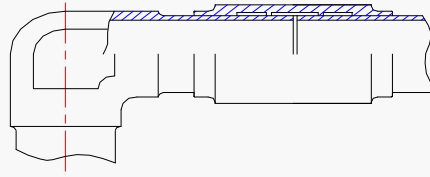


SHAPE MEMORY TUBE FITTING



DESIGN CONCEPT:

Shape Memory is a technology of cryogenic fit concept. Another supplier gave the same fitting a tradename Cryofit. It is a coupling made of Tinel material – half Titanium and half Nickel. The coupling is machined to predetermined dimensions with the I.D. smaller than the tube O.D. Passing a mandrel through the coupling I.D. while submerged in liquid nitrogen at cryogenic temperature will expand the coupling. It will remain as expanded while submerged in liquid nitrogen. When the coupling is installed to couple two pieces of tubing together, it will automatically return to its predetermined dimensions when exposed to room temperature. The shape memory is the result of a change in the crystal structure of the alloy known as reversible austenite to martensite phase transformation.

Shape Memory tube fittings were designed to work with Tinel couplings to provide separable fitting connections in elbow, tee and cross configurations. These fittings were uniquely designed to be compatible for assembly with Tinel couplings on tube ends. Each of these Cryofit joints offers .125 of an inch for tube insertion tolerance that minimize pre-stress caused by stack-up tolerance during hydraulic line installation.

The Shape Memory joints are easy to install. Simply position the coupling on the pre-marked fitting/tubing joint and let the shape memory do the rest of the work within seconds. The coupling material itself accomplishes the crimping leaving no room for human errors. Thus, anticipation of positive sealing in each joint is assured.

DESIGN ADVANTAGES:

- X Positive sealing is assured by constant crimping force of the coupling material over differential tube material resistant strength.
- X Shape Memory fitting joints are easy to install either in production or field repair.
- C No special tooling is required except standard torque wrenches and a pair of tongs.

STANDARD PROCUREMENT SPECIFICATION FOR SHAPE MEMORY TUBE FITTINGS

SAE AS4459 specification defines Form, Fit, Function and Procurement requirements for Shape Memory Tube fittings.

QUALIFICATION AND APPROVAL STATUS

Airdrome fittings were qualified to meet SAE AS18280 & AS4459, Military MIL-F-18280 & MIL-F-85421 and Northrop 37A050 specifications.

The fittings are approved for use in various military programs at Boeing, Northrop/Grumman, Vought, etc.

FITTING MATERIAL SELECTION

The Shape Memory Tube fitting is made out of 6AL-4V Titanium Alloy per AMS4928 or AMS4965 for use on 3AL-2.5V Titanium Alloy tubing per AMS4944 for various fluids and operating temperature.

Recommended tubing wall for fitting installation is per MIL-F-85421.

SIZE VERSUS OPERATING PRESSURE

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

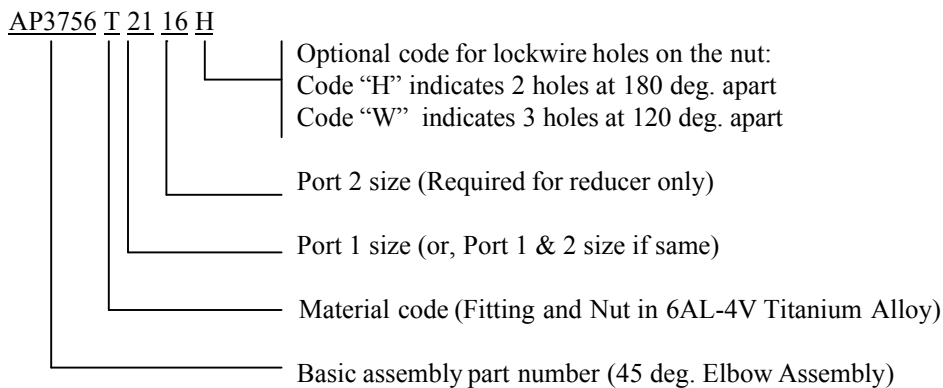
| FITTING SIZE | TUBE O.D. | OPERATING PRESSURE (psi) PER FITTING MATERIAL |
|--------------|-----------|---|
| 04 | 1/4 | 4000 |
| 06 | 3/8 | 4000 |
| 08 | 1/2 | 4000 |
| 10 | 5/8 | 4000 |
| 12 | 3/4 | 4000 |
| 14 | 7/8 | 4000 |
| 16 | 1 | 4000 |
| 20 | 1-1/4 | 4000 |
| 24 | 1-1/2 | 1500 |

Note: Beam/Seal port size callout for tube O.D. 1-1/4 & 1-1/2 shall be 21 & 25 respectively. (See example of part number.)

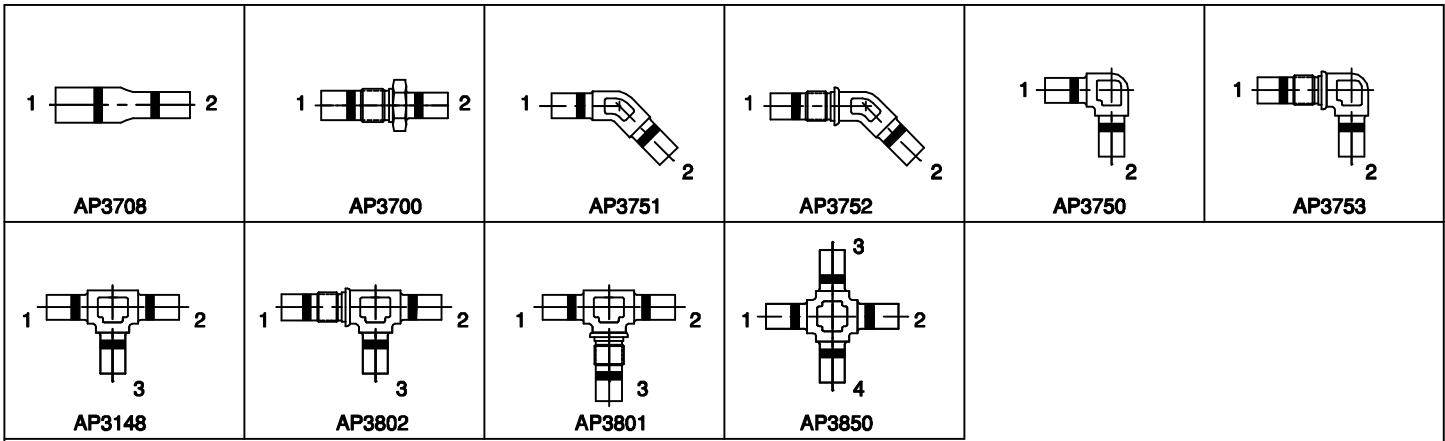
TOOLING

It requires only a pair of tongs, a pair of gloves and a marking pen for fitting installation.

EXAMPLE OF PART NUMBER FOR ORDERING FITTINGS



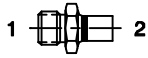

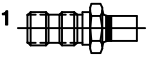
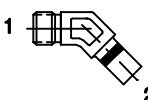
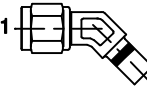
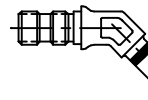
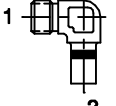
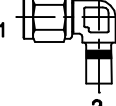
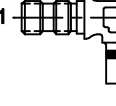
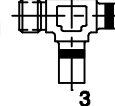
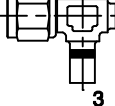
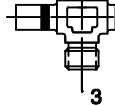
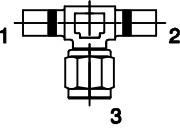
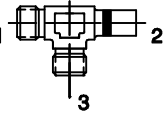
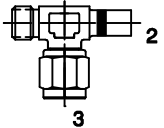
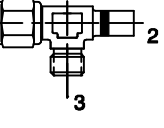
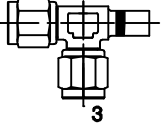
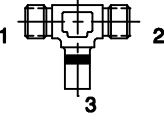
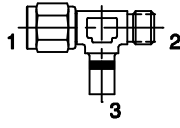
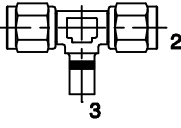
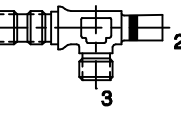
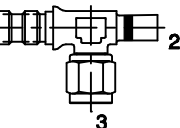
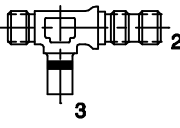
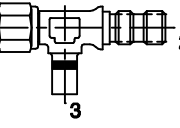
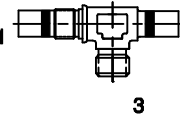
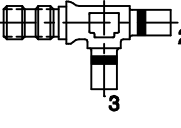
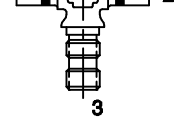
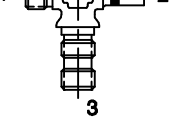
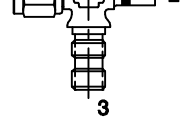
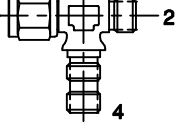
Note: Contact Airdrome Precision Components for special fitting configuration, material and/or size not listed in this catalog.



Shape Memory Tube Fittings

| Fitting Shape | Port Sequence for Airdrome Part No. only (See Example of Part No.) | | | | Airdrome Standard |
|---------------|---|---|---|---|-------------------|
| | 1 | 2 | 3 | 4 | |
| Straight | T | | | | AP 3708 |
| | B | T | | | AP 3700 |
| 45 deg. Elbow | T | T | | | AP 3751 |
| | B | T | | | AP 3752 |
| 90 deg. Elbow | T | T | | | AP 3750 |
| | B | T | | | AP 3753 |
| Tee | T | T | T | | AP 3148 |
| | B | T | T | | AP 3802 |
| | T | T | B | | AP 3801 |
| Cross | T | T | T | T | AP 3850 |

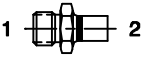

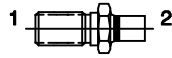
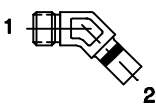
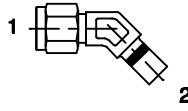
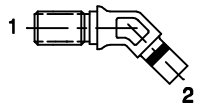
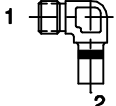
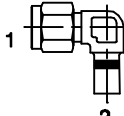
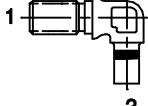
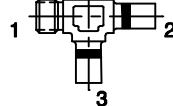
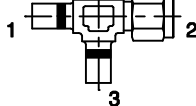
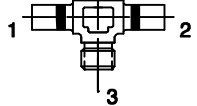
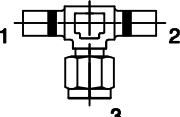
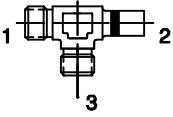
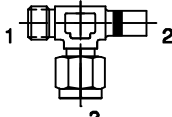
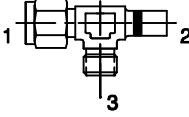
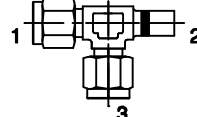
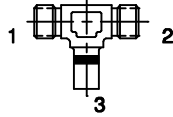
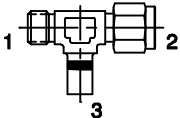
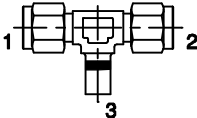
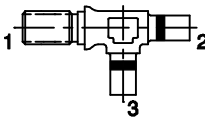
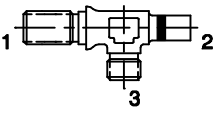
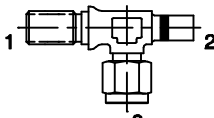
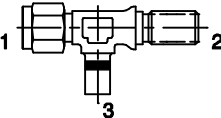
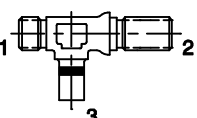
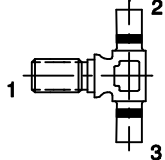
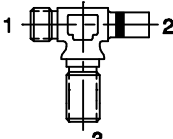
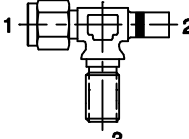
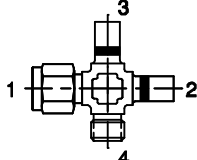
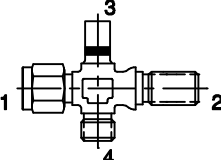
Note: 1. T = Shape Memory Tube port,
 B = Bukhead Shape Memory Tube port.

| | | | | | |
|---|--|---|--|--|--|
|  <p>AP3109</p> |  <p>AP3108</p> |  <p>AP3107</p> |  <p>AP3128</p> |  <p>AP3129</p> |  <p>AP3124</p> |
|  <p>AP3127</p> |  <p>AP3121</p> |  <p>AP3125/AP3126</p> |  <p>AP3154</p> |  <p>AP3149</p> |  <p>AP3152</p> |
|  <p>AP3150</p> |  <p>AP3158</p> |  <p>AP3159</p> |  <p>AP3160</p> |  <p>AP3161</p> |  <p>AP3166</p> |
|  <p>AP3155</p> |  <p>AP3167</p> |  <p>AP3162</p> |  <p>AP3164</p> |  <p>AP3168</p> |  <p>AP3169</p> |
|  <p>AP3156</p> |  <p>AP3153</p> |  <p>AP3157</p> |  <p>AP3163</p> |  <p>AP3165</p> |  <p>AP3861</p> |

**Adapters for Shape Memory
to 24 deg. Flareless Fittings**

| Fitting Shape | Port Sequence for Airdrome Part No. (See Example of Part No.) | | | | Airdrome Standard |
|---------------|---|---|---|--------|----------------------|
| | 1 | 2 | 3 | 4 | |
| Straight | M | T | | | AP3109 |
| | F | T | | | AP3108 |
| | B | T | | | AP3107 |
| 45 deg. Elbow | M | T | | | AP3128 |
| | F | T | | | AP3129 |
| | B | T | | | AP3124 |
| 90 deg. Elbow | M | T | | | AP3127 |
| | F | T | | | AP3121 |
| | B | T | | | AP3125 *AP3126 |
| Tee | M | T | T | | AP3154 |
| | F | T | T | | AP3149 |
| | T | T | M | | AP3152 |
| | T | T | F | | AP3150 |
| | M | T | M | | AP3158 |
| | M | T | F | | AP3159 |
| | F | T | M | | AP3160 |
| | F | T | F | | AP3161 |
| | M | M | T | | AP3166 |
| | F | M | T | | AP3155 |
| | F | F | T | | AP3167 |
| | B | T | M | | AP3162 |
| | B | T | F | | AP3164 |
| | M | B | T | | AP3168 |
| | F | B | T | | AP3169 |
| | B | T | M | | AP3156 |
| B | T | T | | AP3153 | |
| T | T | B | | AP3157 | |
| M | T | B | | AP3163 | |
| F | T | B | | AP3165 | |
| Cross | F | M | T | B | AP3861 |

Notes: 1. F = Female Flareless port, M = Male Flareless port,
B = Bulkhead Flareless or Shape Memory Tube ports,
T = Shape Memory Tube port.
2. * = A different part number assigned for reducers.

| | | | | | |
|--|--|--|--|--|--|
|  <p>AP3712</p> |  <p>AP3709</p> |  <p>AP3701</p> |  <p>AP3768</p> |  <p>AP3756</p> |  <p>AP3754</p> |
|  <p>AP3769</p> |  <p>AP3758</p> |  <p>AP3755</p> |  <p>AP3820</p> |  <p>AP3804</p> |  <p>AP3821</p> |
|  <p>AP3803</p> |  <p>AP3822</p> |  <p>AP3823</p> |  <p>AP3824</p> |  <p>AP3825</p> |  <p>AP3830</p> |
|  <p>AP3831</p> |  <p>AP3832</p> |  <p>AP3807</p> |  <p>AP3826</p> |  <p>AP3828</p> |  <p>AP3834</p> |
|  <p>AP3833</p> |  <p>AP3809</p> |  <p>AP3827</p> |  <p>AP3829</p> |  <p>AP3859</p> |  <p>AP3860</p> |

Adapters for Shape Memory to Beam Seal Fittings

| Fitting Shape | Port Sequence for Airdrome Part No. (See Example of Part No.) | | | | Airdrome Standard |
|---------------|---|---|---|--------|----------------------|
| | 1 | 2 | 3 | 4 | |
| Straight | M | T | | | AP3712 |
| | F | T | | | AP3709 |
| | B | T | | | AP3701 |
| 45 deg. Elbow | M | T | | | AP3768 |
| | F | T | | | AP3756 |
| | B | T | | | AP3754 |
| 90 deg. Elbow | M | T | | | AP3769 |
| | F | T | | | AP3758 |
| | B | T | | | AP3755 |
| Tee | M | T | T | | AP3820 |
| | T | F | T | | AP3804 |
| | T | T | M | | AP3821 |
| | T | T | F | | AP3803 |
| | M | T | M | | AP3822 |
| | M | T | F | | AP3823 |
| | F | T | M | | AP3824 |
| | F | T | F | | AP3825 |
| | M | M | T | | AP3830 |
| | M | F | T | | AP3831 |
| | F | F | T | | AP3832 |
| | B | T | T | | AP3807 |
| | B | T | M | | AP3826 |
| | B | T | F | | AP3828 |
| | F | B | T | | AP3834 |
| | M | B | T | | AP3833 |
| B | T | T | | AP3809 | |
| M | T | B | | AP3827 | |
| F | T | B | | AP3829 | |
| Cross | F | T | T | M | AP3859 |
| | F | B | T | M | AP3860 |

Note: 1. F = Female Beam Seal port, M = Male Beam Seal port,
 B = Bulkhead Beam Seal male port,
 T = Shape Memory Tube port.