WSI WELD SYSTEMS INTEGRATORS, INC.

RESISTANCE WELDING. SOLVED.

MM-610A-00-20

OPERATION MANUAL
PRESSURE GAUGE FOR
RESISTANCE WELDING MACHINE
(M0291E FIRST EDITION)

AMADA®

AMADA WELD TECH

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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

Do not touch the inside of the Equipment unnecessarily.
You may receive an electric shock or be burned.
Do not touch the inside of the Equipment other than for maintenance as described in the operation manual.

Never disassemble, repair or modify the Equipment.
These actions can cause electric shock and fire. Do not do anything other than the maintenance described in the operation manual.

⚠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 arm are very hot.
Do not touch them; otherwise you may be burnt.

Ground the Equipment.
If the Equipment is not grounded, you may get an electric shock when there is trouble, or when electricity leaks.

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

Use only specified cables.
Use of a cable of insufficient capacity can cause fire.

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.

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, consult Miyachi Technos Corp. 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 Miyachi Technos Corp. 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. Spatter 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

Keep the power plug clean and insert it all the way.
If the plug is covered with dust or is not inserted completely, it will become hot and can cause a fire.

When inserting or disconnecting the plug, hold the body.
If the cable is pulled to disconnect the plug, it may be broken, and that can cause electric shock and fire.

When leaving this Equipment unused for a long time, disconnect the power plug from the power outlet.
Deterioration of insulation can cause electric shock, leakage and fire.

Connect the cables securely.
Insecure connection of a cable can cause fire and electric shock.

Use proper tools(wire strippers, pressure wire connectors, etc.) for termination of the connecting cables.
Do not cut the wire conductor. A flaw on it can cause fire and electric shock.

Install the Equipment on firm and level surface.
If the Equipment falls or drops, injury may result.

Do not place a water container on the Equipment.
If water spills, insulation will deteriorate, and this may cause electric leak and fire.

Keep combustible matter away from the Equipment.
Spatter can ignite combustible matter. If it is impossible to remove all combustible matter, cover them with non-combustible material.

Do not cover this Equipment with a blanket, cloth, etc.
Do not cover this Equipment with a blanket, cloth, etc. while you are using it. The cover may be heated and burn.

Do not use this Equipment for any purpose other than welding.
Use of this Equipment 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 Equipment periodically.
Maintain and inspect the Equipment periodically, and repair any damage nearby before starting operation.

Precautions for Handling

- Install this Equipment securely on a firm and level surface, so that the Equipment can not fall.

- Do not install this Equipment in the following places:
  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 5 °C), and places where water will be condensed.

- Use proper tools (wire strippers, pressure wire connector, etc.) for termination of the connecting cables, and take care not to damage the conductors.

- Clean the outside of the Equipment 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 Equipment.

- 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 Equipment, since they can cause a malfunction.

- Operate the Equipment according to the method described in this operation manual.

CONTENTS

1. Warning

(1) Before use

- Before using your pressure gauge, read this operation manual carefully in order to thoroughly understand its correct operation procedure.
- Confirm that all accessories have been prepared.
- Confirm that the device has not been damaged during transportation.

(2) Precautions on storage and using environment

- Do not store or use this device in a place where it may be subjected to strong impact or vibration.
- Do not store or use this device in a place where there is considerable dust.
- Do not store or use this device in a place of abnormally high humidity.
- Do not store or use this device in a place where it may be exposed to direct sunlight.
- Do not store or use this device in a place where temperature is abnormally high or low or changes extremely.

(3) Precautions for use

- Never supply power to the welding machine while measuring the pressure with this device.
- Do not apply pressure larger than the rated pressure of the sensor. Do not apply sudden pressure or impact.
- Do not drop the body or subject it to strong impact.
- Connect only the specified items to the connectors.
- Do not short the connector contacts.
- Keep the contacts of the connectors clean and prevent dust intrusion.
- Keep the batteries charged even if this device is not used for a long period.
- Be sure to charge the batteries in the body with the attached charger and limit the charging time to 15 hours when it is fully discharged.

(4) Other precautions

- Do not open the case of the body, unless the batteries need to be replaced.
- Replace all four batteries with new ones of recommended type, when necessary.
- Never disassemble or modify the body and sensor under any circumstances.

2. Introduction

Model "MM-601 A" is a device to measure the pressure of electrodes of resistance welding machines which use a load cell (Load converter).

With the optional special sensor, this device can easily measure welding force over a wide range (0.2 kg – 950 kg/0.2 daN – 931 daN).

(1) Features

- Simple operation by microcomputer.
- Wide measurement range.
- Large, easy-to-read liquid crystal display.
- Portable, handy size.
- Functional design based on human engineering.
- Sheet panel which effectively resists dust and oil mist.

(2) Functions

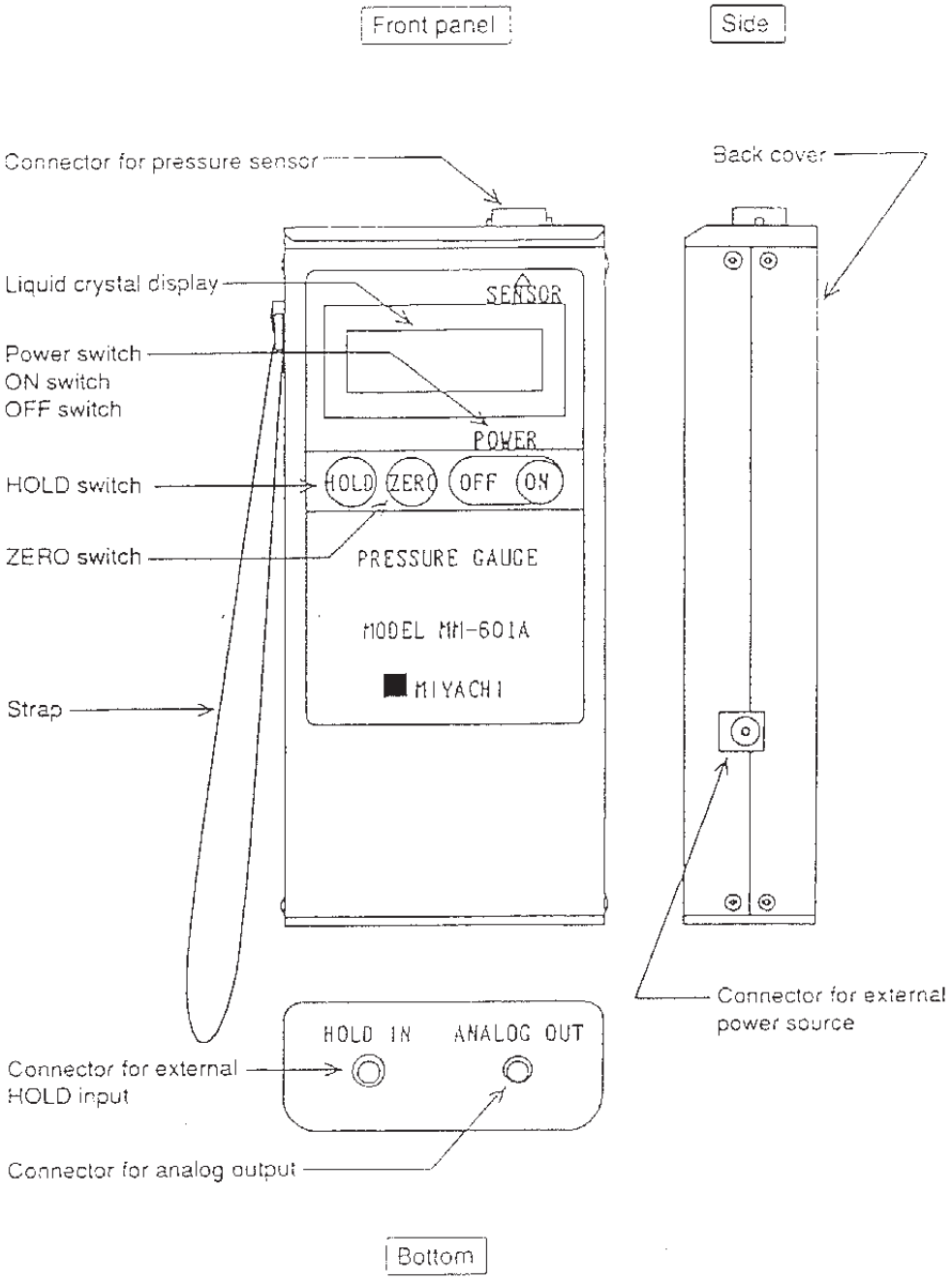
- Indication of measured value and unit.
- Zero setting at any point.
- Holding of indication of measured value.
- External holding input.
- Analog output.
- Automatic power-off mechanism for power saving
- Indication of charging instruction to prevent excess battery discharge
- Overload indication to protect sensor from overload.
- Changeable indication mode in kg and daN (Newton)

3. Specifications

(1) Model name:	MM-601 A
(2) Indicator:	Liquid crystal display, 3 digits, 1 line
(3) Power source:	Built-in nickel-cadmium battery, 4.8 V (1.2 V, 500 mAh x 4) or special AC adapter of 7 VDC
(4) Effective measurement range:	0.20 kg – 9.50 kg 0.20 daN – 9.31 daN (When optional sensor MA-520 is connected) 2.0 kg – 95.0 kg 2.0 daN – 93.1 daN (When optional sensor MA-521 is connected) 20 kg – 950 kg 20 daN – 931 daN (When optional sensor MA-522 is connected) Range is automatically changed if sensor is replaced.
(5) Measurement accuracy:	Full scale ± 3%
(6) Repeat of indication:	Approx. 20 times/sec
(7) Decimal point indication:	Automatically set and indicated according to measurement range.
(8) Unit indication:	Automatically set and indicated according to measurement range. Changeable between kg and daN.
(9) Indication of polarity:	"–" is indicated in case of a negative value. (Relative value corresponding to positive value)
(10) Indication of overload:	"OVER!!" is indicated and buzzer sounds intermittently.
(11) Indication of request for charging:	Indication of "BATTERY" flashes seven times, then automatic power-off mechanism functions.
(12) Automatic power-off:	If no key is pushed for about 7 min, this mechanism turns off the power. If no sensor is connected, this mechanism works in about 3 min.
(13) External holding of input:	Measured value can be held with an external contact input.

(14) Analog output:	Voltage output:	1mV/count approximately (Absolute value)
	Load resistance:	5 kΩ min.
(15) Ambient temperature:	0°C – +40°C	
(16) External dimensions:	Height 170 mm x Width 75 mm x Depth 30 mm	
(17) Weight:	480 g (including leather case)	

4. Names of Each Part



5. Switches and Connectors

(1) Names and functions of each switch

- **POWER** : Power switches

  Used to turn the power for this device on and off. The following pair of **POWER** switches are installed.

  ○ **ON** : ON switch

  When this switch is pressed, the power for this device is turned on.

  ○ **OFF** : OFF switch

  When this switch is pressed, the power for this device is turned off.

- **ZERO** : ZERO switch

  When this switch is pressed, zero is indicated, then value measured later is indicated on the basis of the present value.

- **HOLD** : HOLD switch

  When this switch is pressed, the currently indicated value is maintained.
  Under this condition, "H" is indicated at the right upper part of the liquid crystal display.
  If this switch is pressed again, "H" disappears and the display indicates the normally measured value again.

  If the ON switch is pressed with this switch pressed, the indication mode is changed from kg to daN.
  After the indication mode is changed, this switch works again as the HOLD switch.

(2) Names and functions of each connector

- Connector for external power source

  While the nickel-cadmium batteries are being charged or when an external power source is necessary, connect the special AC adapter to this connector.

- Connector for pressure sensor

  Connect special pressure sensor (optional) matching the measurement range.

- Connector for external HOLD input

  This connector is used to hold a measured value with an external signal.

By connecting an external HOLD input cable and applying a contact input to activate a welding machine timer, etc., through the cable, this device functions as if the **HOLD** switch were pressed.

The HOLD function can be reset with only the **HOLD** switch, however.

Warning

The external HOLD input must be a contact input.
Never input voltage.
If voltage is input, it may not only damage this device but also cause a hazardous situation.

- Analog output connector

This connector is used to connect a measuring instrument such as an oscilloscope to output analog signals to observe the welding status.
By connecting an analog output cable, the voltage output in proportion to the absolute value of the weld force applied to the weld force sensor can be obtained. By observing the change in this voltage level, the time at which the weld force is balanced can be obtained, and used to determine the initial squeeze time.
The output voltage is about 4 mV for 1 count indicated in the display. The input resistance to receive this voltage must be 5 kΩ minimum.

Caution

Take measures to ensure that the analog output will not short-circuit.

6. Measuring method

Caution

Before commencing weld force measurement, be sure to turn off the power to the welding machine, and confirm that it cannot weld.
Applying power while the weld force is being measured will damage this device.

(1) Weld force sensor connection

- Select an appropriate pressure sensor according to the range of the pressure to be measured, and securely connect it to the weld force sensor connector of this device.

(2) Input/output connection

- When using the external HOLD input function, analog output function, etc., connect the appropriate cable for each specific purpose.
  When using an external power source, connect the attached AC adapter to the external power source connector.

(3) Turning on power to the device

- When using in the kg indication mode
  Press the **POWER ON** switch to turn on the power to this device.
- When using in the daN indication mode
  Press the **POWER ON** switch, with the **HOLD** switch pressed. Press and hold the **HOLD** switch until "daN MODE" is indicated (for about 1 sec).

※ Either indication mode can be selected only when the power to the device is turned on.

(4) Zero setting

- Push the **ZERO** switch to set the indication to zero.

(5) Preparation of weld force sensor

- Hold the weld force sensor so that it is aligned with the welding machine electrodes. The weld force of the electrodes will be applied vertically to the sensor.

(6) Welding

- Perform welding as slowly as possible so that no large impact is applied to the weld force sensor.

> Caution
>
> If "OVER!!" is indicated and the buzzer sounds intermittently at this time, stop welding immediately, since this indicates excessive weld force.

(7) Holding and reading the indicated value

① When the weld force is fully applied (equilibrium condition), press the **HOLD** switch to maintain the indicated value.
If the external HOLD input function is used, the **HOLD** switch does not need to be pressed.

② When the indicated value is held, "H" appears at the right upper part of the liquid crystal display.
(If the device is in the daN indication mode, the letter "N" of the unit is replaced with "H". It will be replaced with "N" again when holding is reset.)

③ Read the indicated value.

④ When the **HOLD** switch is pressed again, holding is reset.
When holding is reset, "H" disappears.

⑤ Holding can be reset with only the **HOLD** switch on the front panel in either case.

⑥ Even if the holding input is applied two or more times continuously, the second input and thereafter will not be accepted. Reset holding before measuring the next pressure.

> Caution
>
> If "BATTERY" flashes while this device is used, the built-in batteries must be charged (Indication of charging instruction).
> If the charge in the built-in batteries drops too low, the battery service life will be shortened.
> Accordingly, charge them immediately if this indication appears.

7. Built-in Batteries

(1) Charging procedure

① If the charging instruction is indicated while this device is used, charge the batteries.
Measurement can be continued even while the batteries are being charged.
If the battery charge has lowered substantially, the charging instruction may fail to be indicated.

> **Caution**
> If the nickel-cadmium batteries are left in the discharged state, their lives will be shortened.

② Securely connect the special AC adapter to the external power source connector.

③ Correctly insert the AC adapter to an AC 120 V socket.

> **Warning**
> Be sure to insert the AC adapter in a AC 120 V socket.
> If it is inserted into a socket of improper voltage, it may be damaged and a hazardous situation may arise.

④ The batteries are fully charged in about 15 hours with the power switch turned off.

> **Caution**
> If the nickel-cadmium batteries are over-charged, their lives will be shortened.
> Avoid continued charging after they have been fully charged.

(2) Lives of nickel-cadmium batteries

① Cyclic lives of charging and discharging (Number of repeated uses)

The batteries can be charged and discharged (used repeatedly) at least about 500 times under proper conditions.
If the working time of the batteries is extremely shortened after they are correctly charged, replace them.

② Battery lifetime

If the batteries are used under proper conditions, they can be used from three – five years.
If they are stored unused for a long time, their lifetime will be shortened.

(3) Battery replacement

① Remove the four screws on rear cover.

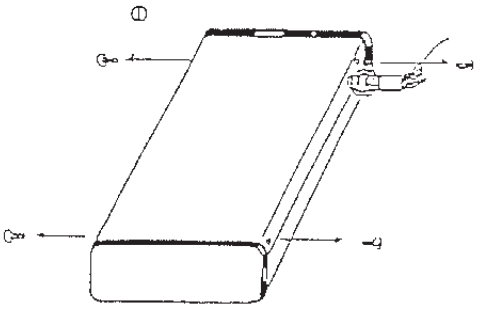
② Remove the rear cover carefully.

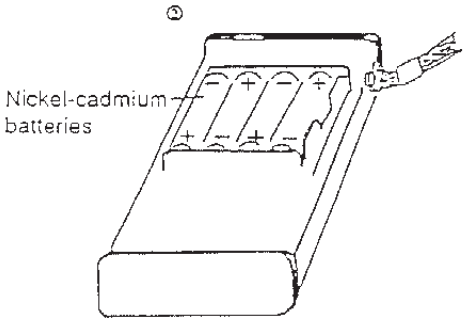
③ Remove all four nickel-cadmium batteries from the battery holder in the body.

④ Insert four new nickel-cadmium batteries in the battery holder, ensuring correct polarity (directions).

⑤ Replace the rear cover.

⑥ Install the four screws for the rear cover.





Caution

Be sure to replace all four batteries with ones of the same type.
If new and used batteries, batteries of different types or other than nickel-cadmium batteries are used, unexpected problems may occur.

⑦ The following nickel-cadmium batteries are available on the market (Recommended replacement batteries).

JIS type No.: KR-AA
Nickel-cadmium battery, UM-3 size
Voltage: 1.2 V, Capacity: 500 mAh

Manufacturer	Model
FURUKAWA BATTERY	AA-500
YUASA BATTERY	500RS
MATSUSHITA BATTERY	P-3R3

8. Accessories and Optional Parts

(1) Accessories

- ☐ Nickel-cadmium batteries, 1.2 V, 500 mAh (JIS type No. KR-AA), 4 pcs.
- ☐ Special AC adapter (Charger)MA-510
- ☐ Leather case
- ☐ External HOLD input cable MA-602
- ☐ Analog output cable MA-603

(2) Optional parts

- ☐ Weld force sensor MA-520 (Measurement range: 0.2 kg – 9.50 kg)
- ☐ Weld force sensor MA-521 (Measurement range: 0.2 kg – 95.0 kg)
- ☐ Weld force sensor MA-522 (Measurement range: 20 kg – 950 kg)
- ☐ Carrying case

Notice

(1) Do not copy a part or all of this manual without permission.

(2) The contents of this manual are subject to change without notice.

(3) If you have any questions on the contents of this manual or find any errors or omissions in it, please notify Miyachi Technos Corporation.

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