



# AEROSPACE STANDARD

**AS150****REV. E**

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Reaffirmed 2014-11

Superseding AS150D

(R) Hose Assembly, Type Classifications of, Basic Performance and Fire Resistance

## RATIONALE

AS150E has been reaffirmed to comply with the SAE five-year review policy.

### 1. SCOPE:

This SAE Aerospace Standard (AS) establishes Type classification for those hose assemblies commonly used in aerospace fuel, lubricating oil, and hydraulic fluid systems.

#### 1.1 Purpose:

The purpose of this document is to create a common Classification (Type) system for the aforementioned hose assemblies. This is to facilitate determining comparability within a Type, offer a consolidated listing of active hose assembly types with performance references including fire resistance properties, and incorporate periodic fire testing of fire proof/resistant hose assemblies (see also Section 6).

#### 1.2 Product Classification:

Hose assemblies are classified (Type) (see Figure 1 for examples).

- 1.2.1 Basic Performance (Using Roman Numerals): Each basic type is identified by performance in accordance with a military, SAE or other industry specification(s) based upon pressure rating, temperature rating, and application(s).

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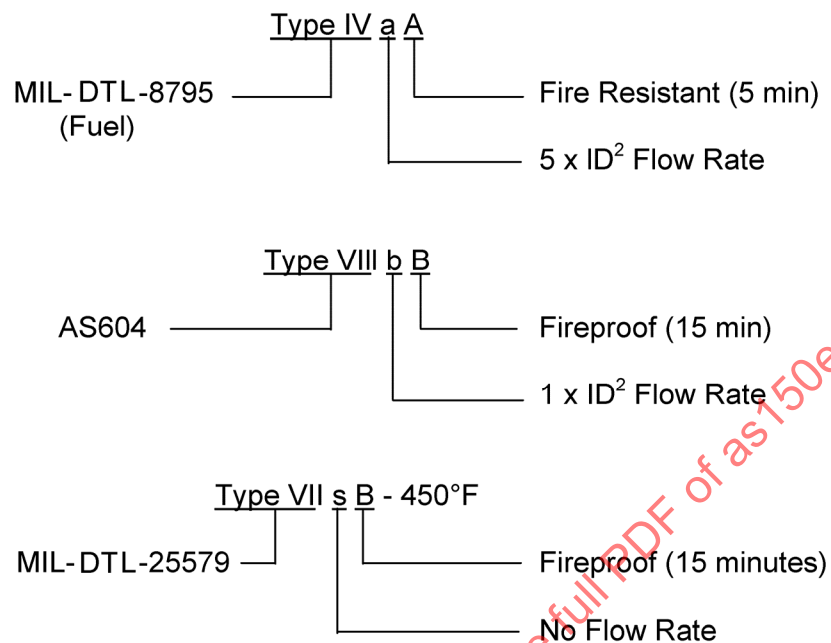


FIGURE 1 - Type Classification, EXAMPLES

### 1.2.2 Fire Resistance (if applicable):

#### 1.2.2.1 Suffix using lowercase Letters "a", "b", or "s" to indicate fluid flow rate:

- "a" indicates a fluid flow rate of  $5 \times ID^2$  [generally fuel and lube oil applications]
- "b" indicates a fluid flow rate of  $1 \times ID^2$  [generally hydraulic (pressure and return) applications]
- Special "s" designates no flow but fluid filled
- No suffix indicates no requirement/qualification for fire resistance

NOTE: TSO-C75 lists various flow rates based on type, size, and pressure (see 3.2).

#### 1.2.2.2 Suffix using upper case letters "A" or "B" to indicate fire test duration requirement (if applicable):

- "A" indicates AS1055 Class A (5 min) fire resistant (same as fire resistance of TSO-C53a and TSO-C75)
- "B" indicates AS1055 Class B (15 min) fireproof
- No suffix indicates no requirement/qualification for fire resistance

### 1.2.3 Identification must include, as minimum:

- a. AS150 "Type\_\_\_\_" (per Table 1)
- b. Flow "a", "b", or "s", if fire resistant (If applicable)
- c. Duration code "A" or "B" (If applicable)
- d. Example "Type laB"

### 1.2.4 A further special case is a single performance (pressure rating) standard, such as AS1227 or MIL-DTL-25579, with two or more temperature classes. The temperature limit must be stated.

### 1.3 Application:

Section 6 describes the shortcomings of current classification systems in adequately providing for the variety of hose (assembly) materials, operating pressures, temperatures, and fire resistance.

## 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, Telephone: (724) 776-4841, Web address: <http://www.sae.org>

AS604	Hose Assembly, Polytetrafluoroethylene, Metallic Reinforced, 3000 psi, 400 °F, Hydraulic, Heavyweight
AS614	Hose Assembly, Polytetrafluoroethylene, Metallic Reinforced, 4000 psi, 400 °F, Heavy Duty, Hydraulic and Pneumatic
AS620	Hose Assemblies, Convuluted Polytetrafluoroethylene Metallic Reinforced, High Temperature, Medium Pressure, Aircraft
AIR797	Hose Characteristics and Selection Chart
AS824	Hose Assemblies, Flexible Metal, High Pressure and High Temperature

## 2.1.1 (Continued):

AS1055	Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings and Similar System Components
AS1072	Sleeve, Hose Assembly, Fire Protection
AS1227	High-Temperature, Low Pressure Hose Assembly, Convuluted Polytetrafluoroethylene, for Aerospace
AS1339	Hose Assembly, Tetrafluoroethylene, 400 °F, 3000 psi, Hydraulic, Lightweight
AS1424	Hose Assemblies, Metal, Medium Pressure, High Temperature
AIR1569	Handling and Installation Practice for Aerospace Hose Assemblies
AS1946	Hose Assembly, Polytetrafluoroethylene, Metallic Reinforced, Up to 1500 psi and 450 °F, Hydraulic and Pneumatic
AS1975	Hose Assemblies, Polytetrafluoroethylene, Aramid Reinforced, 4000lbf/in <sup>2</sup> (27 500 kPa), Hydraulic and Pneumatic
AS4098	Hose Assembly, Polytetrafluoroethylene, Heavy Duty, Metallic Reinforced, 400 °F (204 °C), 5000 psi, Hydraulic and Pneumatic
AS4388	Hose Assembly, PTFE, Heavy Duty, -65 to 400 °F (-55 to 205 °C), 8000 psi, Hydraulic and Pneumatic
AS4604	Hose Assembly, Polytetrafluoroethylene, Cres Reinforced, Heavy Duty, 400 °F, 3000 psi, Aircraft Hydraulic Systems
AS4623	Hose Assembly, Polytetrafluorethylene, Para Aramid Reinforced, Heavy Duty, 275 °F, 3000 psi, Aircraft Hydraulic Systems
AS4897	Hose Assembly, Polytetrafluoroethylene (PTFE), Low Pressure, 450 °F and Fireproof, Procurement Specification for
AS5951	Hose Assembly, Polytetrafluoroethylene, Para-Aramid Reinforced, 5080 psi (35,000 kPa), 275 °F (135 °C), Aircraft Hydraulic Systems
AS5960	Hose Assembly, Polytetrafluoroethylene, Metallic Braid Reinforced, 5080 psi (35,000 kPa), 400 °F (204 °C), Aircraft Hydraulic Systems
AS38390	Hose Assembly, Polytetrafluoroethylene, Metallic Reinforced, 4000 psi, 160 °F, Covered Pneumatic

- 2.1.2 U.S. Government Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone: (215) 697-2179, Web address: <http://assist.daps.dla.mil/quicksearch/>

MIL-DTL-8790	Hose Assembly, Rubber, Hydraulic, High Pressure (3000 psi)
MIL-DTL-8795	Hose Assembly, Elastomeric, Hydraulic, Fuel & Oil Resistant, General Specification for
MIL-DTL-25579	Hose Assembly, Polytetrafluoroethylene, High Temperature, Medium Pressure, General Requirements for
MIL-DTL-83796	Hose Assembly, Rubber, Lightweight, Medium Pressure, General Specification for
MIL-H-85800	Hose Assembly, Polytetrafluoroethylene, Aramid Fiber Reinforced, 5000 and 8000 psi General Specifications for

- 2.1.3 Department of Transportation: Available from U.S. Department of Transportation, Utilization and Storage Section (M-443.2), Washington, DC 20590.

TSO-C53a	Fuel and Engine Oil System Hose Assemblies
TSO-C75	Hydraulic Hose Assemblies

## 2.2 Definitions:

Fire Resistant Quality Conformance Test Lot: A Fire Resistant Quality Conformance Test Lot is defined as a minimum of 1500 fire resistant hose assemblies (over 1500 assemblies establishes a 2nd Fire Resistant Quality Conformance Test Lot), of the same configuration, manufactured under essentially the same conditions, (i.e., Tooling, processes, times, temperatures, etc.), but not necessarily during one continuous run.

## 3. TECHNICAL REQUIREMENTS:

### 3.1 Qualification:

Hose assembly qualification for each Type shall be as specified in the applicable SAE, other industry or U.S. Government publication(s) (procurement specification).

- 3.1.1 Performance: Materials, form, fit and functional qualification shall be as specified in the hose assembly procurement specification: e.g., AS1946, MIL-DTL-25579, etc., unless exception(s) is noted in Table 1.

TABLE 1 - Reflects Standard Types

AS150 Type <sup>1</sup>	Performance Qualification	AS1055 <sup>2</sup>
IaB	AS4897	liab
II	AS1227 Rev. C <sup>4</sup>	—
IIaA	AS1227 Rev. C	IIaa
IIaB	AS1227 Rev. C	liab
IIbB	AS1227 Rev. C	IIbB
III	AS620 Rev. E or MA620	—
IIIaA	AS620 Rev. E or MA620	IIaa
IIIaB	AS620 Rev. E or MA620	liab
IIIbA	AS620 Rev. E or MA620	liba
IIIbB	AS620 Rev. E or MA620	IIbB
IV	MIL-DTL-8795E (Fuel/Oil)	—
IVaA	MIL-DTL-8795E (Fuel/Oil)	IIaA
IVaB	MIL-DTL-8795E (Fuel/Oil)	laB
V	MIL-DTL-83796A Sup 1	—
VaA	MIL-DTL-83796A Sup 1	laA
VaB	MIL-DTL-83796A Sup 1	laB
VI	MIL-DTL-8790E or MIL-DTL-8795E (Hydraulic)	—
VIaA	MIL-DTL-8790E or MIL-DTL-8795E (Hydraulic)	lbA
VIaB	MIL-DTL-8790E or MIL-DTL-8795E (Hydraulic)	lbB
VII	MIL-DTL-25579F <sup>4</sup> or AS1946 Rev. B or MA2146 <sup>4</sup>	—
VIIaA	MIL-DTL-25579F <sup>4</sup> or AS1946 Rev. B or MA2146 <sup>4</sup>	IIaa
VIIaB	MIL-DTL-25579F <sup>4</sup> or AS1946 Rev. B or MA2146 <sup>4</sup>	liab
VIIbA	MIL-DTL-25579F <sup>4</sup>	liba
VIII	AS604 Rev. D (formerly MIL-H-38360)	—
VIIIbA	AS604 Rev. D (formerly MIL-H-38360)	liba
VIIIbB	AS604 Rev. D (formerly MIL-H-38360)	IIbB
IX	AS1339 Rev. F or MA2007 (formerly MIL-H-38360)	—
IXbA	AS1339 Rev. F or MA2007 (formerly MIL-H-38360)	IIba
IXbB	AS1339 Rev. F or MA2007 (formerly MIL-H-38360)	IIbB
X	AS614 Rev. B or MA614 (similar to AS38390)	—
XbA	AS614 Rev. B or MA614 (similar to AS38390)	liba
XbB	AS614 Rev. B or MA614 (similar to AS38390)	IIbB
XI	AS4098 Rev. A/MA4098	—
XII	AS4388	—
XIII	AS1975 Rev. C (Aramid reinforced)	— <sup>3</sup>
XIV	AS4623 Rev. C (Aramid reinforced)	—
XV	MIL-H-85800, Class 5000 (Aramid reinforced)	—
XVI	MIL-H-85800, Class 8000 (Aramid reinforced)	—
XVII	AS1424 Rev. E, Metal Hose	—
XVIII (Inactive)	AS824 (Cancelled)	—
XIX	AS4604 Rev. B	—
XX	AS5951	— <sup>3</sup>
XXI	AS5960	—
XXIbA	AS5960	—
XXIbB	AS5960	—

<sup>1</sup> Typical flow rate code is shown, either rate/code may be applicable.

<sup>2</sup> AS1055 addresses fire resistance only.

<sup>3</sup> Para aramid reinforced assemblies are normally limited to 275 °F versus AS1055 Type II implication of 400 to 450 °F.

<sup>4</sup> For type(s) with two or more temperature classes shall identify temperature limit.

- 3.1.1.1 AIR797 provides additional tabular data regarding pressure, temperature, sizes available and general notes relative to most hose assembly procurement specifications.
- 3.1.1.2 AIR1569 provides information guiding selection and installation of various hose (assembly) styles.
- 3.1.2 Fire Resistance: Fire resistance properties of the hose assembly Type (1.2.1/1.2.2) shall be demonstrated by satisfactory completion of fire test in accordance with AS1055 to the flow rate and class (fire resistant or fireproof) as classified in 1.2.2.1 and 1.2.2.2.
  - 3.1.2.1 Protective sleeve(s), such as those of AS1072, or other accessory(ies) may be used to provide fire protection. Such a device(s) shall not degrade any operational performance characteristic except outer diameter and weight as qualified in 3.1.1. Installation and retention of such device(s) for qualification shall be as provided for an operational/production hose assembly.
  - 3.1.2.2 A minimum of three hose assemblies of each type and size (ID) shall be satisfactorily tested per AS1055 for each level of qualification (see also 3.1.2.3 and 3.1.2.4).
  - 3.1.2.3 Satisfactory test at a "low" flow rate (1.2.2.1 b or lower) shall be considered qualification at a higher flow rate(s). Likewise qualification at the specified (3.1.1) pressure shall be qualification at a lower pressure with similar flow rate.
  - 3.1.2.4 Satisfactory testing a type product at a higher pressure can be used as a lower pressure temperature product provided that all other performance requirements of the lower pressure application have been met.
- 3.2 TSO Equivalency:
  - 3.2.1 AS150 Type Equivalency Examples to Technical Standard Order (TSO): Table 2 lists Type classification(s) of this document to current FAA TSO typical approvals.

TABLE 2 - Typical Conversion

TSO	Performance	AS150
TSO-C53a, Type A	MIL-DTL-8795, Fuel	AS150 Type IV
TSO-C53a, Type B	MIL-DTL-25579, Class I	AS150 Type VII
TSO-C53a, Type D	MIL-DTL-25579, CLI, Fire Resistant	AS150 Type VIIaA <sup>1</sup>
TSO-C53a, Type C	MIL-DTL-8795 (Fuel/Oil)	AS150 Type IvaA <sup>1</sup>
TSO-C53a, Type A	MIL-DTL-83796	AS150 Type V
TSO-C53a, Type C	MIL-DTL-83796	AS150 Type VaA <sup>1</sup>
TSO-C75-IB-P	MIL-DTL-8790 or MIL-DTL-8795 (Hydraulic)	AS150 Type VI
TSO-C75-IB-P-F	MIL-DTL-8790 or MIL-DTL-8795 (Hydraulic)	AS150 Type VIaA <sup>1</sup>
TSO-C75-IIIB-S/P	AS604 (formerly MIL-H-38360)	AS150 Type VIII
TSO-C75-IIIB-S/P-F	AS604 (formerly MIL-H-38360)	AS150 Type VIIIbA <sup>1</sup>
TSO-C75-IIIB-S/P	AS1339 or MA2007 (formerly MIL-H-38360)	AS150 Type IX
TSO-C75-IIIB-S/P-F	AS1339 or MA2007 (formerly MIL-H-38360)	AS150 Type IXbA <sup>1</sup>

<sup>1</sup> Typical flow rate code is shown, either rate/code may be applicable.

- 3.2.1.1 TSO-C75 flow rate(s) during fire resistance testing may be less severe (higher) than AS150 Type ... a or b or AS1055 Type ... a or b.
- 3.2.1.2 TSO-C75 Type IA and IIA (generally rubber, medium pressure) test flow rate is  $7 \times ID^2$  versus  $1 \times ID^2$  of this document and AS1055 through -16 size with  $3 \times ID^2$  for -20 and  $1 \times ID^2$  for -24 for "hydraulic". This document shall equate these types to "Type ... aA of  $5 \times ID^2$ " flow rate for 5 min exposure.
- 3.2.1.3 TSO-C75 Type IA and IIA "Standards" are not shown in Table 2, as TSO-C53a Types A and C are more common and are  $5 \times ID^2$  flow.
- 3.2.2 Converting a TSO-CXX Type to AS150 Type Designation: As noted in various footnotes of Table 1, Table 2, and 6.2, a specific hose assembly (type) may have "qualified" and been approved to various TSO's or TSO types. Table 2 lists the most common or direct TSO previously associated with TYPES of this Standard. Each hose assembly style (standard) has a unique, unambiguous type designation in this document.
- 3.2.2.1 Type: Select the "performance" (1.2.1 and Table 1) standard to which the hose assembly is qualified; e.g., IV, V, etc. TSO-C53a Type A/C required MIL-DTL-8795 for fuel and without impulse test.
- 3.2.2.2 Flow: Select the "flow" rate code (1.2.2.1) corresponding to the TSO specified flow rate. Code "a" corresponds to that of TSO-C53a (all) and TSO-C75 Types IA and IIA (see 3.2.1.3). Code "b" corresponds to that of TSO-C75 Types IIA, IIB, IIIA, and IIIB.
- 3.2.2.3 Resistance: Select the fire resistance (fire test duration) code (1.2.2.2) corresponding to the TSO specified level. "A" corresponds to TSO-C53a and TSO-C75.
- 3.2.2.4 Examples: See Table 2.



### 3.3 Type Classification:

See Table 1.

## 4. QUALITY ASSURANCE PROVISIONS:

### 4.1 Responsibility for Qualification:

4.1.1 Unless otherwise specified in the contract or purchase order, the manufacturer shall qualify the product(s) of 3.1.1 in accordance with the provisions of the respective procurement/performance specification/standard.

4.1.2 Unless otherwise specified in the contract or purchase order, the manufacturer shall qualify the product(s) of 3.1.2 in accordance with AS1055.

### 4.2 Quality Conformance Inspection:

4.2.1 Quality conformance (individual, periodic, and sampling lot) inspections shall be accomplished in accordance with the respective procurement/performance specification/standard. Inspection results shall be maintained and available for inspection by the procuring agency.

4.2.2 Periodic Control Test/Fire Resistant Hose Assemblies: In addition to the quality conformance inspection (QCI) specified in 4.2.1, additional "fire resistant QCI testing" shall be accomplished as defined below. This testing is applicable to any fire resistant type, size and method of fire protection approved by Department of Transportation (DOT), Federal Aviation Authority (FAA), Performance Review Institute (PRI), Department of Defense (DoD) or procuring agencies.

4.2.2.1 Same Configuration: "Same Configuration" is the same hose type, same hose size, same fitting attachment method, same fitting material (CRES, Nickel alloy type 625, 718, etc. and titanium are considered the same for QCI test lots), same method of fire protection (slip-on, integral, thickness, etc.), same fire protection materials and method of fire protection installation/ fabrication process.

4.2.2.2 One representative sample for each lot as defined in 2.2 shall be tested.

4.2.2.3 Conditions of Test: The test conditions shall be per the most severe conditions (lowest flow, highest pressure, and longest duration) for which approval is held for the configuration.

4.2.2.4 Minimum Annual Quantity: A minimum annual quantity of assemblies shall be fire tested. If the minimum annual quantity is not achieved under the 1 per 1500 rule, then additional representative samples shall be tested to meet the minimum annual quantity. The minimum annual quantity shall be based on the total aggregate number of fire resistant hose assemblies manufactured of all configurations. The minimum annual quantity shall be in accordance with Table 3.