

## Test Methods for Tube-Fitting Assemblies

This document is equivalent to MA2094 (ISO 10583).

### FOREWORD

This document has been prepared to standardize on the test methods for qualification of tube-fitting assemblies used in aircraft fluid systems. Compliance with these test methods is necessary for assemblies which are used in systems where a malfunction could affect the safety of flight.

#### 1. SCOPE:

This SAE Aerospace Standard (AS) specifies test methods for fitting assemblies used in aircraft fluid systems in the pressure classes B, D, and E (1500 psi, 3000 psi, and 4000 psi), and in temperature Types I, II, and III (-65 to 160 °F, -65 to 275 °F, and -65 to 400 °F) of AS2001.

This document applies each time that it is referred to in a procurement specification or other definition document.

Fluids and materials used for the tests are listed in Section 2.

#### 2. REFERENCES:

##### 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

ARP603	Impulse Testing of Hydraulic Hose, Tubing and Fitting Assemblies
AS1055	Fire Resistance, Fire Test and Performance Requirements for Flexible Hose and Rigid Tube Assemblies
ARP1185	Flexure Testing of Hydraulic Tubing Joints and Fittings
AS2001	Aerospace Fluid Systems, Pressure and Temperature Classifications
MA2004	Thermal Shock Testing for Piping and Fittings (ISO 6773)

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### 2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

P-D-680	Dry Cleaning Solvent
TT-I-735	Isopropyl Alcohol
TT-S-735	Standard Test Fluids, Hydrocarbon
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-T-5624	Turbine Fuel, Aviation, Grade JP4, JP5/JP8 ST
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-C-81302	Cleaning Compound, Solvent, Trichlorotrifluoroethane
MIL-H-83282	Hydraulic Fluid, Fire Resistant, Synthetic, Hydrocarbon Base, Aircraft
MIL-STD-810	Environmental Test Methods (ISO 7137)

### 2.3 Definitions:

AMBIENT TEMPERATURE: Temperature in the test area or test chamber.

ROOM TEMPERATURE: Temperature in the test laboratory between 15 and 32 °C.

### 3. QUALITY CONFORMANCE INSPECTION PROCEDURES:

Fitting components and assemblies shall be inspected using the normal tools and procedures.

### 4. QUALIFICATION AND PERFORMANCE TEST PROCEDURES:

#### 4.1 Proof Pressure Test:

This test is intended to verify the structural integrity of the fitting assembly prior to its use for other tests or in the production of tube or duct assemblies.

Connect test assemblies to a source of pressure with one end free to move. Bleed all air from the system before any pressure is applied. Proof pressure test at a value as specified by the procurement specification for a minimum period of 3 min. The rate of pressure rise for system pressures of 1500 psi and over shall be 20 000 psi  $\pm$  5000 psi per minute. For system pressures under 1500 psi, the rate shall be 4000 psi  $\pm$  1000 psi per minute. The test shall be conducted at ambient temperature.

#### 4.2 Pneumatic Pressure Test:

This test is intended to verify that the fitting assembly will perform without leakage in pneumatic applications. This test is often used at the start and completion of other tests.

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### 4.2 (Continued):

Solvent clean and air dry test fittings prior to testing. Assemble fittings using a lubricant or compound on the thread and sleeve/nut shoulder (unless they have a solid film lubrication) and tighten to the torques specified in the procurement specification. Pressurize with nitrogen. Maintain the pressure for 3 min while the specimens are immersed in water or suitable oil. Specimens shall be pressure tested at ambient temperature.

WARNING: Conduct pneumatic tests in a special device to protect the operator.

### 4.3 Impulse Test:

This test is intended to verify the service life of a fitting assembly when exposed to hydraulic pressure cycling or pressure surging.

Impulse test the assemblies in accordance with ARP603 Test Type I specimens at ambient temperature and Types II and III at the temperatures and in the sequence specified in ARP603.

### 4.4 Hydrostatic Burst Pressure Test:

This test is intended to verify that a specified overpressure safety factor is being met, also to establish the failure mode under overpressure.

WARNING: Conduct the test in a special device to protect the operator.

Connect the test assembly to a source of pressure with one end free to move. Bleed all air from the system before any pressure is applied. Increase the pressure at a rate of 20 000 psi  $\pm$  5000 psi (1500 bar  $\pm$  375 bar) per minute until the assembly bursts. Specimens shall be tested at ambient temperature.

Specimens from impulse or corrosion testing may be used for the burst test.

### 4.5 Flexure Test:

This test is intended to verify the service life of a fitting assembly when exposed to cyclic bending stresses while the assembly is under system pressure.

Unless otherwise specified by the purchaser, conduct the test in accordance with ARP1185. Determine the bending stress in the flexure test specimen prior to the application of internal pressure.

### 4.6 Stress Corrosion Test:

This test is intended to verify that the tube-to-fitting joining process did not adversely affect the resistance to stress corrosion in the joining area.