

WELD HEAD

THINLINE 180 M SERIES

OPERATION MANUAL



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REVISION RECORD

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C	42860	11/13	Update to Miyachi America name and logo.
D	43481	11/14	Updated to Amada Miyachi America name and logo.
E	43866	08/15	Updated to Amada Miyachi America format.
F	44244	05/16	Update contact information

FOREWORD

Thank you for purchasing a Miyachi Unitek™ THIN-LINE® SERIES 180M Weld Head.

Upon receipt of your equipment, please thoroughly inspect it for shipping damage before its installation. Should there be any damage, please immediately contact the shipping company to file a claim, and notify us at:

Amada Miyachi America
1820 South Myrtle Avenue
Monrovia, California 91016
Phone: (626) 303-5676
FAX: (626) 358-8048
E-mail: info@amadamiyachi.com

The purpose of this manual is to supply operating, maintenance and service personnel with the information needed to properly and safely operate and service the THIN-LINE® SERIES 180M Weld Heads.

We have made every effort to ensure that the information in this manual is accurate and adequate. Should questions arise, or if you have suggestions for improvement of this manual, please contact us at the above location/numbers.

Amada Miyachi America is not responsible for any loss due to improper use of this product.

SAFETY WARNINGS



DANGER

DEATH ON CONTACT may result if you fail to observe the safety precautions labeled on the equipment and noted on this page.



WARNING

HIGH VOLTAGE is used in the operation of this equipment.



CAUTION

Do **not** modify the electrode holders or attach additional mechanisms to the moving parts of the head. Doing so may hurt welding performance, damage the head, and **void the warranty**.

- **Never** work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment, and who is competent in administering first aid. The technician who is aided by operators must warn them about the hazards.
- Whenever possible, turn the power supply to the equipment **OFF** before beginning work on it.
- Do **not** touch high-voltage connections, including input power connections, when installing or operating the equipment.
- Do **not** be misled by the term "low voltage." Potentials as low as 50 volts can be lethal under certain conditions.

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LIMITED WARRANTY

1. (a) Subject to the exceptions and upon the conditions set forth herein, Seller warrants to Buyer that for a period of one (1) year from the date of shipment (“**Warranty Period**”), that such Goods will be free from material defects in material and workmanship.

(b) Notwithstanding the foregoing and anything herein to the contrary, the warranty set forth in this Section 1 shall be superseded and replaced in its entirety with the warranty set forth on **Exhibit A** hereto if the Goods being purchased are specialty products, which include, without limitation, laser products, fiber markers, custom systems, workstations, Seller-installed products, non-catalogue products and other custom-made items (each a “**Specialty Products**.”

(c) **EXCEPT FOR THE WARRANTY SET FORTH IN SECTION 1(A), SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE GOODS (INCLUDING ANY SOFTWARE) OR SERVICES, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.**

(d) Products manufactured by a third party and third party software (“**Third Party Product**”) may constitute, contain, be contained in, incorporated into, attached to or packaged together with, the Goods. Third Party Products are not covered by the warranty in Section 1(a). For the avoidance of doubt, **SELLER MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO ANY THIRD PARTY PRODUCT, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Notwithstanding the foregoing, in the event of the failure of any Third Party Product, Seller will assist (within reason) Buyer (at Buyer’s sole expense) in obtaining, from the respective third party, any (if any) adjustment that is available under such third party’s warranty.

(e) Seller shall not be liable for a breach of the warranty set forth in Section 1(a) unless: (i) Buyer gives written notice of the defect, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect and such notice is received by Seller during the Warranty Period; (ii) Seller is given a reasonable opportunity after receiving the notice to examine such Goods; (iii) Buyer (if requested to do so by Seller) returns such Goods (prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 or to such other location as designated in writing by Seller) to Seller pursuant to Seller’s RMA procedures and Buyer obtains a RMA number from Seller prior to returning such Goods for the examination to take place; and (iii) Seller reasonably verifies Buyer’s claim that the Goods are defective and that the defect developed under normal and proper use.

(f) Seller shall not be liable for a breach of the warranty set forth in Section 1(a) if: (i) Buyer makes any further use of such Goods after giving such notice; (ii) the defect arises because Buyer failed to follow Seller’s oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods; (iii) Buyer alters or repairs such Goods without the prior written consent of Seller; or (iv) repairs or modifications are made by persons other than Seller’s own service personnel, or an authorized representative’s personnel, unless such repairs are made with the written consent of Seller in accordance with procedures outlined by Seller.

(g) All expendables such as electrodes are warranted only for defect in material and workmanship which are apparent upon receipt by Buyer. The foregoing warranty is negated after the initial use.

(h) Subject to Section 1(e) and Section 1(f) above, with respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: (i) repair or replace such Goods (or the defective part) or (ii) credit or refund the price of such Goods at the pro rata contract rate, provided that, if Seller so requests, Buyer shall, at Buyer's expense, return such Goods to Seller.

(i) **THE REMEDIES SET FORTH IN SECTION 1(H) SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN SECTION 1(A).** Representations and warranties made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty, as set forth above, shall not be binding upon Seller.

Exhibit A
Warranty for “Specialty Products”

Limited Warranty

EXCEPT FOR THE WARRANTY SET FORTH BELOW IN THIS EXHIBIT A, SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE GOODS (INCLUDING ANY SOFTWARE) OR SERVICES, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.

Warranty Period: The Warranty Period for Specialty Products is for one (1) year, and the Warranty Period for laser welders and laser markers is two (2) years (unlimited hours), and the Warranty Period for the laser pump diodes or modules is two (2) years or 10,000 clock hours, whichever occurs first (as applicable, the “**Warranty Period**”). The Warranty Period begins as follows: (i) on orders for Goods purchased directly by Buyer, upon installation at Buyer’s site or thirty (30) days after the date of shipment, whichever occurs first; or (ii) on equipment purchased by a Buyer that is an OEM or systems integrators, upon installation at the end user’s site or six (6) months after the date of shipment, whichever occurs first.

Acceptance Tests: Acceptance Tests (when required) shall be conducted at Amada Miyachi America, Inc., Monrovia, CA, USA (the “**Testing Site**”) unless otherwise mutually agreed in writing prior to issuance or acceptance of the Acknowledgement. Acceptance Tests shall consist of a final visual inspection and a functional test of all laser, workstation, enclosure, motion and accessory hardware. Acceptance Tests shall include electrical, mechanical, optical, beam delivery, and software items deliverable under the terms of the Acknowledgement. Terms and conditions for Additional Acceptance Tests either at Seller’s or Buyer’s facility shall be mutually agreed in writing prior to issuance or acceptance of the Acknowledgement.

Performance Warranty: The system is warranted to pass the identical performance criteria at Buyer’s site as demonstrated during final Acceptance Testing at the Testing Site during the Warranty Period, as provided in the Acknowledgement. Seller explicitly disclaims any responsibility for the process results of the laser processing (welding, marking, drilling, cutting, etc.) operations.

Exclusions: Seller makes no warranty, express or implied, with respect to the design or operation of any system in which any Seller’s product sold hereunder is a component.

Limitations: The limited warranty set forth on this Exhibit A does not cover loss, damage, or defects resulting from transportation to Buyer’s facility, improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the equipment, or improper site preparation and maintenance. This warranty also does not cover damage from misuse, accident, fire or other casualties of failures caused by modifications to any part of the equipment or unauthorized entry to those portions of the laser which are stated. Furthermore, Seller shall not be liable for a breach of the warranty set forth in this Exhibit A if: (i) Buyer makes any further use of such Goods after giving such notice; (ii) the defect arises because Buyer failed to follow Seller’s oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods; (iii) Buyer alters or repairs such Goods without the prior written consent of Seller; or (iv) repairs or modifications are made by persons other than Seller’s own service personnel, or an authorized representative’s personnel, unless such repairs are made with the written consent of Seller in accordance with procedures outlined by Seller.

THIN-LINE® SERIES 180M WELD HEADS

Seller further warrants that all Services performed by Seller's employees will be performed in a good and workmanlike manner. Seller's sole liability under the foregoing warranty is limited to the obligation to re-perform, at Seller's cost, any such Services not so performed, within a reasonable amount of time following receipt of written notice from Buyer of such breach, provided that Buyer must inform Seller of any such breach within ten (10) days of the date of performance of such Services.

Seller shall not be liable for a breach of the warranty set forth in this Exhibit A unless: (i) Buyer gives written notice of the defect or non-compliance covered by the warranty, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect or non-compliance and such notice is received by Seller during the Warranty Period; (ii) Seller is given a reasonable opportunity after receiving the notice to examine such Goods and (a) Buyer returns such Goods to Seller's place of business at Buyer's cost (prepaid and insured); or (b) in the case of custom systems, Seller dispatches a field service provider to Buyer's location at Buyer's expense, for the examination to take place there; and (iii) Seller reasonably verifies Buyer's claim that the Goods are defective or non-compliant and the defect or non-compliance developed under normal and proper use.

All consumable, optical fibers, and expendables such as electrodes are warranted only for defect in material and workmanship which are apparent upon receipt by Buyer. The foregoing warranty is negated after the initial use.

No warranty made hereunder shall extend to any product whose serial number is altered, defaced, or removed.

Remedies: With respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: repair such Goods (or the defective part). **THE REMEDIES SET FORTH IN THE FOREGOING SENTENCE SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN THIS EXHIBIT A.** Representations and warranties made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty, as set forth above, shall not be binding upon Seller.

Products manufactured by a third party and third party software ("**Third Party Product**") may constitute, contain, be contained in, incorporated into, attached to or packaged together with, the Goods. Third Party Products are not covered by the warranty in this Exhibit A. For the avoidance of doubt, **SELLER MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO ANY THIRD PARTY PRODUCT, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Notwithstanding the foregoing, in the event of the failure of any Third Party Product, Seller will assist (within reason) Buyer (at Buyer's sole expense) in obtaining, from the respective third party, any (if any) adjustment that is available under such third party's warranty.

CHAPTER 1

SYSTEM DESCRIPTION

Section I. Features

Overview

This manual is organized to assist you in getting productive quickly with your THIN-LINE® Series 180M Weld Head. *Chapter 1* describes the equipment, *Chapter 2* describes installation, *Chapter 3* describes operating procedures so you can run the weld head safely and efficiently, and *Chapter 4* describes maintenance and troubleshooting procedures.

Miyachi Unitek THIN-LINE Series 180M Weld Heads are production line heads having a narrow vertical profile. They are characterized by low inertia, force fired operation. Depending on the model, their primary operational features allow them to be used in a wide variety of precision resistance welding applications.

- 4.44 cm (1.75 inch) width (actual head module)
- 3.17 cm (1.25 inch) stroke
- 22.2 to 445 N (5 to 100 pound) force range
- 15.32 to 25.72 (6.031 to 10.125 inch) throat depth

Bearing life is designed for a minimum of 20 million operations when the head is used according to specifications.

The design of the aluminum extrusion mounting system and main shaft ensures that the offset electrodes do not slide from side to side more than 0.381 mm (0.015 inch) at 445 N (100 pounds). The four mounting holes on the head spine allow you to easily incorporate the head into your custom welding machines. In addition, you can modify the aluminum extrusion used for the base of the head to accommodate your custom fixtures and tooling.

Precision Welding

The weld heads excel in their ability to deliver repeatable weld force and electrode placement on your parts. The low inertia, lightweight design ensures fast dynamic response. This allows the top electrode to follow the minute expansion and contraction of the weld joint as it heats and cools. A "differential motion" force-firing system triggers the weld energy power source at the precise moment when the electrodes reach the preset firing force applied on the work pieces.

Rugged construction, linear ball bearing bushings, and an over-sized anti-rotation system provide perfect in-line electrode travel, which assures smooth vertical travel of the upper electrode arm. This system minimizes the "wiping" (side-to-side sliding) action of the electrodes during welding, even at maximum force settings.

CHAPTER 1: SYSTEM DESCRIPTION

Weld Force

The weld force is continuously adjustable from a minimum of 22.2 N (5 pounds) to a maximum of 445 N (100 pounds). Settings are quickly reproduced by using the force adjustment knob and easy-to-read visual scale. An adjustable tare spring allows you to compensate for the weight of non-standard electrode holders. An adjustment screw allows you to adjust the sensitivity of the force-firing switch.

Weld force is applied via a foot pedal in the case of the manual weld head model. It is applied via an air cylinder in the case of an air-actuated model.

Adjustable Stops

All of the Series 180M Weld Heads have adjustable upstops and downstops. You can use the downstop to limit excessive over-travel. You can use the upstop to reduce the stroke and, therefore, the travel time of the head. This is a particularly useful feature when using the head in an automated system.

Electrode Holders

Electrode holders for the Models 180MF, and 180MA use 6 mm diameter, ES0800M Series Electrodes.

Welding Cables

Depending upon model, either #2 or #2/0 Welding Cables are provided to connect Series 180M Heads to the power source. Miyachi Unitek Heads deliver maximum performance when used with the appropriate Miyachi Unitek power sources.

Footpedal Actuation

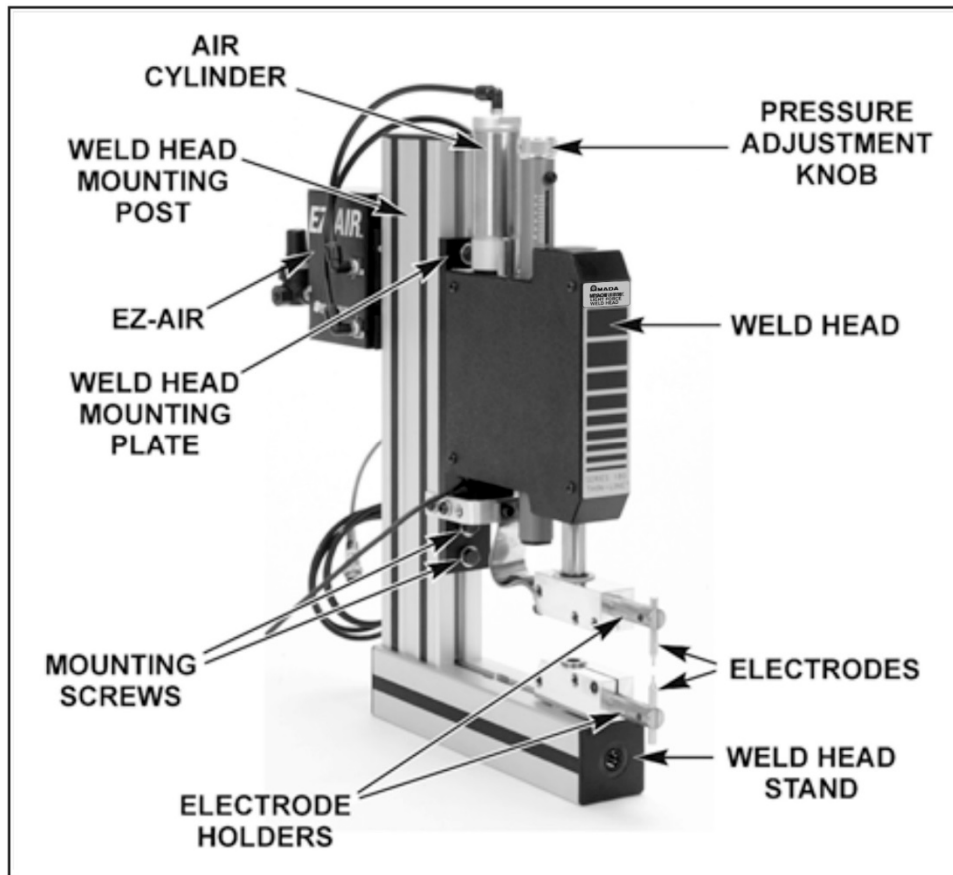
The Series 180MF Weld Head is manually actuated using the Model MSP, Swing Action Footpedal, which provides an approximate 5 to 1 mechanical advantage.

EZ-AIR™ Actuation

The Model 180A-EZ weld head is equipped with factory-installed EZ-AIR, a Miyachi Unitek pneumatic control that actuates the electrodes and maintains a preset firing force. At a predetermined firing force, EZ-AIR closes the inlet and outlet valves to the weld head actuation cylinder and eliminates over-force. Series 180 air-actuated heads are easy to incorporate into automated welding systems. EZ-AIR can be energized by most of the Miyachi Unitek power sources, or by a Model FSAC Footswitch. The Footswitch can be a single or two-level type, dependent upon the power supply and the user's preference.

For EZ-AIR instructions, see the separate EZ-AIR Operator Manual supplied with the weld head.

Section II. System Components



Typical Series 180M Weld Head

Model 180MA

The Model 180MA is an air-actuated head. The actuation source is the top-mounted, 3.81 cm (1.5-inch) diameter air cylinder. This model provides throat depth of 25.72 cm (10.125 inches). The Model 180MF Weld Head includes the Model HE180KM Offset Electrode Holder Block and the Model HE2000M Electrode Holders.

Model 180MF

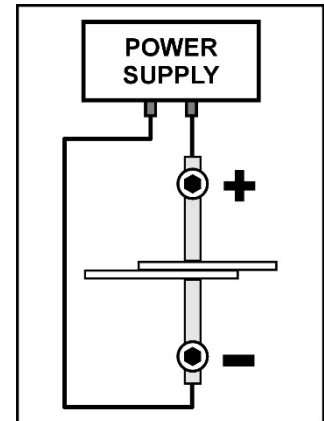
This is a manually-actuated head that uses the Model MSP Foot Pedal for operation. This head includes the Model HE180KM Offset Electrode Holder Block and the Model HE2000M Electrode Holders. These electrode holders use the 6 mm diameter ES0800M Series electrodes. The Model 180MF provides a throat depth of 19.68 cm (7.75 inches).

Section III. Welding Capabilities

Opposed Welding

With opposed welding, the top and bottom electrodes are used to hold the parts and provide the current path. Weld current flows from one electrode through both parts to the other electrode.

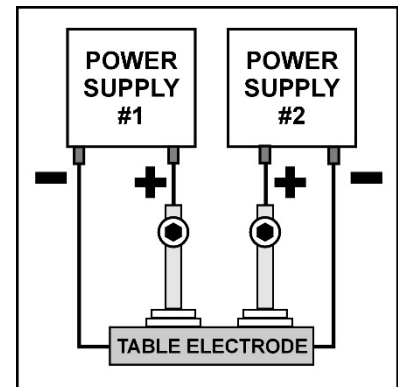
An opposed weld is preferred over other configurations because it is easier to set up and the current path is more easily controlled. It should be used whenever possible.



Dual-Opposed Welding

This method of welding uses two opposed welds being made on a single part, using two separate weld energy power supplies. Weld energy can be delivered in a simultaneous or alternate fashion, depending on your manufacturing requirements. Opposed welding provides maximum weld strength repeatability.

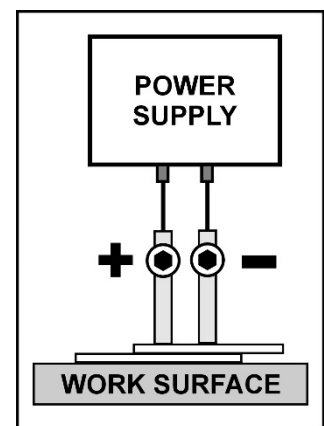
The Table Electrode, or a user supplied fixture, acts as a support for the workpieces in step welding. If the Table is insulated from the workpieces, there is no possibility of shunting current away from the (-) electrode.



Series Welding

In series welding applications, both electrodes contact the *same* surface of each workpiece. The weld current flows from one electrode through the workpiece to the other electrode. This technique is used to weld workpieces which have only one surface accessible.

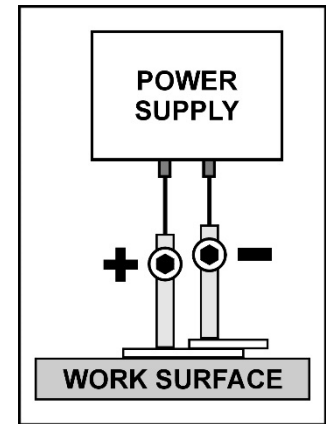
The work surface, or a user supplied fixture, acts as a support for the workpieces in series welding. If the Table is insulated from the workpieces, there is no possibility of shunting current away from the (-) electrode.



CHAPTER 1: SYSTEM DESCRIPTION

Step Welding

Series welding is ideal for welding thin resistive parts, 0.15 mm (0.006 inch) maximum thickness, to a larger part that cannot easily accommodate an opposed electrode. In step welding, the size of the weld and the surface marking is frequently controlled by the diameter of the face of each electrode. If the (+) Electrode is significantly larger than the (-) Electrode the lower workpiece will not have any marking and the weld will be under the (-) Electrode.



Section IV. Operating Controls

There are several Miyachi Unitek direct energy welding controls, high frequency inverter controls, and microprocessor controlled series of stored energy power supplies that have a 24 VAC valve output for automatically energizing the EZ-AIR solenoid valve. The Model FS1L or FS2L Foot Switch is used to initiate all of these Miyachi Unitek weld energy controls.

Series 180M, 24 VAC air actuated heads can also be used in automated environments where a programmable logic control (PLC) provides solenoid power and timing control. The Footswitch can be a single or two level types, depending on the power supply and the user's preference. Lubricators should not be used in "clean" environments. However, the user will then be required to periodically put a few drops of oil in the cylinder. Some users use lubricators, some do not.

CHAPTER 2

INSTALLATION

Section I. Introduction

Overview

Before you start installation, become familiar with the specific model you are using. Series 180M Weld heads come in different sizes and configurations, which require different stands and installation hardware.

Despite differences from model-to-model, the installation principle is the *same* for each head:

- If not already attached, the weld head mounting post is attached to the stand.
- The weld head stand is bolted securely to a workbench.
- If not already attached, the weld head is attached to the mounting post.
- If necessary, the air head (if used), foot pedal (if used), and optics (if used) are installed.
- Electrodes and weld cables are installed on the weld head.

Requirements

Work Area

We recommend that you install your weld head in a well-ventilated area that is free from excessive dirt and moisture. The workstation must be stable, free from vibration, and capable of supporting the combined weight of the head, its accessories, and the weld energy power supply and welding transformer. The combined system weight can reach approximately 54.4 kg (120 lbs).

Utilities

- **AC Power**

For Model 180MF – None required.

For Models 180MA-- Included in Miyachi Unitek weld energy power supplies.

- **Compressed Air**

For Models 180MA only. 4.5 bar (65 psi) minimum.

Section II. Weld Head Installation

Overview

First, this section will give "Typical Installation" instructions that are common to *all* Series 180M weld heads. Then, additional instructions for installing *specific* weld head models are listed by model number. **Before you start installation:**

- Read the *Typical Installation* instructions **and** the instructions for the *specific* weld head you want to install.
- Make sure you have all necessary parts and mounting hardware. Use the shipping list as a reference. Verify that the paper mounting template corresponds to the model number of the weld head. If you do **not** have the correct template, contact Amada Miyachi America at the address shown in the front of the manual.

Series 180M weld heads may be purchased with or without mounting hardware. Amada Miyachi America provides an extruded aluminum post with channels on the front and back. By inserting T-Nuts into the channels, mounting plates can be screwed onto the front (for weld head), back (for air head), or both sides of the post (only the weld head is shown). This installation allows you to adjust the height of the weld head and air head separately.

Typical Installation

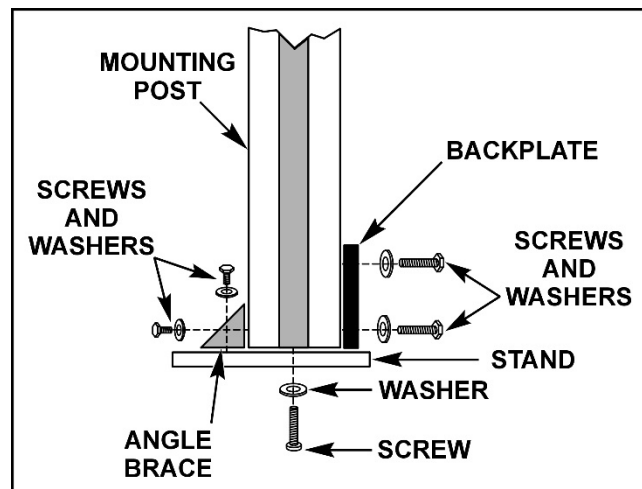
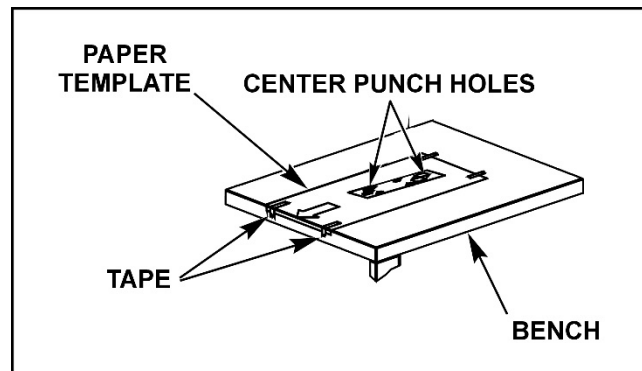
Allow about 20.32-25.4 cm (8-10 inches) between the front edge of the bench and the stand so the operator can use the bench as a support when positioning the workpiece.

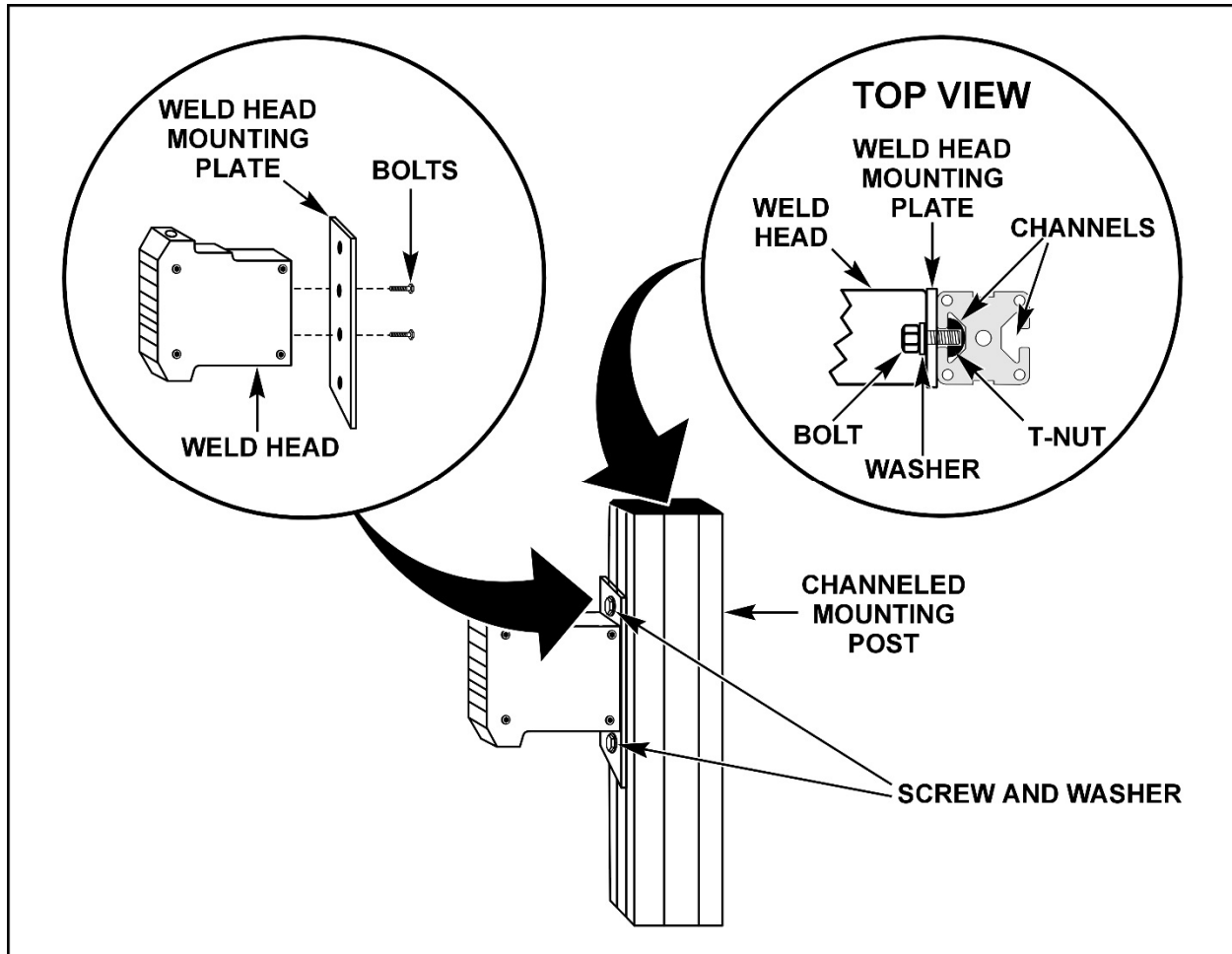
- 1 Place the mounting template in the desired location on the workbench and tape it in place.
- 2 Drill the mounting holes as shown on the template.

- 3 If necessary, install the weld head mounting post to the stand.

NOTE: If you are using optional optics (microscope/illuminator), install the optics according to the instructions that came with the optics.

- 4 Screw the weld head stand (and optics baseplate if used) to the workbench.

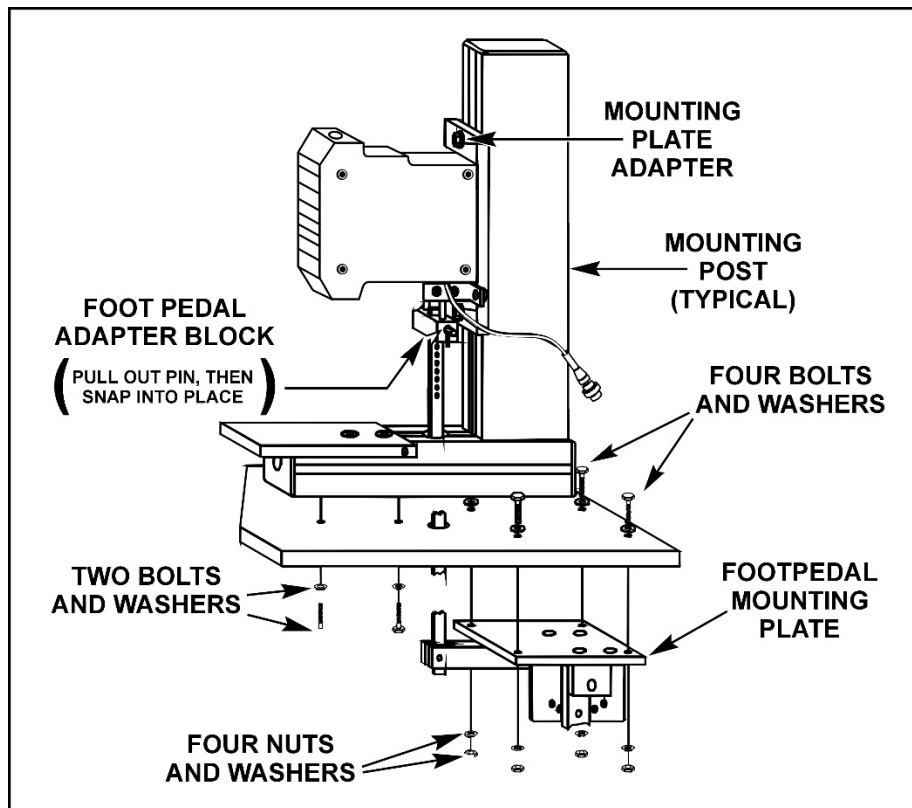




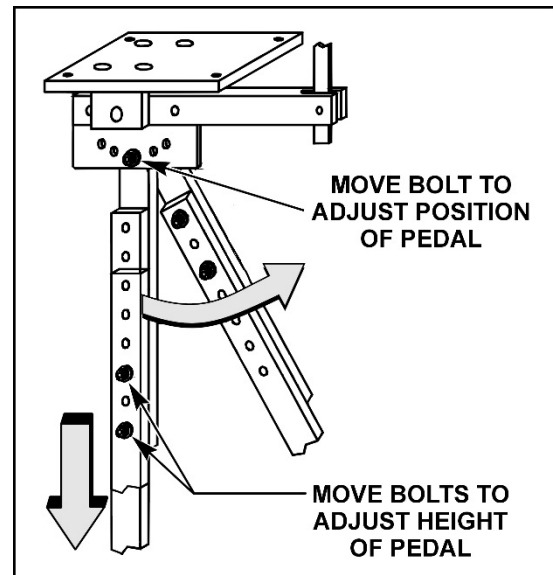
- 5 Install the weld head mounting plate onto the weld head using the screws as shown.
- 6 Install the screws, washers, and T-nuts into the weld head mounting plate as shown.
- 7 If necessary, remove the end cap from the mounting post to expose the channels in the mounting post.
- 8 Raise the weld head and mounting plate above the mounting post, insert the bottom T-nut into the front channel of the mounting post, and slowly lower the weld head until you can insert the top T-nut into the channel. Slide the weld head to the desired height, then tighten the mounting screws.
- 9 If you are using an air head, install it on the rear of the mounting post following the procedures in Steps 3 through 7.

CHAPTER 2: INSTALLATION

Model 180MF MSP Footpedal Installation



- 1 Screw the head to the bench and Model MSP Footpedal using four (4) screws, washers and nuts supplied with the shipping kit.
- 2 To adjust the height of the head, loosen two hex head cap screws on the mounting plate adapter, as illustrated, and slide Head up or down the stand.
- 3 Pull out the pin on footpedal adapter block, as illustrated. Insert the pullrod and allow the pin to snap back into place.
- 5 Attach the pullrod to footpedal. Adjust the height of head, loosen two Allen head cap screws on the mounting plate adapter as shown, and slide Head up or down the stand.
- 6 Attach the pullrod to footpedal. Adjust the angle and length of the footpedal so that it is comfortable for the operator.



EZ-AIR Installation and Connection

Model 180MA-EZ comes with EZ-AIR factory-installed, no further installation is required by the user. For instructions on connecting EZ-AIR to an air supply, follow the procedures in the separate *EZ-AIR Operator Manual* supplied with the weld head.

Optics

If you are using any of the optional optics (microscope or illuminator):

- 1 Verify that the optics mounting post is securely attached to the optics baseplate.
- 2 Install the optics following the instructions provided with the optics.

Section III. Connect Weld Cables

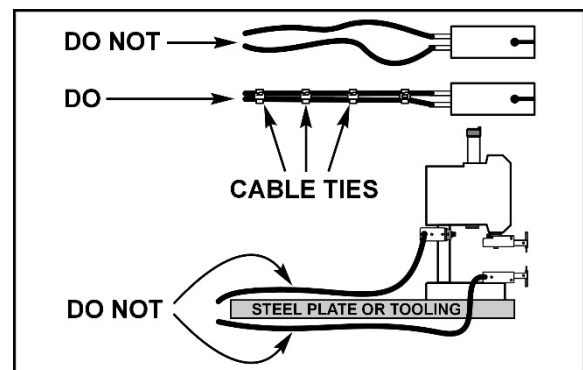
Weld Cables and Energy Losses

All Miyachi Unitek weld heads are supplied with the correct weld cables to provide maximum weld energy. If you need to install longer cables, or replace damaged cables,

- **Use #2 AWG for lengths under 30.5 cm (12 inch) and #2/0 AWG for longer lengths.** Tie or tape cables together to minimize inductive losses. A separation of weld cables surrounding an area of one square foot could result in losses of up to 65%.
- **Use the shortest possible Welding Cables.** It is common to have losses of up to 50% per foot for #6 cables and 20% for #2 cables.
- Connect the welding cables on the **same side of the head**. Otherwise, the inductive losses added by the intervening support post could substantially increase the amount of energy required to join metal satisfactorily

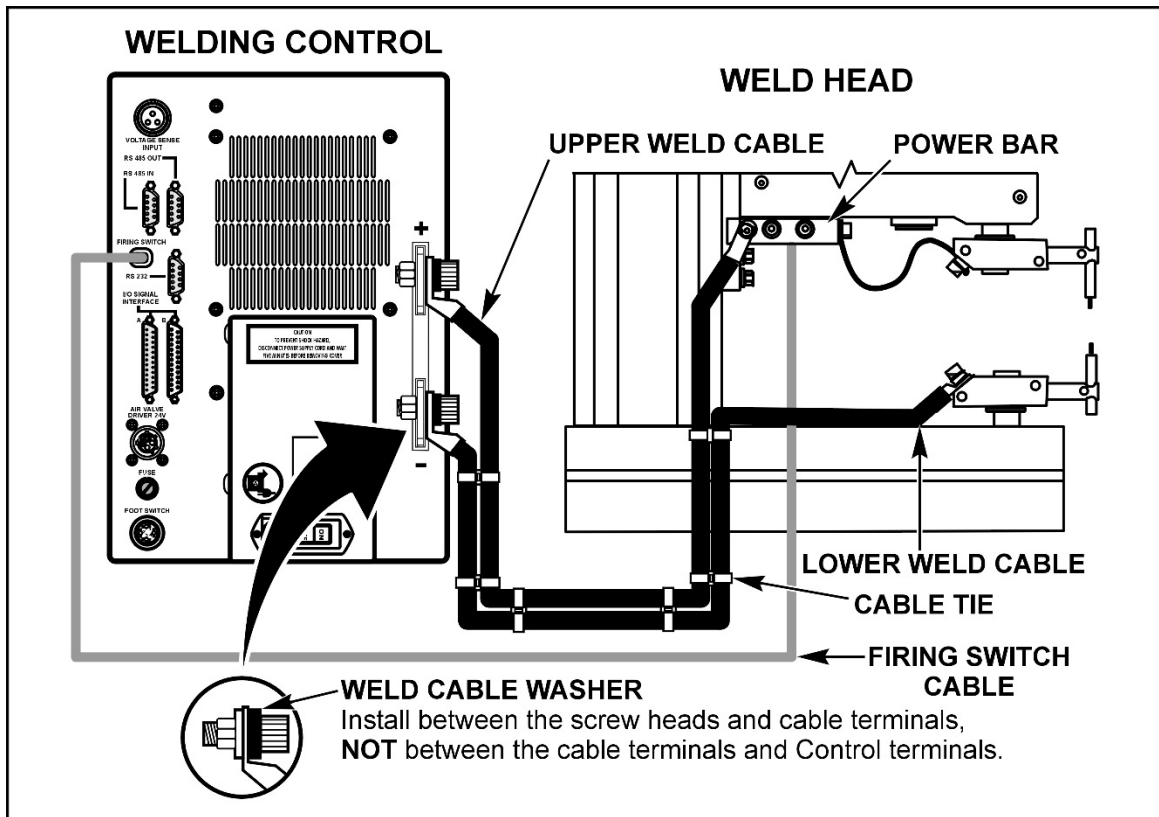
Connect Cables to Head

- Place the washer securing the welding cable terminal between the screw head and the welding cable terminal, *not* the welding cable terminal, and the terminal to which the cable is being attached.
- Make sure the connections are free of oxidation, dirt and grease.
- Use 2/0 AWG cable for lengths under 45 centimeters (18 inches), and 4/0 AWG for longer lengths.



- Use the shortest possible welding cables. Energy losses can range up to 20% per foot for 2/0 AWG cables.
- Tie the welding cables together to minimize weld energy losses caused by unwanted welding cable inductance.
- Route the welding cables so that they do not run adjacent to magnetic materials and devices such as air solenoids, tooling and steel heads. Run the welding cables through a single hole in a steel plate.

Model 180MF, and 180MA Weld Head Connections



- 1 Place the welding control, weld energy power supply, or welding transformer approximately 10.2 to 12.7 cm (4 to 5 inch) behind the weld head.
- 2 Inspect the connections on the weld cables, welding control, weld energy power supply, or welding transformer. Remove any oxidation, dirt, or grease.
- 3 Connect the short welding cable to one terminal on the weld head power bar, using a M8 x 25 hex head bolt, and flat washer. Place the washer between the bolt head and the welding cable terminal, do **not** place the washer between the Cable and the Power Bar because you will get an unstable connection and, consequently, unstable current flow. Tighten connections securely.
- 4 Connect the longer welding cable to the lower electrode holder, or user-supplied welding fixture, using the procedures in Step 3.
- 5 Connect the other end of the cables to the welding control, weld energy power supply, or welding transformer in accordance with the instructions in its Users' Manual.
- 6 Connect the firing switch cable to the welding control, weld energy power supply, or welding transformer in accordance with the instructions in its Users' Manual.

Section IV. Install Electrode Holders

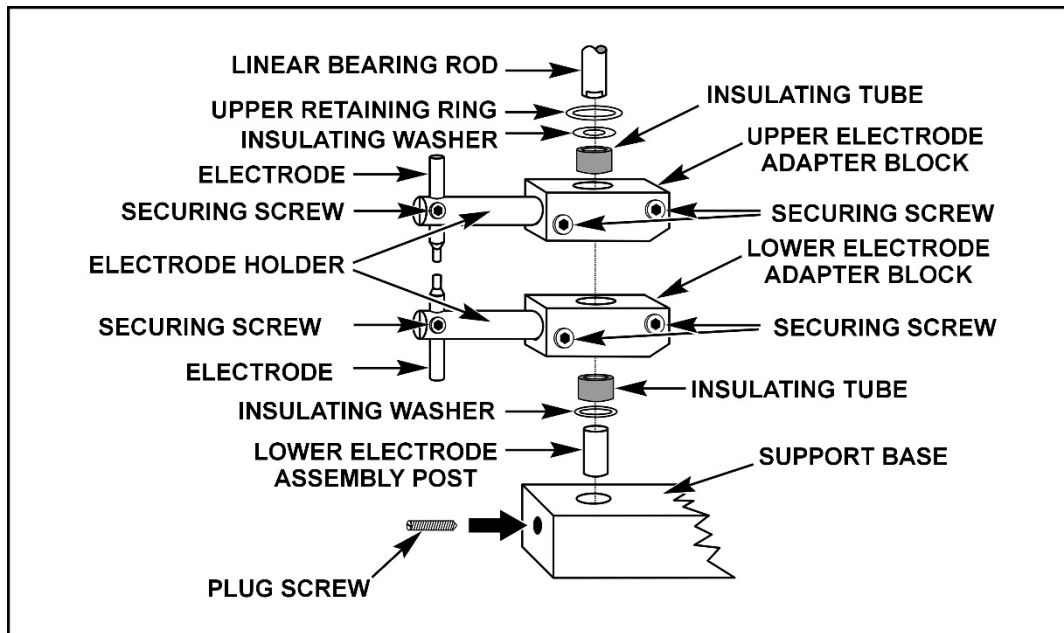
Various electrode holders are interchangeable, as required by your weld head application. All Series 180M Weld Heads are shipped with the electrode holders installed. Use the following procedures to change electrode holders.



CAUTION

Do **not** modify the electrode holders or attach additional mechanisms to the moving parts of the head. Doing so may hurt welding performance, damage the head, and **void the warranty**.

Models 180MF and 180MA Offset Electrode Holders



- 1 Install the upper insulating washer on the linear bearing rod, followed by the upper insulating tube.
- Note:** Do **not** remove the upper retainer ring from the linear bearing rod.
- 2 Slip the upper electrode adapter block over the upper insulating tube. The linear bearing rod should now be flush with the bottom of the upper electrode adapter block.
 - 3 Secure the upper electrode adapter block on the linear bearing rod by tightening the upper electrode adapter block securing screw.

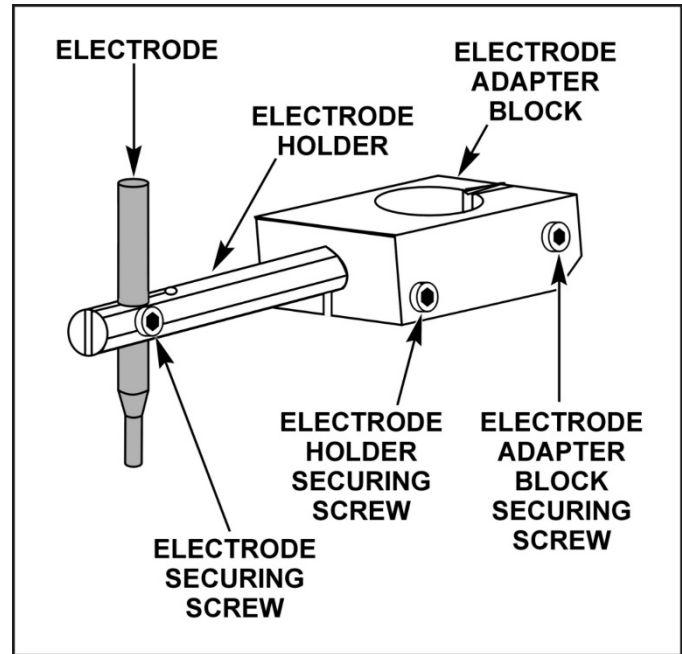
- 4 Slip the lower insulating washer over the lower electrode assembly post, followed by the lower insulating tube.
- 5 Slip the lower electrode adapter block over the lower insulating tube. Secure the lower electrode adapter block on the lower electrode post by tightening the lower electrode adapter block securing screw.
- 6 Insert one finger into the lower electrode post mounting hole in the support base until you feel the plug screw. Turn the plug screw counter-clockwise until it no longer protrudes from the mounting hole.
- 7 Insert the lower electrode assembly post into the support base mounting hole. Secure the assembly by turning the plug screw clockwise.
- 8 To remove the offset electrode holder assembly, reverse the installation procedure.

Section V. Install Electrodes

Model 180MF and Model 180MA Offset Electrodes

- 1 Turn the electrode securing screw in the upper electrode holder counterclockwise to loosen it.
- 2 Insert the electrode in the electrode holder and turn the electrode securing screw clockwise to secure the electrode in the holder.
- 3 Repeat Steps 1 and 2 for the lower electrode and electrode holder.

CAUTION: For safety purposes, adjust the upper and lower electrodes so that the gap between the electrode tips is less than a finger diameter.



- 4 Loosen the lower electrode holder securing screw and rotate the electrode holder to bring the lower electrode into alignment with the upper electrode. Re-tighten the lower electrode holder securing screw.
- 5 Loosen the lower electrode adapter block securing screw and rotate the lower electrode holder assembly to bring the lower electrode into alignment with the upper electrode. Re-tighten the lower electrode adapter block securing screw.
- 6 Tighten the plug screw to secure the lower electrode holder assembly.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. Getting Started

Installation Checklists

INSTALLATION CHECKLIST FOR ALL HEADS	
✓	Check that the cables are correctly attached at both ends.
✓	Verify that the Firing Switch Cable is attached to the welding power supply or Control.
✓	Set the WELD/NO WELD Switch, located on the front of the welding power supply (Control), to the NO WELD position.
✓	Verify that the welding power supply (Control) is connected to the appropriate power source and that the power is switched to ON .
✓	Switch the welding power supply (Control) to ON . Follow the procedures in the manual to program and operate the welding power supply (Control).
INSTALLATION CHECKLIST FOR AIR ACTUATED HEADS	
✓	Verify that the air lines are properly connected to the head and the main air supply (448 kPa (65 psi) nominal) is turned ON .
✓	Verify that the line cord from the air solenoid is connected to the power supply (Control), if required.
✓	Verify that the footswitch is connected to the welding power supply (Control).

Welding Force Theory

Welding force (pressure) is a key variable in the resistance welding process. Excessive or insufficient welding force or pressure can cause a weak weld. More information is available from Amada Miyachi America:

- A) Resistance Welding Troubleshooting Guide
- B) Electrode/Material Selection Guide
- C) Resistance Welding Spot Welding Applications
- D) Technical Service Bulletins on a variety of subjects

CHAPTER 3: OPERATING INSTRUCTIONS

Troubleshooting

WELDHEAD TROUBLESHOOTING GUIDE			
SYMPTOM OR PROBLEM	PRIMARY CAUSE Weldhead-Related Cause	PRIORITY*	SOLUTION
Overheating of Weldment	Excess Welding Time	1	Decrease Welding Time (A.C. Welding)
	Insufficient Force	2	Increase force in steps of 10-20%
	Wrong Electrode Material	2	Check Electrode/Material Selection Guide
	Dirty Electrodes	3	Clean electrodes and/or parts to be welded
	Electrode Tip Shape	3	Use constant area electrodes or shape to suit application
Discoloration	Excess Welding Time	1	Decrease Welding Time (A.C. Welding)
	Wrong Electrode Material	1	Check Electrode/Material Selection Guide
	Insufficient Force	2	Increase force in steps of 10-20%
Weak Weld	Insufficient Current/Energy	1	Increase current/energy in steps of 5-10%
	Dirty Electrodes	1	Clean electrodes and/or parts to be welded
	Electrode Tip Shape	1	Use constant area electrodes or shape to suit application
	Mushroomed Electrodes	1	Replace or reshape electrodes or increase cleaning schedule
	Excess Force	2	Decrease force in steps of 10-20%
	Insufficient Force	2	Increase force in steps of 10-20%
	Wrong Electrode Material	2	Check Electrode/Material Selection Guide
	Poor Weldhead Follow-up	3	Reduce mass of top electrode holder assembly
Insufficient Nugget **	Insufficient Current/Energy	1	Increase current/energy in steps of 5-10%
	Wrong Electrode Material	1	Check Electrode/Material Selection Guide
	Electrode Tip Shape	1	Use constant area electrodes or shape to suit application
	Mushroomed Electrodes	1	Replace or reshape electrodes or increase cleaning schedule
	Dirty Electrodes	2	Clean electrodes and/or parts to be welded
	Excess Force	2	Decrease force in steps of 10-20%
	Insufficient Force	3	Increase force in steps of 10-20%
Metal Expulsion	Excess Current/Energy	1	Decrease current/energy in steps of 5-10%
	Insufficient Force	1	Increase force in steps of 10-20%
	Poor Weldhead Follow-up	1	Reduce mass of top electrode holder assembly***
	Dirty Electrodes	2	Clean electrodes and/or parts to be welded
	Electrode Tip Shape	2	Use constant area electrodes or shape to suit application

CHAPTER 3: OPERATING INSTRUCTIONS

WELDHEAD TROUBLESHOOTING GUIDE			
SYMPTOM OR PROBLEM	PRIMARY CAUSE Weldhead-Related Cause	PRIORITY*	SOLUTION
Sparking	Excess Current/Energy	1	Decrease current/energy in steps of 5-10%
	Insufficient Force	1	Increase force in steps of 10-20%
	Poor Weldhead Follow-up	1	Reduce mass of top electrode holder assembly***
	Electrode Tip Shape	1	Use constant area electrodes or shape to suit application
	Wrong Electrode Material	2	Check Electrode/Material Selection Guide
	Dirty Electrodes	2	Clean electrodes and/or parts to be welded
Warping	Excess Welding Time	1	Decrease Welding Time (A.C. Welding)
	Excess Force	1	Decrease force in steps of 10-20%
	Electrode Tip Shape	2	Use constant area electrodes or shape to suit application

** In most cases capacitor discharge welds do not have a significant nugget.

*** For non-Miyachi Unitek weld heads.

A certain amount of experimentation is necessary to achieve the proper welding force setting for a specific application. The following are some general rules to make quality welds:

- Larger parts require higher force.
- Larger diameter electrode faces require higher force.
- Higher electrode forces require higher weld currents (energy).

CHAPTER 3: OPERATING INSTRUCTIONS

Section II. Model 180MF Manually-Actuated Head Setup

This Section describes the following adjustments for the Model 180MF:

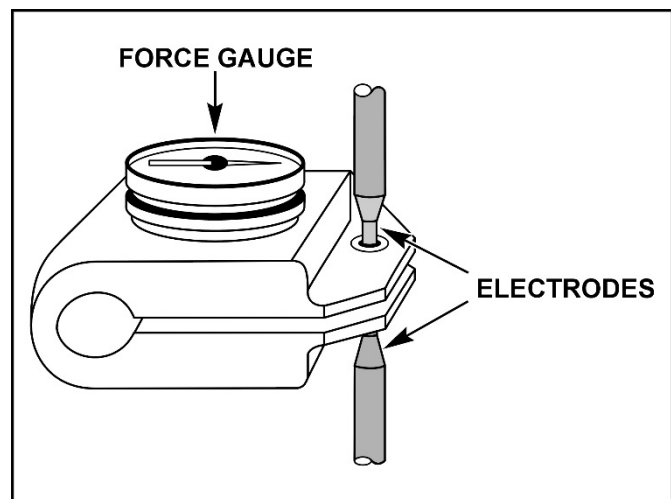
- **Firing force** to the value required by the specific application.
- **Maximum force** the electrodes can exert on the workpiece during the welding cycle.
- **Down stroke** limits.

Electrode Sticking	Insufficient Force	1	Increase force in steps of 10-20%
	Wrong Electrode Material	1	Check Electrode/Material Selection Guide
	Electrode Tip Shape	1	Use constant area electrodes or shape to suit application
	Dirty Electrodes	2	Clean electrodes and/or parts to be welded
	Poor Weldhead Follow-up	3	Reduce mass of top electrode holder assembly ***
Electrode Damage	Excess Current/Energy	1	Decrease current/energy in steps of 5-10%
	Insufficient Force	1	Increase force in steps of 10-20%
	Electrode Tip Shape	1	Use constant area electrodes or shape to suit application
	Excess Force	2	Decrease force in steps of 10-20%
	Wrong Electrode Material	2	Check Electrode/Material Selection Guide
	Dirty Electrodes	2	Clean electrodes and/or parts to be welded

- * Priority numbers refer to troubleshooting priority, with 1 as highest priority. Start troubleshooting with 1 and then proceed to 2 and so on. When there are multiple causes with the same priority, use personal judgement in determining which is more probable in the specific application.

CAUTION: Excessive force can damage the electrodes and/or the workpiece.

- 1 Use the force adjustment knob to set the weld head force indicator to "4." The indicator is located on the front of the force tube just below the force adjustment knob. Set heads with digital readouts to "100."
- 2 Adjust the electrode spacing so that a Miyachi Unitek Force Gauge fits between the electrodes, as illustrated.
- 3 Depress and hold the footpedal. Note the force indication on the force gauge when the head firing switch "clicks." If the firing switch closure is inaudible, it is



easily detected by observing the firing switch indicator on the welding power supply or control. For older or non-Miyachi Unitek controls, an ohmmeter or continuity checker can be connected to the pins on the firing switch connector.

- 4 Use the force gauge reading from the previous step as a starting point. Use the force adjustment knob to **increase** the indicated force if the initial force reading is **less than** the required force setting. If the initial force reading is **greater than** the required force setting, **decrease** the indicated force.
- 5 Depress and release the footpedal. Verify that the force applied by the operator does not exceed the force required to close the firing switch by more than five percent (5%).
- 6 After setting the required force, remove the force adjustment knob by loosening the two setscrews that secure it to the shaft. Invert the knob and place it on the shaft. Be sure to insert the locking tab on the knob into the slot on the force tube. Re-tighten both setscrews.
- 7 If necessary, re-adjust the electrodes in their holders to accommodate the workpiece.
- 8 Turn the downstop screw counter-clockwise to its fullest extension without actually disengaging it. This will allow maximum downward travel of the upper arm. The following downstop adjustment should be made **only** if the workpiece would be damaged if the upper arm travels too far. ***In most applications, use of the downstop is not recommended.***
 - A) Place the workpiece in the appropriate position. Rotate the downstop screw clockwise until the electrode(s) no longer contacts the workpiece. Check the adjustment by depressing and releasing the footpedal.
 - B) Depress and **hold** the footpedal. Slowly rotate the downstop counter-clockwise until the force-firing switch in the head closes. Rotate the downstop one or two additional turns counter-clockwise. The additional turn(s) will allow for electrode wear and/or the slight variations of the position of the electrode in its holder. Re-check that the firing switch consistently closes.

CAUTION: Do **not** attempt to use the downstop adjustment to limit the force, which is applied to the workpiece. This will result in inconsistent welds.

Section III. Model 180MA EZ-AIR Air-Actuated Head Setup

This Section describes the following adjustments for the Model 180MA-EZ:

- **Welding force** to the value required by the specific application.
- **Down speed** of the electrode approaching the parts.
- Eliminating any **down stop** setting.

CAUTION: Excessive force can damage the electrodes and/or the workpiece.

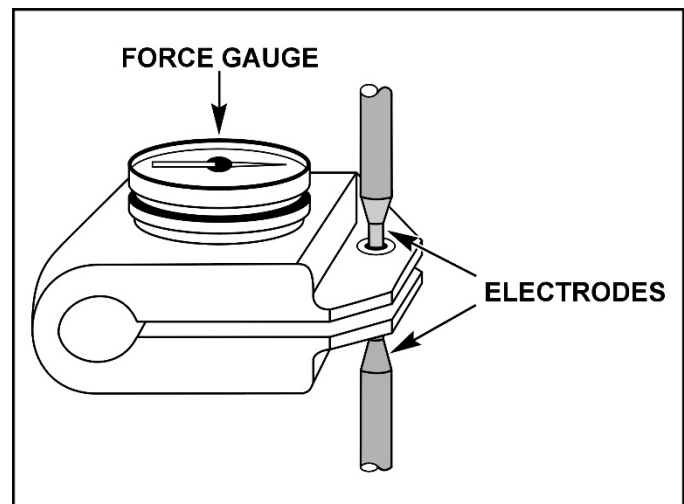
The Model 180MA-EZ air-actuated weld head is supplied with EZ-AIR, a pneumatic control that actuates the electrodes and maintains a preset firing force. At a predetermined firing force, EZ-AIR automatically closes the inlet and outlet valves to the weld head actuation cylinder and eliminates over-force.

Down speed and welding force are the only two adjustments to be made when setting up the EZ-AIR. Down stops are *not* required.

NOTE: *Before* performing the following instructions, get the separate EZ-AIR Operator Manual supplied with the weld head and follow the detailed procedures for operating and adjusting EZ-AIR.

- 1 Use the force adjustment knob to set the weld head force indicator to "4." The indicator is located on the front of the force tube, just below the force adjustment knob. Set heads with digital readouts to "100."
- 2 If electrodes are being used, adjust the electrode spacing so that a Miyachi Unitek Force Gauge fits between the electrodes, as shown.

Depress and hold the footswitch. Note the force indication on the force gauge. When the head-firing switch "clicks" (closes), the force will stabilize. If the firing switch does not close, or the force keeps increasing, verify that all of the connections have been properly made as described in the EZ-AIR manual.



- 3 Cycle the electrode up and down several times and adjust the down speed by turning the knob that is located on the back of the EZ AIR. The down speed should be adjusted to provide a comfortable speed for the operator or automation without excessive impact force to the parts.
- 4 The force gauge will indicate the electrode force. Use the force adjustment knob to increase the indicated force if the initial force reading is less than the required force setting for the welding application. If the initial force reading is greater than the required force setting, decrease the indicated force.

- 5 After setting the required force, particularly in automated applications, remove the force adjustment knob by loosening the two setscrews, which secure it to the shaft. Invert the knob and place it on the shaft. Be sure to insert the locking tab on the knob into the slot on the force tube. Re-tighten both setscrews.
- 6 If necessary, re-adjust the electrodes in their holders to accommodate the work piece.
- 7 A down stop is never required when using EZ-AIR. Turn the down stop screws counter-clockwise to their fullest extension without actually disengaging them. This will allow maximum downward travel of the upper arms.

CHAPTER 4

USER MAINTENANCE

Section I. General Maintenance

Inspection

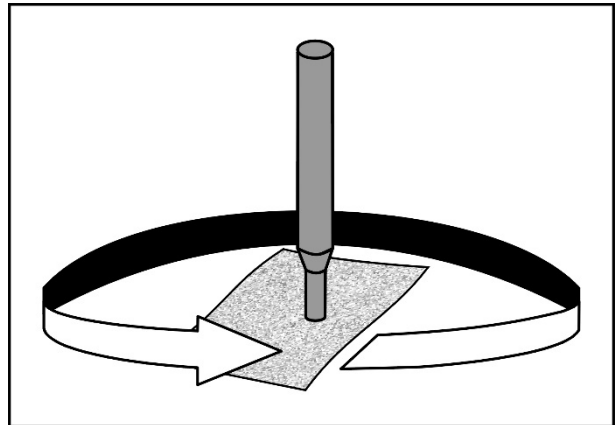
Clean all electrical connections every six months to minimize welding circuit resistance. Inspect all bearings and braces for excessive wear every three years and replace as necessary.

Lubrication

All bearing surfaces are designed for non-lubricated operation. Do **not** oil any bearings or sleeves *except* for the use of a dry lubricant on weld heads used in automated, air actuated systems.

Section II. Electrode Cleaning

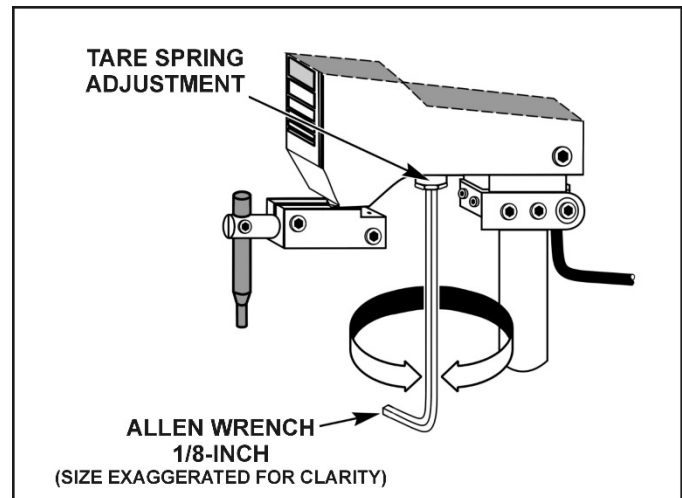
- 1 Re-surface tips periodically to remove oxides and welding debris from the electrodes.
- 2 Set the **WELD/NO WELD** Switch on the welding power supply, or control, to the **NO WELD** position.
- 3 Clean the electrodes using 400 to 600 grit emery paper. Fold the emery paper over a *flat, rigid backing* with the grit surface facing out. The rigid backing will maintain the "flatness" of the electrode face during cleaning.
- 4 Place emery paper and backing between electrodes. If the head is air actuated, reduce the pressure on the top of the cylinder. Actuate the head. The electrodes should contact with the paper with a force which is low enough to allow the paper to be moved without damaging its surface. Move the paper in a circular motion while maintaining the contact force.
- 5 Wipe the electrodes so that they are clean.



Section III. Tare Spring Adjustment

The tare spring adjustment compensates for the varying mass of different upper electrodes and adapters.

- 1 With the head in a vertical position and the upper arm and electrodes installed, set the force adjustment to **minimum** by turning the firing force adjustment knob fully counterclockwise.
- 2 Hold a measuring scale beside the upper electrode adapter block, grasp the block, and move the block up and down between the tare spring travel limits. The total travel will be about 3.2 mm ($\frac{1}{8}$ inch). Push the block down against the bottom limit, then gently release it. The tare spring should exert enough force to return the electrode to the center of its travel, approximately 1.6 mm ($\frac{1}{16}$ inch) from either extreme. If the electrode block does not re-center, adjust the tare spring.
- 3 If necessary, adjust the tare spring tension adjustment screw setting with a $\frac{1}{8}$ inch Allen wrench. The adjustment screw is recessed in the center of the tare spring assembly at the bottom of the force spring tube.
- 4 Adjust the screw until the electrode block centers itself after being depressed and released. Tightening the screw increases tare spring tension, which increases the upward force on the upper electrode assembly. If the upper electrode interconnecting flexure interferes with the adjustment procedure, temporarily disconnect it from the upper electrode adapter block.
- 5 After adjusting the tare spring tension, recheck the firing force adjustment and readjust if required.



APPENDIX A.

Technical Specifications

FEATURES			180MF	180MA
Actuation			Manual	Air
Air Cylinder Inside Diameter	mm (inch)		-	38.1 (1.5)
Air Cylinder Stroke	mm (inch)		-	50.8 (2)
Air Pressure for Max. Force	kg/cm ² (psi)		-	4.57 (65)
Air Solenoid Voltage	(VAC)		-	24
Cycle Rate	(full strokes/sec)		1	1
Electrode Diameter	mm (inch)		6.4 (0.25)	6.4 (0.25)
Electrode Holder Type			Offset	Offset
Electrode Series			ES-0800M	ES-0800M
Electrode Stroke Maximum	mm (inch)		31.75 (1.25)	31.75 (1.25)
Foot Pedal Model Number			MSP	-
Max. Throat Size	mm		N/A	46 x 79
Height x Width	in			1.8 x 3.1
Maximum Rating	KVA (watt-seconds)		20 (1,000)	20 (1,000)
Weld Cable Size (AWG)			#2/0	#2/0
Weld Force	Maximum:	N (Lbs)	445 (100)	445 (100)
	Minimum:	N (Lbs)	8.9 (2)	22.3 (5)
Dimensions:	Height:	mm (inch)	609.6 (24)	609.6 (24)
	Width:	mm (inch)	95.3 (3.75)	95.3 (3.75)
	Depth:	mm (inch)	400.2 (15.75)	400.2 (15.75)
Weight	kg (lbs)		8.4 (18.5)	9.8 (21.5)

APPENDIX B

ACCESSORIES

Accessories

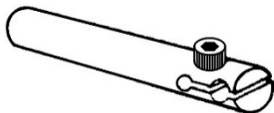
MODEL	DESCRIPTION
BLFOI	Fiber Optic Illuminator System , 115V-50/60Hz. Self-Supporting Gooseneck, Bifurcated Light Pipes, Focusing Lenses, and Mounting Adapter for Optic Mounting Assembly.
BLFOI/230	Fiber Optic Illuminator System , 230V-50/60Hz. Self-Supporting Gooseneck, Bifurcated Light Pipes, Focusing Lenses, and Mounting Adapter for Optic Mounting Assembly.
DFS	Firing Switch Junction Box . Connects 2 Firing Switch Cables to one Power Supply.
DFS/88	Series Firing Switch Junction Box . Connects two firing switch cables in Series. (Model 188)
FG100	Electrode Force Gage , 100 lb, SCALE 100 lb x 1 lb.
FG20	Electrode Force Gage , 20 lbs, SCALE 20 lb x 0.2 lb
FG10KG	Electrode Force Gage , 10 kg, SCALE 10 kg x 0.1 kg.
FS1L	Footswitch, Single Level .
FS2L	Footswitch, Two Level .
MSP	Footpedal, Medium Force Swing Type , 45.5 kg (100 lb) maximum, 5:1 mechanical advantage (Model 180MF).
OMA	Optic Mounting Assembly . Use with SZO and BPTL.
PD	Polishing Disks , 600 grit, 1.5 in. diameter, 50 pieces. Use to polish electrodes.
SMZ-660	Nikon SMZ 660 Stereo Zoom Microscope , 10X wide eyepieces, object lens 0.5X wide field, 195 mm maximum working distance. Includes C-Bonder arm.
WP	Work Positioner , 76 mm (3 inch) diameter, Height Adjustable from 36.5 mm (1-7/16) to 50.8 mm (2 inches).

APPENDIX B. ACCESSORIES

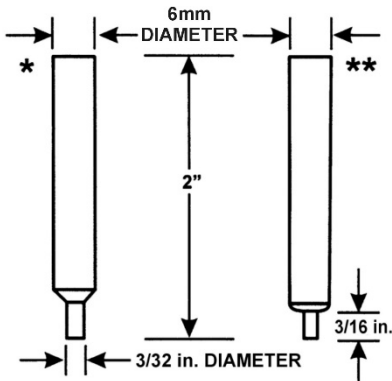
Electrodes

MATERIAL	DESCRIPTION
RWMA 2 -- Copper-Chromium Alloy	83B Rockwell Hardness, 85% conductivity. Used for welding steels, nickel alloys and other high resistance materials.
RWMA 3 -- Copper-Beryllium Alloy	100B Rockwell Hardness, 48% conductivity. Used for welding high resistance materials requiring high weld forces.
GLIDCOP -- AL-15 -- Dispersion Strengthened Copper With 0.15% Aluminum Oxide	68B Rockwell Hardness, 92% conductivity. Longer life, greater thermal stability, higher strength than RWMA 2. Generally interchangeable with RWMA 2 without changing schedules. GLIDCOP is a trademark of SCM.
RWMA 11 -- Copper-Tungsten Alloy	90B Rockwell Hardness, 46% conductivity. Usually inserted into an RWMA 2 shank. Used for welding cuprous and precious metals. Used for light projection welding dies.
RWMA 13 -- Tungsten	70A Rockwell Hardness, 32% conductivity. Usually inserted into an RWMA 2 shank. Cannot be machined but may be ground to the desired shape. Used to weld non-ferrous metals such as copper and brass.
RWMA 14 -- Molybdenum	90B Rockwell Hardness, 31% conductivity. Usually inserted into an RWMA 2 shank. Machineable. Used for welding copper, silver, gold, and their alloys.

Electrode Holders

	Electrode Holder, holds 6 mm diameter electrodes. Used on Model 180M weld heads.
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Electrodes

ES0800M 6 MM DIAMETER STRAIGHT ELECTRODES Used with 180M Series Weld Heads		
Model	Material	
ES0802M	RWMA 2	
ES0803M	RWMA 3	
ES0850M	GLIDCOP	
ES0811M	RWMA 11 INSERT	
ES0813M	RWMA 13 INSERT	
ES0820M	MOLY INSERT	
ES0820AM	3 mm DIAMETER MOLY INSERT	
* Copper Alloy ** Refractory Alloy Insert		

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