

# High Volume Swaging Unit (HVSU)

## User's Manual



## Contents

Safety .....	3
Safety Summary .....	3
High Volume Swaging Unit (HVSU)	
Product Information .....	4
General Information .....	5
Setup .....	6
HVSU Setup .....	6
Tooling Assembly and Installation .....	6
Operation .....	8
Fitting Installation and Gauging .....	10
Maintenance .....	11
HVSU ON/OFF Switch Lamp Replacement .....	13
Troubleshooting .....	14
Tooling Ordering Information .....	15

## 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 representative for service.

<b>WARNING</b>	Statements that indicate a hazardous situation which, if not avoided, could result in death or serious injury.
<b>CAUTION</b>	Statements that indicate a hazardous situation which, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>	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



#### WARNING

#### ***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.

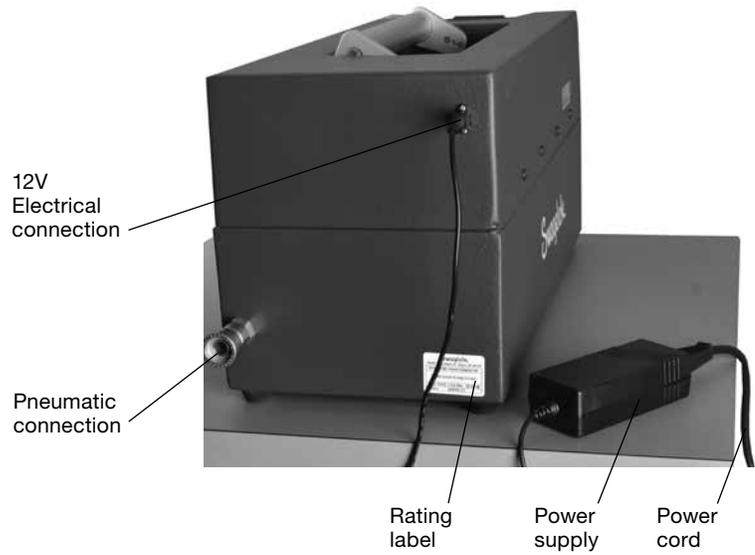
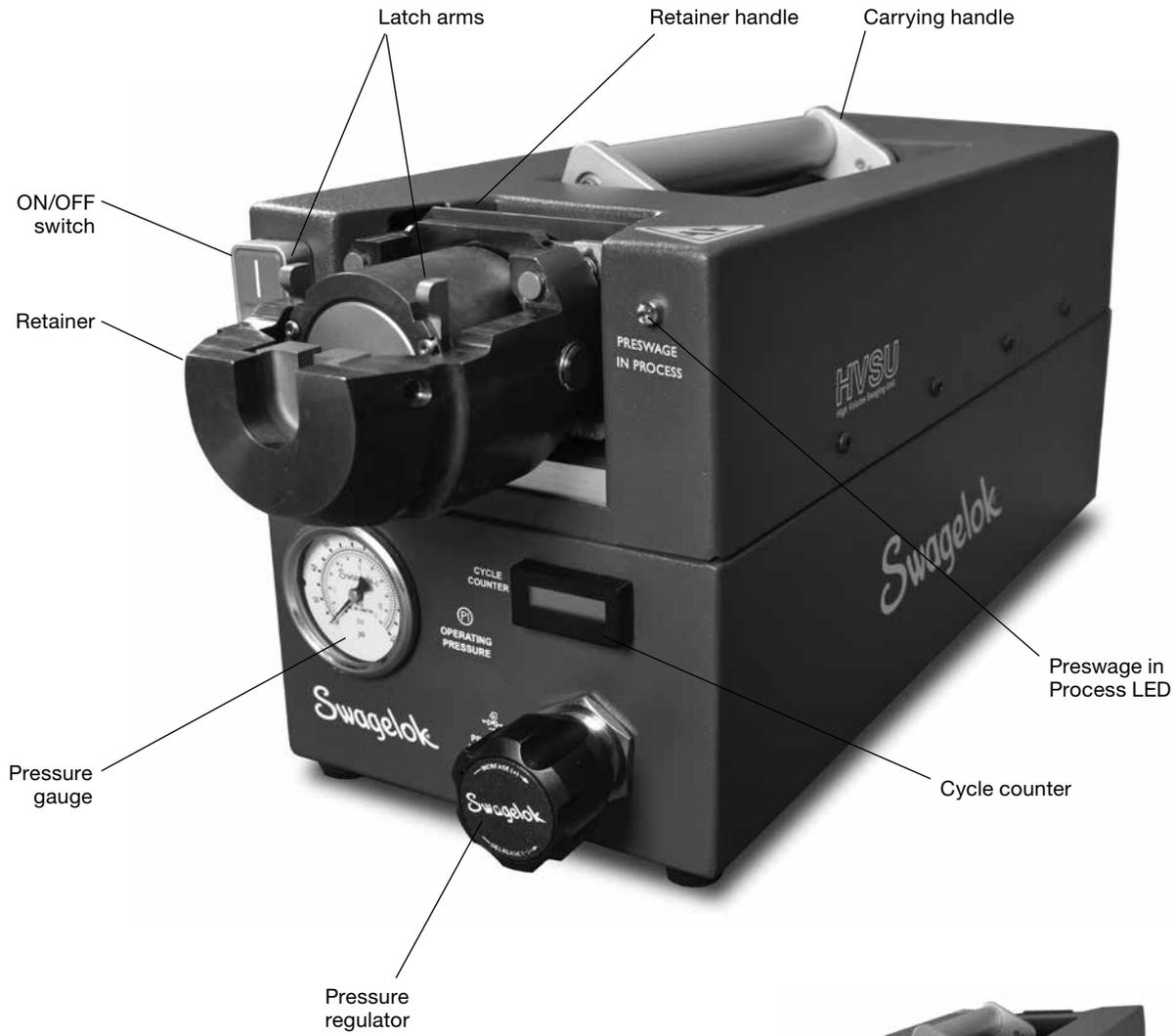


#### CAUTION

#### **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 ASTM A269, EN ISO 1127, or equivalent stainless steel tubing as described in Swagelok *Tubing Data* catalog, MS-01-107 and *High-Volume Swaging Unit (HVSU)* catalog, MS-02-441 for acceptable tube O.D. and wall thickness.

A tube bottoming sensor starts the preswage process and helps to achieve proper tube bottoming.

A nut bottoming sensor stops the preswage process after the designated preswage stroke has been achieved.

### 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.

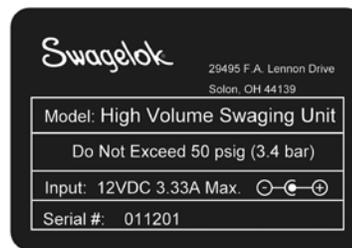


Fig. 2 Rating Label

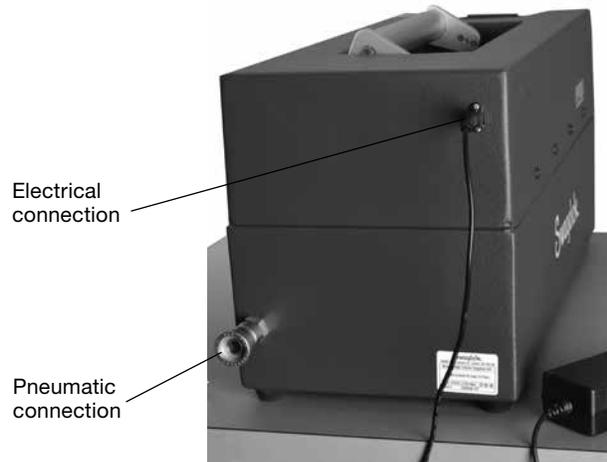


Fig. 3 Back of the HVSU

## 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 according to the following instruction.

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.**

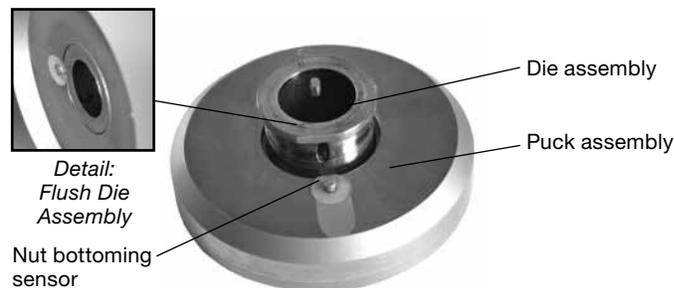


Fig. 4 Die and Puck Assemblies

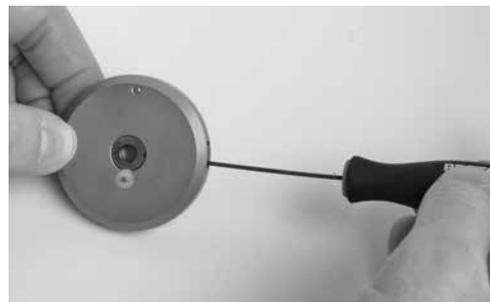


Fig. 5 Securing the Puck Set Screw



#### 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.

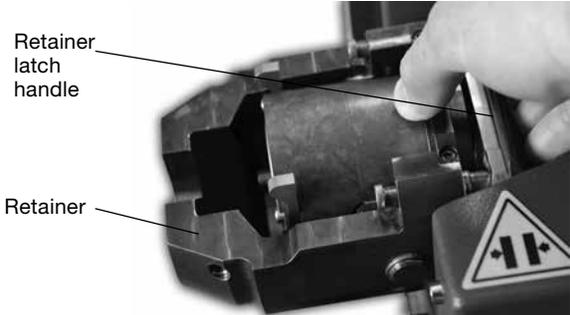


Fig. 6 Pulling the Retainer Latch Handle

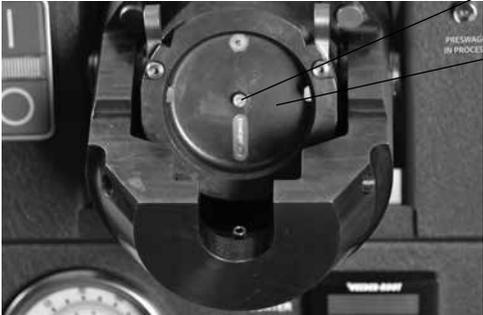


Fig. 7 Lowered Retainer

Tube bottoming sensor  
Contact plate

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.

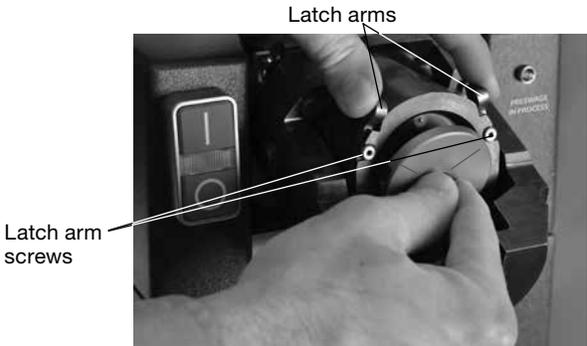


Fig. 8 Squeezing the Latch Arms

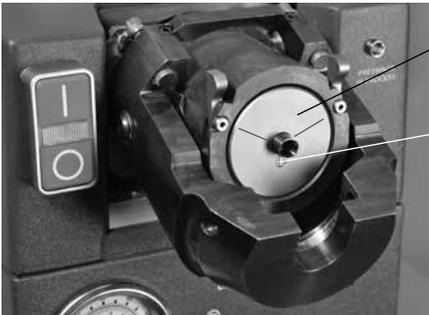


Fig. 9 Installed Die/Puck Assembly

Die/puck assembly  
Nut contact sensor

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.

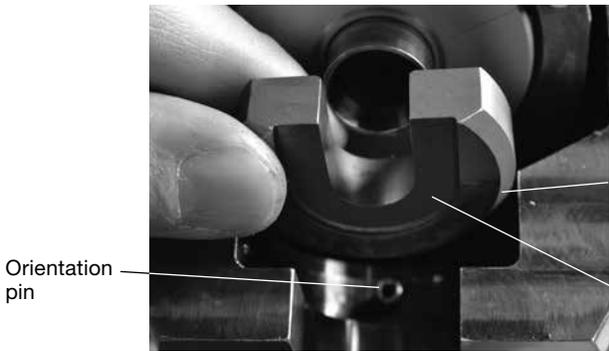


Fig. 10 Installing the Spacer

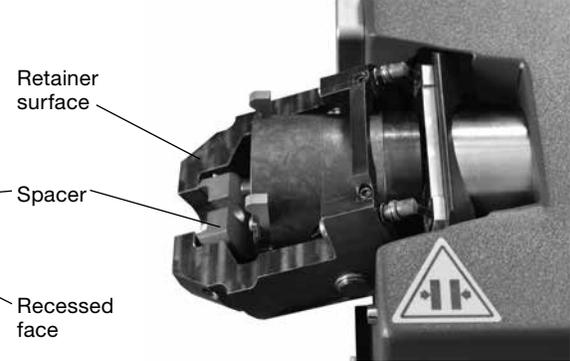


Fig. 11 Spacer Flush with the Retainer

Retainer surface  
Spacer  
Recessed face

## Operation

**⚠ WARNING**

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.

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 ± 2.0 (2.1 ± 0.20)
1/2 in. 12 mm	40 ± 2.0 (2.8 ± 0.20)

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. Cut the tube squarely and remove any burrs.

**⚠ WARNING**

Failure to deburr the OD of the tube could prevent the tube from bottoming properly against the tooling shoulder which may affect fitting performance.

**⚠ CAUTION**

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

7. To ensure tube end will activate the tube bottoming sensor, refer to *Table 3, Recommended Tube OD & Minimum Chamfer*, only if tube OD exceeds the nominal size.

**Table 3 Recommended Tube OD & Minimum Chamfer**

Size	Max Allowable Tube OD in. (mm)	Min. Chamfer in. (mm)
1/4 in.	0.254 (6.45)	5 to 30° x 0.015 (5 to 30° x 0.40)
3/8 in.	0.379 (9.62)	
1/2 in.	0.503 (12.78)	None required
6 mm	0.240 (6.09)	5 to 30° x 0.020 (5 to 30° x 0.50)
8 mm	0.319 (8.10)	
10 mm	0.398 (10.11)	
12 mm	0.475 (12.08)	

① May be required only for greater than nominal OD tube

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

**⚠ WARNING**

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



Fig. 12 Front Panel of HVSU

- 9. Load the nut and ferrule assembly onto the die and raise the retainer up. Fig. 13.
- 10. Insert the tubing into the nut and ferrule assembly as far as the tube will go. Press the tube firmly against the bottom of the tooling die for 1 to 2 seconds after the tube bottoming sensor activates the preswaging process.

**Note:** Pushing hard enough to overcome the tube bottoming sensor spring force will not affect tooling die life.

**Note:** The green Preswage in Process light will illuminate when the tube bottoming sensor activates the cycle, however this alone does not indicate full tube bottoming. Follow the instructions in step 10 above to ensure proper tube bottoming, Fig 14.

- 11. Pull the retainer latch handle to lower the retainer, then remove the preswaged assembly.

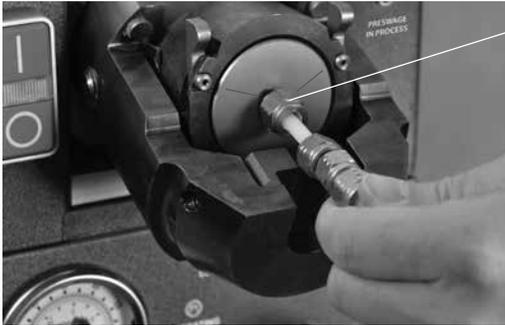


Fig. 13 Loading the Nut and Ferrule Assembly

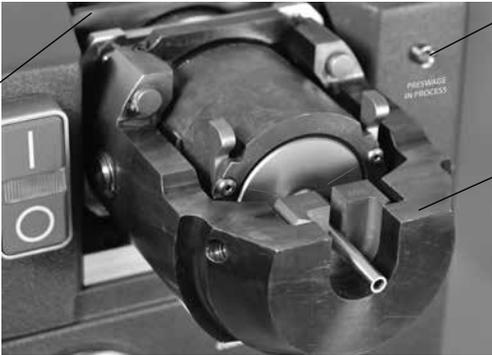


Fig. 14 Preswaging the Tubing

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

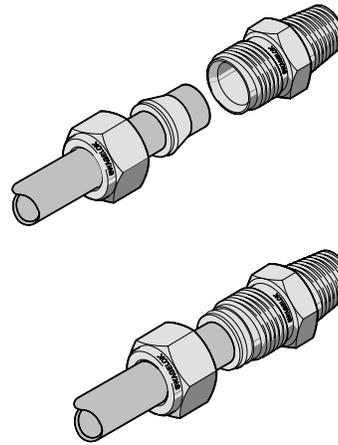


Fig. 15 Installing Preswaged Assembly into Fitting Body

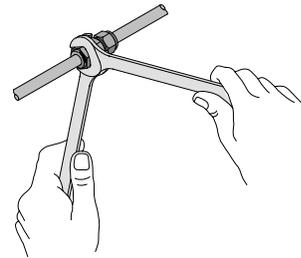


Fig. 16 Tighten Nut with Wrench

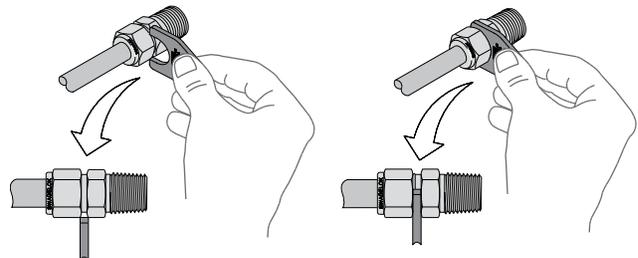


Fig. 17 Using the Gap Inspection Gauge

## Maintenance

### 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.

### 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.



Fig. 18 Cycle Counter

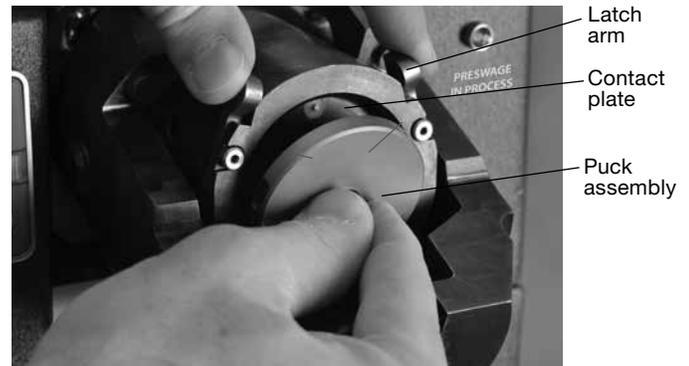


Fig. 19 Puck and Contact Plate

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



Fig. 20 Removing Clips from Retainer Shaft



Fig. 21 Applying Lubricant to Retainer Shaft

### Connector Shaft

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



*Fig. 22 Applying Lubricant to Connector Shaft*

### 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.
4. Repeat steps 1 through 3 for the other pin.



*Fig. 23 Applying Lubricant to Latch Pins*

## HVSU ON/OFF Switch Lamp Replacement

Follow these steps to replace the ON/OFF switch lamp.



### WARNING



**Touching live electrical parts can cause fatal electric shock and severe burns.**

**To avoid injury:**

1. Properly unplug the power cord. Grasp the plug to remove it from the receptacle.
2. Disconnect the air connection from the back of the unit.



### CAUTION

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

3. Vent all air pressure by turning the regulator handle as far counterclockwise as it will go.
4. Disconnect the air connection from the back of the unit.
5. Remove eight (8) screws from the HVSU top cover (4 on right side; 4 on left side) using a Torx 25 screwdriver. Fig 24.
6. Use handle and pull top cover off **gently**.

### NOTICE

Avoid pulling on wire harness attached to the top cover. Fig 25.

7. Lay top cover on the left side of the HVSU on a clean surface free of debris. Fig 25.
8. Locate latch on the lamp holder and push away from the side of the cover. Fig 26.
9. Carefully pull lamp holder out of switch housing.
10. Lightly push in bulb while also gently twisting counterclockwise (CCW) to remove bulb.
11. Lightly push in new bulb while also gently twisting clockwise to replace bulb. Opposite of Fig 27.
12. Put bulb back into switch housing and align lamp holder so latch can be pushed back toward cover to its original position. Ensure lamp holder is secure in the switch housing.
13. Install top cover. Thread right side screw nearest the front until the head just touches the cover. See "square" in Fig 24.
14. Thread and fully tighten the screws on the left side directly across from the first screw. Finish tightening the right side screws, then install the rest of the screws in any order.
15. To operate the HVSU, follow the setup and operating instructions in this manual.



Fig. 24 Remove screws from top cover

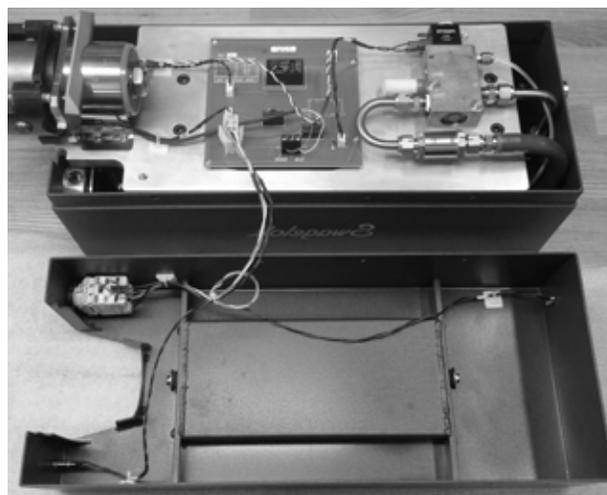


Fig. 25 Top cover off

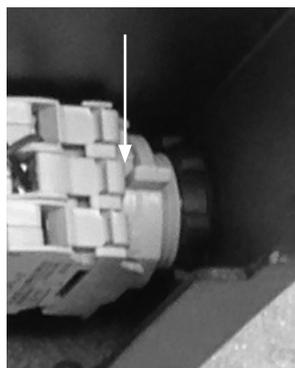


Fig. 26 Locate latch on the lamp holder



Fig. 27 Push and twist bulb CCW to remove.

## 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>⚠ NOTICE</b> <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>⚠ NOTICE</b> <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>⚠ NOTICE</b> <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 representative for additional assistance.

## Tooling Ordering Information

### Tooling Kit

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.

Nominal Tube Size	Tooling 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 as needed.

Nominal Tube 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 as needed.

Nominal Tube Size	Puck Assembly Ordering Number
1/4 in.	MS-HVSU-PCK-ASM-400 <sup>①</sup>
3/8 in.	MS-HVSU-PCK-ASM-600
1/2 in.	MS-HVSU-PCK-ASM-810
6 mm	MS-HVSU-PCK-ASM-400 <sup>①</sup>
8 mm	MS-HVSU-PCK-ASM-8M
10 mm	MS-HVSU-PCK-ASM-10M
12 mm	MS-HVSU-PCK-ASM-810

<sup>①</sup> Puck assembly for 1/4 in. and 6 mm sizes shares the same ordering number.

### Spacers

Spacers can be reordered individually as needed.

Nominal Tube Size	Spacer Ordering Number
1/4 in.	MS-HVSU-SPC-400 <sup>①</sup>
3/8 in.	MS-HVSU-SPC-600
1/2 in.	MS-HVSU-SPC-810
6 mm	MS-HVSU-SPC-400 <sup>①</sup>
8 mm	MS-HVSU-SPC-8M
10 mm	MS-HVSU-SPC-10M
12 mm	MS-HVSU-SPC-810

<sup>①</sup> Spacer for 1/4 in. and 6 mm sizes shares the same ordering number.

## 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.

 **WARNING**

**Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.**

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