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Internal Elastomeric Swage Fittings & Tools

Where performance in high pressure, high temperature applications are required, Eaton provides engineered mechanically attached fittings for critical aerospace applications. These fittings were developed to meet the demands of the aerospace industry as a cost-effective, lightweight alternative to brazing, welding, or other mechanically attached tube joints. Eaton's sleeves and unions provide a proven concept of internal swage attachments and reliable, critical performance in aerospace applications.

Advantages of Internal Swaging

Internal swaging is a mechanical method for the attachment of fittings to tubing. This is accomplished by forming rigid tubing outward into grooves within the fitting. The following advantages can be realized from this technique.

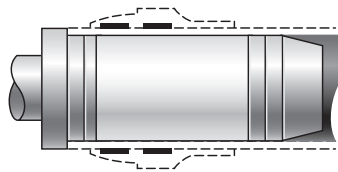
- No special tube end preparation (cleaning or sizing)
- Very rapid fabrication (less than 20 seconds to install)
- No X-ray inspection required
- Reduces scrap rate
- Improved fatigue performance vs. braze
- No heat-affected zones or heat-induced distortion
- No stress-relieving required

These advantages can result in significant installed cost savings. The use of Eaton internal swage fittings is ideally compatible with CAD/CAM systems for tube assembly production. Mechanical attachment at room temperature is a plus in situations where flammability is a concern.

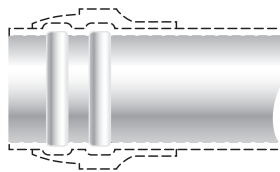
Fitting Features

- Fittings are made of high-strength alloys and standard aircraft materials (15-5 CRES, 7075 AL, 6AL-4V Ti)
- Flared fitting with machined metal sealing surface eliminates tube flare cracking
- Flared fittings use a 2-angle face which results in a line-contact seal allowing up to 4° angular misalignment
- Various fitting styles are available which are compatible with all fitting systems in use today
- Lipseal fittings provide excellent sealing due to a flexible beam surface plus maximum fitting interface clearance
- Available in sizes from 1/4" (6.35 mm) through 1-1/2" (38 mm).

Internal Swaging Technique



Before swaging, with drawbolt/expander assembly inserted



After swaging, with tube formed into fitting grooves

Cannot Be Over Torqued

Over torquing can damage the conventional MS sleeve and deform the fittings. Usually, this requires costly replacement of the entire tube assembly. Eaton's sleeve incorporates a shoulder which contacts the end of the fitting. This mechanical stop prevents damage to the sleeve from over torquing.

Permits Use of Virtually Any Tubing

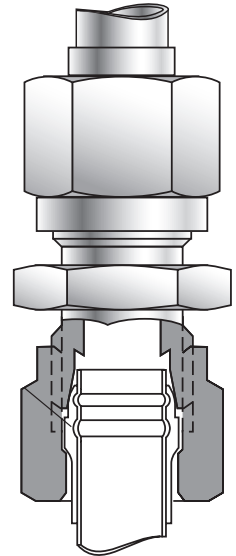
The conventional MS sleeve must "bite" into the tubing O.D. for attachment and to effect a seal, restricting its use to softer tubing materials. Eaton's sleeve is attached by swaging, i.e. expanding the tubing into annular grooves within the sleeve. Almost any tubing material, hardness and thickness can be used, including the new lightweight, high strength, thin-wall tubes.

Requires Less Torque

The close tolerances and fine surface finishes on Eaton's sleeves result in "zero leakage" even when torqued to as low as two-thirds the recommended value for MS fittings. This provides an additional margin for safety and ensures a leak-free joint every time.

Out Performs Conventional MS Fittings

Major aerospace manufacturers have extensively tested Eaton's sleeve to AS18280B. In all cases, performance of the sleeve surpassed conventional MS sleeves giving leak-proof service without re-torquing.



MS Fittings with Eaton Sleeve

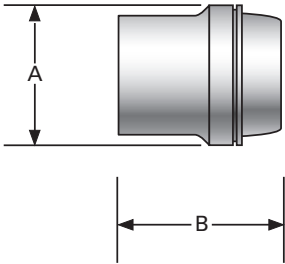
Internal Elastomeric Swage Sleeves

35235 Flareless Sleeve

Dimensions: inches/mm

Tube Size	OD A	Length B
-04	0.37/9.3	0.55/13.9
-05	0.44/11.1	0.64/16.2
-06	0.49/12.4	0.67/17.0
-08	0.67/17.0	0.77/19.5
-10	0.79/20.0	0.82/20.8
-12	0.96/24.8	0.75/19.0
-16	1.21/30.7	0.80/20.3
-20	1.47/37.3	0.79/20.0
-24	1.72/43.6	0.79/20.0

Ref: NSA855034 (Airbus),
BACS13BX (Boeing)



Material Call-out

V	15 - 5PH CRES Per AMS 5659	Passivate Per AMS-2700, Type II
GV*	7075 - T73 Al. Aly. Per QQ-A-225/g	Anodize per AMS-A-8625, Type II, Color Brown, Class 2
GC*	7075-T73 Al. Aly. Per QQ-A-225/g	Chemical Film Coat Per AMS-C-5541, Class 1A
VN	15-5PH CRES Per AMS5659	Cadmium plate per AMS-QQ-P-416, Type II, Class 3
VG	15-5PH CRES Per AMS5659	Passivated with machining finish of 16μ on the sealing surface

*The GV and GC do not apply to the 35235 sleeves

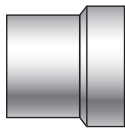
How To Order

Part Number Example:

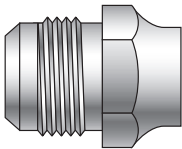
35066	VN	08	
			Tube Size (.500 Tube O.D.)
			Material Code: (15-5PH CRES/CAD. Plate)
			Basic Part Number

Other available configurations include:

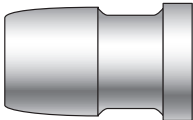
34012 Sleeve, Flared



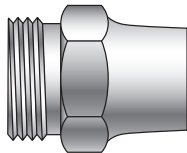
34020 Union, Flared



35247 Lipseal Assembly



35252 Lipseal, Male

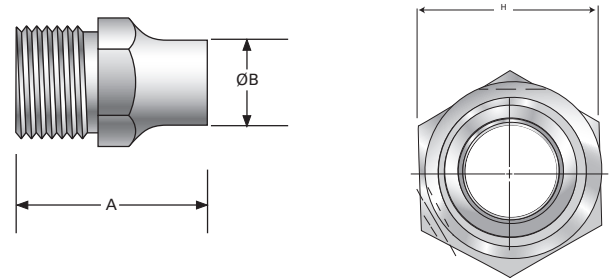


35056 Flareless Union

Dimensions: inches/mm

Size Dash No.	Tube O.D.	A	ØB	Hex	(T) Thread Class 3A MIL-S-8879
-04	0.25/6.3	0.97/24.6	0.28/7.1	0.44/11.1	.4375 - 20 UNJF
-06	0.38/9.6	1.09/27.6	0.41/10.4	0.56/14.2	.5625 - 18 UNJF
-08	0.50/12.7	1.27/32.2	0.54/13.7	0.75/19.0	.7500 - 16 UNJF
-10	0.63/16.0	1.42/36.0	0.68/17.2	0.88/22.3	.8750 - 14 UNJF
-12	0.75/19.0	1.35/34.2	0.82/20.8	1.06/26.9	1.0625 - 12 UNJ
-16	1.00/25.4	1.50/38.0	1.06/26.9	1.31/33.2	1.3125 - 12 UNJ
-20	1.25/31.7	1.58/40.1	1.35/34.2	1.63/41.4	1.6250 - 12 UNJ
-24	1.50/38.0	1.63/41.4	1.60/40.6	1.88/47.7	1.8750 - 12 UNJ

Ref: BACU24AB (Boeing)



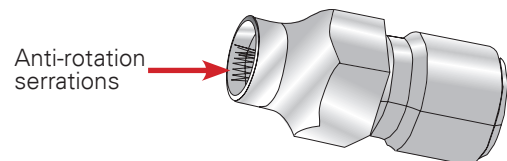
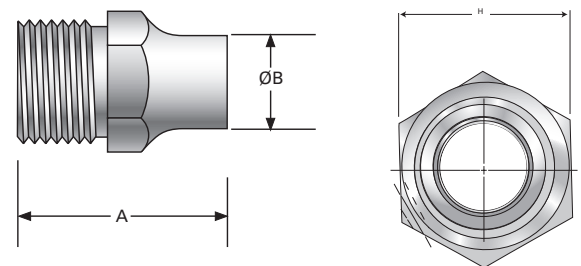
35066 Flareless Union

Dimensions: inches/mm

Size Dash No.	Tube O.D.	A	ØB	Hex Flats	(T) Thread Class 3A AS8879
-04	0.25/6.3	0.97/24.6	0.31/7.8	0.44/11.1	.4375 - 20 UNJF
-05	0.31/7.8	1.05/26.6	0.38/9.6	0.50/12.7	.5000 - 20 UNJF
	0.38/9.6	1.09/27.6	0.45/11.4	0.56/14.2	.5625 - 18 UNJF
-08	0.50/12.7	1.27/32.2	0.58/14.7	0.75/19.0	.7500 - 16 UNJF
-10	0.63/16.0	1.42/36.0	0.73/18.5	0.88/22.3	.8750 - 14 UNJF
-12	0.75/19.0	1.35/34.2	0.86/21.8	1.06/26.9	1.0625 - 12 UNJ
-16	1.00/25.4	1.37/34.7	1.11/28.1	1.31/33.2	1.3125 - 12 UNJ
-20	1.25/31.7	1.37/34.7	1.36/34.5	1.62/41.1	1.6250 - 12 UNJ
-24	1.50/38.0	1.61/40.8	1.61/40.8	1.87/47.4	1.8750 - 12 UNJ

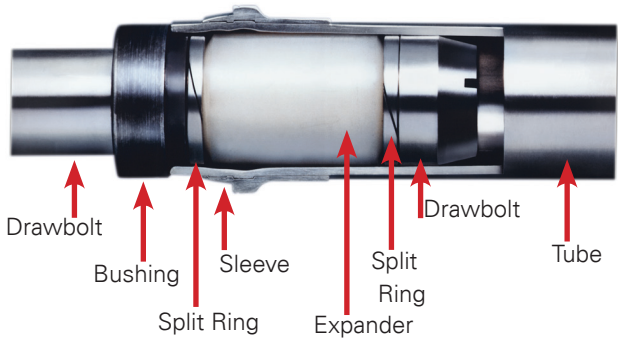
Ref: NSA855010 (Airbus)

35066 fitting includes internal anti-rotation serrations



Internal Elastomeric Swaging Tools and Equipment

Elastomeric Swage



Portable Hand-Operated Kits

Hand Swage Tools

- Compact
- Easy-to-operate
- Portable hand swage equipment is available for use in the laboratory, on the flight line or at repair bases
- Also available with electric pump

Model 5175
Portable Hand Swage Head
1/4" (6.3) – 5/8" (40.6) tube



Model 5720
Portable Hand Swage Head
3/4" (19.0) – 1 1/2" (38.0) tube



Swage Jaw Sets



Drawbolt Assembly



Model 7150K
Electric Pump
(115V)



Model 5919
Gauge



Anvil



Two-Groove Sleeve

Manually Swage Sleeves to Tubing in Seconds

The following illustrations show Eaton's manual swage heading operation. Full size production equipment also available.

1. Install anvil to swage head.



2. Install draw bolt assembly.



3. Insert the tubing and sleeve into the tooling head and install swage jaws.



4. After selecting proper swaging pressure, use the hand pump to complete the attachment in seconds.



5. Finished attachment. Sleeve is permanently swaged to tubing.



Automatic Power Swage Machine

- For high volume production use
- Completely automatic
- Operator loads, swages and unloads
- Tooling can be changed in seconds
- Practically all tubing materials (including titanium), all hardnesses and wall thicknesses can be swaged

For Hydraulic System Use

Model 6520—Accommodates tubing diameters from 1/4" (6.3) through 3/4" (19.0)

Model 6530—Accommodates tubing diameters from 3/4" (19.0) through 1-1/2" (38.0)

Model 5420A—Combines two swaging heads which operate independently and accommodates tubing diameters from 1/4" (6.3) through 1-1/2" (38.0)



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