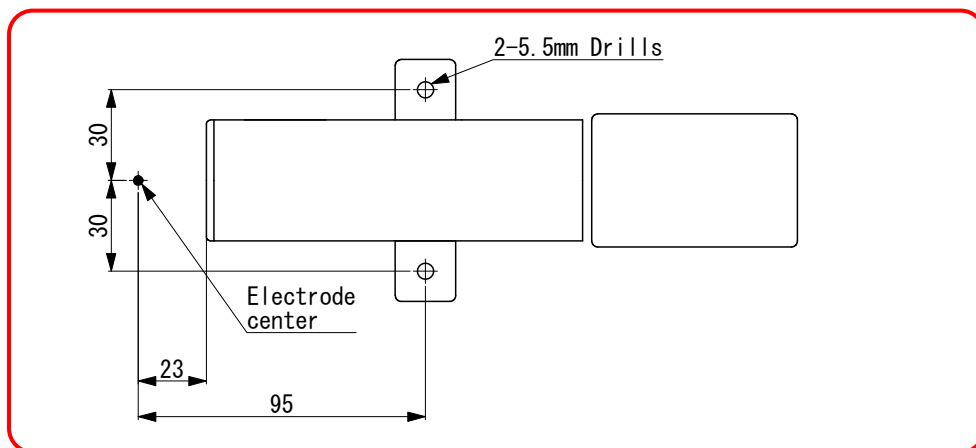
When using, install and fix the Welding Head firmly.  
If you use it not fixed, it may cause injury due to its fall, and degraded weld quality.

#### ① Determining Where to Install

Determine where to install the Welding Head, welding power supply and welding transformer.

#### ② Drilling Mounting Holes

Drill mounting holes on the workbench to secure the Welding Head, following the drawing below:

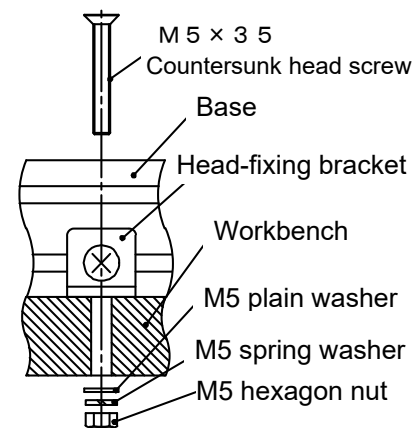


#### ③ Installing the Welding Head

Install the Welding Head to the workbench with the supplied hexagon socket head bolts/cross-recessed countersunk head screws, plain washers, spring washers and hexagon nuts (See drawing at right). Use a proper tool suitable for the bolts/screw to secure the Head.

#### ATTENTION

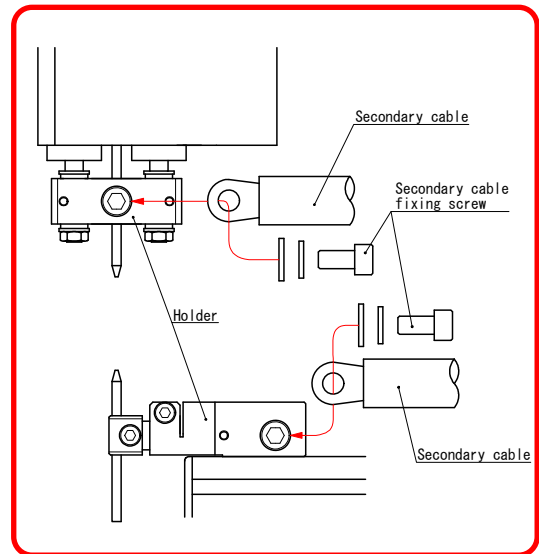
The supplied bolts/screws are for installing the Welding Head on our Workbench **MA-11A**. When using another workbench, prepare bolts/screws suitable for it.



#### ④ Connecting the Secondary Cable

After finishing the installation to your workbench, connect the secondary cable to the Welding Head, which has no polarity.

When connecting, use tools of correct sizes for the screws, bolts and nuts to secure cables.

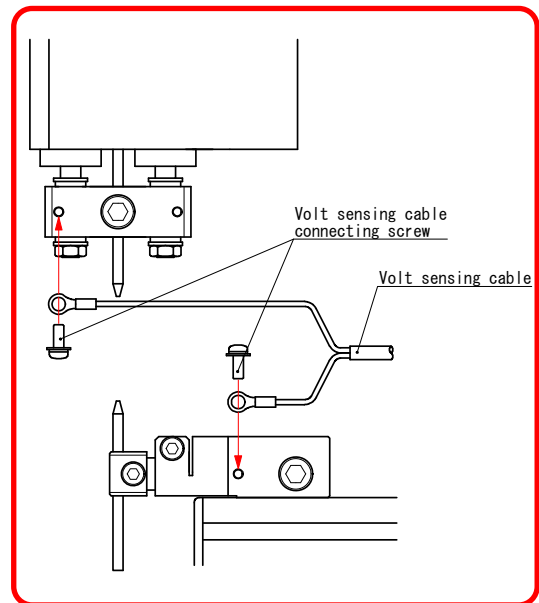


#### ⑤ Connecting the Volt-Sensing Cable

When employing the voltage-detecting function of our Inverter Power Supply **MD-A4000B**, Weld Checker, etc., connect the Volt-Sensing Cable to the Electrode Holder.

#### ATTENTION

The Volt-Sensing Cable is sold separately. Please purchase it from us.



#### ⑥ Connecting the Controller

Connect the I/O connector (see **5. Interface**).



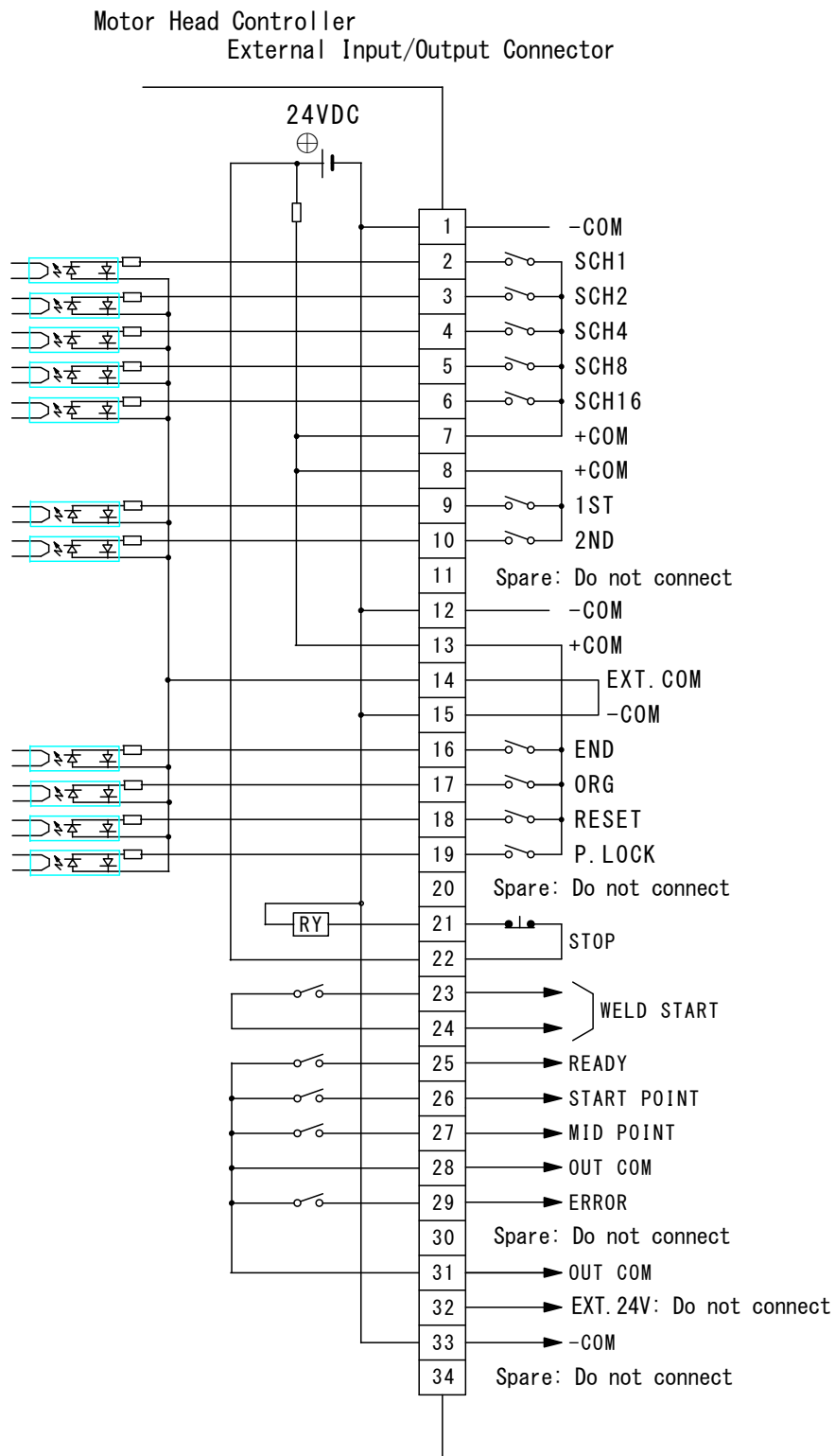
Connect the connector for weld force detecting sensor and MOTOR CONTROL connector.



Lastly, connect the AC Cable to the 100–240 V AC, 50/60 Hz outlet.

## 5. Interface

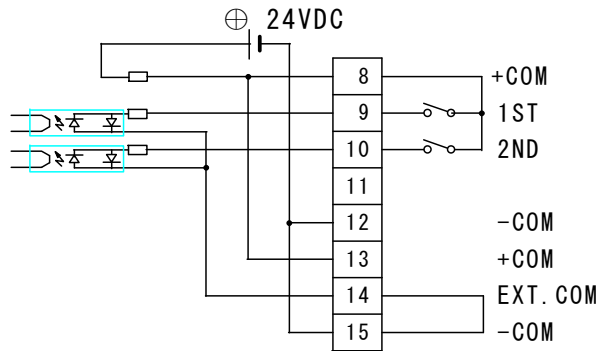
### (1) Connection Diagram of External Input/Output Signal



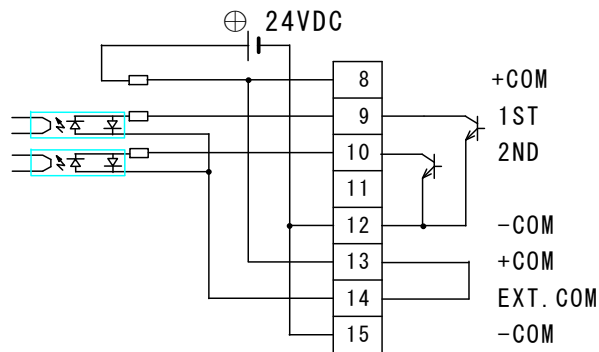


### [Example of Connection]

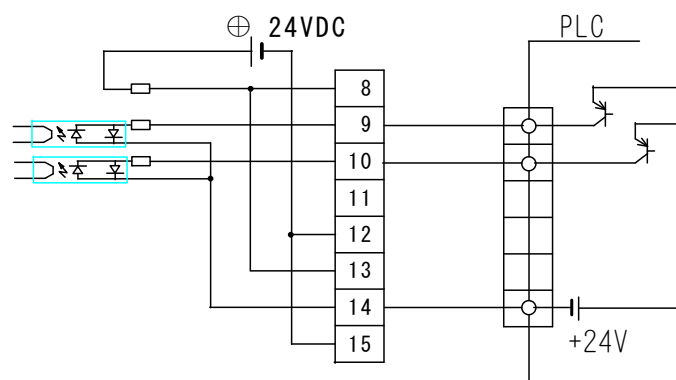
- When contacts are used as input terminal of I/O connector



- When NPN transistor (sink type) on PLC is used as input terminal of I/O connector



- When PNP transistor (source type) on PLC is used as input terminal of I/O connector



## (2) Explanation of Input/Output Signal

Each pin on I/O signal is described.

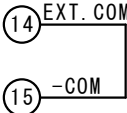
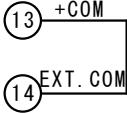

Input signal is explained as contact input.

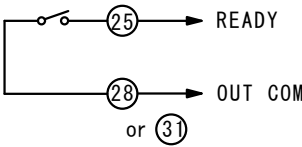
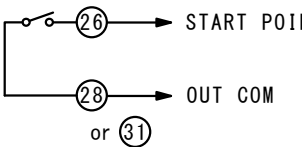
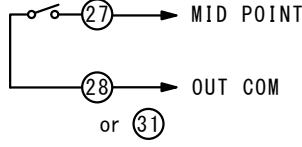
| Pin No. | I/O   | Description   |
|---------|-------|---|
| 1       |       | Internally connected to GND (0V).   |
| 2       | Input | Select a schedule number, referred to as <b>SCH No.</b> below, indicating a combination of the circuit-closed pins among Pins, No. 2, 3, 4, 5 and 6 (See table below.).<br><br>The schedule number selected by I/O Connector has priority over the schedule number set on <b>MH-D24B</b> . Before selecting the schedule number by the operation button on <b>MH-D24B</b> , open the circuits of all the Pins of No. 2, 3, 4, 5 and 6 in I/O Connector.<br><br>Input [SCH] signal at least 2 ms before the welding current flows. During in operation, the schedule number cannot be changed. |
| 3       |       |   |
| 4       |       |   |
| 5       |       |   |
| 6       |       |   |

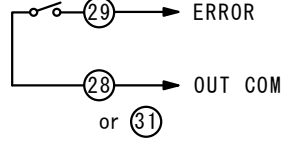
| SCHNo. \ Pin No. | 6 | 5 | 4 | 3 | 2 |
|------------------|---|---|---|---|---|
| 1                |   |   |   |   | ● |
| 2                |   |   |   | ● |   |
| 3                |   |   |   | ● | ● |
| 4                |   |   | ● |   |   |
| 5                |   |   | ● |   | ● |
| 6                |   |   | ● | ● |   |
| 7                |   |   | ● | ● | ● |
| 8                |   | ● |   |   |   |
| 9                |   | ● |   |   | ● |
| 10               |   | ● |   | ● |   |
| 11               |   | ● |   | ● | ● |
| 12               |   | ● | ● |   |   |
| 13               |   | ● | ● |   | ● |
| 14               |   | ● | ● | ● |   |
| 15               |   | ● | ● | ● | ● |
| 16               | ● |   |   |   |   |

| SCHNo. \ Pin No. | 6 | 5 | 4 | 3 | 2 |
|------------------|---|---|---|---|---|
| 17               | ● |   |   |   | ● |
| 18               | ● |   |   | ● |   |
| 19               | ● |   |   | ● | ● |
| 20               | ● |   | ● |   |   |
| 21               | ● |   | ● |   | ● |
| 22               | ● |   | ● | ● |   |
| 23               | ● |   | ● | ● | ● |
| 24               | ● | ● |   |   |   |
| 25               | ● | ● |   |   | ● |
| 26               | ● | ● |   | ● |   |
| 27               | ● | ● |   | ● | ● |
| 28               | ● | ● | ● |   |   |
| 29               | ● | ● | ● |   | ● |
| 30               | ● | ● | ● | ● |   |
| 31               | ● | ● | ● | ● | ● |

The mark ● denotes the circuit-closed pin.

| Pin No. | I/O   | Description   |
|---------|-------|---|
| 7       |       | Output pins for 24 V DC through 100Ω internal resistor.   |
| 8       |       |   |
| 9       | Input | Input pin for start-up signal.<br>When [1ST] is closed, electrode moves from Start Point to Mid-Point.<br>When [2ND] is closed after [1ST] was closed, electrode moves from Mid-Point to Weld Point.<br>Although only [2ND] is closed, electrode does not move.   |
| 10      |       |   |
| 11      |       | Spare pin: Do not connect.  |
| 12      |       | Connected to [GND] (0V) internally at factory shipment.   |
| 13      |       | Output pins for 24 V DC through 100Ω internal resistor.   |
| 14      |       | <p>According to the usage, connect pins as follows.</p> <ul style="list-style-type: none"> <li>When contact is used as input signal of I/O Connector, connect Pins 14 and 15.<br/>(In the 2-stage footswitch which is Accessories, Pins 14 and 15 are connected at factory shipment.)</li> </ul>  <ul style="list-style-type: none"> <li>When NPN transistor (sink type) on PLC is used as input signal of I/O Connector, connect Pins 13 and 14. COM terminal of PLC connects to —COM terminal, that is, Pins 1, 12 and 15.</li> </ul>  <ul style="list-style-type: none"> <li>When PNP transistor (source type) on PLC is used as input signal of I/O connector, connect Pin 14 to COM terminal of PLC.</li> </ul>  |
| 15      |       | Connected to [GND] (0V) internally at factory shipment.   |
| 16      | Input | Input pin for [End] signal from welding power supply.<br>If Pin 16 is closed, input signal of [2ND] cannot be accepted.   |

| Pin No. | I/O    | Description  |
|---------|--------|--|
| 17      | Input  | Input pin for Start Point resuming signal.<br>When the circuit of Pin 17 becomes closed, the electrode resumes Start Point. (In case that the motor finishes moving back to Original Point, the electrode does not move.)  |
| 18      |        | Input pin for [RESET] signal.<br>If a trouble occurs, rectify the trouble and close the circuit of the Pin to turn off [NG] signal. (See Chapter 7 for fault codes.)<br>Close at least for 2 ms. Pin 18 does not work while the circuit of Pin 18 is closed.                               |
| 19      |        | Input pin for prohibition of changing the program<br>When Pin 19 is closed, the program of <b>MH-D24B</b> cannot be modified.  |
| 20      |        | Spare pin: Do not connect.   |
| 21      | Output | Output pin for an emergency stop of the motor.<br>When the circuit between Pins 21 and 22 is opened, the motor carries out emergency stop.   |
| 22      |        | Usually, close it by an electric wire or switch whose capacity is more than 24 V DC, 20 mA.  |
| 23      |        | Output pin for current-supplying start signal to the welding power supply.<br>When the weld force is completed, the circuit between Pins 23 and 24 becomes closed.   |
| 24      |        | Contact capacity is 24 V DC, 20 mA.  |
| 25      |        | Output pin for completion signal of being ready for work.<br>When the resumption of Start Point is completed, the Pin becomes closed. In an emergency of <b>MH-D24B</b> , the Pin becomes opened.<br> |
| 26      |        | Output pin for completion signal of arriving at Start Point.<br>When the electrode is at Start Point, the Pin becomes closed.<br>   |
| 27      |        | Output pin for completion signal of arriving at Mid-Point.<br>When the electrode is at Mid-Point, the Pin becomes closed.<br>   |

| Pin No. | I/O    | Description  |
|---------|--------|--|
| 28      |        | Common terminal to [READY], [START POINT], [MID POINT] and [ERROR]   |
| 29      | Output | <p>Output pin for a trouble signal. When a trouble occurs in <b>MH-D24B</b>, the Pin becomes opened until it is reset.</p>  |
| 30      |        | Spare pin: Do not connect.   |
| 31      |        | Common terminal to [READY], [START POINT], [MID POINT] and [ERROR]   |
| 32      |        | Do not connect to the Pin for [EXT. 24 V].   |
| 33      |        | Connected to [GND] (0 V) internally at factory shipment.   |
| 34      |        | Spare pin: Do not connect.   |

## 6. Operation

### (1) Getting Started

#### ① 2-Level Footswitch

It is of 2-level type. The switch of the first level is External Input [1ST]. The switch of the second level is External Input [2ND].

These two switches allow a variety of operations.

#### ② Position of Electrode

The **MH-D24B** Electrode has five (5) positions to stop.

| Position              | Description   |
|-----------------------|---|
| <b>Original Point</b> | The position where the electrode has completely returned.   |
| <b>Start Point</b>    | A little bit farther position from Original Point. It can be set arbitrarily. [READY] Lamp lights up when the electrode is at this position.                              |
| <b>Mid-Point</b>      | Just before the position where the electrode contacts workpiece. It can be set arbitrarily. [MID] Lamp lights up when the electrode is at this position.                  |
| <b>Weld Point</b>     | The position where the electrode contacts workpiece. [WELD] Lamp lights up when the electrode is at this position. Weld start signal is output and welding current flows. |
| <b>Downstop Point</b> | A little bit beyond the position from Weld Point. It can be set arbitrarily.  |

#### ③ Working Mode of Electrode

| Movement  | Mode 0                                   | Mode 1   |
|---|--|--|
| <b>For setting Position or measuring Weld Force</b>                             | Performed by External Input [1ST or 2ND] | Performed by External Input [1ST or 2ND] or pressing the operation button. |
| <b>For resuming Start Point of motor</b>  | Performed by External Input [1ST or ORG] | Performed by External Input [1ST or ORG] or pressing [ORG/CANCEL] button.  |
| <b>Electrode is pressed on the way other than from Mid-Point to Weld Point.</b> | Error indicated                          | Error indicated and the power supply to motor turned off.                  |

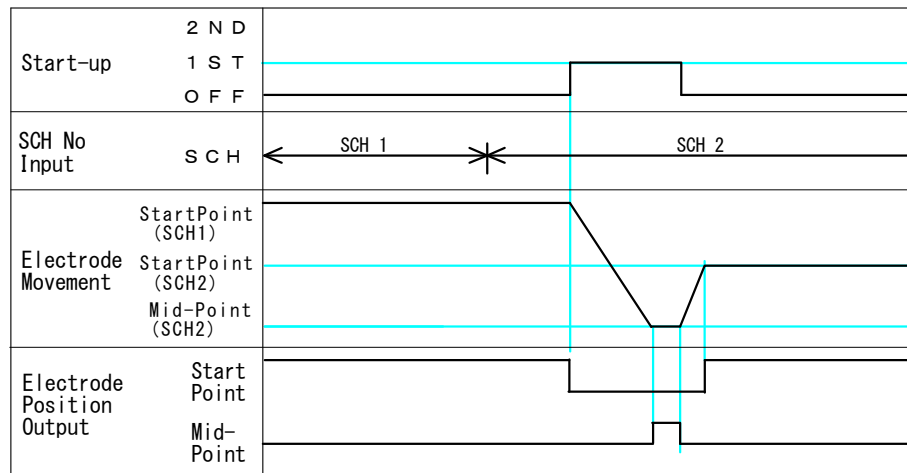
In **Mode 1**, when the electrode is at Start Point and no setting is performed, then, "A" is shown on [SPEED HOLD TIME] Display.

#### ④ Attention on Movement

- Change of Schedule No.

Only the change of Schedule No. does not allow the electrode to move. External Output [START POINT] continues to hold the signal of the previous position.

In case that Start Point of changed Schedule No. differs from the one of the last Schedule No., once make the electrode move to Mid-Point to attain the new Start Point.



- In case of continuous operations across several Schedule Numbers, set each Start Point so as to keep them always the same.
- When the weld force is exerted on the electrode on the way other than moving from Mid-Point to Weld Point, then the fault code “E” is displayed.

In case of **Mode 0**,

When a trouble occurs at the side of released weld force, that is, between Mid-Point and Start Point, open External Input [1ST] to make the electrode move to Start Point.

When a trouble occurs at the side of increased weld force, that is, between Start Point and Original Point, open External Input [1ST] to make the electrode move to Original Point (to the direction of released weld force). At Original Point, External Output [START POINT] is output.

In case of **Mode 1**,

The supplying of power to the motor is turned off to stop.

## (2) Mode Setting

### ① Setting

Turn on the power while pushing the operation button. The character of “Set” blinks on [SCH (SCHEDULE)] Display and [SPEED HOLD TIME] Display.

Continue to press the button until blinking changes into lighting-up.

Depress the operation button, and “0” blinks on [SPEED HOLD TIME] Display. Rotate the operation button, and indication changes as follows.

- 0.....means “change of Mode”
- 1.....means “change of [ERROR] signal output”
- E.....means “end”

### ② Changing

Press the operation button while “0” blinks on [SPEED HOLD TIME] Display.

Mode No. blinks on [SCH (SCHEDULE)] display. Rotate the operation button to select “0” or “1”.

Press the operation button to fix Mode No.

Finally, be sure to perform the step ④.

### ③ Change of ERROR Signal Output

Press the operation button while "1" blinks on [SPEED HOLD TIME] Display.

Mode No. blinks on [SCH (SCHEDULE)] Display. Rotate the operation button to select "0" or "1".

- 0.....means "circuit opened in case of error"
- 1.....means "circuit closed in case of error"

Press the operation button to fix.

Finally, be sure to perform the step ④.

### ④ End of Setting

Rotate the operation button to select "E". Press the operation button to fix.

Confirm "End" on [SCH (SCHEDULE)] and [SPEED HOLD TIME] Display, which means the completion of setting.

Turn off the power.

## (3) Applying Power and Moving to Start Point

Turn on the power.

Zero "0" blinks on [SCH] Display of the front panel.

Close the circuit of External Input [1ST or ORG], and the electrode, after it once returns back to Original Point, moves to Start Point.

If the circuit of External Input [1ST or ORG] is opened while electrode is moving, the electrode stops there.

When the circuit of External Input [1ST or ORG] is closed again, the electrode begins to move.

When the electrode reaches Start Point, [READY] Lamp lights up and the preparation is completed.

Note that Original Point and Start Point are at the same position when the shipping package is opened and the power is supplied for the first time.

In case of **Mode 1**, it works by pressing [ORG/CANCEL] button in addition to the use of External Input.



## (4) Auto-Setting of Electrode Position

The electrode position can be set automatically by means of the auto-setting function. Turn the operation button to light up [AUTO] Lamp.

Press the operation button for 1 second, and [AUTO] Lamp blinks.

Close External Input [1ST], and the electrode moves to Original Point.

Open External Input [1ST] when electrode stops with beeps.  
(Beeps are given when the package is opened and the power is supplied for the first time, because Original Point and Start Point are at the same position.)

A numeral blinks on [SCH] Display. Turn the operation button to change Schedule No.

When Schedule No. is determined, press the operation button.  
The blinking numeral on [SCH] Display changes to the illuminated one.

Place the workpiece.

Close External Input [1ST and 2ND] to make the electrode move forward. Hold External Input [1ST and 2ND] closed. The electrode presses the workpiece and beeps are given.

When the application of the electrode force is completed, the electrode returns to the position before Original Point with beeps.

Open External Input [1ST and 2ND] to complete the auto-setting with a beep.  
The position where the electrode stops is Start Point.

The electrode positions determined by the auto-setting are as follows:

| Electrode Position    | Description   |
|-----------------------|---|
| <b>Original Point</b> | Position where the electrode has completely returned. |
| <b>Start Point</b>    | Between Weld Point and Original Point.                |
| <b>Mid-Point</b>      | 2 mm before Weld Point.                               |
| <b>Downstop Point</b> | 5 mm beyond Weld Point.                               |

The electrode speed and Hold Time are not set automatically. The previous settings are valid. Change these settings manually.

In case of **Mode 1**, it works by pressing the operation button in addition to the use of External Input. When using the operation button, press the operation button again, because the electrode stops after pressing the workpiece.

## (5) Manual Setting of Electrode Position

### ① Selecting Schedule No.

Turn the operation button to light up [SCH] Lamp.

Press the operation button for 1 second. [SCH] Lamp and [SCH] Display blink.

Turn the operation button clockwise and counterclockwise to select a numeral (1 to 31) on [SCH] Display.

After selecting Schedule No., press the operation button.

Press [ORG/CANCEL] button to interrupt the operation.

### ② Setting Start Point

Turn the operation button to light up [READY] Lamp.

Press the operation button for 1 second, and [READY] Lamp lights up.

Close External Input [1ST].

The electrode moves to Start Point with beeps. (When the electrode has been at Start Point, only beeps are given.)

Open External Input [1ST].

Turn the operation button clockwise and counterclockwise to make the electrode move forward and backward in 0.1 mm-increment/decrement.

Press the operation button until the electrode reaches the desired position. [READY] Lamp blinks fast.

Close External Input [1ST]. The Start Point setting is completed with beeps.

#### When you want to interrupt the operation,

Press [ORG/CANCEL] button, and [READY] Lamp blinks fast.

Close External Input [1ST]. The electrode returns to the previous position with beeps.

In case of **Mode 1**, it works by pressing the operation button in addition to External Input.

### ③ Changing Moving Speed between Start Point and Mid-Point

Turn the operation button to light up both [READY] and [MID] Lamp.

Press the operation button for 1 second. [READY] and [MID] Lamp blink.

The number of blinking [SPEED HOLD TIME] Lamp indicates the current speed setting. Turn the operation button clockwise and counterclockwise to change the number of the blinking lamp. Select your desired speed.

| No. | Moving Speed (mm/s) | Note |
|-----|---------------------|------|
| 1   | 20                  | Min. |
| 2   | 60                  |      |
| 3   | 100                 |      |
| 4   | 140                 |      |
| 5   | 180                 |      |
| 6   | 220                 |      |
| 7   | 260                 |      |
| 8   | 300                 | Max. |

After setting the speed, close and thereafter open External Input [1ST]. Check the speed of the electrode that moves forward and backward.

Press the operation button when your desired speed is determined.

Press [ORG/CANCEL] button to interrupt.

### ④ Setting Mid-Point

Turn the operation button to light up [MID] Lamp.

Press the operation button for 1 second. [MID] Lamp blinks.

Close External Input [1ST] to make the electrode move to Mid-Point with beeps.

Open External Input [1ST].

Turn the operation button clockwise and counterclockwise to make the electrode move forward and backward in 0.1 mm-increment/decrement.

Press the operation button when the electrode reaches the desired position. [MID] Lamp blinks fast.

Close External Input [1ST]. The electrode moves to Start Point with beeps to complete Mid-Point setting.

**When you want to interrupt the operation,**

Press [ORG/CANCEL] button, and [MID] Lamp blinks fast.

Close External Input [1ST]. The electrode returns to the previous position with beeps.

In case of **Mode 1**, it works by pressing the operation button in addition to External Input.

**⑤ Setting Moving Speed from Mid-Point to Weld Point**

Turn the operation button to light up all of [MID], [WELD] and [FORCE CHK] Lamp.

Press the operation button for 1 second. [MID], [WELD] and [FORCE CHK] Lamp blink.

The number of the blinking [SPEED HOLD TIME] Lamp indicates the current speed setting. Turn the operation button clockwise and counterclockwise to change the number of the blinking lamp. Select your desired speed.

| No. | Moving Speed (mm/s) | Note |
|-----|---------------------|------|
| 1   | 7.5                 | Min. |
| 2   | 15                  |      |
| 3   | 25                  |      |
| 4   | 30                  | Max. |

After setting the speed, close and thereafter open External Input [both 1ST and 2ND]. Check the speed of the electrode that moves forward and backward.

Press the operation button when your desired speed is determined.

Press [ORG/CANCEL] button to interrupt.

**⑥ Setting Downstop Point**

Turn the operation button to light up [WELD] Lamp.

Press the operation button for 1 second. [WELD] Lamp blinks.

Close External Input [2ND and 1ST] to make the electrode move to Downstop Point with beeps.

Open External Input [2ND and 1ST].

Turn the operation button clockwise and counterclockwise to make the electrode move forward and backward in 0.1 mm-increment/decrement.

Press the operation button when the electrode reaches the desired position. [WELD] Lamp blinks fast.

**[In case that the electrode cannot move beyond Weld Point because of a workpiece]**

Turn the operation button until the electrode stops, then press the operation button.

Downstop Point is set 5 mm beyond Weld Point and [WELD] Lamp blinks fast.

Close External Input [1ST]. The electrode moves to Start Point with beeps to complete Weld Point setting.

#### When you want to interrupt the operation

Press [ORG/CANCEL] button, and [WELD] Lamp blinks fast.

Close External Input [1ST]. The electrode returns to the previous position with beeps.

In case of **Mode 1**, it works by pressing the operation button in addition to External Input.

### ⑦ Setting Additional Pressing Time at Weld Point

By the function of setting the additional pressing time, the additional electrode force can be exerted on the electrode for desired period without stopping the motor.

Turn the operation button to light up both [WELD] and [HOLD] Lamp.

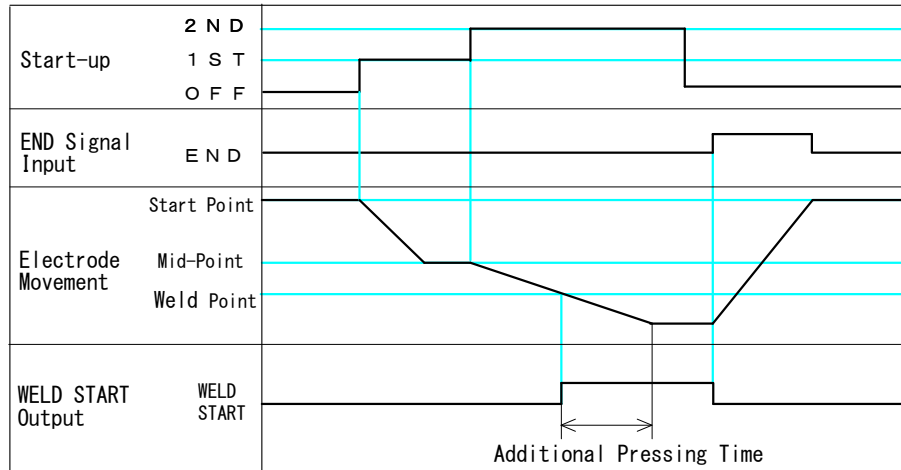
Press the operation button for 1 second. [WELD] and [HOLD] Lamp blink.

The number of the blinking [SPEED HOLD TIME] Lamp indicates the additional pressing time setting. Turn the operation button clockwise and counterclockwise to change the number of the blinking lamp. Select your desired period.

| Numerical of [SPEED HOLD TIME] Lamp | Additional Pressing Time (ms) | Note               |
|-------------------------------------|-------------------------------|--------------------|
| 0                                   | 0                             | Stop at Weld Point |
| 1                                   | 10                            | Min.               |
| 2                                   | 20                            |                    |
| 3                                   | 30                            |                    |
| 4                                   | 40                            |                    |
| 5                                   | 50                            |                    |
| 6                                   | 60                            |                    |
| 7                                   | 70                            |                    |
| 8                                   | 80                            |                    |
| 9                                   | 90                            |                    |
| A                                   | 100                           | Max.               |

Press the operation button when your desired period is indicated.

Press [ORG/CANCEL] button to interrupt.



### ⑧ Setting of Hold Time

Turn the operation button to light up [HOLD] Lamp.

Press the operation button for 1 second. [HOLD] Lamp blinks.

The number of the blinking [SPEED HOLD TIME] Lamp indicates the present Hold Time setting. Turn the operation button clockwise and counterclockwise to change the number of the blinking lamp. Select your desired speed.

| No. | Hold Time (ms)                          | Note |
|-----|---|------|
| 1   | 100                                     | Min. |
| 2   | 200                                     |      |
| 3   | 300                                     |      |
| 4   | 400                                     |      |
| 5   | 500                                     |      |
| 6   | 1000                                    |      |
| 7   | 2000                                    | Max. |
| 8   | Keep holding until End Signal is input. |      |

After selecting the number, close and thereafter open External Input [both 1ST and 2ND]. Check the Hold Time, observing the electrode that moves forward and backward.

Press the operation button when your desired Hold Time is determined.

Press [ORG/CANCEL] button to interrupt.

### ⑨ Setting Moving Speed from Weld Point to Mid-Point

Turn the operation button to light up both [MID] and [WELD] Lamp.

Press the operation button for 1 second. [MID] and [WELD] Lamp blink.

The number of the blinking [SPEED HOLD TIME] Lamp indicates the current speed setting.

Turn the operation button clockwise and counterclockwise to change the number of the blinking lamp. Select your desired speed.

| No. | Moving Speed (mm/s) | Note |
|-----|---------------------|------|
| 1   | 20                  | Min. |
| 2   | 60                  |      |
| 3   | 100                 |      |
| 4   | 140                 |      |
| 5   | 180                 |      |
| 6   | 220                 |      |
| 7   | 260                 |      |
| 8   | 300                 | Max. |

After selecting the number, close and thereafter open External Input [both 1ST and 2ND]. Check the speed, observing the electrode that moves forward and backward.

Press the operation button when your desired speed is determined.

Press [ORG/CANCEL] button to interrupt.

## (6) Welding Work

Close External Input [1ST]. Then the electrode moves forward to Mid-Point. Close External Input [2ND and 1ST]. Then the electrode moves forward to Weld Point.

When the electrode contacts the workpiece and the weld force reaches the setting value, then the electrode stops.

Weld Start Signal is output and the welding starts.

When Weld Start Signal is once output, the weld force of the electrode is maintained although External Input [2ND and 1ST] is opened.

When Hold Time has elapsed or End Signal is output from the welding power supply, the weld force is released.

**[In case that End Signal cannot be input although Hold Time is set to "8"]**  
Press [ORG/CANCEL] button while closing External Input [2ND and 1ST]. The electrode returns to Start Point or Mid-Point.

Be sure not to release the electrode while welding current is being applied.


## (7) Measuring Weld Force

After the electrode has returned to Start Point, press [ORG/CANCEL] button to complete the mode of measuring the weld force.

**When you want to interrupt the operation except at Start Point,**

**When you want to interrupt the operation except at Start Point,**

Press [ORG/CANCEL] button. [FORCE CHK] Lamp blinks fast.



Close External Output [1ST]. The electrode returns to Start Point with beeps.

In case of **Mode 1**, it works by pressing the operation button in addition to External Input.



## 7. Fault Indications

When a trouble occurs at the apparatus, [TROUBLE] Lamp lights up and a fault code is shown on [SCH] Display. Closing External Input [RESET] or continuing to press the operation button can reset the fault signal.

| Fault Code                           | Trouble Content  | Corrective Measures   |
|--------------------------------------|--|---|
| <b>E</b><br><b>(Movement Mode 0)</b> | Electrode force is applied on the way to return to Start Point                             | Close External Input [1ST] again to make the electrode move to Original Point. Rectify the cause of the trouble.<br>Thereafter, reset the fault signal and close External Input [1ST]. [TROUBLE] output is released.  |
|                                      | Electrode force is applied before Mid-Point  | Close External Input [1ST] and [2ND] to make the electrode return to Start Point. Rectify the cause of a trouble.<br>Thereafter, reset the fault signal and close External Input [1ST]. [TROUBLE] output is released. |
| <b>E</b><br><b>(Movement Mode 1)</b> | Electrode force is applied on the way to return to Start Point or applied before Mid-Point | After rectifying the cause of a trouble, reset the fault signal and resume Start Point.   |
| <b>1</b>                             | Fault occurred in controller memory  | Some settings have been lost. You must re-set again.<br>Turn on the power while pressing [ORG/CANCEL] button to clear all the settings.   |
| <b>2</b>                             | Fault occurred in memory's R/W-function in controller                                      | Turn off the power and thereafter, turn it on again.<br>If the trouble continues, repair is needed. Consult us.   |
| <b>3</b>                             | Fault occurred in controller CPU   | After turning off the power or resetting the fault signal, resume Start Point.<br>If the trouble continues, repair is needed. Consult us.   |
| <b>4</b>                             | Fault occurred in electrode-driving motor  | After turning off the power or resetting the fault signal, resume Start Point.<br>If the trouble continues, repair is needed. Consult us.   |
| <b>5</b>                             | Fault occurred in the control signal of electrode-driving motor                            | After turning off the power, check the connector conduction between the controller and motor.<br>If the trouble continues, repair is needed. Consult us.  |
| <b>6</b>                             | [STOP]-Pin circuit is opened   | Close the circuit of [STOP]-Pin.<br>After turning off the power or resetting the fault signal, resume Start Point.  |

## 8. User's Maintenance

### ATTENTION

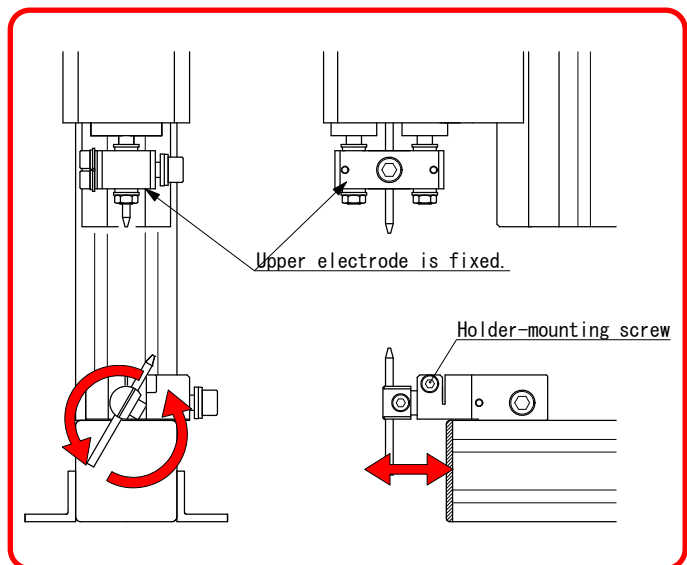
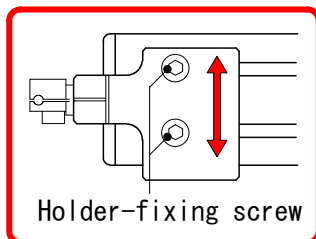
- Make sure that the tool used for adjustment fits the screw size.  
Upon completion of adjustment, tighten the screws firmly. There should be no looseness or rattling.
- The Holder is made of soft material. When tightening a screw, take care not to damage it.
- When a caution is given that denotes "Unplug the AC Cable from outlet", strictly observe it to avoid an electric shock.

#### ① Aligning the Electrodes

Unplug the AC Cable from the outlet to turn off the power supply.



Loosen the lower Holder-Mounting Screw. Rotate or move back and forth the Electrode Holder to align the upper and lower electrodes as shown at lower right.



If you cannot align the electrodes, loosen the Holder-Fixing Screw to move right and left the lower Electrode Holder as shown at upper left.

#### ② Adjusting the Electrode Mounting Angle

Unplug the AC Cable from the outlet to turn off the power supply.



Loosen the lower Holder-Mounting Screw and turn the Electrode Holder to adjust the mounting angle of the electrode.



After the adjustment, tighten the lower Holder-Mounting Screw securely.

### ③ Replacing the Electrode and Adjusting the Electrode Position

Unplug the AC Cable from the outlet to turn off the power supply.



Loosen the Electrode-Fixing Screw using the supplied M4 hexagon rod spanner.



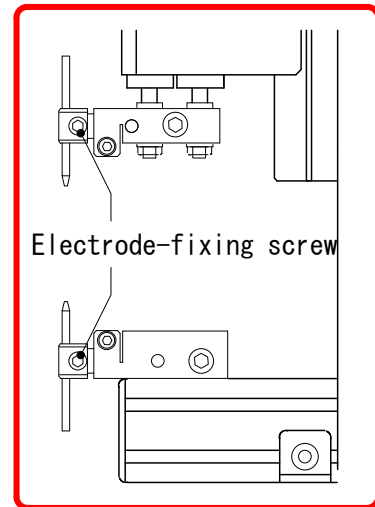
When replacing the electrode, remove the old one and insert a new one.



Adjust the electrode position.



Tighten the Electrode-Fixing Screw firmly.



### ④ Adjusting the Weld Force

#### ATTENTION

- For safety, always stop operation before starting adjustment.
- The weld force conversion graph represents theoretical values. To measure the actual weld force, use a pressure gauge or spring balance.

Loosen the Lock Screw using the supplied M2.5 hexagon rod spanner.



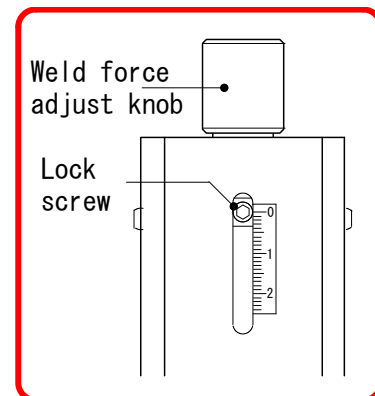
The scale represents the weld force. Turn the Weld Force Adjust Knob to adjust the center of the Lock Screw to the desired weld force scale.



Tighten the lock screw to lock the Weld Force Adjust Knob.



After adjusting, measure the weld force using a pressure gauge or spring balance.



### ⑤ Other

See **6. Operation** for the settings of “Head ascending/descending speed”, “Position of Start Point/Mid-Point”, “Hold Time”, etc.

## 9. Specifications

### (1) Product Specifications

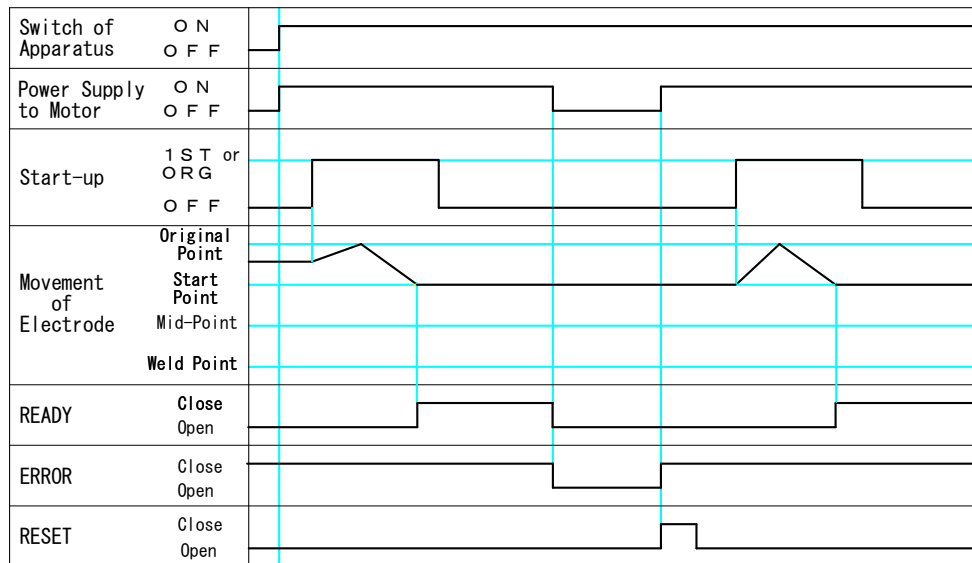
| Items                       | MH-D24B-00-00   | MH-D24B-00-02 |
|-----------------------------|---|---------------|
| Head Type                   | For direct welding  |               |
| Mounting to PLC etc.        | Mountable   |               |
| Controller                  | Separately installed  |               |
| Load Cell                   | None  | Supplied      |
| Electrode Force             | 10–70 N (Approx. 1.0–7.0 kgf)<br>Stepless adjustment  |               |
| Weld Force Method           | Spring forced   |               |
| Electrode Holder            | φ3 mm (Std. Supplied)   |               |
| Electrode Dia.              | φ3 mm (Cr-Cu alloy, Std. Supplied)  |               |
| Electrode-Driving Method    | Servomotor  |               |
| Electrode Stroke            | 45 mm   |               |
| Throat Depth                | 105 mm  |               |
| Number of Welding Schedules | 31 Schedules (selectable externally)  |               |
| Electrode Speed             | Between Start Point and Mid-Point, Weld Point to Mid-Point<br>: 8 Speeds (Selectable for each Schedule)<br>Mid-Point to Weld Point<br>: 4 Speeds (Selectable for each Schedule) |               |
| Hold Time Setting           | 7 Settings  |               |
| Power Supply Volt           | 100–240 V AC ±10%, 50/60 Hz, 70 VA  |               |
| Welding Current             | 3000 A (at 2% duty cycle)   |               |
| Operating Conditions        | Temperature: 0°–40°C, Humidity: 90% or less (No condensation)   |               |
| Mass                        | Head  | 3.5 kg        |
|                             | Controller  | 3 kg          |
|                             | Indicator   | —             |
|                             |   | Approx. 3 kg  |

### (2) Accessories

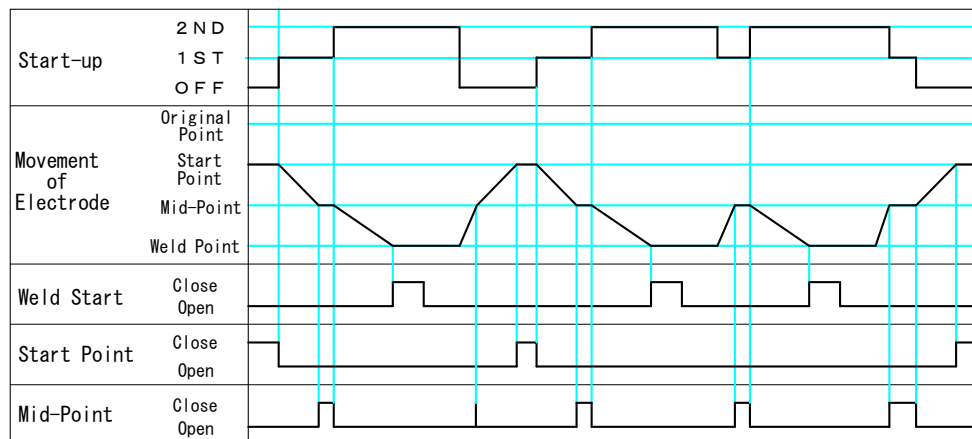
| Name   | Q'ty   |
|--|--------|
| Bolts for Fixing the Head (M5 x 35 Countersunk head screw) | 2 pcs  |
| Nuts for Fixing the Head (M5 Hexagon nut)                  | 2 pcs  |
| M2 Hexagon rod spanner (Nominal #2)                        | 1 pc   |
| M4 Hexagon rod spanner (Nominal #3)                        | 1 pc   |
| 2-Stage Footswitch   | 1 pc   |
| Operation Manual   | 1 copy |
| Electrode (φ3 x 50 mm (Cr-Cu alloy))                       | 2 pcs  |

### (3) Timing Chart

#### ① Power ON and Error occurring



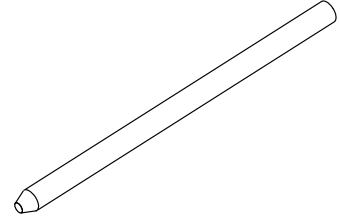
#### ② Operating



## (4) Separately Sold Items

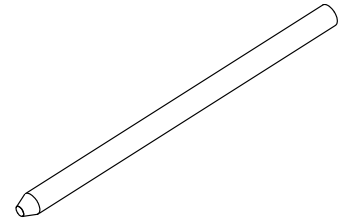
### ① $\phi 3$ Straight Electrode

| Model No.       | Size (Material)  |
|-----------------|--|
| <b>41040</b>    | $\phi 3 \times 50$ (Cr-Cu alloy)                           |
| <b>A4-03494</b> | $\phi 3 \times 50$ (MCZ)                                   |
| <b>A4-03495</b> | $\phi 3 \times 50$ (NBC)                                   |
| <b>A4-04066</b> | $\phi 3 \times 50$ (Alumina-dispersed-strengthened-copper) |
| <b>M4-00792</b> | $\phi 3 \times 50$ (Molybdenum)                            |
| <b>M4-15593</b> | $\phi 3 \times 50$ (Tungsten)                              |



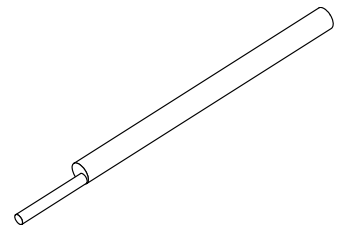
### ② $\phi 4$ Straight Electrode

| Model No.          | Size (Material)  |
|--------------------|--|
| <b>M4-00083</b>    | $\phi 4 \times 50$ (Cr-Cu alloy)                           |
| <b>Z-02712-001</b> | $\phi 4 \times 50$ (Alumina-dispersed-strengthened-copper) |
| <b>Z-02712-002</b> | $\phi 4 \times 50$ (MCZ)                                   |
| <b>Z-02712-003</b> | $\phi 4 \times 50$ (Tungsten)                              |
| <b>Z-02712-004</b> | $\phi 4 \times 50$ (Molybdenum)                            |



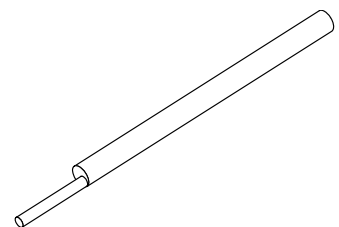
### ③ $\phi 3$ Eccentric Electrode

| Model No.          | Size (Material)  |
|--------------------|--|
| <b>Z-02701-001</b> | $\phi 3 \times 50$ , $\phi 1.2 \times 8$ Tip (Cr-Cu alloy)                           |
| <b>Z-02701-002</b> | $\phi 3 \times 50$ , $\phi 1.2 \times 8$ Tip (Alumina-dispersed-strengthened-copper) |
| <b>Z-02701-003</b> | $\phi 3 \times 50$ , $\phi 1.2 \times 8$ Tip (MCZ)                                   |



### ④ $\phi 4$ Eccentric Electrode

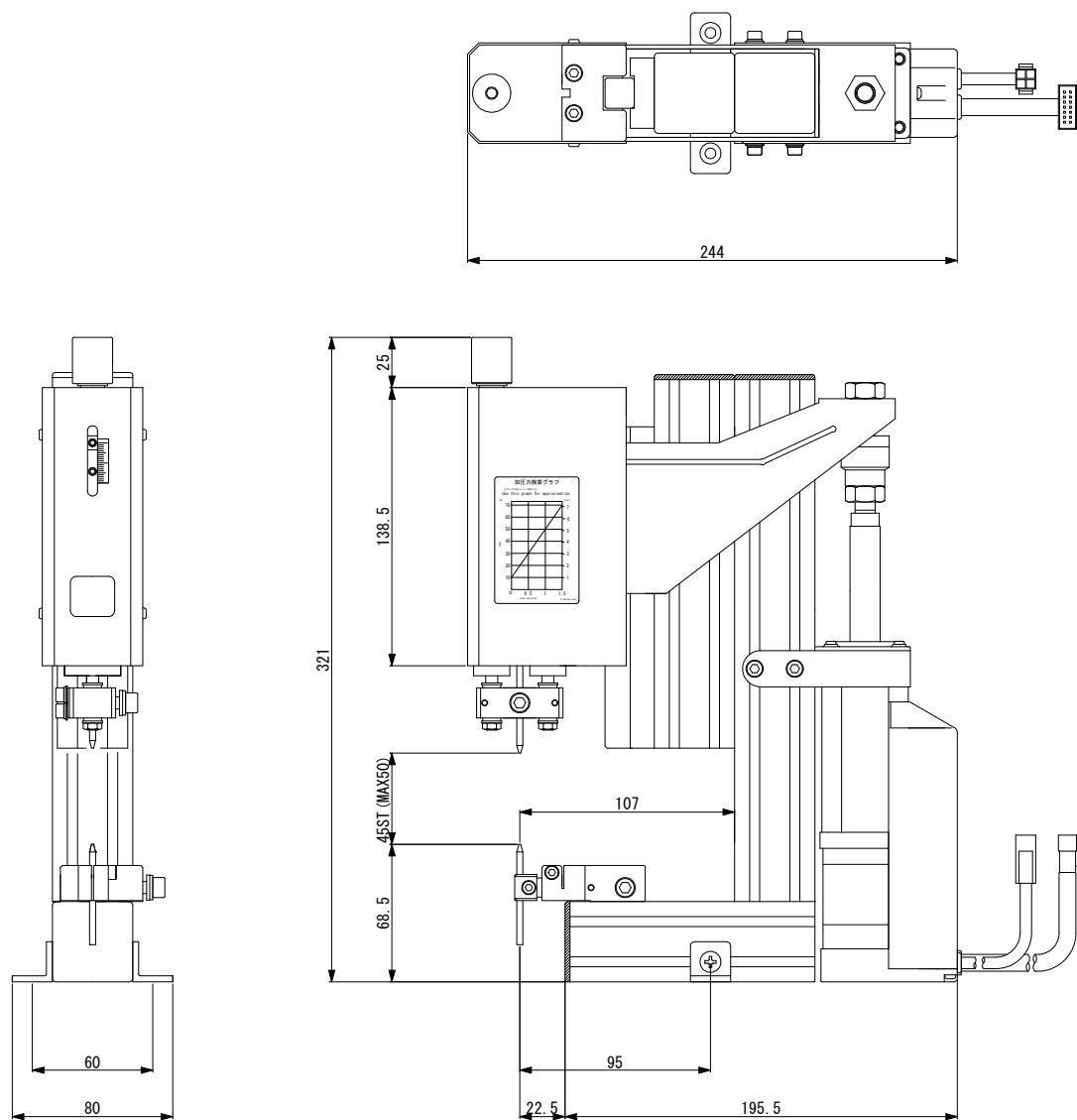
| Model No.          | Size (Material)  |
|--------------------|--|
| <b>Z-02702-001</b> | $\phi 4 \times 50$ , $\phi 1.5 \times 8$ Tip (Cr-Cu alloy)                           |
| <b>Z-02702-002</b> | $\phi 4 \times 50$ , $\phi 1.5 \times 8$ Tip (Alumina-dispersed-strengthened-copper) |
| <b>Z-02702-003</b> | $\phi 4 \times 50$ , $\phi 1.5 \times 8$ Tip (MCZ)                                   |



# 10. Outline Drawings

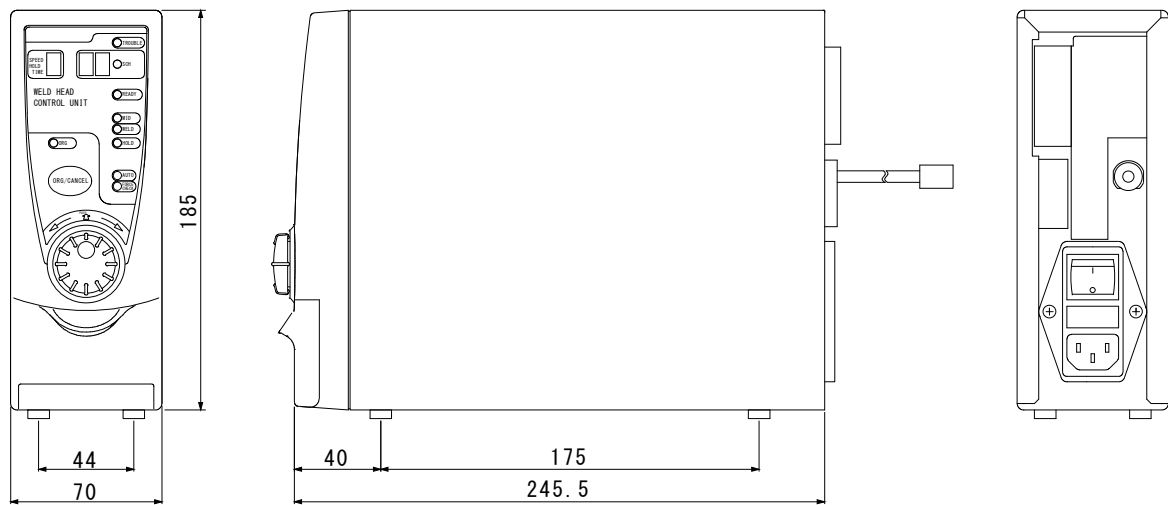
## (1) Head

(Dimensions in mm)



## (2) Head Controller

(Dimensions in mm)



## (3) Indicator

(Dimensions in mm)

