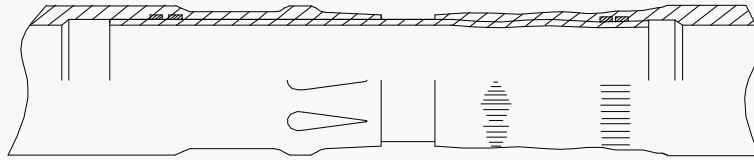


EXTERNALLY SWAGED FITTING



DESIGN CONCEPT

The Externally Swaged fitting was originally developed by McDonnell Douglas (prior to become Boeing) who granted the manufacturing authority to Airdrome Precision Components. Another supplier gave the same fitting a tradename Permaswage.

After the patent was expired in 1991, Airdrome Precision Components improved the fitting design concept by lower the fitting yield strength slightly to increase significantly broader fitting application for use on softer tubing materials and/or thinner tube wall. It has also enhanced swaging tool life.

The unique geometric of the fitting design has a body and tail connected by a thinner wall mid section. It creates a flexible tail to absorb vibration and bending in flight conditions while static sealing takes place in the body section.

Externally Swaged fittings were designed for permanently assembled onto tubing by crimping with swaging tool. Each fitting offers .300 of an inch for tube insertion tolerance that minimizes pre-stress caused by stack-up tolerances during hydraulic line installation. This advantage can also be utilized by installing a union for repair of small tube defects less than .300 of an inch.

Fitting materials are available in Aluminum Alloy, Cres and Titanium for use with various tubing materials. Each fitting tail I.D. is coated with Teflon for lubrication to enhance stress relief on fitting joints under bending or vibration conditions. The Teflon finish is also colored differently for fitting material identification and surface protection purposes. For 3,000 psi rated fittings: Green Teflon is coated on inside and outside of Aluminum Alloy and inside of Cres fittings only, black Teflon is coated on inside and outside of Titanium fittings. For 4,000 psi rated fittings: Blue Teflon is coated on inside and outside of Titanium fittings.

Each fitting end has two internal grooves for baked on silicone seal. Double silicone seal is required on Aluminum Alloy fittings for use on Aluminum Alloy tubing. Single silicone seal is sufficient on Cres and Titanium fittings for use on Cres and Titanium Alloy tubing. It is however, recommended that optional double silicone seal (to add suffix code Y in part number) should be used on all fittings.

DESIGN ADVANTAGES:

- Sealing efficiency eliminates unnecessary down time and high repair cost.
- Large tube insertion tolerance minimizes pre-stress within hydraulic systems.
- Ext-Swage fittings are easy to install either in production or field repair.
- Ext-Swage fittings are compatible for use with Boss, Flared, Flareless and Beam Seal separable fitting ends.

STANDARD PROCUREMENT SPECIFICATION FOR EXTERNALLY SWAGED FITTINGS

SAE AS4459 specification defines Form, Fit, Function and Procurement requirements for Ext-Swage fittings.

QUALIFICATION AND APPROVAL STATUS

Airdrome fittings were qualified to meet SAE AS18280 & AS4459, MIL-F-18280 & MIL-F-85421 and Boeing 27D0001 & BPS-F-142 specifications. The fittings are approved for use in various military and commercial programs at AIDC, CASA, Boeing, Bombardier, Cessna, Lockheed, Textron Marine, etc.

FITTING MATERIAL SELECTION

The 3000 psi rated Adapters and Permanent Ext-Swage fittings are offered in the following materials for use with various tubing materials, fluid and operating temperature:

MATERIAL AND CODING

Titanium	Code T	Indicates commercially pure Titanium per AMS4921.
Cres	Code -	Indicates 21-6-9 per AMS5656 not to exceed 65,000 psi yield strength.
Aluminum Alloy	Code D	Indicates 6061-T6 per QQ-A-225/8 except overaged to 23,000 and 33,000 psi yield strength.

COMPATIBILITY OF FITTING AND TUBING MATERIALS **(Recommended tube wall per AS18280, AS4459, MIL-F-18280 & MIL-F-85421)** **(Fitting Code) (Tubing material)**

T	Titanium Alloy 3AL-2.5V per AMS4944 or similar.
-	Titanium Alloy 3AL-2.5V per AMS4944 or, Cres 21-6-9 per AMS5561 or, Cres 304 1/8 Hard per MIL-T-6845 or, Aluminum Alloy 6061-T6 per MIL-T-7081 or similar.
D	Aluminum Alloy 6061-T6 per MIL-T-7081 or similar.

TOOLING

Deutsch D12xxx or DLT tooling designed for swaging fittings to meet as qualified fitting performance swages all fittings. Established Form, Fit and Function of all supplier's fittings are fully defined and controlled by Boeing (formally McDonnell Douglas) and other major worldwide OEM specifications.

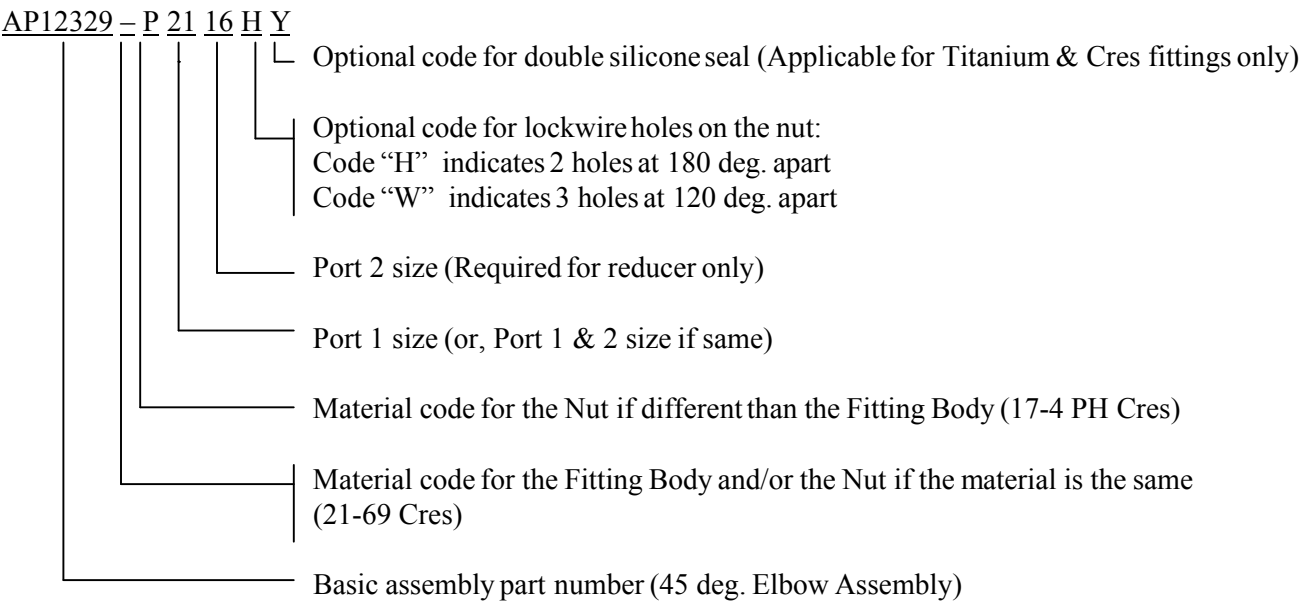
SIZE AND MATERIAL VERSUS OPERATING PRESSURE

Fitting/tubing operating pressures vary according to size and material. The following shows standard size range and corresponding operating pressures:

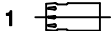
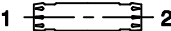

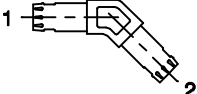

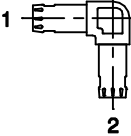
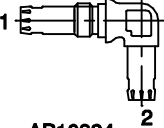
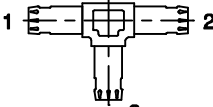
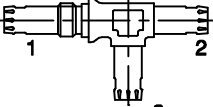
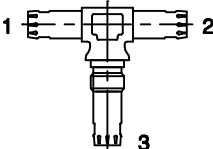
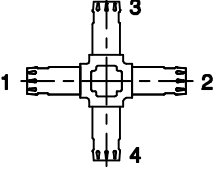
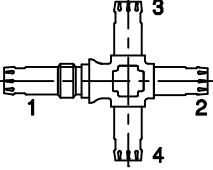
FITTING SIZE	TUBE O.D.	OPERATING PRESSURE (psi) PER FITTING MATERIAL	
		Titanium & Cres	Alum Alloy
03	3/16	3000	1000
04	1/4	3000	1000
05	5/16	3000	1000
06	3/8	3000	1000
08	1/2	3000	1000
10	5/8	3000	1000
12	3/4	3000	1000
16	1	3000	1000
20	1-1/4	3000	1000
24	1-1/2	2000	1000

Note: Beam Seal port size callout for tube O.D. 1-1/4 & 1-1/2 shall be 21 & 25 respectively.

EXAMPLE OF PART NUMBER FOR ORDERING FITTINGS



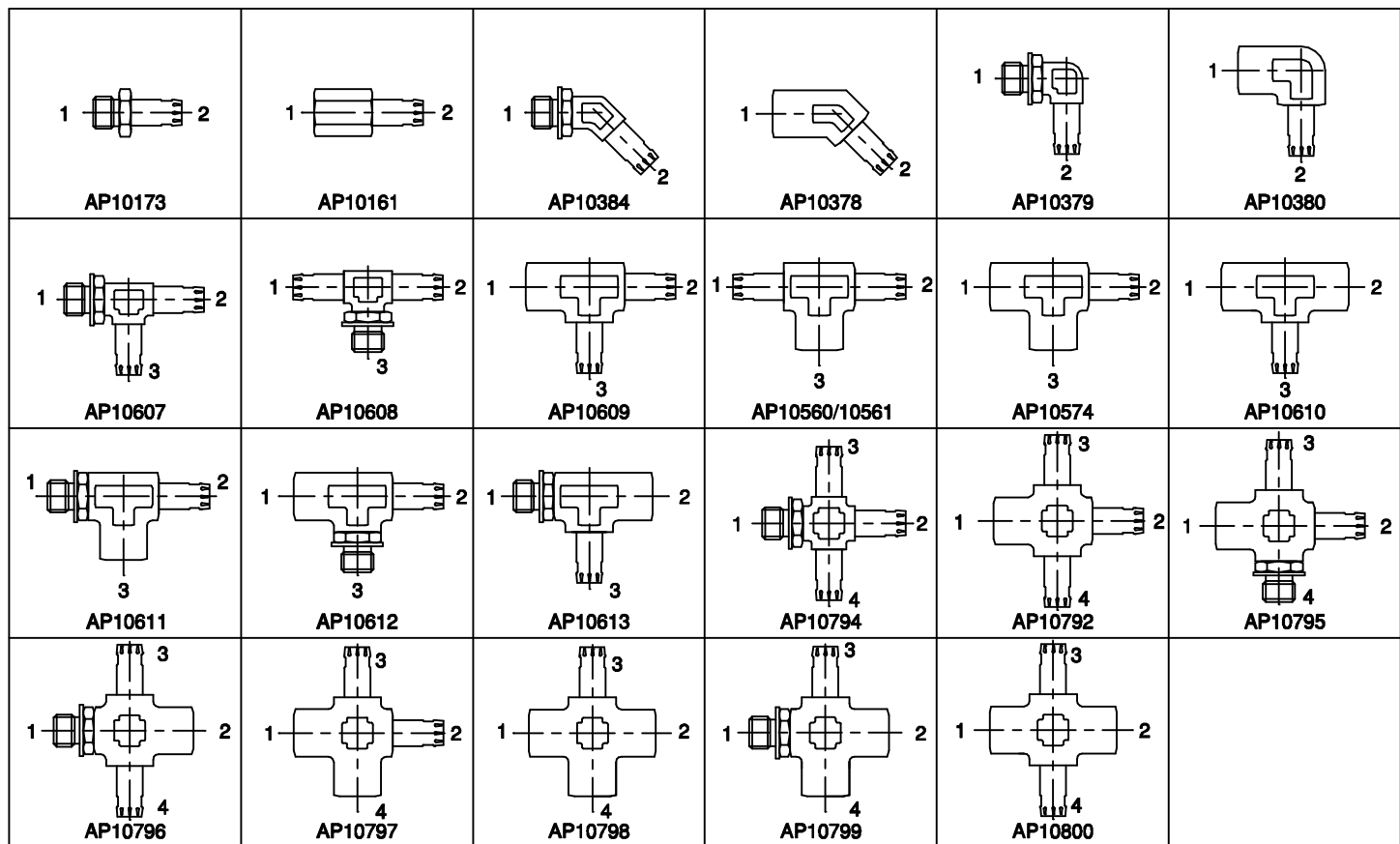
Note: Contact Airdrome Precision Components for special fitting configuration, material and/or size not listed in this catalog.

 <p>AP10145</p>	 <p>AP10100</p>	 <p>AP10116 AP10122 AP10136 AP10148</p>	 <p>AP10358</p>	 <p>AP10336 AP10338 AP10339</p>	 <p>AP10101</p>
 <p>AP10334 AP10362</p>	 <p>AP10102</p>	 <p>AP10584</p>	 <p>AP10586</p>	 <p>AP10103</p>	 <p>AP10783</p>

**3000 psi rated Ext-Swage Fittings
and Equivalent Industry Standards**

Fitting Shape	Port Sequence for Airdrome Part No. only (See Example of Part No.)				Airdrome Standard	Aerospace Standard
	1	2	3	4		
Cap	S				AP 10145	
Straight	S	S			AP 10100	AS5008
	S	B			AP 10116 AP 10122 AP 10136 AP 10148	
45 deg. Elbow	S	S			AP 10358	
	B	S			AP 10336 AP 10338 AP 10339	
90 deg. Elbow	S	S			AP 10101	AS5009
	B	S			AP 10334 AP 10362	
Tee	S	S	S		AP 10102	AS5010
	B	S	S		AP 10584	
	S	S	B		AP 10586	
Cross	S	S	S	S	AP 10103	AS5011
	B	S	S	S	AP 10783	

Note: 1. S = Ext-Swage port, B = Bulkhead Ext-Swage port.



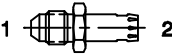
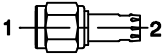

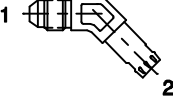
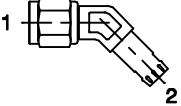
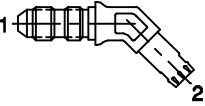
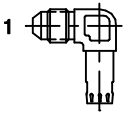
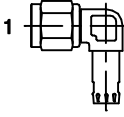
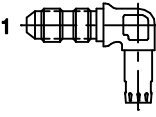
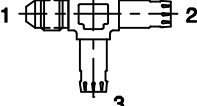
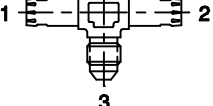
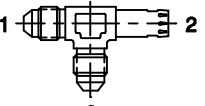
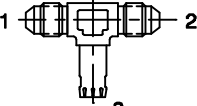
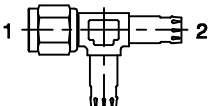
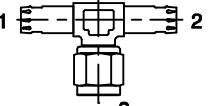
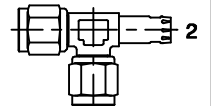
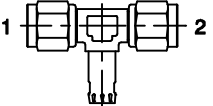
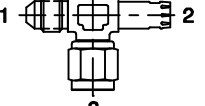
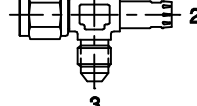
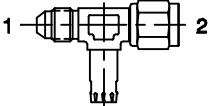
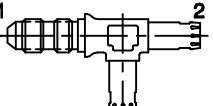
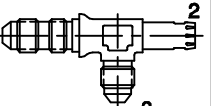
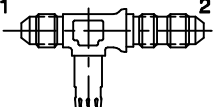
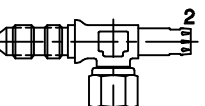
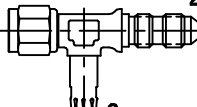
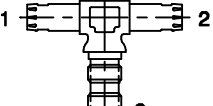
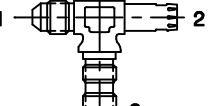
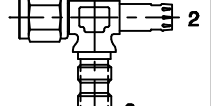
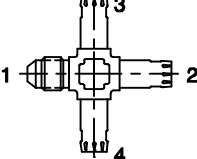
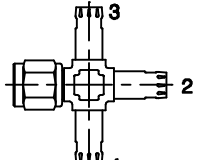
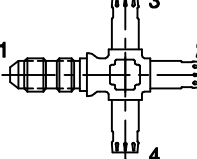


Adapters for 3000 psi rated Ext-Swage to Boss Fittings

Fitting Shape	Port Sequence for Airdrome Part No. (See Example of Part No.)				Airdrome Standard
	1	2	3	4	
Straight	M	S			AP 10173
	F	S			AP 10161
45 deg. Elbow	M	S			AP 10384
	F	S			AP 10378
90 deg. Elbow	M	S			AP 10379
	F	S			AP 10380
Tee	M	S	S		AP 10607
	S	S	M		AP 10608
	F	S	S		AP 10609
	S	S	F		AP 10560
					*AP 10561
	F	S	F		AP 10574
	F	F	S		AP 10610
	M	S	F		AP 10611
	F	S	M		AP 10612
Cross	M	F	S		AP 10613
	M	S	S	S	AP 10794
	F	S	S	S	AP 10792
	F	S	S	M	AP 10795
	M	F	S	S	AP 10796
	F	S	S	F	AP 10797
	F	F	S	F	AP 10798
	M	F	S	F	AP 10799
	F	F	S	S	AP 10800

Notes: 1. F = Female Boss port, M = Male Boss port,
S = Ext-Swage port.



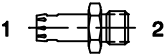
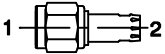
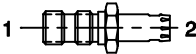
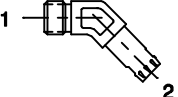
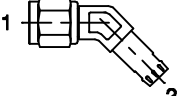
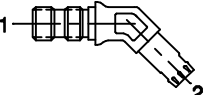
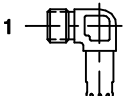
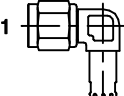
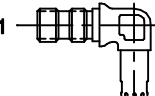
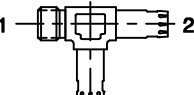
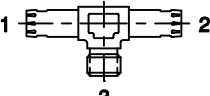
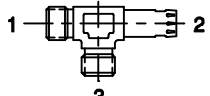
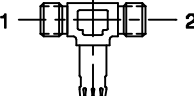
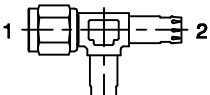
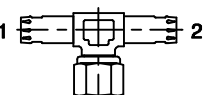
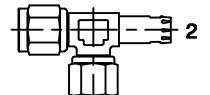
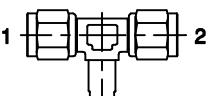
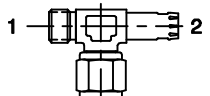
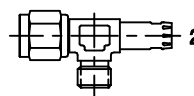
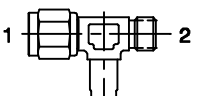
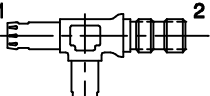
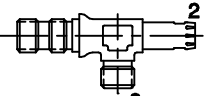
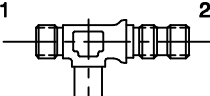
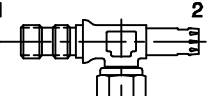
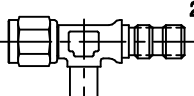
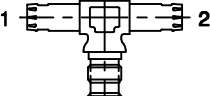
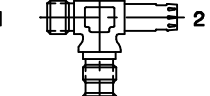
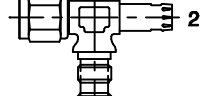
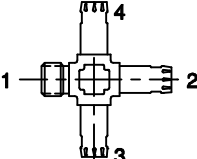
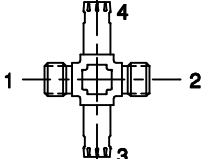
2. * = A different part number assigned for reducers.

					
AP10006	AP10107	AP10108	AP10174	AP10109	AP10373
					
AP10352	AP10374	AP10371	AP10325	AP10351	AP10614
					
AP10550	AP10588	AP10615	AP10593	AP10590	AP10616
					
AP10617	AP10618	AP10589	AP10587	AP10594	AP10620
					
AP10621	AP10623	AP10624	AP10591	AP10619	AP10622
					
AP10801	AP10802	AP10803			

Adapters for 3000 psi rated Ext-Swage to 24 deg. Flareless Fittings

Fitting Shape	Port Sequence for Airdrome Part No. only (See Example of Part No.)				Airdrome Standard	Aerospace Standard
	1	2	3	4		
Coupling Nut					AP10006	
Sleeve	F	S			AP10106	
Straight	S	M			AP10110 *AP10121	AS5013
	F	S			AP10123 * AP10151	AS5267
	B	S			AP10105	
45 deg. Elbow	M	S			AP10356	
	F	S			AP10353	
	B	S			AP10335	
90 deg. Elbow	M	S			AP10329	
	F	S			AP10327	
	B	S			AP10331	
Tee	M	S	S		AP10559	
	S	S	M		AP10552	
	M	S	M		AP10580	
	M	M	S		AP10625	
	F	S	S		AP10567	
	S	S	F		AP10566	
	F	S	F		AP10582	
	F	F	S		AP10626	
	M	S	F		AP10568	
	F	S	M		AP10595	
	F	M	S		AP10562	
	S	B	S		AP10554	
	B	S	M		AP10628	
	M	B	S		AP10629	
	B	S	F		AP10631	
	F	B	S		AP10632	
	S	S	B		AP10553	
	M	S	B		AP10627	
	F	S	B		AP10630	
Cross	M	S	S	S	AP10778	
	M	M	S	S	AP10781	

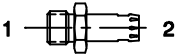
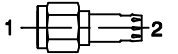
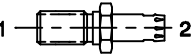
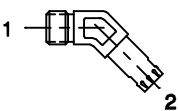
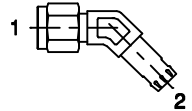
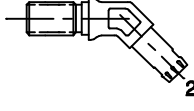
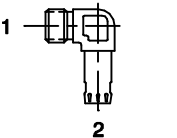
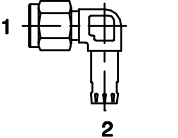
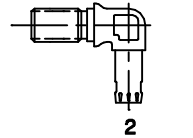
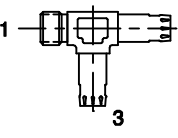
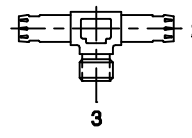
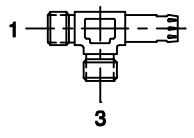
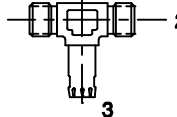
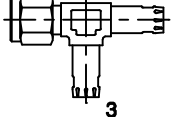
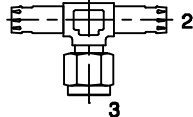
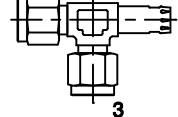
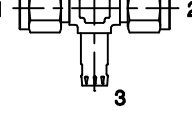
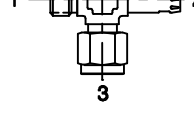
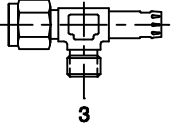
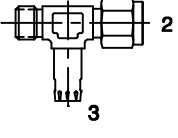
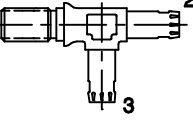
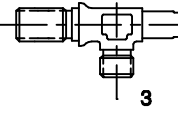
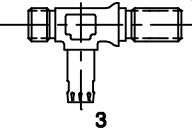
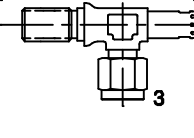
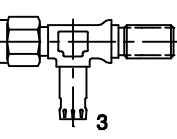
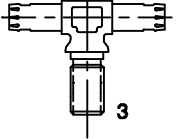
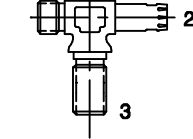
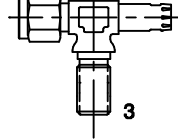
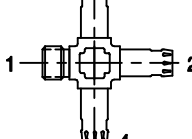
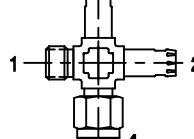
Notes: 1. F = Female 24 deg. Flareless port,
M = Male 24 deg. Flareless port,
B = Bulkhead 24 deg. Flareless male port,
S = Ext-Swage port.
2. * = A different part number assigned for reducers.

					
AP10006	AP10106	AP10110/AP10121	AP10123/AP10151	AP10105	AP10356
					
AP10353	AP10335	AP10329	AP10327	AP10331	AP10559
					
AP10552	AP10580	AP10625	AP10567	AP10566	AP10582
					
AP10626	AP10568	AP10595	AP10562	AP10554	AP10628
					
AP10629	AP10631	AP10632	AP10553	AP10627	AP10630
					
AP10778	AP10781				

Adapters for 3000 psi rated Ext-Swage to 37 deg. Flared Fittings

Fitting Shape	Port Sequence for Airdrome Part No. only (See Example of Part No.)				Airdrome Standard	Aerospace Standard
	1	2	3	4		
Coupling Nut Sleeve					AP10006	
	F	S			AP10107	AS5012
Straight	M	S			AP10108	
	F	S			AP10174	AS5266
	B	S			AP10109	
45 deg. Elbow	M	S			AP10373	
	F	S			AP10352	
	B	S			AP10374	
90 deg. Elbow	M	S			AP10371	
	F	S			AP10325	
	B	S			AP10351	
Tee	M	S	S		AP10614	
	S	S	M		AP10550	
	M	S	M		AP10588	
	M	M	S		AP10615	
	F	S	S		AP10593	
	S	S	F		AP10590	
	F	S	F		AP10616	
	F	F	S		AP10617	
	M	S	F		AP10618	
	F	S	M		AP10589	
	M	F	S		AP10587	
	B	S	S		AP10594	
	B	S	M		AP10620	
	M	B	S		AP10621	
	B	S	F		AP10623	
	F	B	S		AP10624	
	S	S	B		AP10591	
	M	S	B		AP10619	
	F	S	B		AP10622	
Cross	M	S	S	S	AP10801	
	F	S	S	S	AP10802	
	B	S	S	S	AP10803	

Note: 1. F = Female 37 deg. Flared port,
M = Male 37 deg. Flared port,
B = Bulkhead 37 deg. Flared male port,
S = Ext-Swage port.

 <p>AP12103</p>	 <p>AP12102</p>	 <p>AP12104</p>	 <p>AP12335</p>	 <p>AP12329</p>	 <p>AP12334</p>
 <p>AP12336</p>	 <p>AP12327</p>	 <p>AP12328</p>	 <p>AP12559</p>	 <p>AP12552</p>	 <p>AP12560</p>
 <p>AP12573</p>	 <p>AP12551</p>	 <p>AP12550</p>	 <p>AP12561</p>	 <p>AP12562</p>	 <p>AP12563</p>
 <p>AP12564</p>	 <p>AP12565</p>	 <p>AP12554</p>	 <p>AP12566</p>	 <p>AP12567</p>	 <p>AP12568</p>
 <p>AP12569</p>	 <p>AP12570</p>	 <p>AP12571</p>	 <p>AP12572</p>	 <p>AP12776</p>	 <p>AP12777</p>

Adapters for 3000 psi rated Ext-Swage to Beam Seal Fittings

Fitting Shape	Port Sequence for Airdrome Part No. only (See Example of Part No.)				Airdrome Standard	Aerospace Standard
	1	2	3	4		
Straight	M	S			AP12103	AS4215
	F	S			AP12102	AS4234
	B	S			AP12104	AS4217
45 deg. Elbow	M	S			AP12335	AS4218
	F	S			AP12329	
	B	S			AP12334	AS4219
90 deg. Elbow	M	S			AP12336	AS4225
	F	S			AP12327	
	B	S			AP12328	AS4226
Tee	M	S	S		AP12559	
	S	S	M		AP12552	
	M	S	M		AP12560	
	M	M	S		AP12573	
	F	S	S		AP12551	
	S	S	F		AP12550	
	F	S	F		AP12561	
	F	F	S		AP12562	
	M	S	F		AP12563	
	F	S	M		AP12564	
	M	F	S		AP12565	
	B	S	S		AP12554	
	B	S	M		AP12566	
	M	B	S		AP12567	
	B	S	F		AP12568	
	F	B	S		AP12569	
	S	S	B		AP12570	
	M	S	B		AP12571	
	F	S	B		AP12572	
Cross	M	S	S	S	AP12776	
	M	S	S	F	AP12777	

Note: 1. F = Female Beam Seal port, M = Male Beam Seal port,
B = Bulkhead Beam Seal male port,
S = 3000 psi rated Ext-Swage port.

FITTING MATERIAL SELECTION

The 4000 psi rated Adapters and Permanent Ext-Swage fittings are offered in the following materials for use with various tubing materials, fluid and operating temperature:

MATERIAL AND CODING

Titanium	Code T	Indicates commercially pure Titanium per AMS4921.
Aluminum Alloy	Code D	Indicates 6061-T6 per QQ-A-225/8 except overaged to 23,000 and 33,000 psi yield strength.

COMPATIBILITY OF FITTING AND TUBING MATERIALS (Recommended tube wall per MIL-F-85421.) (Fitting Code) (Tubing material)

T	Titanium Alloy 3AL-2.5V per AMS4944 or similar.
D	Aluminum Alloy 6061-T6 per MIL-T-7081 or similar.

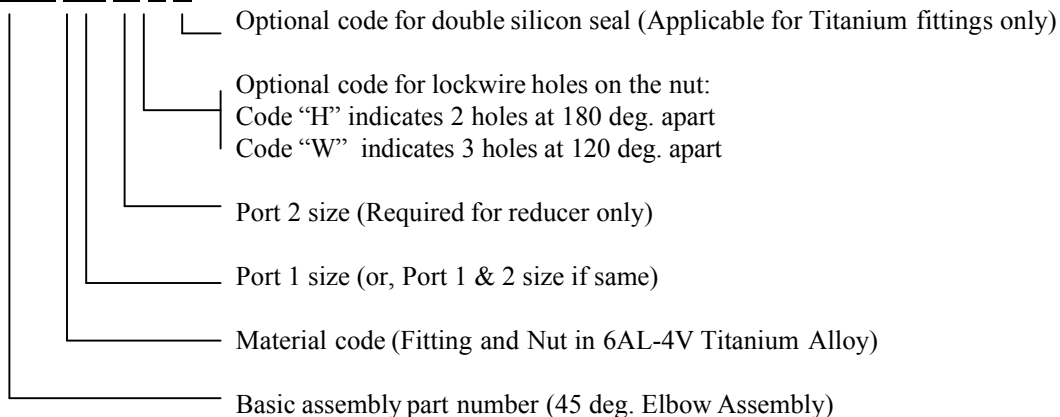
SIZE AND MATERIAL VERSUS OPERATING PRESSURE

Fitting/tubing operating pressures vary according to size and material. The following shows standard size range and corresponding operating pressures:

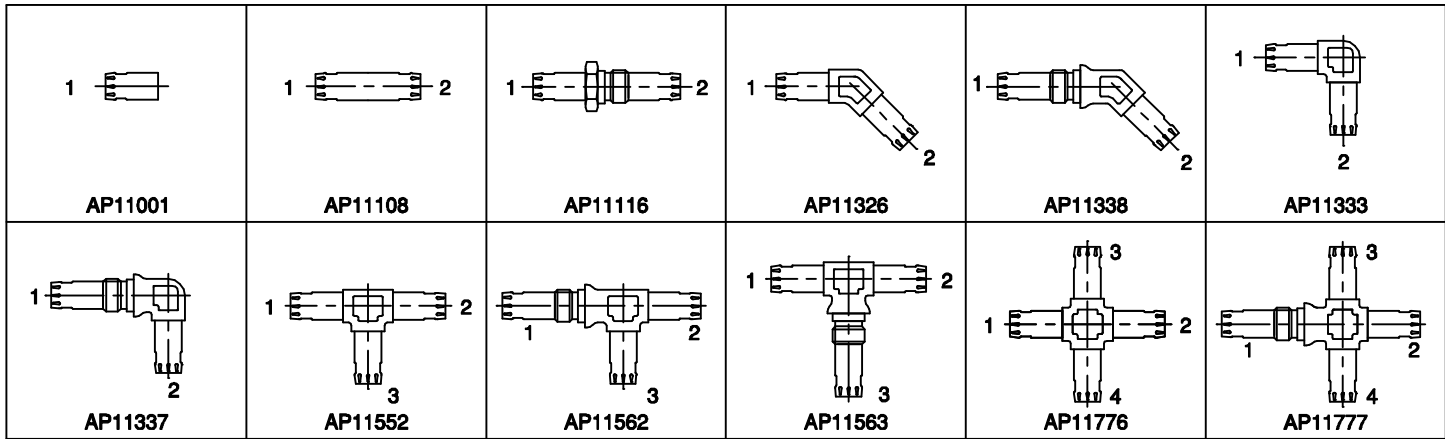
FITTING SIZE	TUBE O.D.	OPERATING PRESSURE (psi) PER FITTING MATERIAL	
		Titanium	Alum Alloy
04	1/4	4000	1000
06	3/8	4000	1000
08	1/2	4000	1000
10	5/8	4000	1000
12	3/4	4000	1000
16	1	4000	1000
20	1-1/4	4000	1000
24	1-1/2	2000	1000

EXAMPLE OF PART NUMBER FOR ORDERING FITTINGS

AP11336 T12 08 H Y



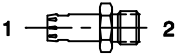
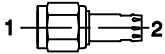
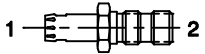
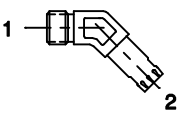
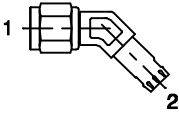
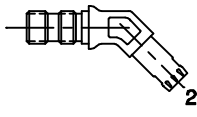
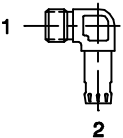
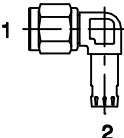
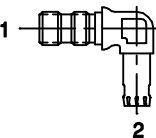
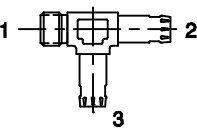
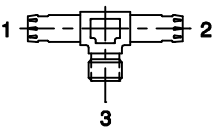
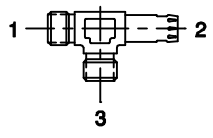
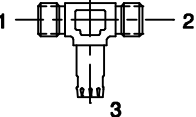
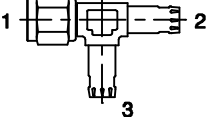
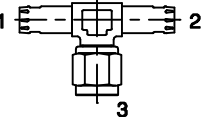
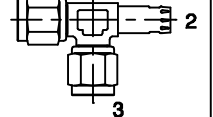
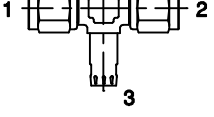
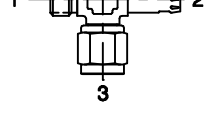
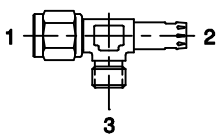
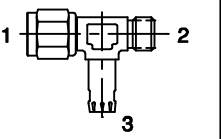
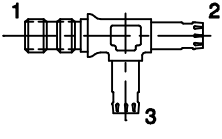
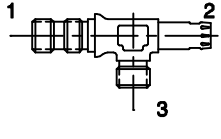
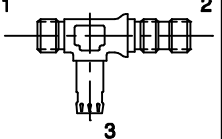
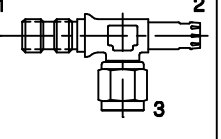
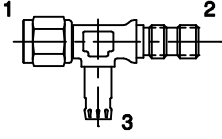
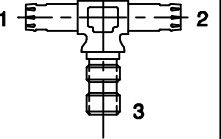
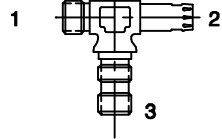
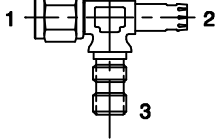
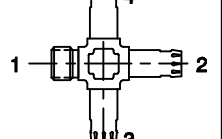
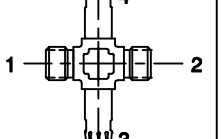
Note: Contact Airdrome Precision Components for special fitting configuration, material and/or size not listed in this catalog.



4000 psi rated Ext-Swage Fittings

Fitting Shape	Port Sequence for Airdrome Part No. only (See Example of Part No.)				Airdrome Standard
	1	2	3	4	
Cap	S				AP 11001
Straight	S	S			AP 11108
	S	B			AP 11116
45 deg. Elbow	S	S			AP 11326
	B	S			AP 11338
90 deg. Elbow	S	S			AP 11333
	B	S			AP 11337
Tee	S	S	S		AP 11552
	B	S	S		AP 11562
	S	S	B		AP 11563
Cross	S	S	S	S	AP 11776
	B	S	S	S	AP 11777

Note: 1. S = Ext-Swage port, B = Bulkhead Ext-Swage port.

 <p>AP11106</p>	 <p>AP11105</p>	 <p>AP11107/AP11110</p>	 <p>AP11339</p>	 <p>AP11336</p>	 <p>AP11332</p>
 <p>AP11334</p>	 <p>AP11331</p>	 <p>AP11335</p>	 <p>AP11558</p>	 <p>AP11555</p>	 <p>AP11564</p>
 <p>AP11565</p>	 <p>AP11556</p>	 <p>AP11553</p>	 <p>AP11566</p>	 <p>AP11567</p>	 <p>AP11568</p>
 <p>AP11569</p>	 <p>AP11560</p>	 <p>AP11557</p>	 <p>AP11561</p>	 <p>AP11570</p>	 <p>AP11571</p>
 <p>AP11572</p>	 <p>AP11554</p>	 <p>AP11573</p>	 <p>AP11574</p>	 <p>AP11778</p>	 <p>AP11779</p>

**Adapters for 4000 psi rated Ext-Swage
to 24 deg. Flareless Fittings**

Fitting Shape	Port Sequence for Airdrome Part No. (See Example of Part No.)				Airdrome Standard
	1	2	3	4	
Staright	S	M			AP11106
	F	S			AP11105
	S	B			AP11107
					*AP11110
45 deg. Elbow	M	S			AP11339
	F	S			AP11336
	B	S			AP11332
90 deg. Elbow	M	S			AP11334
	F	S			AP11331
	B	S			AP11335
Tee	M	S	S		AP11558
	S	S	M		AP11555
	M	S	M		AP11564
	M	M	S		AP11565
	M	S	S		AP11556
	S	S	M		AP11553
	F	S	F		AP11566
	F	F	S		AP11567
	M	S	F		AP11568
	F	S	M		AP11569
	F	M	S		AP11560
	B	S	S		AP11557
	B	S	M		AP11561
	M	B	S		AP11570
	B	S	F		AP11571
	F	B	S		AP11572
	S	S	B		AP11554
	M	S	B		AP11573
	F	S	B		AP11574
Cross	M	S	S	S	AP11778
	M	M	S	S	AP11779

Notes: 1. F = Female 24 deg. Flareless port,
M = Male 24 deg. Flareless port,
B = Bulkhead 24 deg. Flareless male port,
S = 4000 psi rated Ext-Swage port.
2. * = A different part number assigned for reducers.