Synflex Assembly Equipment and Accessories



Synflex Swaging Machines

SST and Mark IX

Designed to Attach Synflex Permanent Fittings to Synflex Hose

- Synflex swaging equipment produces smooth, uniform fitting surfaces, without raised edges or ridges common in other fitting methods.
- Complete range of fitting swaging pushers and dies up to -16 size are ordered separately.



SST Portable Hand Swager

Part No.: 4530-01002

- · Portable hand operated machine for field assembly
- Frame can be attached to bench vise or directly to a table with separate mounting bracket
- Weight: 3.6 kgs (8 lbs)



SST Portable Hand Swager Carrying Case

Part No.: 45J0-05600



Mark IX Swager

Part No.: 45J0-05600

- Fully automatic opens dies to release completed assembly
- Fast actuation capable of five-second cycle time
- Three power supply options for a broad range of production needs
- For heavy duty, continuous high-speed production needs the Mark IX can be equipped with a high capacity power unit (see option three below)
- Weight: 59.4 kgs (131 lbs)

Option 1 (Part No.: 4530-009S0)

1HP, 60Hz,115/208/230V single-phase motor; medium duty

Option 2 (Part No.: 4530-009S1)

1HP, 60 Hz,230/460V three-phase motor; medium duty

Option 3 - A & B (Part No.: 453C-00020 and Part No.: 4530-009S4)

• (A) Mark IX machine without standard power supply.

Part No.: 4530-009S4

• (B) Commercial-duty hydraulic power unit with 5HP,

three-phase 230/460V motor, five-gallon reservoir, 4.1 GPM displacement. Part No.: **453C-00020**

Synflex Swaging Machines

Tools and Accessories



Pushers

Pusher selection is based on fitting end design chosen from assembly. Pusher part numbers are listed in the fitting tables on pages H12-15.

Example

To attach a -06 (3/8-inch) hose to a -06 female JIC/SAE 37° swivel fitting (90306-065500), use pusher part number 4599-FP015.



Dies

Swaging dies are applied in paired sets. Die selection is based on hose series and size. Die part numbers are listed in hose selection chart, page H12-15.

Example:

To attach fitting 90306-065500 to a 3130-06 hose, die part number 4540-306 is utilized.



Die and Pusher Storage Rack

Part No.: 45J0-03401

- Rack holds twelve pushers and eight dies
- 16-gauge welded steel frame
- Wall mount or bench top
- Dimensions: 19 inches wide; 22-1/2 inches high; extends 3 inches from mounting surface

Hose Accessories

Hose Guards/Bend Restricters, Protective Sleeving

Hose and Spring Guards

- Fitting-to-hose interface protection
- Made from high-grade, spring steel wire
- Guards provide protection against hose kinking at fittings
- Spring-type guards hand screw to the fitting shell to form a single unit assembly



Hose Part Number	Part Number
3R30-04, 3800-04, 3130-04, 37AL-04, 30CT-04	4521-91005
3130-05, 37AL-05, 30CT-05	4521-90005
3R30-06, 3R80-04	4521-92005
3R30-03, 3800-03, 3130-03, 37AL-03	4521-AG004
3800-06, 3130-06, 37AL-06	4521-94005
30CT-06, 3R80-06	4521-AA005

Plastic Protective Coil Sleeve

- Fitting-to-hose interface protection
- A convenient and economical way to protect hose and tubing lines
- Can be installed after hose assembly is made
- Lightweight
- Order in multiples of 20-ft (6m) lengths.



Hose Part Number	Part Number
3130-02	4554-04000
3R30-03, 3800-03, 3130-03, 3630-03, 37AL-03	4554-06000
3R30-04, 3130-04, 3630-03, 37AL-04, 30CT-04	4554-07000
3R30-06, 3800-04, 3440-04, 34PW-04, 3130-05, 3R80-03, 37AL-05, 30CT-05	4554-08000
3440-06, 34PW-06, 3130-06, 3R80-04, 37AL-06, 30CT-06	4554-10000
3R30-08, 3800-06, 3130-08, 3R80-06, 37AL-08, 30CT-08	4554-12000
3800-08, 3440-08, 34PW-08, 3R80-08	4554-14000
3130-12, 3R80-12, 3440-10, 34PW-10, 3630-12	4554-16000
3440-12, 34PW-12	4554-19000
3R80-16, 3440-16, 34PW-16	4554-22000

Hose Guards/Bend Restricters (continued)

Vinyl Hose Guards

- Assembly abrasion protection and support
- Use when a non-metallic guard is required. Guard assembly may require the use of lubricant on the hose
- Available in 15.2m (50-ft) lengths
- Note: 4513-05
 30m (100-ft) lengths



Hose Part Number	Part Number	Guard I.D.	Guard O.D.	
3R30-04, 3440-04, 34PW-04, 3130-04, 3R80-03, 37AL-04, 30CT-04	4513-04000	9/16	13/16	
3R30-06, 3440-06, 34PW-06, 3130-06, 3R80-04, 37AL-06, 30CT-06	4513-05000	11/16	1-1/16	
3R80-06	4513-06000	15/16	1-13/14	
3R80-08, 3800-08	4513-10000	15/16	1-5/16	
3130-12, 3R80-12	4513-11000	1-3/16	1-11/16	

Molded Black PVC Hose Guards

- Assembly abrasion protection and support
- Protects against wear when a stiffer, non-metal guard is preferred
- Hand-held use, keeps hose from kinking at fitting



Hose Part Number	Part Number	Guard I.D. A	Length L
30CT-04, 3R30-04, 3630-04, 3130-04, 3580-04, 3R80-03, 3800-04, 37AL-04	45J0-04801	.55	6.0
30CT-06, 3R30-06, 3630-06, 3130-06, 3580-06, 3R80-04, 3800-06, 37AL-06	45J0-04802	.69	7.0

Clamps

Plastic-covered clamps to secure hose



Hose Part Number	Part Number	bolt hose Size (in)
3130-02	45J0-00201	13/32
3130-03, 3630-03, 3800-03, 37AL-03	45J0-00202	13/32
3130-04, 3630-04, 3800-04, 37AL-04, 30CT-04	45J0-00204	13/32
3R80-03, 3130-05, 37AL-05, 30CT-05	45J0-00203	13/32
3R80-04	45J0-00205	13/32
3130-06, 3630-06, 3800-06, 37AL-06, 30CT-06	45J0-00206	13/32
3R80-06, 3130-08, 3630-08, 3800-08, 37AL-08, 30CT-08	45J0-00207	13/32
3R80-08	45J0-00208	13/32
3130-12	45J0-00209	13/32
3R80-12, 3630-12	45J0-00210	17/32
3R80-16	45J0-00212	17/32

Tools & Accessories

Hand-Held Hose Cutter

Part No. 4523-04006

 Handy tool for cutting Synflex hose 1/8-inch to 1/2-inch in diameter. Blades are replaceable. Vinyl cushioned grips.

Replacement Blade

Part No. 4523-04005



Multi-Line Hose Separation Tool

Part No. 4573-00000

• Designed for Separation of tri-, quad- and five-line

Replacement Blades

Part No. 4573-01000



Swage Lubricant

Part No. 4545-01001

· Lubricant for use in the assembly of Synflex reusable and permanently attached stainless steel fittings.



Vise Blocks

Part No. 4504-00000

• 3/16-inch through 1/2-inch hose

Part No. 4504-01000

3/4-inch and 1-inch hose.



Used in making assemblies.

Twin-Line Hose Separation Tool

Part No. 4574-01000

· Designed for separating Twin-Line hose



Part No. 4574-02000 (set of 10)



Part No. 4574-03000-XXX



Insertion Depth Marker Part No. 45J0-04603



Synflex De-Twinner Die Reference Chart (4574-03000-xxx)

Hose Product	Die* No.
3R30-03	027
3R30-04	003
3R30-06	010
3R30-08	013
3130-02	001
3130-03	002
3130-04	004
3130-05	800
3130-06	011
3130-08	013
3160-03	002
3160-04	004
3160-05	800
3160-06	011
3160-08	013

Hose Product	Die* No.
37AL-03	002
37AL-04	003
37AL-05	007
37AL-06	010
37AL-08	013
30CT-04	003
30CT-05	022
30CT-06	011
30CT-08	014
3360-03	002
3360-04	004
3360-05	023
3360-06	024
3360-08	025

Hose Product	Die* No.
3R80-04	009
3R80-06	012
3R80-08	015
3E80-04	009
3E80-06	012
3E80-08	015
3V10-03	005
3V10-04	016
3V10-06	017
3VEO-03	005
3VEO-04	016
3VEO-06	017

Hose Product	Die* No.
3840-03	018
3840-04	019
3840-06	020
3840-08	021
35NG-03	004
35NG-04	026
35NG-06	012
35NG-08	015
3V20-04	016
3V20-06	017
3251-08	006
31DW-04	005

Selection, Installation and Maintenance of Synflex Hose and Assemblies

Proper hose selection, installation and maintenance practices should be followed to ensure that hose and hose assemblies have long life and operate safely. Failure to consider these practices could result in unplanned down-time, damage or injury. The general industry practices assembled below are provided as a guide for hose selection, installation and maintenance. Careful consideration for applying these practices is recommended.

Pressure

Determine the maximum operating system pressure and select a hose that will have a maximum working pressure equal to or in excess of the operation system's maximum pressure. It is very important to take into account surge pressures that may be higher than normal operating pressures.

Temperature

Determine the maximum and minimum operating temperatures and select a hose that is designed for use within this temperature range. Consider transient thermal conditions resulting from startup, heat build up from idling, etc. Special protection from hot equipment may be required.

Chemical and Environmental Resistance

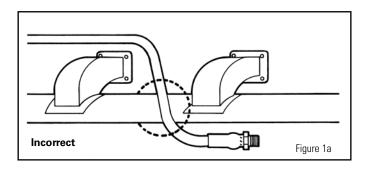
Determine the type and concentration of the fluids and chemicals that will come in contact with the hose core tube I.D. and hose cover. Refer to the hose and tubing sections with product descriptions to identify the types of polymers used to form the core tube and cover. With this information, locate the compatibility rating of the combination of chemicals and/or fluids with the polymer type described in the Chemical Resistance data on pages I12-13. Contact Eaton technical support to request data for chemicals and conditions not listed.

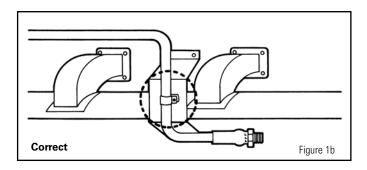
Size

Select the proper I.D. based on system requirements such as fluid flow rate or velocity. The hose selection nomograph on page I4 can help determine the hose I.D.

Electrical Conductivity

Each hose application should be evaluated for the importance of selecting a hose designed to prevent flow of electrical current (e.g. aerial hydraulics) or a hose designed to sufficiently conduct static electricity to safe ground connections. The conducting hose design requires special conducting fittings which should be selected along with the hose.





Component Inspection

Prior to installation, inspect hose for I.D. obstruction or damage such as blisters, looseness or cracks in the hose cover and evidence of having been kinked. Check fittings for thread damage or bent fitting components.

Routing

Many problems can be avoided by installing hose and hose assemblies away from hot equipment such as exhaust manifolds. Insulating heat shields may be necessary in some cases (Figure 1).

Selection, Installation and Maintenance of Synflex Hose and Assemblies

Minimum Bend Radius

Tight bends (Figure 2) that exceed the hose minimum bend radius should be avoided. Spring guards or stress relief sleeves may be required to protect against exceeding prescribed minimum bend radii.

Torsional Flexing

When equipment parts exhibit relative motion, hose connections should be located so hoses bend instead of twist.

Fitting Connections

Follow the fitting installation instructions provided in this catalog or enclosed with assembly equipment and described in product standards. Attach only the fittings specified for each hose design and do not mix components that are produced by different manufacturers. Proper fitting end selection is very important to eliminate twists and kinks in installed assemblies when connecting fittings to port connections. Swivel fittings are designed to allow for the hex rotation during tightening and bent tube or elbow fittings can eliminate kinks (Figure 3).

Torque Wrench Application

Use torque values where specified when tightening fitting connections to prevent leakage and damage.

Final Check Out

After components are assembled, purge entrapped air and pressurize system to maximum operating pressure. Inspect for leaks and proper function. Perform electrical conductivity tests on designs serving as static electricity discharge paths.

It is important that designers and users consider hose and hose assemblies as having a finite life. Therefore maintenance and replacement is usually necessary at specific intervals.

Maintenance Interval

Frequency of maintenance inspection should be determined by the system designer as well as user feedback based on the severity of the application, including service life data and risk potential.

Maintenance Program

Recommended maintenance should include the following steps as minimum practice:

Leakage

Turn off equipment and bleed down pressures prior to inspection to minimize risk to personnel. Inspect the full length of the hose and fitting connections for leaks.

Damage

Inspect hose for cuts, abrasion, cracks, blisters, kinked or crushed areas, heat degradation or cover looseness at the port or hose connection. Inspect hose guards for damage.

Electrical Continuity

In applications requiring the hose assembly to conduct static electricity to a ground connection, test hose assemblies using a megohmeter in accordance with recommended procedures described on the permanently attached tag.

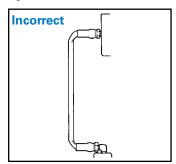
Replacement

Hose and/or assembly replacement should be considered at specific intervals under normal conditions. If leakage, loss of conductivity (when required), fitting separation and/or signs of damage are detected, the hose assembly should be replaced immediately.

Hose Routing

Under pressure, a hose may change in length. Always provide some slack in the hose to allow for this shortening or elongation. However, excessive slack in hose lines may cause poor appearance (Figure 4).

Figure 2



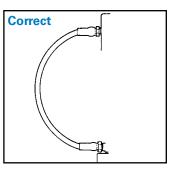
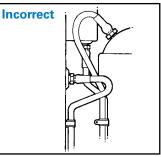


Figure 3



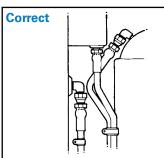
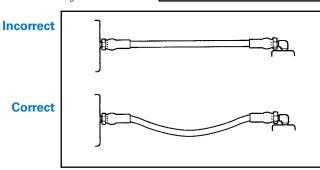


Figure 4



How to Assemble Permanent Hose Fittings

Synflex Mark IX Swaging Machine

Permanent Fitting Chart Insertion Depth Table

Fitting Series Insertion Depth (in)	
903, 90H, 90L 90A, 90N	906
9/16	-
25/32	-
1-1/16	7/8
1-1/8	-
1-1/4	1-1/4
1-1/2	1-1/2
1-9/16	-
1-11/16	-
2-1/16	-
	903, 90H, 90L 90A, 90N 9/16 25/32 1-1/16 1-1/8 1-1/4 1-1/2 1-9/16 1-11/16



 Cut hose squarely with handheld hose cutter 4523-04006 or bench-mounted hose cutter 4523-04007.



 Mark hose for proper insertion depth into fitting. Use insertion depth chart or use insertion depth marker 45J0-04603.



3. Oil inside hose diameter with SAE 20 oil.

Consult Eaton's Technical Support for oxygen system special assembly recommendations.



4. Insert hose into fitting to depth mark. (Use vise block 4504-00000 or 4504-01000 and rubber mallet to ease assembly.)



Insert the specified die and pusher into the swaging machine.



 Lubricate die swaging surface with SAE 90 gear oil. For stainless steel fittings use swage lubricant 4545-01001.



7. Insert hose end into the pusher.



8. Pull control lever and guide fitting into the die until the pusher bottom is against the top of the die surface.



 Push control lever to retract pusher and open die halves. Remove swaged hose assembly.

Permanent Fitting Chart Insertion Depth Table

Fitting Series Insertion Depth (in)

Hose I.D. (in)	903, 90A, 90H, 90L,90N	906
1/8	9/16	1
3/16	25/32	-
1/4	1-1/16	7/8
5/16	1-1/8	-
3/8	1-1/4	1-1/4
1/2	1-1/2	-
5/8	1-9/16	-
3/4	1-11/16	-
1	2-1/16	-



 Cut hose squarely with handheld hose cutter 4523-04006 or bench-mounted hose cutter 4523-04007.



 Mark hose for proper insertion depth into fitting. Use insertion depth chart or use insertion depth marker 45J0-04603.



Lubricate inside hose diameter with SAE 20 oil.

Consult Eaton's Technical Support for oxygen system special assembly recommendations.



 Insert hose into fitting to depth mark. (Use vise block 4504-00000 or 4504-01000 and rubber mallet to ease assembly.)



5. Insert the specified pusher with the pusher retainer in the raised position. Fingertighten retaining screw to hold pusher firmly in place. Pusher must be allowed to rotate freely.



6. Place one die half into the base plate. Lightly oil the inner surface of both die halves with SAE 90 gear oil. For stainless steel fittings use swage lubricant 4545-01001.



7. Insert the assembled hose and fitting through the base plate and firmly into the pusher cavity. Place the other die half in base and lock into place by swinging clamps down firmly against top of dies. Rotate ball screw until fitting reaches the die.



8. With handle provided or 1-1/8 socket and ratchet, rotate screw clockwise until pusher bottom contacts top of die. Maintain pressure on ball screw and release die clamps. Slowly release pressure and rotate ball screw counterclockwise until it is clear of the die. Remove swaged assembly.

Reusable Fitting Chart Insertion Depth Table

	Fitting Series Insertion Depth (in)	
Hose I.D. (in)	902, 904, 908	
1/8	21/32	-
3/16	27/32	27/32
1/4	1	7/8
5/16	1-3/32	1-1/8
3/8	1-3/16	1-1/4
1/2	1-5/16	1-1/2
3/4	1-1/4	1-11/16
1	1-11/16	-



 Cut hose squarely with hand-held hose cutter 4523-04006 or benchmounted hose Cutter 4523-04007.



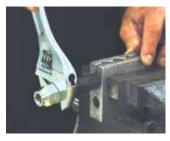
Use the table (to the right) to establish the length of hose that is inserted into the fitting socket. Use a rule for measurement and mark the hose with a colored pencil.



3. Insert hose into vise blocks (4504-0000 or 4504-01000) and tighten to hold hose firmly in place.



4. Lightly lubricate the outer surface of the hose to make it easier to push the fitting over the hose. For mild steel fittings and standard hose, use SAE 20 motor oil. For stainless steel fittings use swage lubricant 4545-01001*.



5. Push fitting socket over the lubricated hose and screw socket on by hand counterclockwise until the socket end is even with the depth mark. The end of the hose should be 3/32 inch to 1/16 inch from the inner shoulder of the fitting socket. It should NOT be bottomed against the shoulder. Do not over-tighten.



- 6. Remove hose and fitting assembly from vise block.
- Place fitting socket in the vise and lubricate the mating fitting threads.



8. Screw the fitting insert clockwise into the socket with a wrench until the bottom of the inserted hex contacts the socket shoulder. Do not over-tighten.

How to Separate Twin Line & Multi-Line Hose

Synflex De-Twinner Die Reference Chart (4574-03000-xxx)

Hose Product	Die* No.	
3R30-03	027	
3R30-04	003	
3R30-06	010	
3R30-08	013	
3130-02	001	
3130-03	002	
3130-04	004	
3130-05	800	
3130-06	011	
3130-08	013	
3160-03	002	
3160-04	004	
3160-05	800	
3160-06	011	
3160-08	013	
37AL-03	002	
37AL-04	003	
37AL-05	007	
37AL-06	010	

Hose Product	Die* No.	
37AL-08	013	
30CT-04	003	
30CT-05	022	
30CT-06	011	_
30CT-08	014	_
3360-03	002	_
3360-04	004	
3360-05	023	
3360-06	024	
3360-08	025	_
3R80-04	009	-
3R80-06	012	
3R80-08	015	_
3E80-04	009	_
3E80-06	012	
3E80-08	015	_
3V10-03	005	_
		_
3V10-04	016	_
3V10-06	017	_

Hose Product	Die* No.
3VEO-03	005
3VEO-04	016
3VEO-06	017
3840-03	018
	* * *
3840-04	019
3840-06	020
3840-08	021
35NG-03	004
35NG-04	026
35NG-06	012
35NG-08	015
3V20-04	016
3V20-06	017
2251.00	006
3251-08	006
31DW-04	005

*Die number stamped on end.

Instructions for using the Twin-Line Hose Separation Tool

CAUTION: Tool Contains a Sharp Blade. Do Not Put Your Hands or Objects Inside the Tool.



1. The De-Twinner tool 4574-01000 is designed to split twinned hose without any damage to the hose. Selecting the proper die is critical to operating this tool safely. The proper die can be selected from the provided chart. Customer service can assist in proper die selection. The hose should fit snugly in the die without extra play.



2. To insert the die into the tool, first remove the retainer pin. This pin should also fit snugly to prevent the die from moving. DO NOT REACH INTO THE TOOL OR PUSH ANYTHING THROUGH THE TOOL TO REMOVE THE DIE! The die extends out one side of the tool to allow ease of removal. Set the tool on its side with the long end of the die pointing up. Remove the die. Insert the new die from the same side and reset the pin.



- Insert the assembled tool
 with die into a proper holding
 fixture (vise or other) and set
 stop at appropriate distance.
 The tool is cutting 2" before
 the exit end of the tool.
- 4. Apply a water soluble lubricant to the end of the first piece of product to be cut and slide it through the tool to the appropriate stop. Apply a few drops of lubricant to the end of each hose to be cut just before cutting. This will ease the cutting force and prolong blade life.

Blade Replacement



- Replacement blades are available from Eaton performance plastics.
- Use proper protective gear (cut resistant gloves) when replacing the blade. This blade is very sharp.
- Remove blade retainer nut and slide out blade retainer bolt. Tip tool over and the blade should fall out from the top. DO NOTTRY TO REMOVE IT FROM THE SLOT, THE MATERIAL SLIDES THROUGH.
- Insert new blade, bolt and nut.
 Tighten the locking nut only to the point that the bolt rotates as the product is cut. If it is too tight the blade and bolt will wear out prematurely.
- The blade will last for thousands of cuts if properly installed and the operating procedures are followed correctly.

Instructions for using the Twin-Line Hose Separation Tool





1. Remove the hose separation knife (4573-00000) from the handle and place in a vise at a 45° angle to the top of the vise. Fasten securely in the vise jaws.





2. Measure and mark the distance to be separated.





3. Lightly lubricate the hoses on both sides at the connecting web with a soap solution or lubricating oil. This step reduces friction between the knife blade and hose cover surfaces, plus keeps the knife centered during the cutting step.







4. Push the hose into the "V" notch on the knife blade using a rocking motion to start the hoses into the blade.

How to Separate Twin Line & Multi-Line Hose

(continued)







5. Hold the hoses together and aligned with the blade while first pushing then pulling them to the mark, taking care not to cut the hose covers.





6. Wipe lubricant from the hose.





7. Examine the hose cover material where the hoses were attached to ensure they have not been cut, or the reinforcement fiber exposed. If the hose covers shows signs of damage, the hose assembly should not be placed in service. If no damage is apparent, proceed with normal hose assembly.