SAE Aerospace
An SAE International Group

# AEROSPACE STANDARD

SAE AS603A

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Superseding AS603

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

RATIONALE

Add publication internet site information and correct error in Table 1.

## 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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AIR1228 Standard Impulse Machine Equipment and Operation

MA2002 Impulse Testing of Hydraulic Hose, Tubing and Fitting Assemblies

#### 2.1.2 U.S. Government Publications

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, http://assist.daps.dla.mil/quicksearch/.

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, 1, rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland, Tel: +41-22-749-011, www.iso.org.

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

2.1.4 ASME Publications

Available from ASME, Three Park Ave., New York, NY 10018-5990 or www.asme.org.

ASME Y14.38 Abbeviation for the use on drawings and text

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.

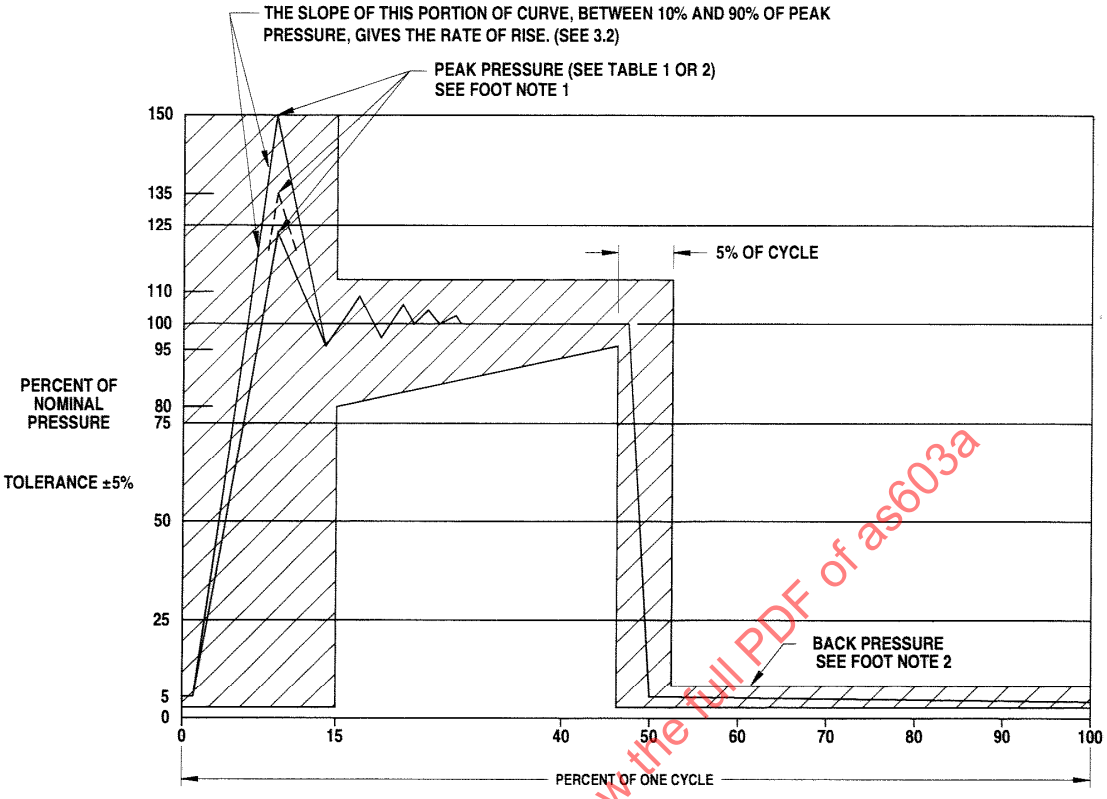
2.3 Definitions

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.




[1]Only one pressure peak above 110% of operating pressure is allowed within 15% of cycle.
[2]Back pressure in Pressure Class B 50 ±25 psi / 345 ±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 1 or 2)

t = time in seconds

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.

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 ± 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 | | | 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 |