

# High Volume Swaging Unit (HVSU)

## User's Manual



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# Safety

## Safety Summary

This manual contains important information for the operation of the Swagelok® High Volume Swaging Unit (HVSU). Users should read and understand the contents before operating the HVSU.

The HVSU has no internal serviceable parts. Return the HVSU to your authorized Swagelok sales and service representative for service.

- WARNING** Statements that indicate a hazardous situation which, if not avoided, could result in death or serious injury.
- CAUTION** Statements that indicate a hazardous situation which, if not avoided, could result in minor or moderate injury.
- NOTICE** Statements that indicate a hazardous situation which, if not avoided, could result in damage to the equipment or other property.



Safety alert symbol indicating a potential personal injury hazard.



Safety alert symbol indicating a potential for personal injury from electrical shock.

## High Volume Swaging Unit (HVSU) Safety Information



**ELECTRIC SHOCK can kill.**



Touching live electrical parts and failure to operate equipment properly can cause fatal electric shock and severe burns. Incorrectly installed or improperly grounded equipment is a hazard. To avoid injury:

- Do not touch live electrical parts.
- Keep all panels and covers securely in place.
- Follow local electrical codes and the guidelines in this manual when installing the HVSU. Shock hazards can exist even when equipment is properly installed, so it is important that the operator be trained in the proper use of the equipment and follow established safety practices.
- Frequently inspect input power cord for damage or bare wiring—replace immediately if damaged.
- Properly unplug the power cord. Grasp the plug to remove it from the receptacle.



**WARNING**

**Danger of eyes being injured.**

Eye protection must be worn while operating or working near the equipment.



**WARNING**

**Keep dry. Equipment and components are not waterproof.**

Do not use electric tools in a damp or wet environment.

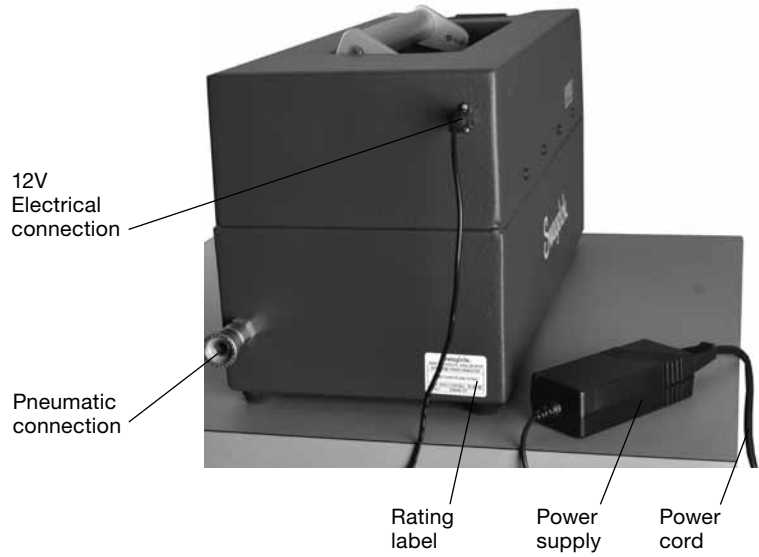
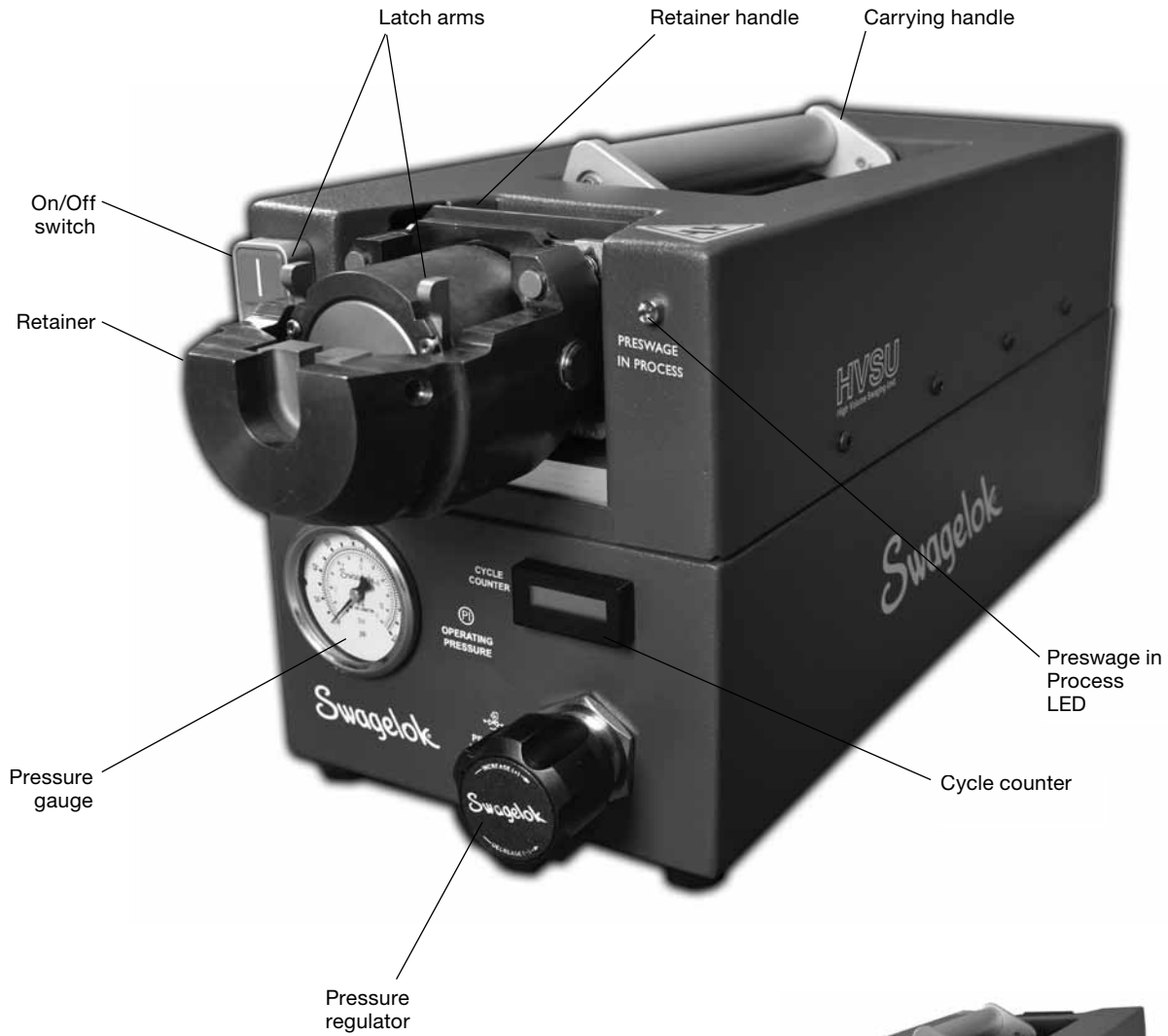


**CAUTION**

**Fingers can be injured.**

Do not place fingers or hands near the retainer assembly while operating the HVSU.

## Product Information



## General Information

### Description

The Swagelok High Volume Swaging Unit (HVSU) is designed to preswage ferrules on to a tube. Refer to *Tube Data*, MS-01-107, for acceptable tube wall thicknesses.

A tube bottoming sensor ensures proper tube bottoming to start the preswage process.

The nut bottoming sensor stops the preswage process after the designed preswage stroke has been reached.

### Product Technical Data

Dimensions, in. (mm)	8.3 W by 11.1 H by 26 L (211 W by 279 H by 660 L)
Weight, lbs (kg)	70 (31.8)

### Electrical Requirements

	Voltage Requirements	Service Current Requirement
HVSU	12 V (dc)	3.33 A maximum
Power supply	120 to 240 V (ac)	1 A

### Unpacking the HVSU

#### Shipping Case Contents

- HVSU (MS-HVSU-X, with X indicating power cord)
- Power supply (MS-HVSU-PS-12V)
- 3/8 in. Male quick connect stem (SS-QC6-D-600)
- 0.050 in. hex key (MS-HD-050)
- User manual (MS-13-223)

Report any missing or damaged parts to your authorized Swagelok sales and service representative immediately.

**Note:** The tooling kit, comprised of a puck assembly, a die assembly, and a spacer, is ordered and shipped separately.

### NOTICE

**The HVSU should be used to preswage only Swagelok tube fittings.**



Fig. 1 Shipping Case  
(Tooling ordered separately.)

## Setup

### HVSU Setup

1. Lift the HVSU from the shipping case using the handle on the top of the unit. Place the HVSU on a stable surface.



#### CAUTION

**The HVSU weighs 70 lbs (31.8 kg).**

2. Inspect the HVSU and tooling for damage.
3. Record the model number and serial number from the rating label on the back of the unit for your reference. Fig. 2.
4. Connect the power supply to the electrical connection on the back of the HVSU. Fig. 3. Connect the power cord to a properly rated and grounded electrical receptacle.
5. Connect a filtered, dry compressed air supply line (maximum 125 psig [8.6 bar]) to the supplied quick connect.

#### NOTICE

**Do not exceed a 125 psig (8.6 bar) supply line.  
Damage to the unit could result.**

6. Connect the supplied quick connect to the pneumatic connection on the back of the HVSU. Fig. 3.

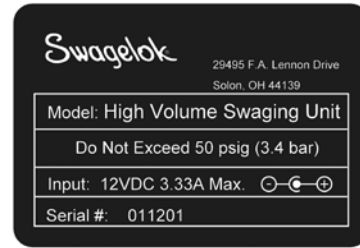


Fig. 2 Rating Label

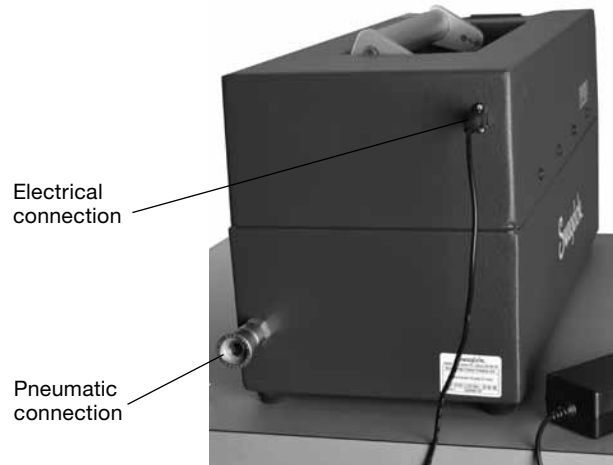


Fig. 3 Back of the HVSU

## Tooling Assembly and Installation

### Assembly

Select a tooling set consisting of a puck assembly, a die assembly, and a spacer to match the size of tubing to be used. The puck and die must be assembled together.

1. Place the die into the puck with the flange facing upward.
2. Ensure the flat of the die assembly is aligned with the nut bottoming sensor and the die assembly is seated flush with the puck assembly face. Fig. 4.
3. Use a 0.050 in. hex key to turn the set screw until the die assembly is held in place. Ensure the die has slight movement in the puck. Fig. 5.

### NOTICE

**Do not overtighten the set screw. Damage to the die assembly could result.**



Fig. 4 Die and Puck Assemblies

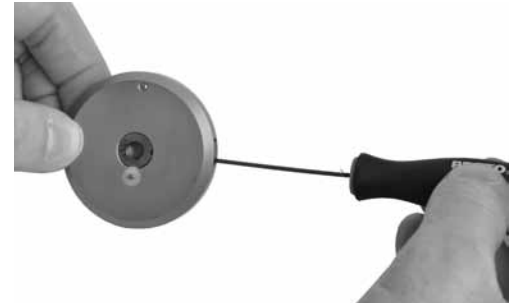


Fig. 5 Securing the Puck Set Screw

### ⚠ CAUTION

**Disconnect the air pressure and turn the power off prior to installing or changing tooling.**

### Installation

1. Pull the retainer latch handle forward to lower the retainer. Fig. 6 and 7.

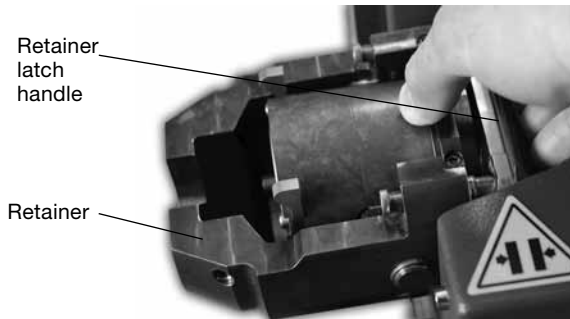


Fig. 6 Pulling the Retainer Latch Handle



Fig. 7 Lowered Retainer

2. Squeeze the left and right latch arms and place the die/puck assembly into the contact plate with the marks on the die/puck assembly aligning with the latch arm screws and release the arms. Ensure that the nut contact sensor is pointing downward. Fig. 8 and 9.

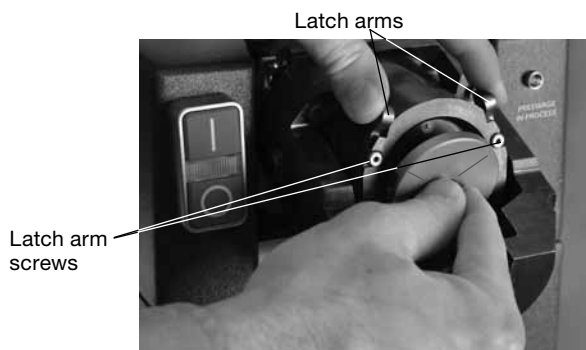


Fig. 8 Squeezing the Latch Arms

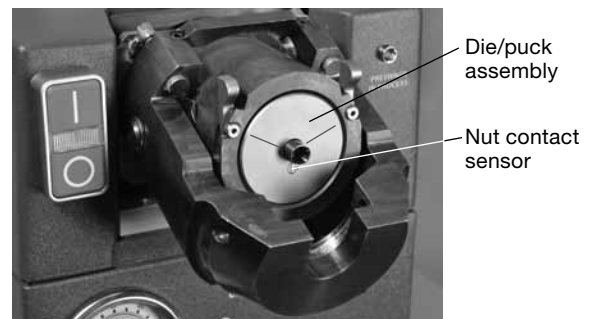
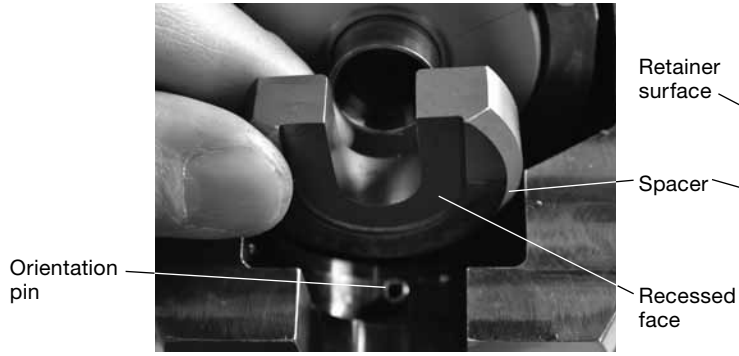
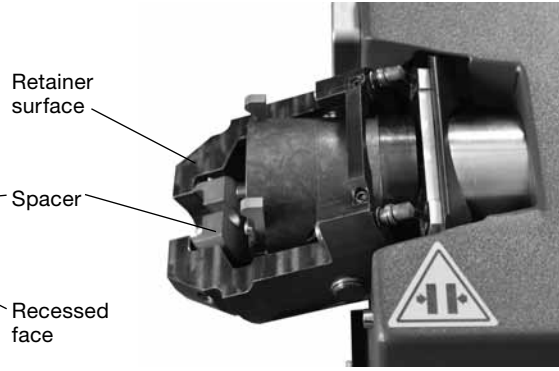


Fig. 9 Installed Die/Puck Assembly

3. Install the spacer into the retainer with the recessed face facing away from the puck, aligning the orientation pin and sliding the spacer down until it is flush with the retainer surface. Fig. 10 and 11.



*Fig. 10 Installing the Spacer*



*Fig. 11 Spacer Flush with the Retainer*



## Operation

1. Use the on/off switch to turn on the power to the HVSU.
2. Refer to Table 2, *Recommended Air Pressure*, for the correct operating pressure.

Table 2 Recommended Air Pressure

Tube OD	Air Pressure, psig (bar)
1/4 in. 3/8 in. 6 mm 8 mm 10 mm	30 ± 2 (2.1 ± 0.2)
1/2 in. 12 mm	40 ± 2 (2.8 ± 0.2)

3. Turn the handle on the pressure regulator on the front of the HVSU until the pressure gauge displays the correct operating pressure. Fig. 12.
4. To ensure the proper pressure, verify the retainer latch handle is up. Insert a piece of tube without nut and ferrules into the die to actuate it. Remove the tube and verify the pressure gauge has returned to the desired value.
5. Pull the retainer latch handle forward to lower the retainer.
6. Prepare the tube ends according to the following:
  - Cut the tube squarely. Use of a Swagelok tube saw guide is recommended.
  - Remove any burrs. Use of a Swagelok deburring tool is recommended.



### WARNING

Failure to deburr the OD of the tube could prevent the tube from bottoming properly against the tooling shoulder.



### CAUTION

Failure to deburr the ID of the tube could result in burrs entering the system and damaging other components of your system.

7. Wipe the ID and OD of the tooling free of debris.



### WARNING

Debris on the tooling ID could result in damage to the ferrules.

8. Load the nut and ferrule assembly onto the die and raise the retainer up. Fig. 13.
9. Insert the tubing into the nut and ferrule assembly until the tube bottoming sensor is activated. The green Preswage in Process light will illuminate momentarily to indicate proper tube bottoming. Fig. 14.
10. Pull the retainer latch handle to lower the retainer, then remove the preswaged assembly.

## NOTICE

Fitting performance may be affected if recommended pressure setting is not used.



### CAUTION

Do not place fingers or hands behind or in the retainer when operating the HVSU.



Fig. 12 Front Panel of HVSU

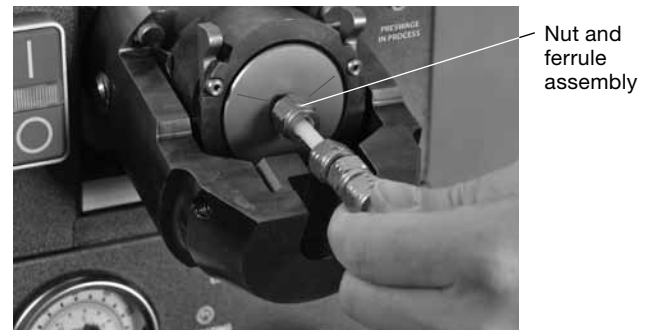


Fig. 13 Loading the Nut and Ferrule Assembly



Fig. 14 Preswaging the Tubing

## Fitting Installation and Gauging

These instructions are for the traditional Swagelok tube fittings. For other fitting types refer to the applicable Swagelok tube fitting installation instructions.

### Installation

1. Turn the nut onto the fitting body until fingertight. Fig. 15.
2. While holding the fitting body stable, tighten the nut 1/2 turn with a wrench. Fig. 16.

### Gauging

On initial installation, the standard Swagelok gap inspection gauge assures the installer or inspector that a fitting has been sufficiently tightened.

Position the standard Swagelok gap inspection gauge next to the gap between the nut and the body. Fig. 17.

- If the gauge will not enter the gap, the fitting is sufficiently tightened.

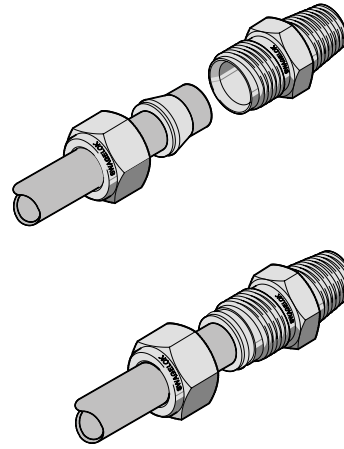


Fig. 15 Installing Preswaged Assembly into Fitting Body

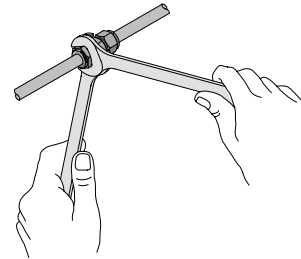


Fig. 16 Tighten Nut with Wrench

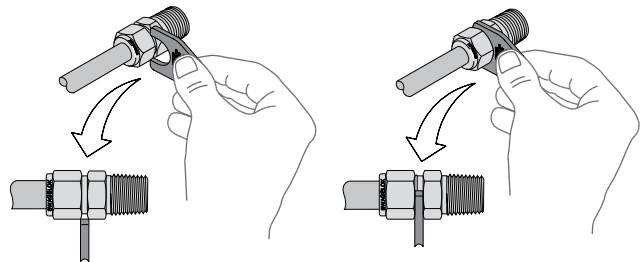


Fig. 17 Using the Gap Inspection Gauge

- If the gauge will enter the gap, additional tightening is required.

## Maintenance



Fig. 18 Cycle Counter

### Cycle Counter

The cycle counter can be used to track the number of preswage cycles and/or tooling usage. Fig. 18.

### Puck and Contact Plate Cleaning

Every 25 000 cycles, clean the puck and contact plate according to the following procedure.

1. Squeeze the latch arms and remove the puck assembly from the contact plate.
2. Use a clean towel and spray WD-40® lubricant or an equivalent water dispersal lubricant (liquid only) onto the towel.
3. Wipe the puck assembly and the face of the contact plate with the towel to remove dirt and contaminants.

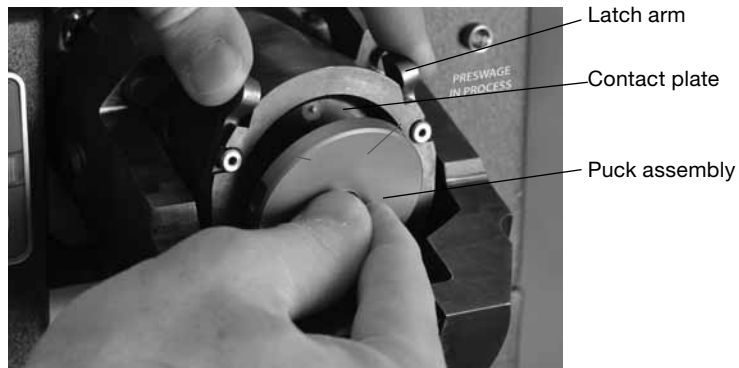


Fig. 19 Puck and Contact Plate

### NOTICE

**Do not spray lubricant directly onto the puck assembly or contact plate. Unit performance could be affected.**

4. Reinstall the puck assembly. Do not wipe off the lubricant.

### **HVSU Lubrication**

Every 100 000 cycles, lubricate the following locations with a NLGI grade 2 white lithium grease (spray or brush on).

#### **Retainer Shaft**

1. Remove the clip from left end of the retainer shaft. Fig. 20.

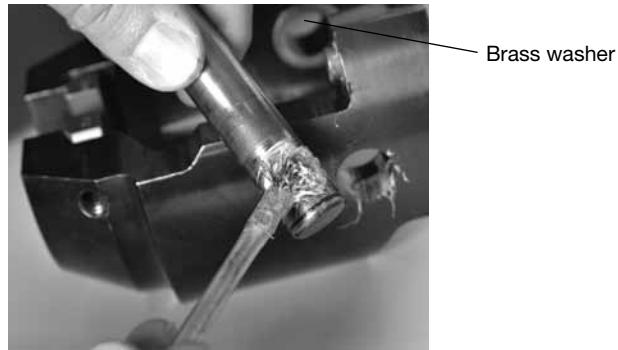


*Fig. 20 Removing Clips from Retainer Shaft*

2. Remove the retainer shaft.

Note: The retainer will now be loose and should be placed on a stable surface.

3. Clean the shaft with a towel.



*Fig. 21 Applying Lubricant to Retainer Shaft*

4. Spray or brush lithium grease on both ends of the shaft, including the inside of the retainer. Fig. 21.

### Connector Shaft

1. Liberally spray or brush lithium grease in the area behind the square block that holds the retainer shaft. Fig. 22.



*Fig. 22 Applying Lubricant to Connector Shaft*

2. Wipe off any excess grease.

### Latch Pins

1. Push one pin forward toward the front of the retainer as far as possible.
2. Clean the pin with a towel.
3. Spray or brush lithium grease on the exposed portion of the pin. Fig. 23.



*Fig. 23 Applying Lubricant to Latch Pins*

4. Repeat steps 1 through 3 for the other pin.
5. Squeeze the latch arms and set the retainer into place.  
Note: Verify brass washers are in counterbores. Lubricate with lithium grease if needed to hold washers in place.
6. Reinsert the retainer shaft and replace the clip.

## Troubleshooting

Problem	Cause	Remedy
Tubing is difficult to or will not install into the tooling die.	Tubing is out of tolerance or has a burr on end of tubing.	Measure the tubing wall thickness. Verify the tube is properly cut and prepared for swaging. <b>⚠ Do not swage a tube more than once.</b>
Tubing is difficult to remove from the HVSU after preswaging.	Tube wall thickness may be below recommended minimum wall thickness.	Gently rock the tubing back and forth to remove it. Use tubing with a wall thickness equal to or larger than the minimum recommended. <b>⚠ Do not rotate the tubing.</b>
The HVSU fails to swage sufficiently as indicated by the gap inspection gauge after fitting installation.	The working pressure is too low.	Verify the working pressure is set to the recommended air pressure defined in Table 2. Check the air line connections to the HVSU. <b>⚠ Do not swage a tube more than once.</b> If the working pressure is sufficient, return the unit to your authorized Swagelok sales and service representative.
There is audible air flow.	The regulator is set too high.	Adjust the regulator. If the problem persists, return the unit to your authorized Swagelok sales and service representative.
Oil is leaking from the HVSU.		Return the unit to your authorized Swagelok sales and service representative.

Contact your authorized Swagelok sales and service representative for additional assistance.

## Tooling Ordering Information

### Tooling

Tool kits are ordered separately according to size.

Each kit contains a die assembly, a puck assembly, and a spacer to match the size of tubing to be used.

Tooling Size	Kit Ordering Number
1/4 in.	MS-HVSU-TLG-KIT-400
3/8 in.	MS-HVSU-TLG-KIT-600
1/2 in.	MS-HVSU-TLG-KIT-810
6 mm	MS-HVSU-TLG-KIT-6M
8 mm	MS-HVSU-TLG-KIT-8M
10 mm	MS-HVSU-TLG-KIT-10M
12 mm	MS-HVSU-TLG-KIT-12M

### Replacement Die Assemblies

Die assemblies are consumable and can be reordered individually for replacement as needed.

Die Size	Die Assembly Ordering Number
1/4 in.	MS-HVSU-TLG-ASM-400
3/8 in.	MS-HVSU-TLG-ASM-600
1/2 in.	MS-HVSU-TLG-ASM-810
6 mm	MS-HVSU-TLG-ASM-6M
8 mm	MS-HVSU-TLG-ASM-8M
10 mm	MS-HVSU-TLG-ASM-10M
12 mm	MS-HVSU-TLG-ASM-12M

### Puck Assemblies

Puck assemblies can be reordered individually for replacement as needed.

Die Size	Die Assembly Ordering Number
1/4 in.	MS-HVSU-PCK-ASM-400
3/8 in.	MS-HVSU-PCK-ASM-600
1/2 in.	MS-HVSU-PCK-ASM-810
6 mm	MS-HVSU-PCK-ASM-400
8 mm	MS-HVSU-PCK-ASM-8M
10 mm	MS-HVSU-PCK-ASM-10M
12 mm	MS-HVSU-PCK-ASM-810

### Spacers

Spacers can be reordered individually for replacement as needed.

Die Size	Die Assembly Ordering Number
1/4 in.	MS-HVSU-SPC-400
3/8 in.	MS-HVSU-SPC-600
1/2 in.	MS-HVSU-SPC-810
6 mm	MS-HVSU-SPC-400
8 mm	MS-HVSU-SPC-8M
10 mm	MS-HVSU-SPC-10M
12 mm	MS-HVSU-SPC-810

## Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit [swagelok.com](http://swagelok.com) or contact your authorized Swagelok representative.

**Caution: Do not mix or interchange parts with those of other manufacturers.**

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