# MICRO SERIES

The micro weld heads are used to weld work pieces from 1/16 to 1/2 in. (3 to 12 mm) OD. The Series 4 Micro Weld Head can weld work pieces from 1/16 to 1/4 in. (3 to 6 mm) OD and is available in both rigid-drive and flexible-drive configurations. The Series 8 Micro Weld Head can weld work pieces from 1/8 to 1/2 in. (5 to 12 mm) OD and is available in a rigid-drive configuration. All micro weld heads operate with a detachable motor module. See Figure 1.

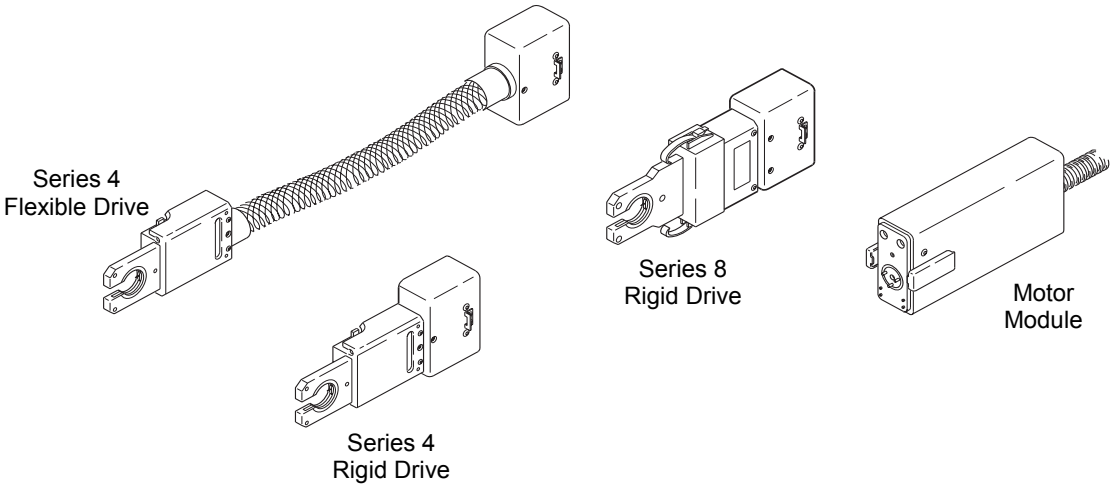


*Figure 1 Rigid-Drive and Flexible-Drive Micro Weld Heads*

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This manual presents information that is specific to the micro weld heads. Additional handling is necessary because the motor module and weld head are separate units. The micro weld head fixtures do not use separate collets, so fixture setup differs slightly from the Series 5/10/20 fixture block procedures.

The procedures, unless noted, are the same for all micro weld heads. Most figures in this section show the Series 4 Rigid-Drive Micro Weld Head.

Refer to the *Power Supply* manual for information on power supply setup and weld procedure guidelines.

This manual includes:

- using the micro fixture tool
- installing the motor module
- connecting the micro weld head to the motor module
- installing/replacing the electrode
- electrode geometry
- calculating the arc gap gage settings
- setting the arc gap
- fixturing the work
- connecting the micro weld head to the fixture
- considerations during welding
- using the optional bench mounting bracket
- fixture block maintenance
- micro weld head maintenance
- parts drawings.


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# Using the Micro Fixture Tool

Each micro weld head includes a micro fixture tool. See Figure 2. The primary purpose of the tool is to latch and unlatch the fixtures. In addition, the tool can be used for the following:

- aligning the micro weld head rotor
- attaching the optional bench mount bracket (Series 8 only).

The micro fixture tool has a hole that allows the tool to be secured to a key chain.

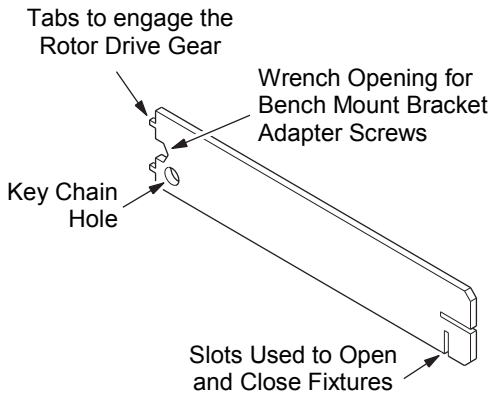


*Figure 2 Micro Fixture Tool*

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# Installing the Motor Module

1. To connect the motor module to the power supply, connect the four connectors to the rear panel of the power supply by performing the following steps. See Figure 3.
    a. Locate the motor module.
    b. Align the notch on the multi-pin connector with the small tab in the mating socket on the rear panel labeled FIXTURE. Insert the connector in the socket. Turn the connector sleeve clockwise by hand until it is tight. This connection provides the control signals to drive the motor module.
    c. Insert and fully seat the red connector into the socket on the rear panel labeled ELECTRODE. Twist the connector 1/4-turn clockwise to lock it into place. This connection is the negative (-) terminal of the motor module.
    d. Insert the green connector into the socket on the rear panel labeled WORK. Twist the connector 1/4-turn clockwise to lock it into place. This connection is the positive (+) terminal of the motor module.
    e. Insert the motor module shielding gas connector into the Swagelok Quick-Connect stem labeled TO WELD HEAD. Ensure that the connector is firmly attached. This connection provides shielding gas to the weld head through a solenoid valve in the power supply.
2. Press **HOME** to return the drive coupling to the home position.

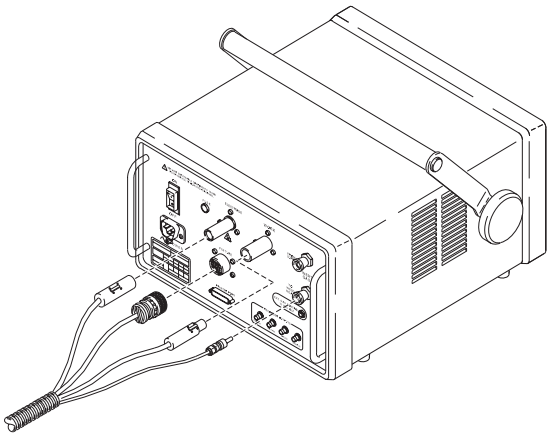

*Figure 3 Motor Module Connectors*

**Caution!**

**Ensure that the fixture connector is fully seated in the mating socket and the threaded sleeve is tight.**

***Note:***
*The motor module shielding gas connector must be a single-end shut-off (SESO) Swagelok Quick-Connect stem (SS-QC4-S-400).*


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# Connecting the Micro Weld Head to the Motor Module

1. Using the micro fixture tool, turn the weld head drive gear on the base of the micro weld head to align the rotor opening to the weld head housing opening. See Figure 4(A) and Figure 4(B), showing views of the rotor misaligned and in proper alignment.

   The drive gear on the base of the micro weld head must be aligned so that it meshes with the drive pins on the motor module.

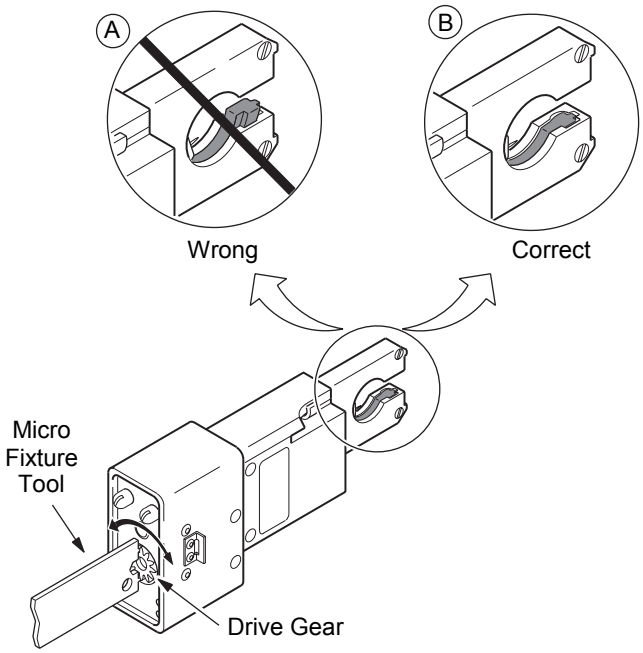


*Figure 4 Rotor Manual Adjustment*

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2. Locate the shielding gas port on the micro weld head and verify that the O-ring is in place. See Figure 5. The O-ring seals the gas port. A valve in the port opens the gas flow through the motor module. The valve opens when the micro weld head is properly connected to the motor module.
3. Align the connecting surfaces of the micro weld head and motor module. See Figure 5.

**Caution!**

**The micro weld heads should not be started in any rotor position except fully homed. See Figure 5. Arc start in any other location may cause weld head damage.**

**Caution!**

**Step Programs should not be used with Series 4 or Series 8 Micro Weld Heads.**

**Caution!**

**Tack programs or programs that include tacks should not be used with the micro weld heads.**

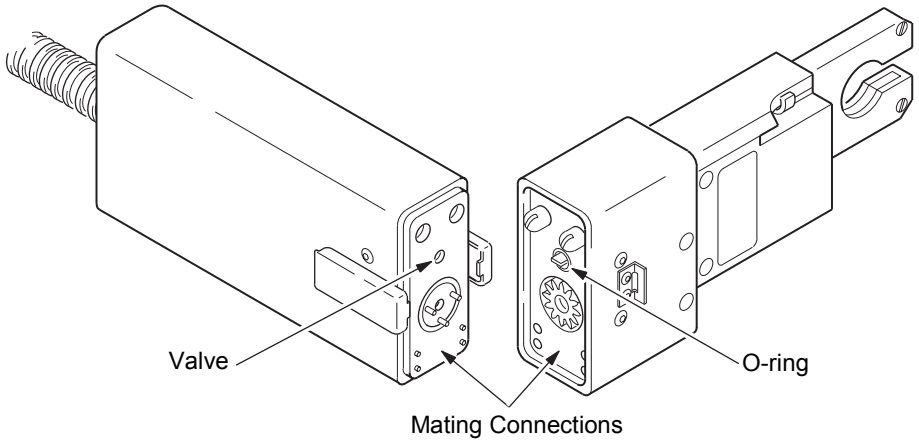


*Figure 5 O-ring and Mating Connections*


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4. Push the micro weld head onto the motor module until it is firmly seated, then lock the assembly together with the two side latches. See Figure 6(A) and Figure 6(B).

**Caution!**

**Do not force the micro weld head and motor module together. The drive gears of the micro weld head and the motor module must be aligned for the pieces to mate correctly. If you have problems mating the components, rotate the micro weld head drive gear a small amount and try again.**
**See Step 1 on page 5.**

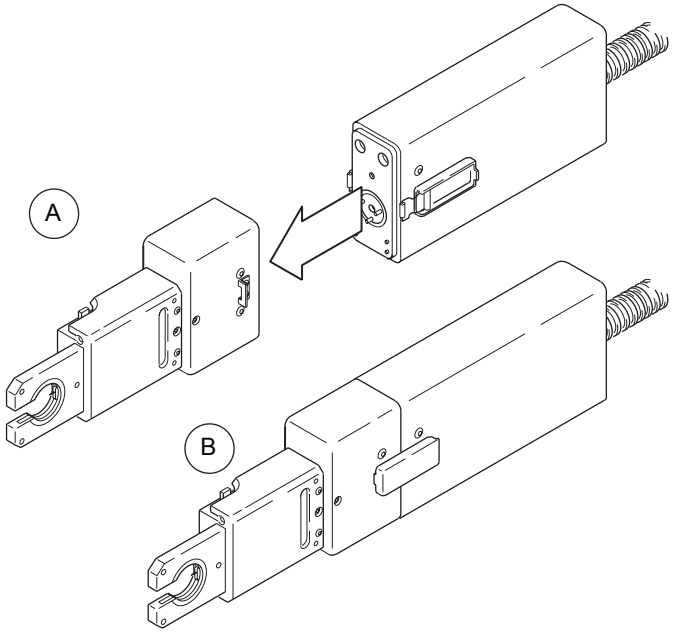


*Figure 6 Connecting Weld Head and Motor Module*

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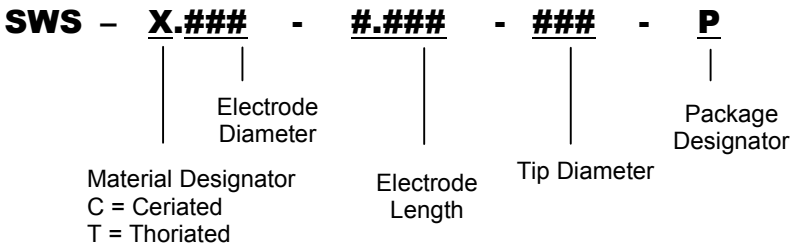
# Electrode Geometry

This illustration shows the electrode shape Swagelok suggests. Properly ground electrodes provide consistent, repeatable welds. Pre-ground electrodes are available from your Swagelok representative. See your parts list for ordering information.

The electrode part numbers are assigned as follows:



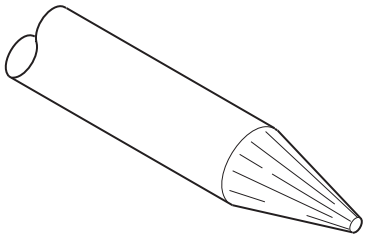



*Figure 7 Tungsten Electrode*

The ceriated electrode material type is a mixture of 98 % tungsten and 2 % cerium and is commonly referred to as "2 % ceriated." This electrode type has demonstrated improved arc starting performance over the 2 % thoriated type, particularly when using purified shielding gas.

# Installing/Replacing the Electrode

The micro weld head tool package includes a screwdriver, tweezers, and an electrode cleaning tool. Use these tools for installing or replacing the electrode.

1. Select the proper electrode for the job.

*Table 1 Series 4 Electrode Selection*

| Electrode Part No. | Component OD | Electrode Length (L) | Electrode Diameter (D) |
|---|---|---|---|
| CWS-C.040-.405-P | 1/8 in.<br>1/16 in.<br>3 mm | 0.405 in.<br>(10,29 mm) | 0.040 in.<br>(1,02 mm) |
| CWS-C.040-.325-P | 1/4 in.<br>6 mm | 0.325 in.<br>(8,26 mm) | 0.040 in.<br>(1,02 mm) |

*Table 2 Series 8 Electrode Selection*

| Electrode Part No. | Component OD | Electrode Length (L) | Electrode Diameter (D) |
|---|---|---|---|
| CWS-C.040-.405-P | 1/4 in.<br>6 to 8 mm | 0.405 in.<br>(10,29 mm) | 0.040 in.<br>(1,02 mm) |
| CWS-C.040-.325-P | 3/8 in.<br>10 mm | 0.325 in.<br>(8,26 mm) | 0.040 in.<br>(1,02 mm) |
| CWS-C.040-.281-P | 1/2 in.<br>12 mm | 0.281 in.<br>(7,14 mm) | 0.040 in.<br>(1,02 mm) |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2. Disconnect the micro weld head from the motor module.
3. Manually turn the rotor drive gear, shown in Figure 4, until the electrode clamping screw is exposed. See Figure 8.

**Caution!**

**Only ceriated tungsten should be used in the micro weld heads. The use of other types of tungsten may cause weld head damage.**

***Note:***
*Replace the electrode when it shows signs of deterioration.*

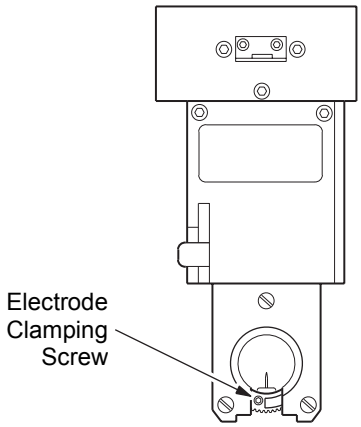


*Figure 8 Electrode Clamping Screw Location*

**Caution!**

**Do not rotate the rotor with the electrode clamping screw loose. Damage to the micro weld head housing may result.**

4. While holding the micro weld head as shown in Figure 9(A), loosen the electrode clamping screw.

This orientation helps to prevent the electrode from falling out during installation.

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5. Install a new electrode using tweezers. Insert the electrode through the ceramic insulator and into the rotor to its full insertion depth. Make sure the sharp tip of the electrode is pointing out. See Figure 9(B).
6. Tighten the clamping screw sufficiently to prevent the electrode from falling out of the rotor. Do not over tighten the clamping screw.

***Note:***
*Clean the electrode before every weld for optimum performance.*

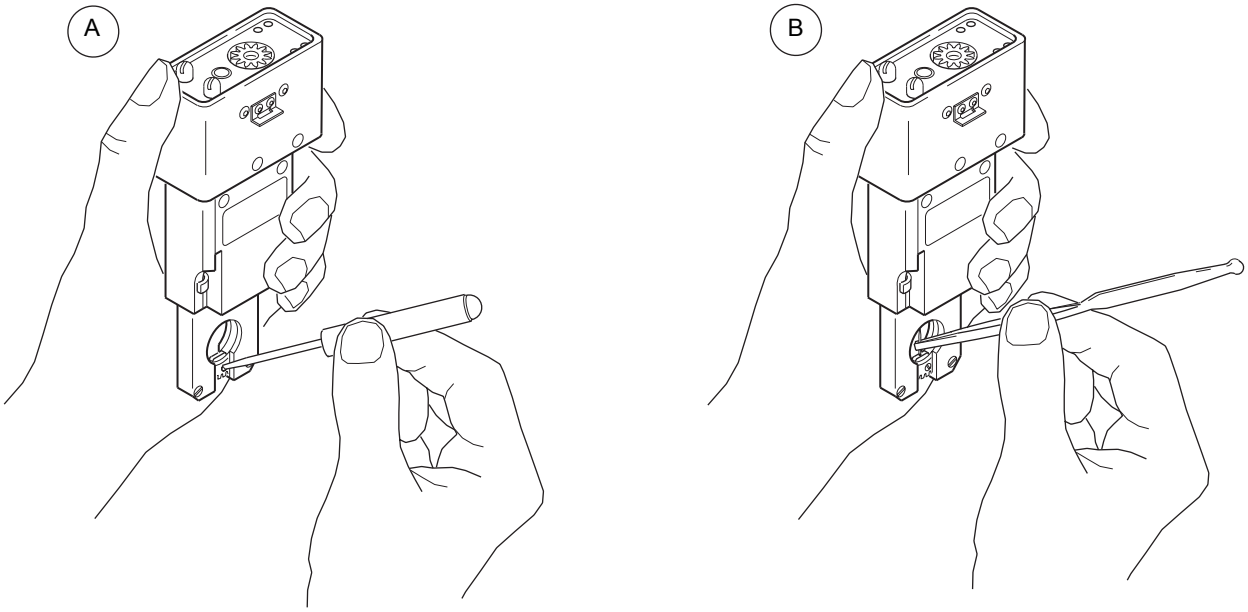


*Figure 9 Installing the Electrode*


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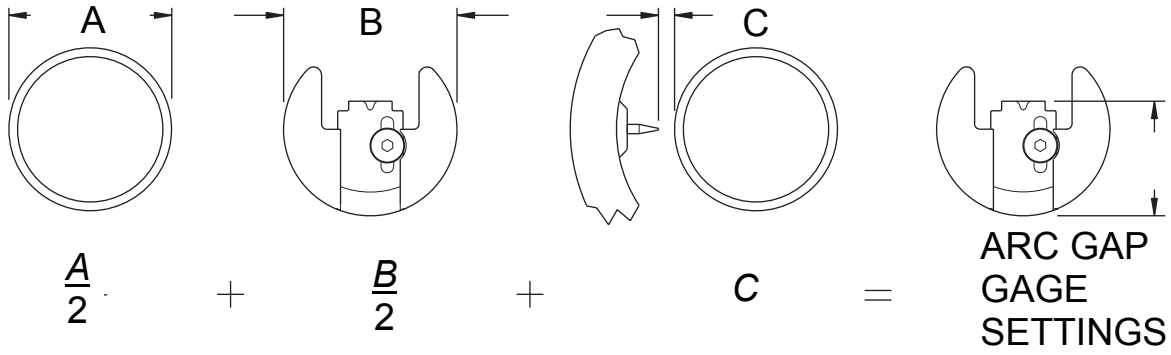
# Calculating Arc Gap Gage Settings

To determine the arc gap gage setting for a specific arc gap, use the formula below.




**Where**

A = largest OD on the weld end of the tubing or fitting (welding diameter)

B = arc gap gage diameter

C = desired arc gap

*Figure 10 Arc Gap Gage Setting Formula*

## Example No. 1: (Series 4 Weld Head)

| | |
|---|---|
| 1/8 to 1/8 in. tube butt weld – largest outside diameter | A = 0.125 in. |
| Arc gap gage diameter | B = 0.620 in. |
| Desired arc gap | C = 0.03 in. |

$$\frac{0.125 \text{ in.}}{2} + \frac{0.620 \text{ in.}}{2} + 0.03 \text{ in.} = 0.4025 \text{ in.}$$

## Example No. 2: (Series 4 Weld Head)

| | |
|---|---|
| 6 to 6 mm tube butt weld – largest outside diameter | A = 6,00 mm |
| Arc gap gage diameter | B = 15,75 mm |
| Desired arc gap | C = 0,64 mm |

$$\frac{6{,}00 \text{ mm}}{2} + \frac{15{,}75 \text{ mm}}{2} + 0{,}64 \text{ mm} = 11{,}515 \text{ mm}$$

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# Setting the Arc Gap

The micro weld head also includes an arc gap gage, which is required to set the arc gap. The gage fits the rotor aperture and adjusts for the desired arc gap.

1. Measure the OD of the work to be welded with a caliper or micrometer and record the value. See Figure 11(A).
2. Locate the OD value in the following table that matches the OD of the work. Find the arc gap gage setting listed for that OD and record it.

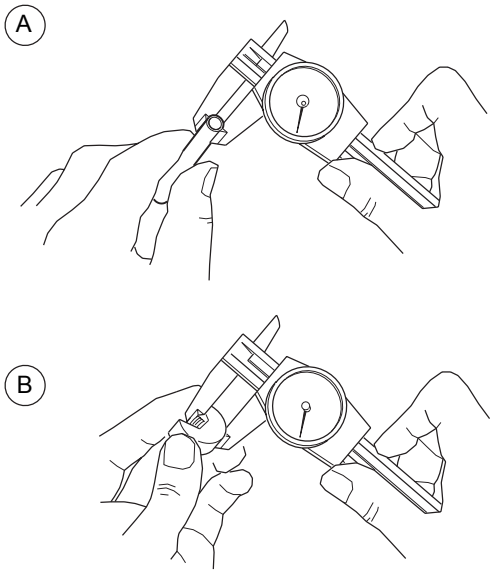


*Figure 11 Setting Arc Gap Gage*


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*Table 3 SWS-4MRH-B, SWS-4MFH-B Arc Gap Gage Dia. 0.620 in.*

| Nominal OD (in.) | Actual OD (in.) | Setting for 0.020 in. Arc Gap (in.) | Setting for 0.025 in. Arc Gap (in.) | Setting for 0.030 in. Arc Gap (in.) | Setting for 0,51mm Arc Gap (mm) | Setting for 0,64mm Arc Gap (mm) | Setting for 0,76mm Arc Gap (mm) |
|---|---|---|---|---|---|---|---|
| 1/16 | 0.062 | 0.361 | 0.366 | 0.371 | 9,19 | 9,32 | 9,44 |
| 1/8 | 0.125 | 0.393 | 0.398 | 0.403 | 9,99 | 10,12 | 10,24 |
| 1/4 | 0.250 | 0.456 | 0.461 | 0.466 | 11,58 | 11,71 | 11,83 |

*Table 4 SWS-4MRH-B, SWS-4MFH-B Arc Gap Gage Dia. 15,75 mm*

| Nominal OD (mm) | Actual OD (mm) | Setting for 0,51 mm Arc Gap (mm) | Setting for 0,64mm Arc Gap (mm) | Setting for 0,76mm Arc Gap (mm) |
|---|---|---|---|---|
| 3 | 3,00 | 9,91 | 10,04 | 10,16 |
| 6 | 6,00 | 11,41 | 11,54 | 11,66 |

*Table 5 SWS-8MRH-B Arc Gap Gage Dia. 0.813 in.*

| Nominal OD (in.) | Actual OD (in.) | Setting for 0.020 in. Arc Gap (in.) | Setting for 0.025 in. Arc Gap (in.) | Setting for 0.030 in. Arc Gap (in.) | Setting for 0.035 in. Arc Gap (in.) | Setting for 0,51mm Arc Gap (mm) | Setting for 0,64mm Arc Gap (mm) | Setting for 0,77mm Arc Gap (mm) | Setting for 0,89 mm Arc Gap (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 0.125 | 0.490 | 0.495 | 0.500 | N/A | 12,45 | 12,57 | 12,70 | N/A |
| 1/4 | 0.250 | 0.552 | 0.557 | 0.562 | 0.567 | 14,02 | 14,15 | 14,28 | 14,40 |
| 3/8 | 0.375 | 0.614 | 0.619 | 0.624 | 0.629 | 15,60 | 15,73 | 15,86 | 15,98 |
| 1/2 | 0.500 | 0.677 | 0.682 | 0.687 | 0.692 | 17,20 | 17,33 | 17,46 | 17,58 |

*Table 6 SWS-8MRH-B Arc Gap Gage Dia. 20,65 mm*

| Nominal OD (mm) | Actual OD (mm) | Setting for 0,51 mm Arc Gap (mm) | Setting for 0,64mm Arc Gap (mm) | Setting for 0,76mm Arc Gap (mm) | Setting for 0,89 mm Arc Gap (mm) |
|---|---|---|---|---|---|
| 6 | 6,00 | 13,84 | 13,97 | 14,09 | 14,22 |
| 8 | 8,00 | 14,84 | 14,97 | 15,09 | 15,22 |
| 10 | 10,00 | 15,84 | 15,97 | 16,09 | 16,22 |
| 12 | 12,00 | 16,84 | 16,97 | 17,09 | 17,22 |

3. Set the arc gap gage to the value from the table using the provided 3/32 in. hex wrench. Measure from the bottom of the arc gap gage to the top of the adjustment screw. See Figure 11(B).
4. Insert the arc gap gage into the micro weld head rotor opening.

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5. Hold the micro weld head so that the electrode tip is pointing down. Loosen the electrode clamping screw to allow the electrode to fall against the arc gap gage. See Figure 12.
6. Tighten the electrode clamping screw to hold the electrode in place. Do not over tighten. Remove the arc gap gage.

   The rotor may move due to the torque of tightening the clamping screw. Use your finger to hold the rotor in place.
7. Attach it to the motor module. Complete the steps in **Connecting the Micro Weld Head to the Motor Module** beginning on page 5. When complete, proceed with step 8.
8. Press **HOME** to return the rotor to the home position.

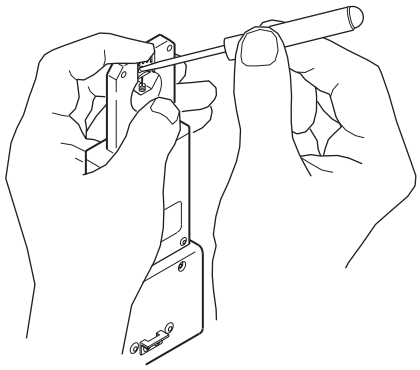

*Figure 12 Setting the Arc Gap*


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# Fixturing the Work

The work pieces must be properly prepared before fixturing.

1. Locate the centering gage. Turn the gage so the labeled side faces the part to be installed first. Insert the gage into the fixture. See Figure 13.
2. Open the fixture side facing the labeled side of the centering gage by rotating the latch 90°. See Figure 14.

   The fixture opens with a scissors type action. Figure 14 shows how to use the micro fixture tool on the Series 4 fixture.

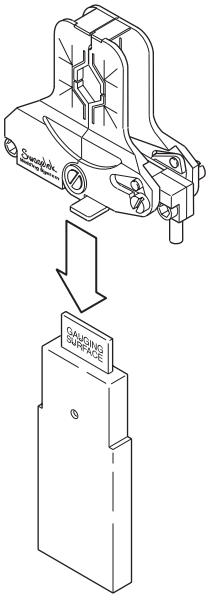

*Figure 13 Inserting Centering Gage*

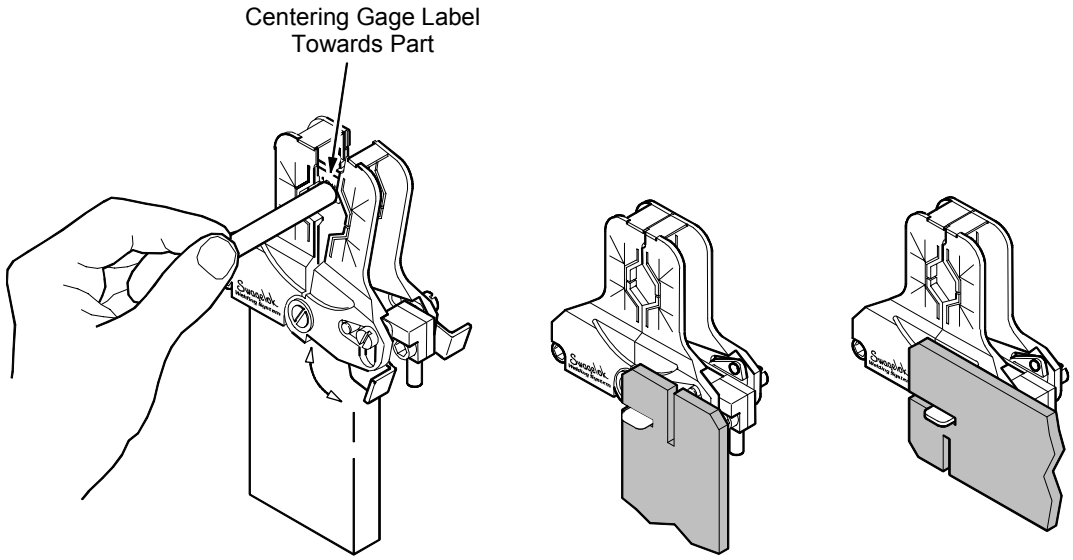


*Figure 14 Insert First Work Piece*

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3. Insert the first work piece, butting the weld end against the centering gage surface. Close and latch that side of the fixture. Make sure that the latch is fully closed against the body of the fixture. See Figure 15.
4. Remove the centering gage.
5. Open the other side of the fixture and insert the second work piece. Butt the weld ends together. Close and latch that side.
6. Check the weld joint for proper fit and alignment. See Figure 15. Verify that the latches are fully closed. See Figure 15 (Series 4) or Figure 16 (Series 8).
7. Connect the purge gas line to the work pieces. Refer to the **Purge Gas Delivery System** section in the *Power Supply* manual.
8. Open the shut-off valve in the purge gas line.
9. Set the flow meters according to the weld procedure guideline for both the shielding and internal purge gas.

   The length of time for internal purge before welding depends on the internal volume and length of the work piece to be welded. Refer to the **Gas Flow Rate Tables** in the *Power Supply* manual.

**Caution!**

**When closing the fixture, be sure the moving side of the fixture engages into the small groove on the stationary side of the fixture.**

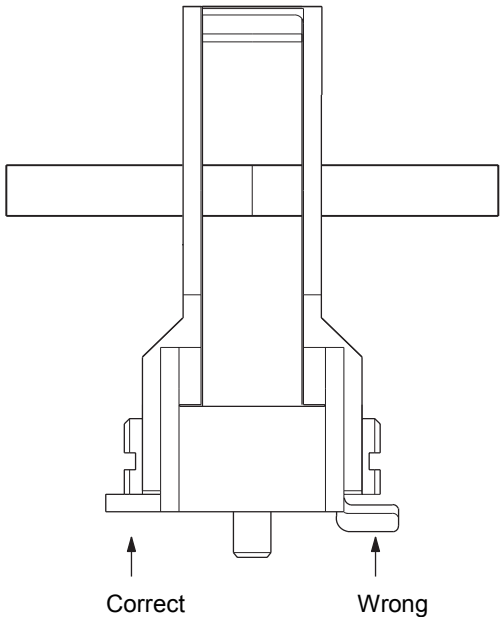


*Figure 15 Checking the Weld Joint and Latch Position (Series 4 Fixture)*

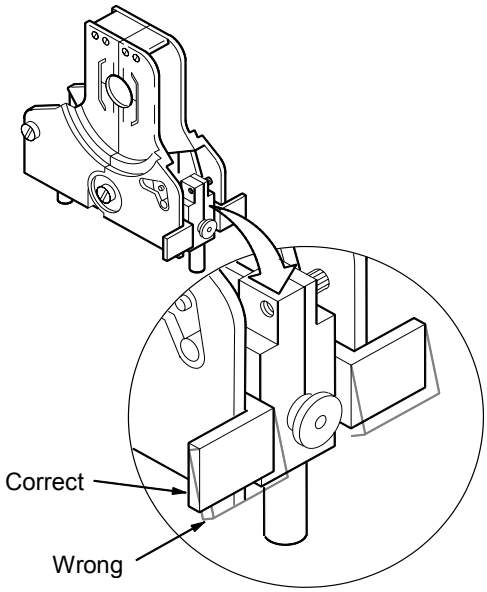


*Figure 16 Proper Latch Position (Series 8 Fixture)*


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# Aligning the Work Pieces

## Series 4 Micro Weld Head Fixture

To align tubing in the Series 4 Micro Weld Head Fixture, follow these steps:

1. Using the micro fixture tool, place the latch in the open position then open the fixture. See Figure 17(A).
2. Loosen the two alignment screws. See Figure 17(A).
3. Insert the tubing. See Figure 17(B).
4. Close the fixture and latch and then align the tubing. See Figure 17(C).
5. Tighten the two alignment screws. See Figure 17(C).

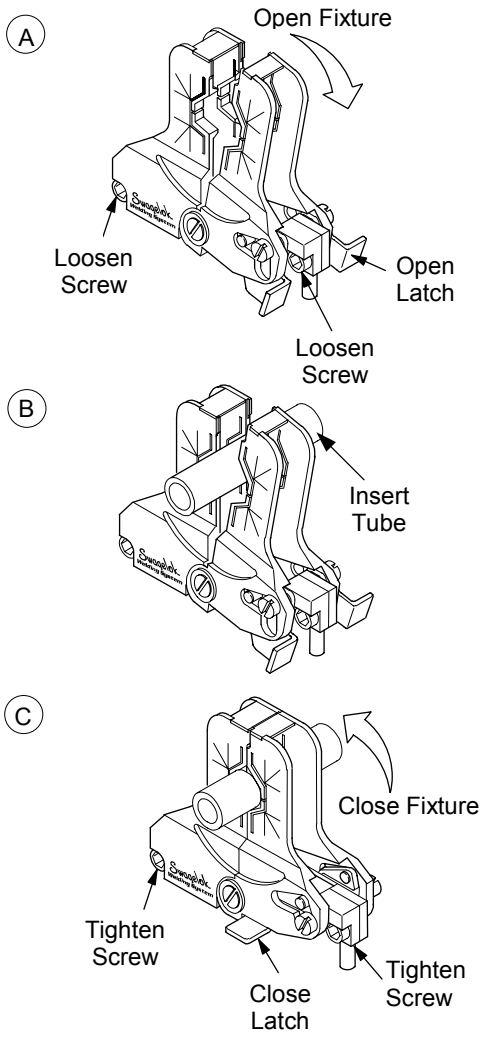


*Figure 17 Aligning the Tubing in the Series 4 Micro Weld Head Fixture*

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## Series 8 Micro Weld Head Fixture

To align tubing in the Series 8 Micro Weld Head Fixture, follow these steps:

1. Using the micro fixture tool, place the latch in the open position then open the fixture. See Figure 18(A).
2. Loosen the two alignment screws. See Figure 18(A).
3. Insert the tubing. See Figure 18(B).
4. Close the fixture and latch and then align the tubing. See Figure 18(C).
5. Tighten the two alignment screws. See Figure 18(C).

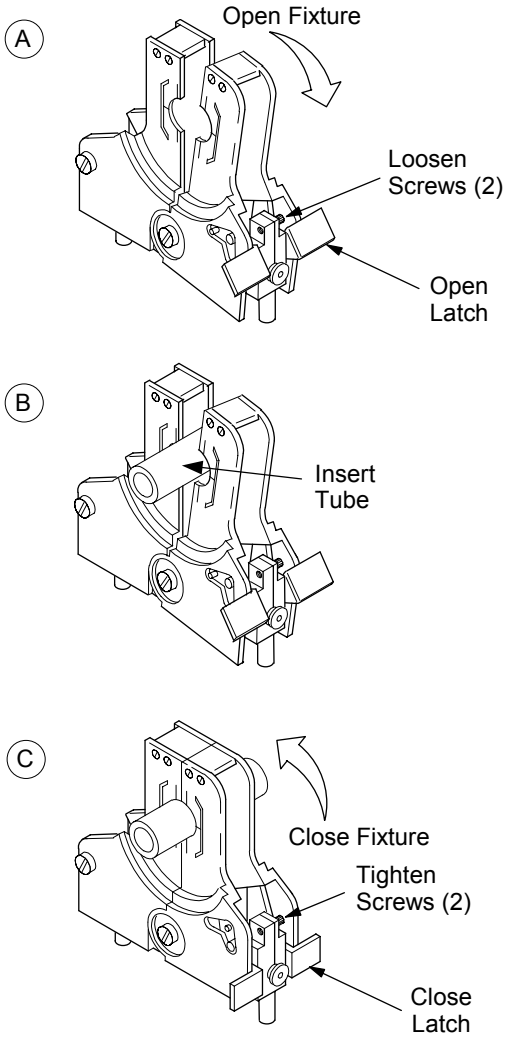


*Figure 18 Aligning the Tubing in the Series 8 Micro Weld Head Fixture*



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# Connecting the Micro Weld Head to the Fixture

1. Place the fixture on the micro weld head.
   - On the Series 4 Micro Weld Head, make sure the fixture is firmly seated. Rotate the locking lever 90° to secure the fixture to the micro weld head. See Figure 19(A).
   - On the Series 8 Micro Weld Head, engage the two latch springs over the button keepers on the sides of the fixture and close the latch levers. See Figure 19(B).

   The micro weld head assembly and the work are ready for welding.
2. Press **PURGE** to begin the shielding gas flow. The shielding gas should remain on at all times when using the micro weld head.
3. Program the power supply and perform the weld using the parameters in **Operating the Weld Head** on page 20.

**Caution!**

**Make sure the fixture latches are closed before attaching the fixture to the micro weld head. The electrode can be damaged if the latches are left open during welding.**

**Caution!**

**Make sure that the purge line or a heavy work piece does not exert a side load force on the fixture. This may cause an unacceptable weld, damage to the micro weld head, or both.**

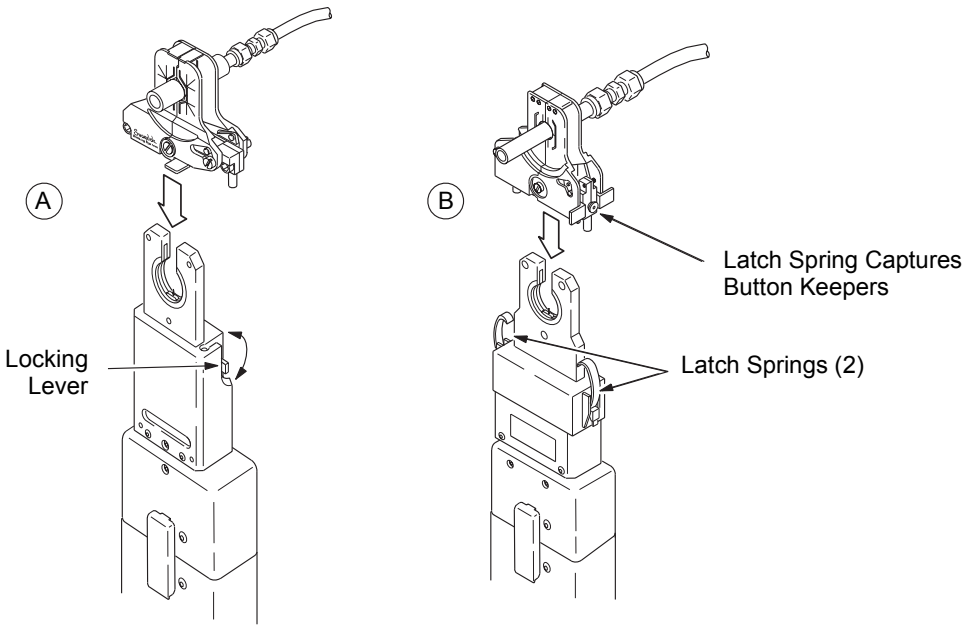


*Figure 19 Placing the Fixture on the Micro Weld Head*

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# Operating the Weld Head

Operate the weld head using the following parameters:

## Series 4

| | |
|---|---|
| **Shield gas flow rate std ft3/hr (std L/min)** | 8 to 10 (3,8 to 4,7) |
| **Prepurge and Postpurge minimum time in seconds** | Continuous |
| **Start Power** | U-low, Low, Norm① |
| **Maximum Recommended Average Amps** | 30A |

## Series 8

| | |
|---|---|
| **Shield gas flow rate std ft3/hr (std L/min)** | 15 to 20 (7,1 to 9,4) |
| **Prepurge and Postpurge minimum time in seconds** | Continuous |
| **Start Power** | U-low, Low, Norm①② |
| **Maximum Recommended Average Amps** | 38A③ |

① Use U-low start power for 0.010 in. (0,25 mm) wall thickness and an arc gap of 0.020 in. (0,51 mm) or less.

Use Low start power for wall thickness less than 0.030 in. (0,76 mm) and an arc gap of 0.025 in. (0,64 mm) or less.

Use Norm start power for wall thickness greater than 0.030 in. (0,76 mm) and an arc gap of 0.035 in. (0,89 mm) or less.

② U-low power setting only available on M100 Power Supply.

③When welding 1/2 in. or 12 mm OD with a Series 8 weld head, use the single pass (one revolution) weld procedure only.

*Table 7 Wall Thickness and Arc Gap*

| Material Thickness (mm) | | Arc Gap | |
|---|---|---|---|
| **In.** | **mm** | **In.** | **mm** |
| 0.010 to 0.020 | 0,25 to 0,51 | 0.020 | 0,51 |
| 0.021 to 0.030 | 0,52 to 0,76 | 0.025 | 0,64 |
| 0.031 to 0.045 | 0,77 to 1,14 | 0.030 | 0,76 |
| 0.046 to 0.055 | 1,15 to 1,40 | 0.035 | 0,89 |

**Caution!**

**The Series 8 weld head can not be used with 1/2 in. ATW fittings.**



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## Considerations During Welding

The approach to welding using the micro weld head is similar to that used for other Swagelok weld heads. Develop a weld procedure guideline as you would for any job. The power supply controls and indicators work the same. However, the unique qualities of the micro weld head and its fixtures cause some noticeable differences during welding:

- The sound of the weld is slightly louder compared to other Swagelok weld heads. This is due to the reduced size of the fixture.
- You may notice a clicking sound during the downslope cycle. This is normal. The fixture contracts slightly due to heat dissipation, producing the sound.
- Because the fixture is small, heat build-up may make the device too hot to handle immediately after welding. Hold the fixture in the base areas shown in Figure 20. Use the optional aluminum cooling plate to hold the fixture and allow it to cool faster. See Figure 20.
- Extended internal purging assists the cooling process.

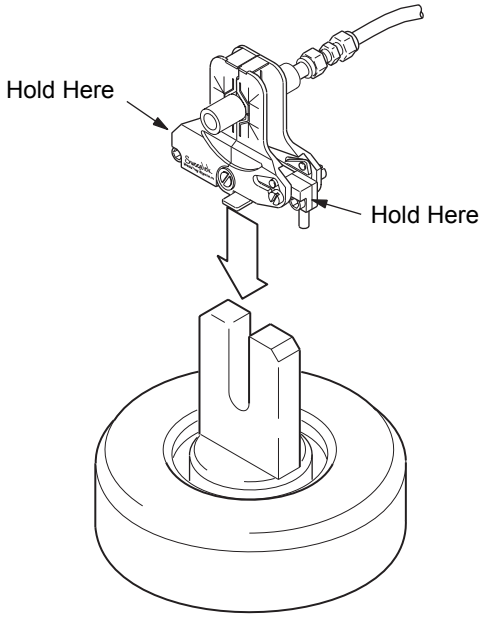


*Figure 20 Cooling Plate*

**WARNING!**

**THE FIXTURE MAY BE HOT AFTER WELDING IS COMPLETE. USE CAUTION WHEN HANDLING.**

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# Using the Optional Bench Mounting Bracket

The bench mounting brackets attach Series 4 and Series 8 Micro Weld Heads to a workbench. There are two mounting plates on the bracket, giving you a choice of mounting orientations.

**Caution!**

**Do not put the micro weld head in a vise. Severe damage may result, which would void any warranty.**

## Series 4 Bench Mount Bracket

1. Determine the mounting orientation of the bracket on the workbench. See Figure 21. Secure the bracket to the workbench. Make sure the latch is accessible.
2. Open the latch on the side of the bracket.
3. Slide the micro weld head into the bracket from below until the raised detent on the bracket is aligned to the recess of the micro weld head body. Fasten the latch to secure the micro weld head to the bracket.

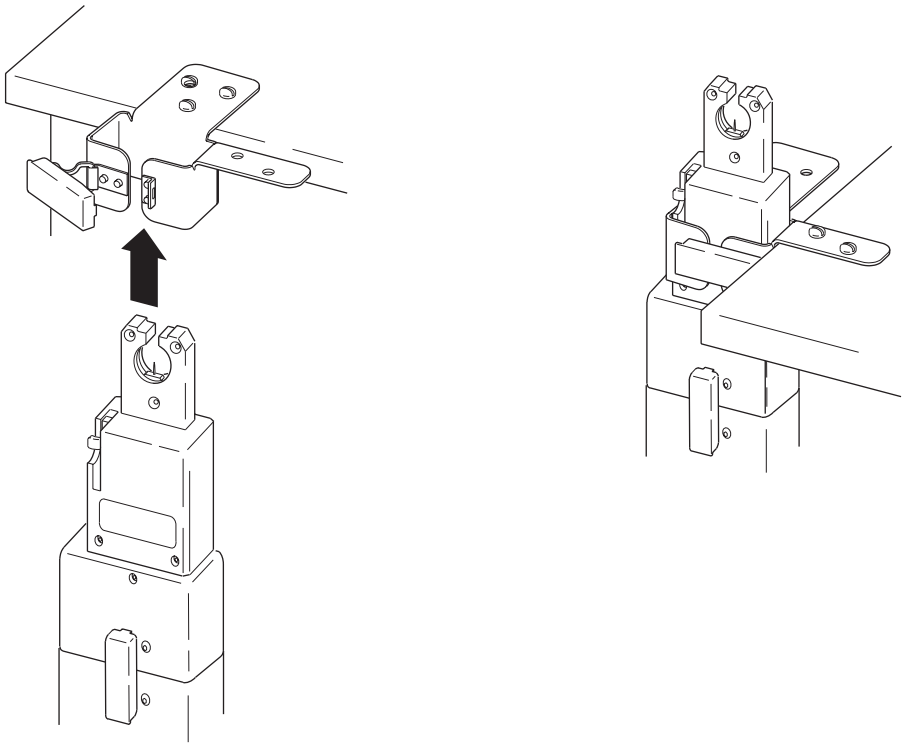

*Figure 21 Using the Series 4 Bench Mount Bracket*



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## Series 8 Bench Mount Bracket

1. Remove one of the button head screws holding the latch bracket to the weld head. See Figure 22(A). Insert one of the supplied adapter screws.
2. Secure the adapter screw with a 1/4 in. wrench or the micro fixture tool. See Figure 22(B).
3. Repeat steps 1. and 2. for the remaining latch bracket screw. Verify the latch bracket remains securely attached to the weld head.
4. Secure the bracket to the workbench.
5. Position the weld head so that the exposed ends of the adapter screws slide through the hole in the bracket. See Figure 22(C).

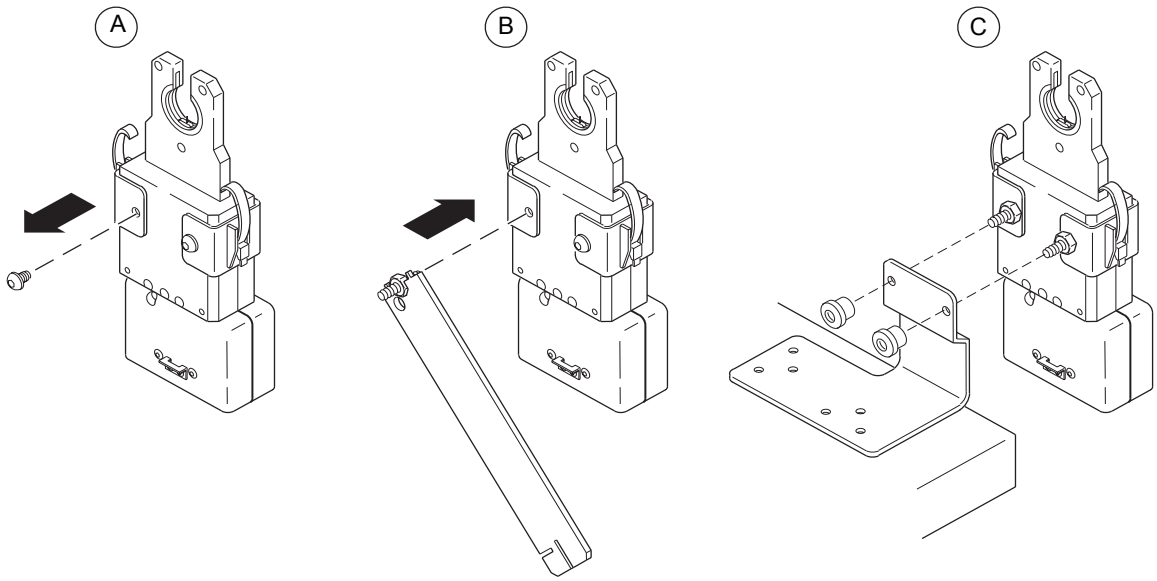


*Figure 22 Using the Series 8 Bench Mount Bracket*

6. Secure the weld head using the two knurled thumb nuts supplied with the bench mounting bracket.

   Keep the thumb nuts on the adapter screws when not using the bench mount bracket. See Figure 23.

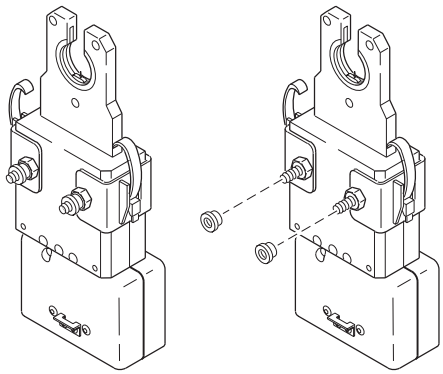

*Figure 23 Storing the Thumb Nuts on the Adapter Screws*

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# Fixture Block Maintenance

The micro weld head fixtures require regular cleaning and maintenance.

## Daily Maintenance

1. Clean the surfaces of the fixture that contact the work pieces. Use the wire brush included in the micro weld head tool package. See Figure 24.
2. If applicable, check the fixture insulating tape for damage. Replace the tape if it is loose or torn, exposing the metal under it. See Figure 25.

To replace the tape:

a. Remove the damaged tape from both sides of the fixture. Disassembly of the SWS-8MFA-08 and SWS-8MFA-12MM may be necessary to assist in replacing the tape. Disassemble by removing the screws that hold the arc covers on each side of the fixture. Refer to the **Part Drawings** section of this manual for more detail.

b. Clean the surfaces with alcohol or acetone.

c. Apply one end of the pre-cut tape strip to the inside edge of the underside surface. The tape should wrap in the direction shown in Figure 25.

d. Wrap the tape tightly (approximately 1 1/2 turns). The tape should end at the outside edge of the top surface.

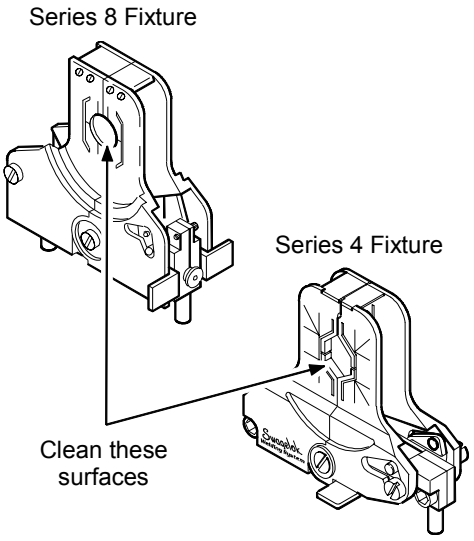


*Figure 24 Cleaning the Micro Weld Head Fixtures*

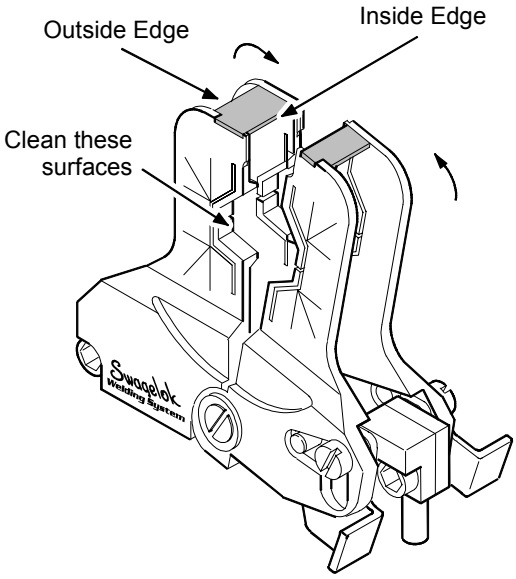


*Figure 25 Checking/Replacing the Insulator Tape*


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# Micro Weld Head Maintenance

Perform micro weld head maintenance daily and every 1200–1500 welds. Depending on usage and wear, maintenance may be performed before the 1200–1500 weld interval.

**WARNING!**

**DISCONNECT THE WELD HEAD FROM THE POWER SUPPLY BEFORE PERFORMING THE ADJUSTMENT AND MAINTENANCE PROCEDURES.**

## Daily Maintenance

At the start of each work day:

1. Inspect the micro weld head for cleanliness. Pay close attention to the rotor area. See Figure 26.
2. Press **HOME**. Check the rotor for smooth rotation. If the rotation is erratic or noisy, disassemble the micro weld head and clean the rotor, idler gears, and brush.

At the end of each work day:

1. Remove dirt, carbon, and vapor deposits from the weld head with a clean, soft cloth and a solvent such as alcohol. See Figure 26.
2. Store the micro weld head in a clean, dry place.

**Caution!**

**Do not use lubricants inside the weld head.**

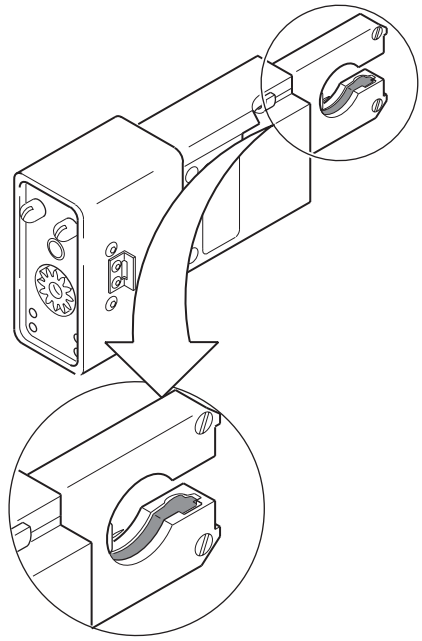

*Figure 26 Inspect Exposed Surfaces of the Weld Head*

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## Periodic Maintenance

Clean the motor module and weld head after every 1200–1500 welds.

### Motor Module

1. Disconnect the weld head from the motor module.
2. Clean the motor module power lug sockets with the provided stainless steel brush. See Figure 27.
3. Carefully remove any obstructions from the purge port. See Figure 27.
4. Clean the two power lugs on the weld head with the provided stainless steel wire brush. See Figure 28.

**Caution!**

**Do not clamp the motor module in a vise while cleaning.**

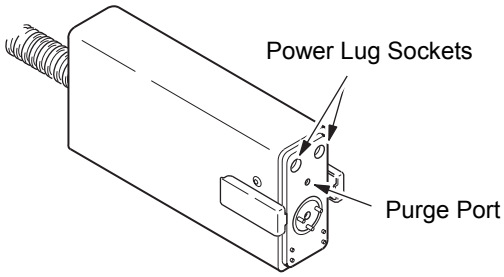


*Figure 27 Cleaning the Power Lug Sockets and the Purge Port*

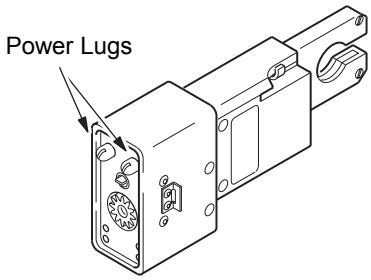


*Figure 28 Cleaning the Weld Head Power Lugs*



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## Series 4 Micro Weld Head Disassembly and Cleaning

To disassemble the Series 4 micro weld head for cleaning, use the following instructions. See Figure 29 and Figure 30 for part references.

1. Lay the micro weld head down on a clean, dry surface with the model and serial numbers facing up.
2. Remove the five screws from the weld head housing. See Figure 29(A).
3. Rock the gear side body gently to loosen it from the rest of the assembly. Lift and remove the housing.
4. Remove the rotor by lifting it clear of the brush side housing. See Figure 29(B).
5. Loosen the electrode clamping screw, then remove the electrode and ceramic insert. See Figure 29(C).
6. Clean the rotor with the provided stainless steel wire brush.
7. Clean the ceramic insert with the provided nylon brush.
8. Remove and inspect the two idler gears for damage. Replace if necessary. See Figure 29(D).
9. Clean the two idler gears with isopropyl alcohol and a soft cloth.
10. See Figure 30(A). Hold the micro weld head as shown. Gently lift the brush from the brush side housing noted in the figure and rotate it outward a few degrees.
11. Note the position of the spring in the groove in the weld head brush. The spring ends bend toward the brush when the spring lays in the groove. Remove the spring. See Figure 30(B).
12. Clean any oxide deposits from the weld head brush with the provided stainless steel wire brush.
13. Inspect all other weld head components and clean any that are dirty. Blow any loose dirt from the weld head with clean, dry, low-pressure air.

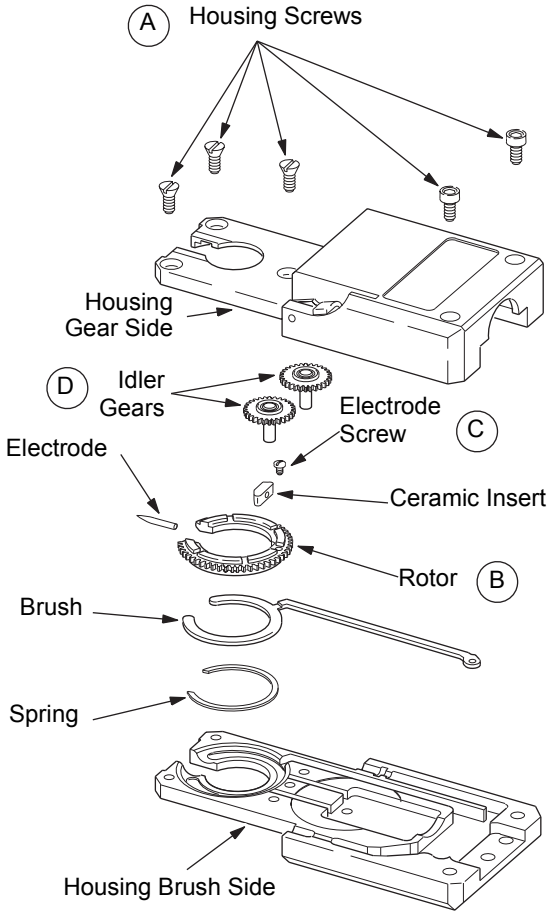


*Figure 29 Removing Series 4 Micro Weld Head Components for Cleaning*

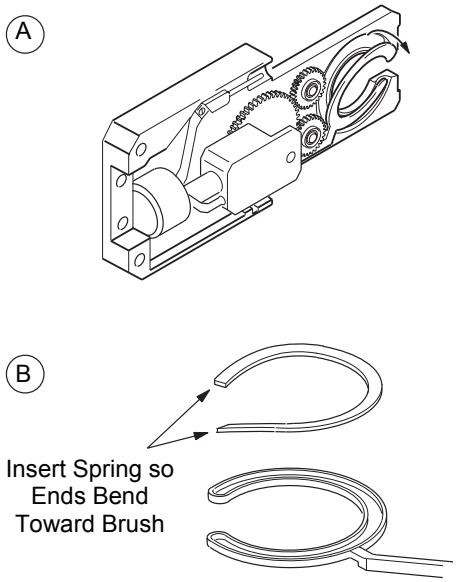


*Figure 30 Lifting the Weld Head Brush for Cleaning*

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# Series 8 Micro Weld Head Disassembly and Cleaning

To disassemble the Series 8 micro weld head for cleaning, use the following instructions. See Figure 31 and Figure 32 for part references.

1. Remove the two screws that secure the latch bracket and remove the bracket from the weld head. See Figure 31.
2. Lay the micro weld head down on a clean, dry surface with the model and serial numbers facing up.
3. Remove the seven screws from the weld head housing. See Figure 32(A).
4. Rock the gear side housing gently to loosen it from the rest of the assembly. Lift and remove the housing.
5. Remove the rotor by lifting it clear of the brush side housing. See Figure 32(B).
6. Loosen the electrode clamping screw, then remove the electrode and ceramic insert. See Figure 32(C).
7. Clean the rotor with the provided stainless steel wire brush.
8. Clean the ceramic insert with the provided nylon brush.
9. Remove and inspect the four idler gears for damage. Replace if necessary. See Figure 32(D).
10. Clean the idler gears with isopropyl alcohol and a soft cloth.

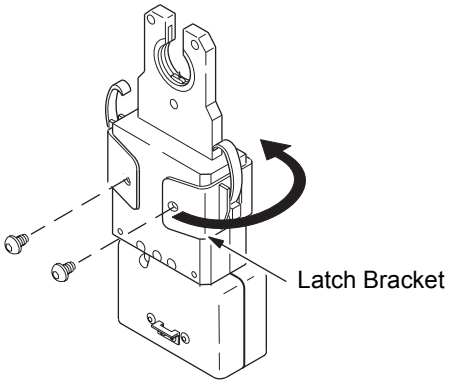


*Figure 31 Removing Series 8 Micro Weld Head Latch Bracket*

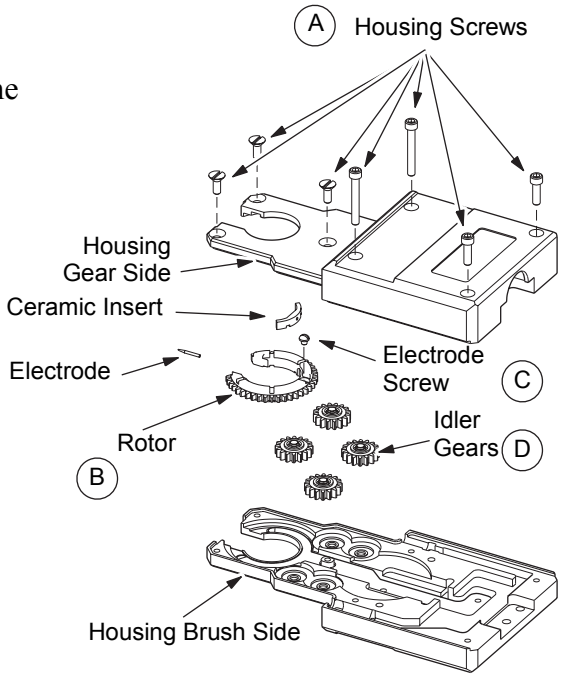


*Figure 32 Removing Series 8 Micro Weld Head Components for Cleaning*



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11. Replace the idler gears in the micro weld head housing. Verify the idler gear axles are pressed into the body. See Figure 33.
12. Clean any oxide deposits from the exposed surface of the weld head brush with the provided stainless steel wire brush.
13. Verify that the spring under the weld head brush is not exposed. See Figure 34. If necessary reposition the spring under the weld head brush.
14. Inspect all other weld head components and clean any that are dirty. Blow any loose dirt from the weld head with clean, dry, low-pressure air.

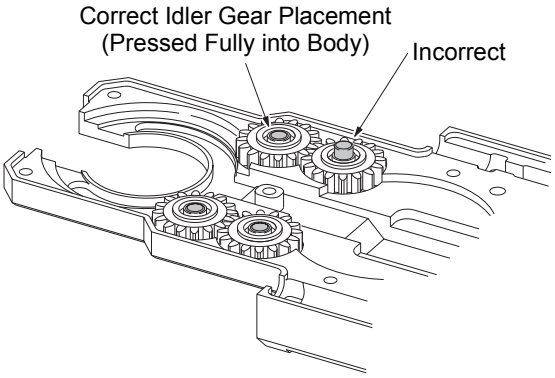


*Figure 33 Correct Placement of Idler Gears in Micro Weld Head Housing*

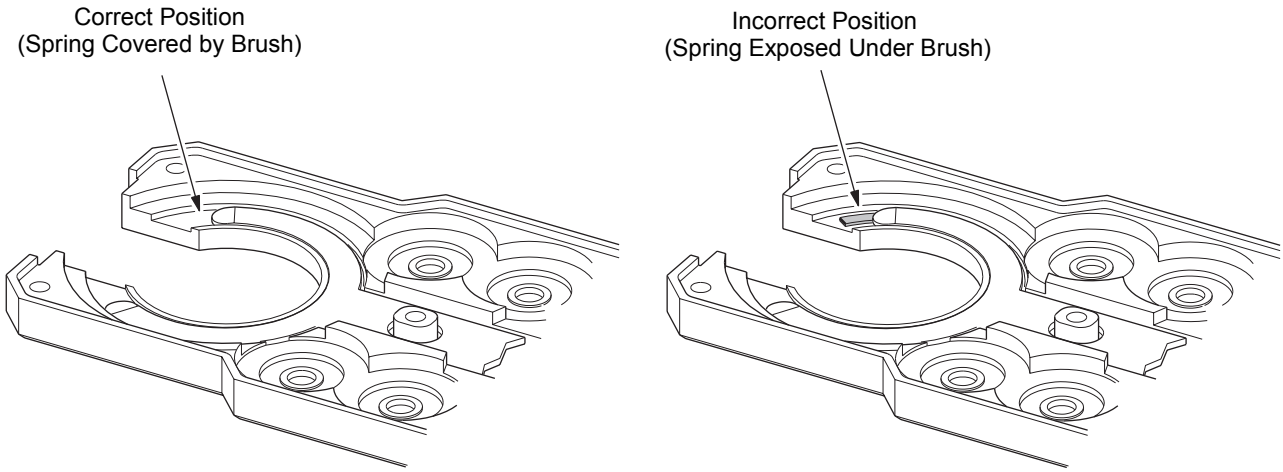


*Figure 34 Spring Position*

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# Parts Drawings

This section includes exploded assembly drawings and associated parts lists. These drawings are provided as a guide to identifying part names. For specific part ordering information, contact your Swagelok representative.

The parts identified in this section include:

- SWS-M-MTR-B Motor Module
- SWS-4MRH-B Rigid Weld Head
- SWS-4MFH-B Flexible Weld Head
- SWS-4MFB-XX Fixture
- SWS-8MRH-B Rigid Weld Head
- SWS-8MFA-XX Fixture

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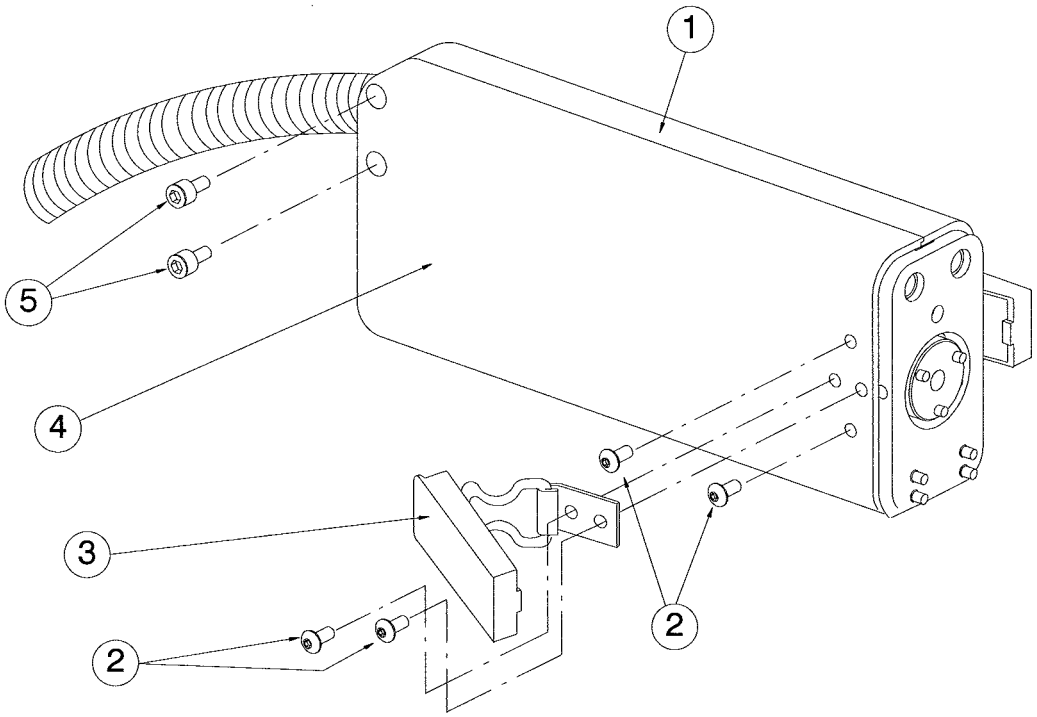


*Figure 35 SWS-M-MTR-B Motor Module*


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*Table 8 SWS-M-MTR-B Motor Module Parts List*

| Reference No. | Description | Part No. | Minimum Order Quantity |
|---|---|---|---|
| 1 | Motor Module Cover (Brush Side) | 10011 | 1 |
| 2 | SS Button Head Cap Screw, 4-40 x 0.250 in. | 13167 | 10 |
| 3 | Latch | 11434 | 1 |
| 4 | Motor Module Cover (Gear Side) | 11427 | 1 |
| 5 | SS Socket Head Cap Screw, 4-40 x 0.250 in. | 13112 | 10 |

For part ordering information, contact your Swagelok representative.

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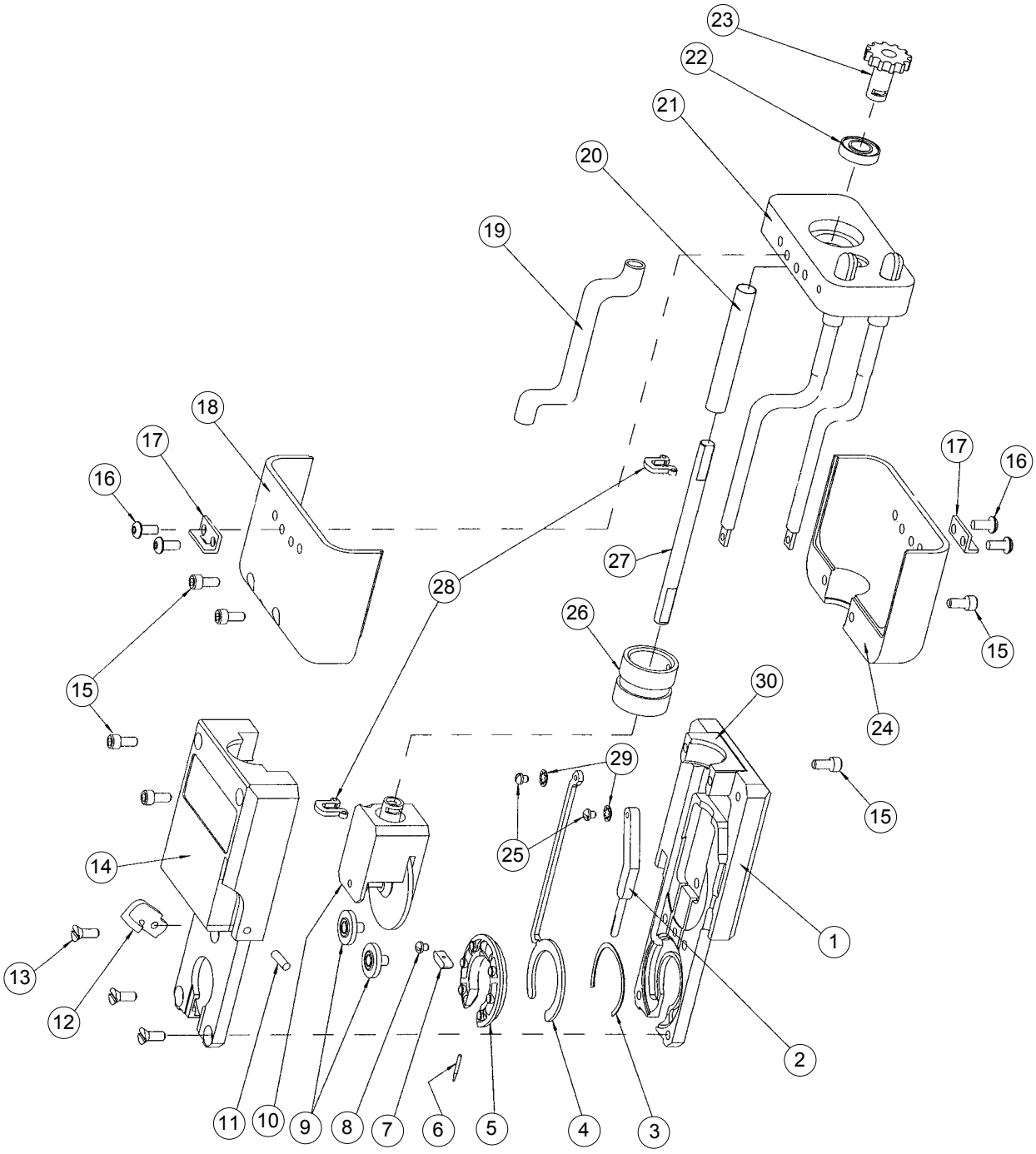


*Figure 36 SWS-4MRH-B Rigid Weld Head*



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*Table 9 SWS-4MRH-B Rigid Weld Head Parts List*

| Reference No. | Description | Part No. | Minimum Order Quantity |
|---|---|---|---|
| 1 | Housing (Brush Side)① | 21160 | 1 |
| 2 | Work Pin | 11412 | 1 |
| 3 | Brush Spring | 11405 | 1 |
| 4 | Brush | 11404-A | 1 |
| 5 | Rotor | 11403-A | 1 |
| 6 | See Electrode Chart | N/A | N/A |
| 7 | Ceramic Insert | 11446 | 1 |
| 8 | SS Round Head Screw, 2-56 x 0.125 in., modified | 13158 | 1 |
| 9 | Gear Assembly | 10009-1 | 1 |
| 10 | Transmission | 11447 | 1 |
| 11 | SS Dowel Pin, 0.093 x 0.375 in. | 13211 | 10 |
| 12 | Locking Lever | 11435 | 1 |
| 13 | Plastic Flat Head Screw, 4-40 x 0.313 in. | 13157 | 1 |
| 14 | Housing (Gear Side)② | 21159 | 1 |
| 15 | SS Socket Head Cap Screw, 4-40 x 0.250 in. | 13112 | 10 |
| 16 | SS Button Head Cap Screw, 4-40 x 0.250 in. | 13167 | 10 |
| 17 | Latch Keeper | 13197 | 10 |
| 18 | Interface Cover (Gear Side) | 11422 | 1 |
| 19 | Purge Gas Tubing | 10010-2 | 1 |
| 20 | Plastic Drive Shaft Sleeve | 09999 | 10 |
| 21 | Interface Assembly (Rigid)③ | 21241 | 1 |
| 22 | Pinion Gear Bearing | 11411 | 1 |
| 23 | Drive Coupling Gear | 11424 | 1 |
| 24 | Interface Cover (Brush Side) | 10007 | 1 |
| 25 | SS Round Head Screw, 2-56 x 0.125 in. | 13159 | 10 |
| 26 | Solid Drive Coupling | 11414 | 1 |
| 27 | Drive Shaft | 11425 | 1 |
| 28 | Drive Spring Clip | 13202 | 1 |
| 29 | SS #2 Internal Star Washer | 13220 | 10 |
| 30 | Coupling Collar | 11448 | 1 |

For part ordering information, contact your Swagelok representative.

① Use Part Number 11401-A for the CWS-4MRH-A

② Use Part Number 11402-A for the CWS-4MRH-A

③ Use Part Number 10456 for the CWS-4MRH-A

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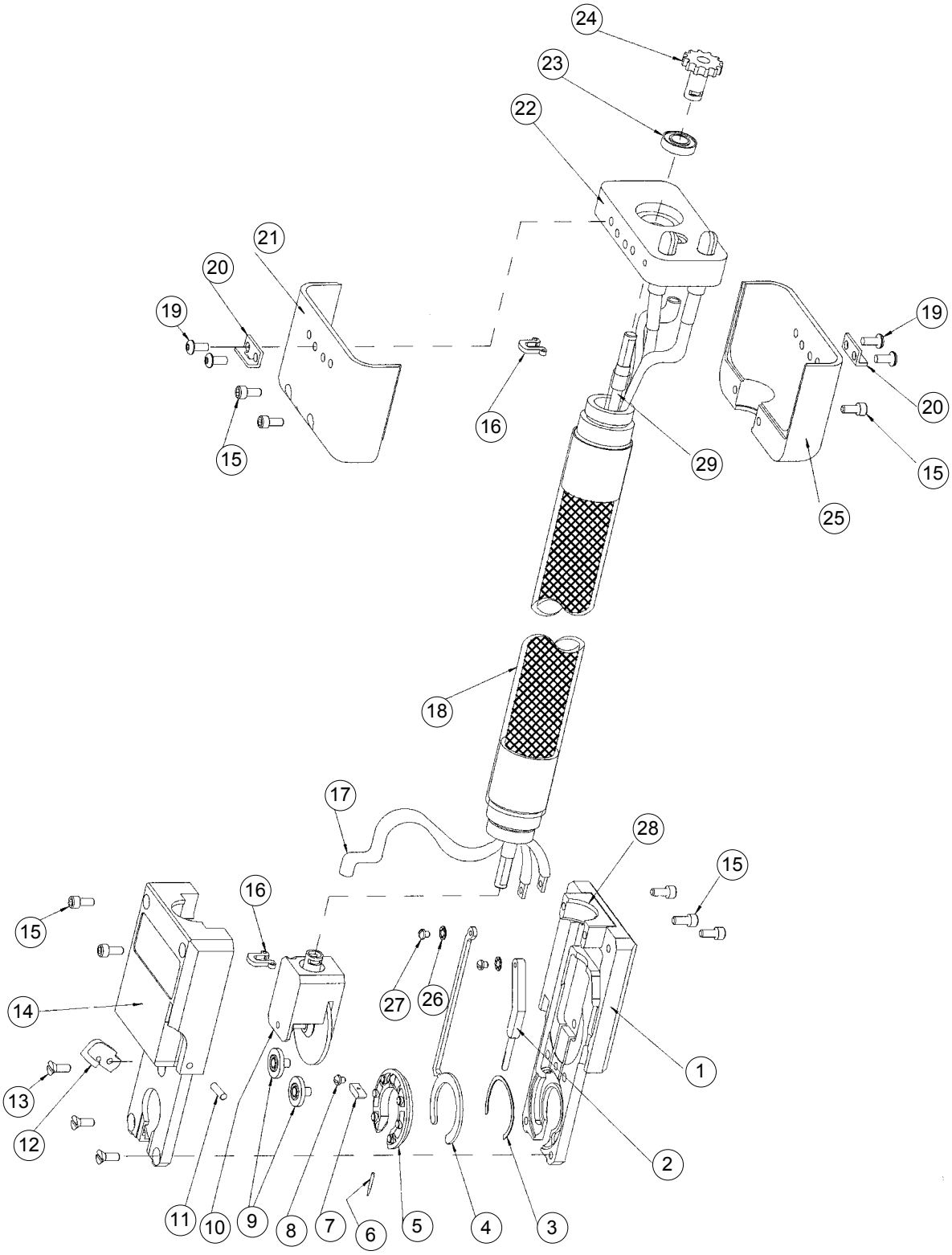


*Figure 37 SWS-4MFH-B Flexible Weld Head*


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*Table 10 SWS-4MFH-B Flexible Weld Head Parts List*

| Reference No. | Description | Part No. | Minimum Order Quantity |
|---|---|---|---|
| 1 | Housing (Brush Side)① | 21160 | 1 |
| 2 | Work Pin | 11412 | 1 |
| 3 | Brush Spring | 11405 | 1 |
| 4 | Brush | 11404-A | 1 |
| 5 | Rotor | 11403-A | 1 |
| 6 | See Electrode Chart | N/A | N/A |
| 7 | Ceramic Insert | 11446 | 1 |
| 8 | SS Round Head Screw, 2-56 x 0.125 in., modified | 13158 | 1 |
| 9 | Gear Assembly | 10009-1 | 1 |
| 10 | Transmission | 11447 | 1 |
| 11 | SS Dowel Pin, 0.093 x 0.375 in. | 13211 | 10 |
| 12 | Locking Lever | 11435 | 1 |
| 13 | Plastic Flat Head Screw, 4-40 x 0.313 in. | 13157 | 1 |
| 14 | Housing (Gear Side)② | 21159 | 1 |
| 15 | SS Socket Head Cap Screw, 4-40 x 0.250 in. | 13112 | 10 |
| 16 | Drive Spring Clip | 13202 | 1 |
| 17 | Purge Gas Tubing | 10010-1 | 1 |
| 18 | Flexible Tube Assembly | 11415 | 1 |
| 19 | SS Button Head Cap Screw, 4-40 x 0.250 in. | 13167 | 10 |
| 20 | Latch Keeper | 13197 | 10 |
| 21 | Interface Cover (Gear Side) | 11422 | 1 |
| 22 | Interface Assembly (Flex)③ | 21240 | 1 |
| 23 | Pinion Gear Bearing | 11411 | 1 |
| 24 | Drive Coupling Gear | 11424 | 1 |
| 25 | Interface Cover (Brush Side) | 10007 | 1 |
| 26 | SS #2 Internal Star Washer | 13220 | 10 |
| 27 | SS Round Head Screw, 2-56 x 0.125 in. | 13159 | 10 |
| 28 | Coupling Collar | 11448 | 1 |
| 29 | Flexible Drive Shaft | 11419 | 1 |

For part ordering information, contact your Swagelok representative.

① Use Part Number 11401-A for the CWS-4MFH-A

② Use Part Number 11402-A for the CWS-4MFH-A

③ Use Part Number 10455 for the CWS-4MFH-A

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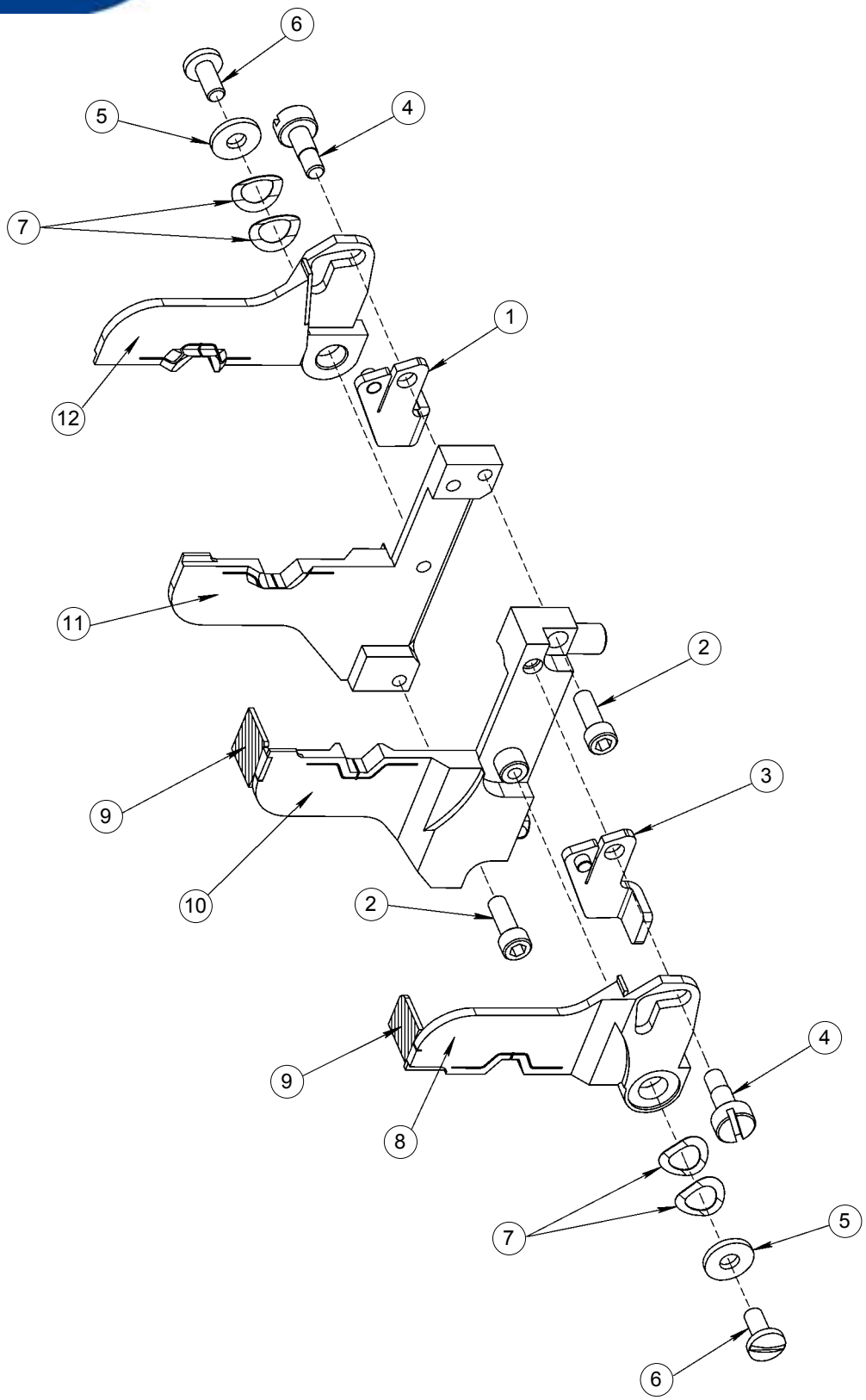


*Figure 38 SWS-4MFB-XX Fixture*


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*Table 11 SWS-4MFB-XX Fixture Parts List*

| Reference No. | Description | Part No. | Minimum Order Quantity |
|---|---|---|---|
| 1 | Latch Cam (Right) | 12045-B | 1 |
| 2 | SS Socket Head Cap Screw, 4-40 x 0.313 in. | 13320 | 10 |
| 3 | Latch Cam (Left) | 12044-B | 1 |
| 4 | SS Shoulder Screw, 4-40 | 13286 | 10 |
| 5 | SS #4 Washer, 0.312 in. | 13285 | 10 |
| 6 | SS Binding Screw, 4-40 x 0.188 in. | 13287 | 10 |
| 7 | SS Disk Spring, 0.230 x 0.322 in. | 13319 | 10 |
| 8 | 1/16 in. Moveable Side Plate (Left) | 20716 | 1 |
| 8 | 1/8 in. Moveable Side Plate (Left) | 20717 | 1 |
| 8 | 3/16 in. Moveable Side Plate (Left) | 20718 | 1 |
| 8 | 1/4 in. Moveable Side Plate (Left) | 20719 | 1 |
| 8 | 2 mm Moveable Side Plate (Left) | 20720 | 1 |
| 8 | 3 mm Moveable Side Plate (Left) | 20721 | 1 |
| 8 | 4 mm Moveable Side Plate (Left) | 20723 | 1 |
| 8 | 6 mm Moveable Side Plate (Left) | 20724 | 1 |
| 9 | Non-Conductive Tape | 14098 | 10 |
| 10 | 1/16 in. Fixed Side Plate (Right) | 20707 | 1 |
| 10 | 1/8 in. Fixed Side Plate (Right) | 20708 | 1 |
| 10 | 3/16 in. Fixed Side Plate (Right) | 20709 | 1 |
| 10 | 1/4 in. Fixed Side Plate (Right) | 20710 | 1 |
| 10 | 2 mm Fixed Side Plate (Right) | 20711 | 1 |
| 10 | 3 mm Fixed Side Plate (Right) | 20712 | 1 |
| 10 | 4 mm Fixed Side Plate (Right) | 20714 | 1 |
| 10 | 6 mm Fixed Side Plate (Right) | 20715 | 1 |
| 11 | 1/16 in. Fixed Side Plate (Left) | 20698 | 1 |
| 11 | 1/8 in. Fixed Side Plate (Left) | 20699 | 1 |
| 11 | 3/16 in. Fixed Side Plate (Left) | 20700 | 1 |
| 11 | 1/4 in. Fixed Side Plate (Left) | 20701 | 1 |
| 11 | 2 mm Fixed Side Plate (Left) | 20702 | 1 |
| 11 | 3 mm Fixed Side Plate (Left) | 20703 | 1 |
| 11 | 4 mm Fixed Side Plate (Left) | 20705 | 1 |
| 11 | 6 mm Fixed Side Plate (Left) | 20706 | 1 |
| 12 | 1/16 in. Moveable Side Plate (Right) | 20725 | 1 |
| 12 | 1/8 in. Moveable Side Plate (Right) | 20726 | 1 |
| 12 | 3/16 in. Moveable Side Plate (Right) | 20727 | 1 |
| 12 | 1/4 in. Moveable Side Plate (Right) | 20728 | 1 |
| 12 | 2 mm Moveable Side Plate (Right) | 20729 | 1 |
| 12 | 3 mm Moveable Side Plate (Right) | 20730 | 1 |
| 12 | 4 mm Moveable Side Plate (Right) | 20732 | 1 |
| 12 | 6 mm Moveable Side Plate (Right) | 20733 | 1 |

For part ordering information contact your Swagelok representative.

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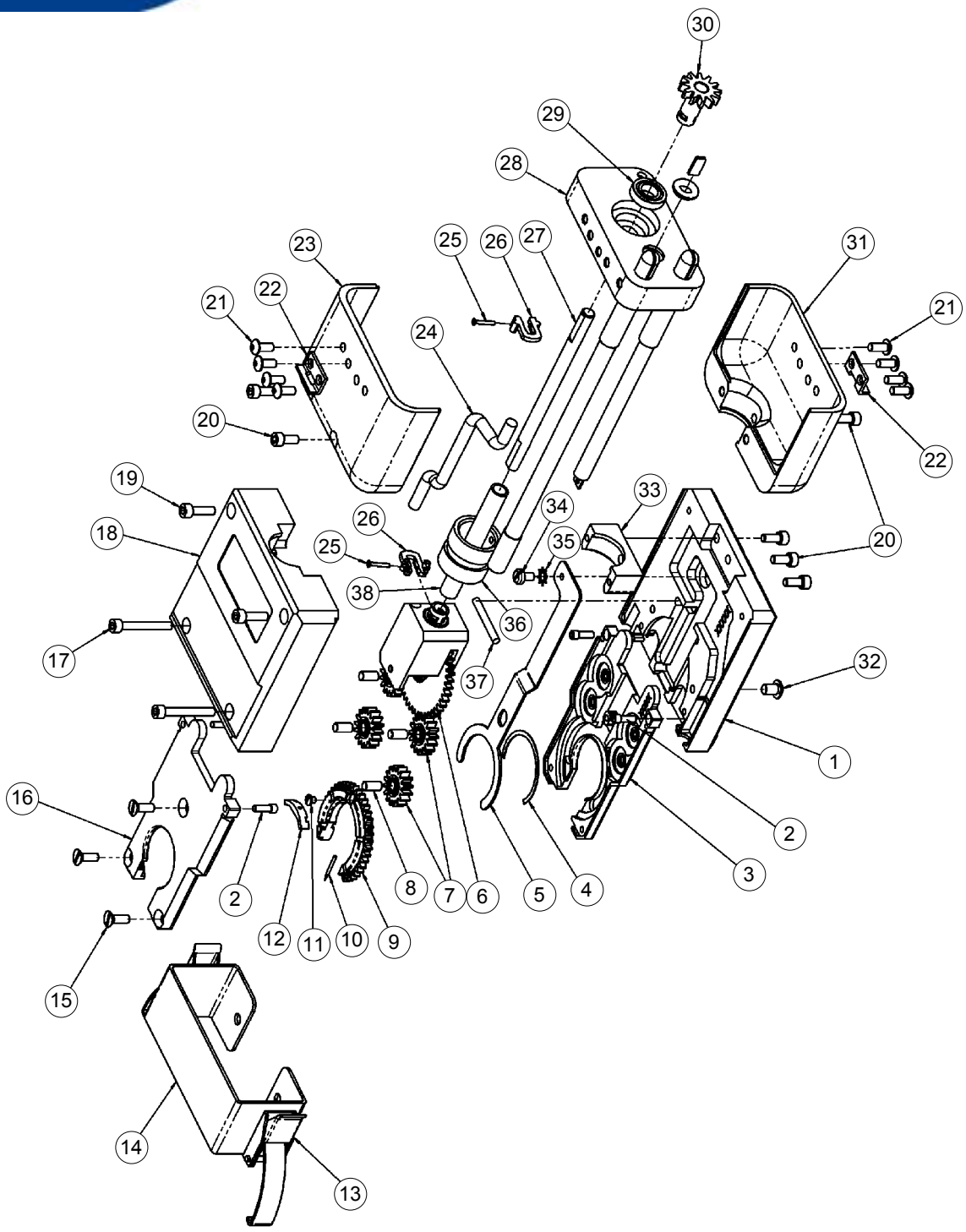


*Figure 39 SWS-8MRH-B Rigid Weld Head*


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*Table 12 SWS-8MRH-B Rigid Weld Head Parts List*

| Reference No. | Description | Part No. | Minimum Order Quantity |
|---|---|---|---|
| 1 | Housing (Brush Side, Bottom)① | 21158 | 1 |
| 2 | SS Socket Head Cap Screw, 2-56 x 0.250in. | 13176 | 10 |
| 3 | Housing (Brush Side, Top) | 11523 | 1 |
| 4 | Brush Spring | 11510 | 1 |
| 5 | Brush | 11506 | 1 |
| 6 | Transmission | 11503 | 1 |
| 7 | Gear Assembly | 11515 | 1 |
| 8 | Dowel Pin (Included with 11515) | N/A | N/A |
| 9 | Rotor | 11502 | 1 |
| 10 | See Electrode Chart | N/A | N/A |
| 11 | SS Round Head Screw, 2-56 x 0.125 in., modified | 13158 | 1 |
| 12 | Ceramic Insert | 11505 | 1 |
| 13 | Latch | 11520 | 1 |
| 14 | Latch Bracket | 11519 | 1 |
| 15 | Plastic Flat Head Screw, 4-40 x 0.313 in. | 13309 | 1 |
| 16 | Housing (Gear Side, Top) | 11524 | 1 |
| 17 | SS Socket Head Cap Screw, 4-40 x 0.812 in. | 13161 | 10 |
| 18 | Housing (Gear Side, Bottom)② | 21157 | 1 |
| 19 | SS Socket Head Cap Screw, 4-40 x 0.375 in. | 13114 | 10 |
| 20 | SS Socket Head Cap Screw, 4-40 x 0.250 in. | 13112 | 10 |
| 21 | SS Button Head Cap Screw, 4-40 x 0.250 in. | 13167 | 10 |
| 22 | Latch Keeper | 13197 | 10 |
| 23 | Interface Cover (Gear Side) | 11422 | 1 |
| 24 | Purge Gas Tubing | 10010-3 | 1 |
| 25 | SS Flat Head Screw, 00-96 x 0.320 in. | 13206 | 10 |
| 26 | Retaining Drive Clip | 13205 | 1 |
| 27 | Drive Shaft | 11511 | 1 |
| 28 | Interface Assembly (Rigid)③ | 21242 | 1 |
| 29 | Pinion Gear Bearing | 11411 | 1 |
| 30 | Drive Coupling Gear | 11424 | 1 |
| 31 | Interface Cover (Brush Side) | 10007 | 1 |
| 32 | SS Button Head Cap Screw, 6-32 x 0.250 in. | 13155 | 10 |
| 33 | Coupling Collar | 11448 | 1 |
| 34 | Brass Pan Head Screw, 4-40 x 0.187 in. | 13296 | 10 |
| 35 | SS #4 External Star Washer | 13171 | 10 |
| 36 | Solid Drive Coupling | 11414 | 1 |
| 37 | Brush Spacer | 11513 | 10 |
| 38 | Plastic Drive Shaft Sleeve | 09999 | 10 |

For part ordering information, contact your Swagelok representative.

① Use Part Number 11521 for the SWS-8MRH-A

② Use Part Number 11522 for the SWS-8MRH-A

③ Use Part Number 11516 for the SWS-8MRH-A

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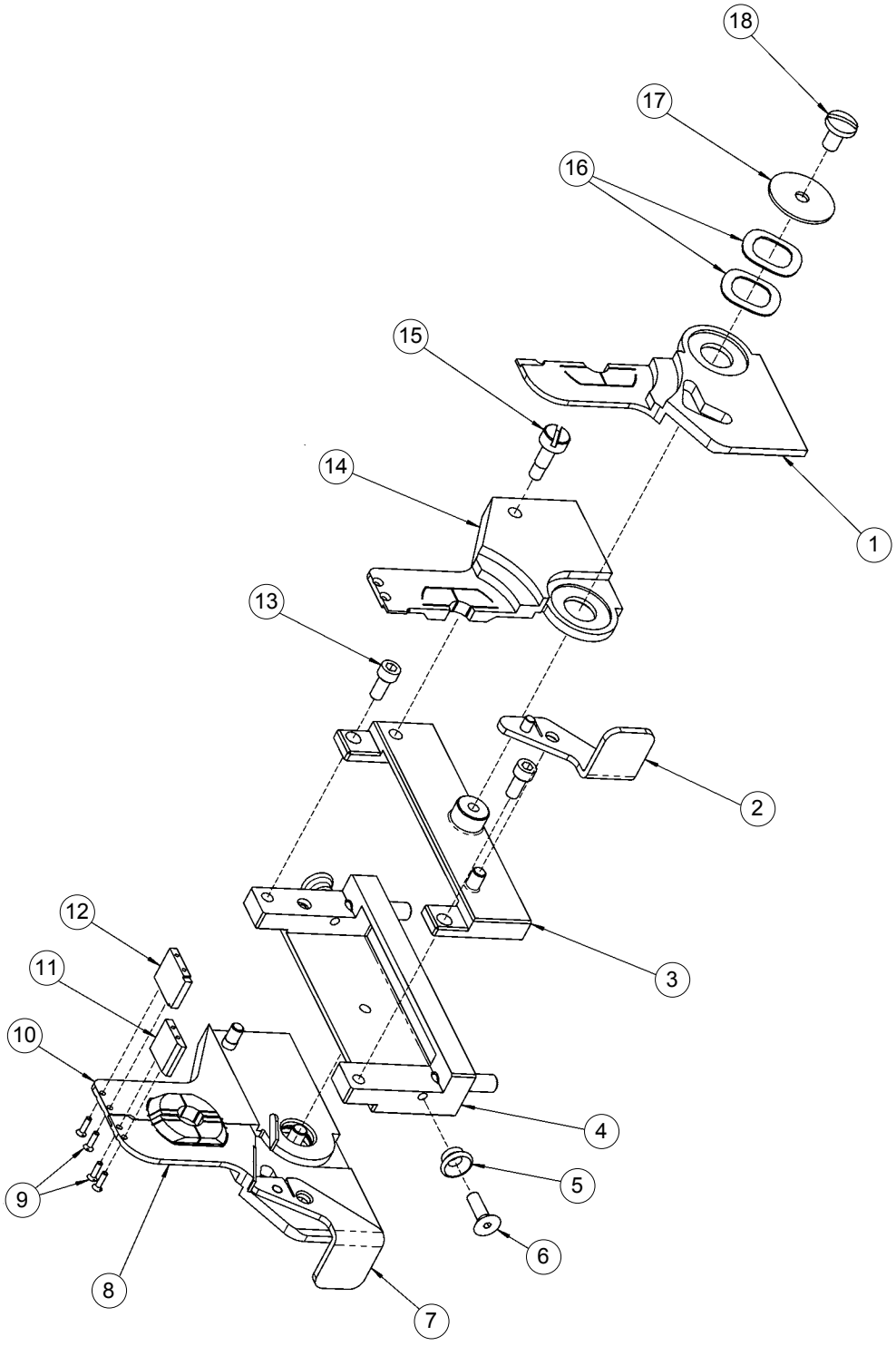


*Figure 40 SWS-8MFA-XX Fixture*


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*Table 13 SWS-8MFA-XX Fixture Parts List*

| Reference No. | Description | Part No. | Minimum Order Quantity |
|---|---|---|---|
| 1 | 1/8 in. Moveable Side Plate (Right) | 12504-02 | 1 |
| 1 | 1/4 in. Moveable Side Plate (Right) | 12504-04 | 1 |
| 1 | 3/8 in. Moveable Side Plate (Right) | 12504-06 | 1 |
| 1 | 1/2 in. Moveable Side Plate (Right) | 12504-08 | 1 |
| 1 | 6 mm Moveable Side Plate (Right) | 12504-6MM | 1 |
| 1 | 8 mm Moveable Side Plate (Right) | 12504-8MM | 1 |
| 1 | 10 mm Moveable Side Plate (Right) | 12504-10MM | 1 |
| 1 | 12 mm Moveable Side Plate (Right) | 12504-12MM | 1 |
| 2 | Latch (Right) | 12508 | 1 |
| 3 | Split Base (Adjustable) | 12516 | 1 |
| 4 | Split Base (Fixed) | 12515 | 1 |
| 5 | Button Keeper | 13300 | 10 |
| 6 | SS Flat Head Screw, 4-40 x 0.375 in. | 13108 | 10 |
| 7 | Latch (Left) | 12507 | 1 |
| 8 | 1/8 in. Moveable Side Plate (Left) | 12503-02 | 1 |
| 8 | 1/4 in. Moveable Side Plate (Left) | 12503-04 | 1 |
| 8 | 3/8 in. Moveable Side Plate (Left) | 12503-06 | 1 |
| 8 | 1/2 in. Moveable Side Plate (Left) | 12503-08 | 1 |
| 8 | 6 mm Moveable Side Plate (Left) | 12503-6MM | 1 |
| 8 | 8 mm Moveable Side Plate (Left) | 12503-8MM | 1 |
| 8 | 10 mm Moveable Side Plate (Left) | 12503-10MM | 1 |
| 8 | 12 mm Moveable Side Plate (Left) | 12503-12MM | 1 |
| 9 | SS Flat Head Screw, 00-90 x 0.188 in. | 13302 | 10 |
| 10 | 1/8 in. Fixed Side Plate (Right) | 12502-02 | 1 |
| 10 | 1/4 in. Fixed Side Plate (Right) | 12502-04 | 1 |
| 10 | 3/8 in. Fixed Side Plate (Right) | 12502-06 | 1 |
| 10 | 1/2 in. Fixed Side Plate (Right) | 12502-08 | 1 |
| 10 | 6 mm Fixed Side Plate (Right) | 12502-6MM | 1 |
| 10 | 8 mm Fixed Side Plate (Right) | 12502-8MM | 1 |
| 10 | 10 mm Fixed Side Plate (Right) | 12502-10MM | 1 |
| 10 | 12 mm Fixed Side Plate (Right) | 12502-12MM | 1 |
| 11 | Arc Cover (Moveable) | 12506-B | 1 |
| 12 | Arc Cover (Fixed) | 12505-B | 1 |
| 13 | SS Socket Head Cap Screw, 4-40 x 0.250 in. | 13112 | 10 |
| 14 | 1/8 in. Fixed Side Plate (Left) | 12501-02 | 1 |
| 14 | 1/4 in. Fixed Side Plate (Left) | 12501-04 | 1 |
| 14 | 3/8 in. Fixed Side Plate (Left) | 12501-06 | 1 |
| 14 | 1/2 in. Fixed Side Plate (Left) | 12501-08 | 1 |
| 14 | 6 mm Fixed Side Plate (Left) | 12501-6MM | 1 |
| 14 | 8 mm Fixed Side Plate (Left) | 12501-8MM | 1 |
| 14 | 10 mm Fixed Side Plate (Left) | 12501-10MM | 1 |
| 14 | 12 mm Fixed Side Plate (Left) | 12501-12MM | 1 |
| 15 | SS Shoulder Screw, 4-40 | 13288 | 10 |
| 16 | Wave Washer | 13291 | 10 |
| 17 | SS #6 Washer | 13290 | 10 |
| 18 | SS Screw, 6-32 x 0.240 in. | 13289 | 10 |

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