

# AEROSPACE STANDARD

**SAE AS603**

Issued 2004-09

Supersedes ARP603F

## Impulse Testing of Hydraulic Hose, Tubing, and Fitting Assemblies

### 1. SCOPE:

This SAE Aerospace Standard (AS) establishes the requirements and procedures for impulse testing of hose, tubing, and fitting assemblies for use in aerospace hydraulic systems of 8000 psi nominal operating pressure or less. It also refers to standard impulse test equipment to be used in conducting these impulse tests.

### 2. REFERENCES:

#### 2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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

AIR1228 Standard Impulse Machine Equipment and Operation

MA2002 Impulse Testing of Hydraulic Hose, Tubing and Fitting Assemblies

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- 2.1.2 U.S. Government Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-PRF-7808      Lubrication, Oil Aircraft Turbine Engine, Synthetic Base

MIL-PRF-83282      Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, NATO Code Number H-537

- 2.1.3 ISO Publications: Available from International Organization for Standardization, Case Postale 56, CH-1211 Geneve 20, Switzerland.

ISO 6772      Aerospace Fluid Systems, Impulse testing of hydraulic hose, tubing, fitting assemblies

## 2.2 Abbreviations and Acronyms:

Standard abbreviations used in this document and frequently used in aerospace technical documents may be found in ASME Y14.38.

## 2.3 Definitions:

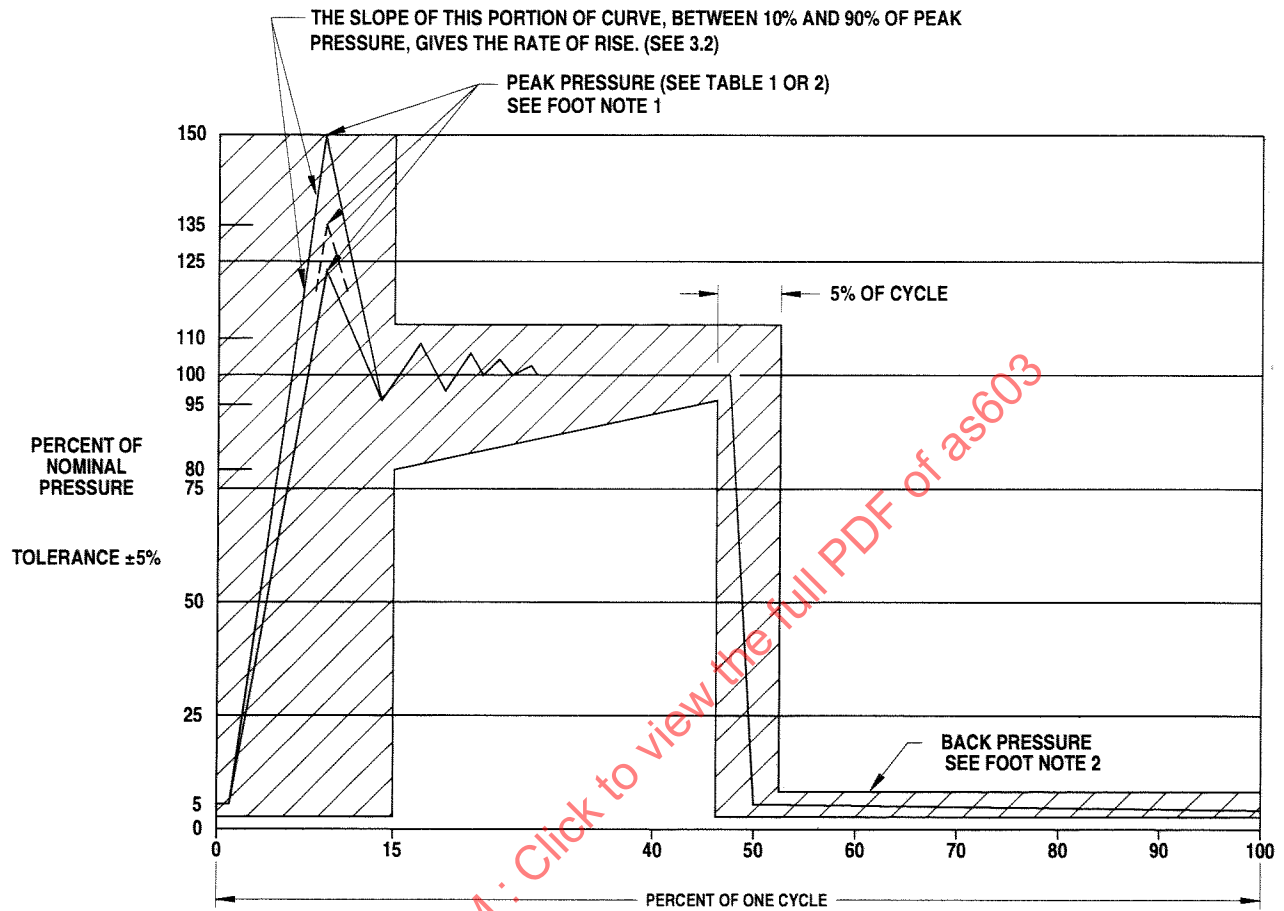
Standard abbreviations used in this document and frequently used in aerospace technical documents may be found in the SAE Dictionary or Aerospace Engineering.

## 3. REQUIREMENTS:

### 3.1 Shape of the Impulse Trace:

When observed on an oscilloscope, the impulse traces show as approximate pressure-time cycles. It is mandatory that these pressure-time curves be confined to the shaded area indicated in Figure 1, and that the dynamic impulse trace produced by the test machine shall be in conformance with the trace illustrated in Figure 1.

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<sup>1</sup>Only one pressure peak above 110% of operating pressure is allowed within 15% of cycle.

<sup>2</sup>Back pressure in Pressure Class B 50  $\pm$  25 psi / 345  $\pm$  170 kPa  
Back pressure in Pressure Classes D, E, H, G: 1% to 3% of the nominal pressure

FIGURE 1 - Impulse Trace

### 3.2 Calculations:

The rate of rise will be calculated as follows:

$$\text{Rate of pressure rise} = \frac{0.9p - 0.1p}{t \text{ at } 0.9p - t \text{ at } 0.1p} \quad (\text{Eq. 1})$$

where:

p = peak pressure in psi or kPa (see Table 1A or 1B)

t = time in seconds

3.2 (Continued):

NOTES:

- (1) The rate of rise is defined as the slope of the pressure-time curve in the straight portion of the pressure rise. For purposes of definition, the rate of rise shall be determined between 10 and 90% of the peak pressure.
- (2) The peak pressure is defined as the maximum pressure reached during the test pressure surge to 100, 125, 135 or 150% of the specified operating pressure, as appropriate.
- (3) Sweep rate on the oscilloscope or recorder shall be adjusted so that the slope of the pressure rise shall take advantage of the full size of the screen. The trace or photograph of the impulse cycle shall be an accurate record of the impulse cycle and shall show a grid or other means to permit accurate checking.

3.3 Preparation of Specimens:

The preparation of test specimens shall be defined in the applicable specification of the component. Specimens shall be subjected to the applicable treatments and production test requirements of the component specifications.

3.4 Equipment:

The testing shall be conducted on equipment in accordance with and instrumented per AIR1228. Equivalent equipment may be used.

3.5 Test Fluid:

Unless the component materials or other considerations prevent it, MIL-PRF-83282 or MIL-PRF-7808 oil shall be used as the test fluid.

3.6 Test Duration and Temperature Cycling:

Testing shall be continuous with as few shutdowns for repair and/or replacement as necessary. Attempts should be made to schedule the testing to minimize downtime, such as over weekends, whether temperature is maintained or not, to provide more nearly uniform conditions of temperature cycling and aging.

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### 4. METHOD OF TEST:

#### 4.1 Hose, Tubing, and Fitting Assemblies:

For testing of hose, tubing and fitting assemblies, including boss or port fittings, the cycle rate shall be 70 cpm  $\pm$  5 cpm. The peak pressure and the rate of pressure rise shall be per Table 1 or 2 of this specification. The assembly shall be tested in the sequence shown in Table 2 unless otherwise specified.

The total number of cycles shall be 200,000, unless otherwise specified in the detail specification.

After the temperature is stabilized at the maximum or minimum per Table 3, a minimum soak time of 1 hour is required before beginning that portion of the test sequence. The fluid temperature shall be as measured at the test manifold. The ambient temperature shall be measured at a point within 6 inches (150 mm) from the assemblies. The pressure peak shall be measured at the test manifold.

TABLE 1 - Peak Pressure and Rate of Pressure Rise  
Imperial Units of Measure

Hoses, Tubing and Fitting Assemblies		Peak Pressure %	Minimum Rate of Pressure Rise psi/s	Maximum Rate of Pressure Rise psi/s
Nominal Pressure Class psi	Nominal Diameter Dash Size			
B 1500	-08 and smaller	125	18,000	100,000
	-10 through -16	100		75,000
	-20			50,000
	-24 and over			40,000
D 3000	All sizes	150	45,000	300,000
E 4000			60,000	
H 5000			75,000	
G 8000		135	75,000	650,000