SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE STANDARD

SAE AS150

REV. C

Issued 1994-01
Revised 2001-03

Superseding AS150B

Hose Assembly, Type Classifications of, Basic Performance and Fire Resistance

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 AS is to create a common Classification (Type) system for the aforementioned hose assemblies. This is to facilitate determining comparability within a Type, and offer a consolidated listing of active hose assembly types with performance references including fire resistance properties. (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).

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. "a" indicates a fluid flow rate of 5 x ID^2 [generally fuel and lube oil applications]
b. "b" indicates a fluid flow rate of 1 x ID^2 [generally hydraulic (pressure and return) applications]
c. Special “s” designates no flow but fluid filled
d. 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.)

TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790 SAE WEB ADDRESS: http://www.sae.org

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

a. "A" indicates AS1055 Class A (5 min) fire resistant. (Same as fire resistance of TS0-C53a and TSO-C75.)

b. "B" indicates AS1055 Class B (15 min) fireproof.

c. 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 IaB”

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

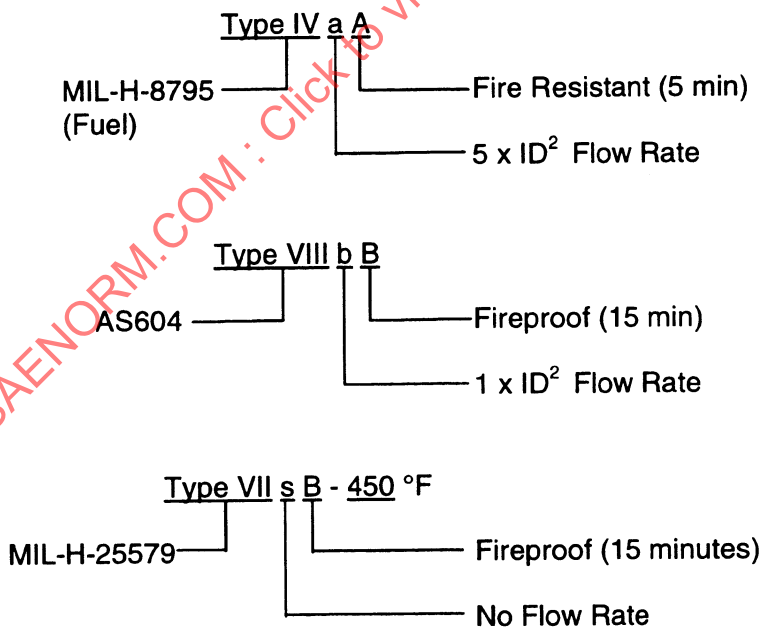

FIGURE 1 - Type Classification, EXAMPLES

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. 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 SAE Publications:

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

AS604	Hose Assembly, Tetrafluoroethylene, 400 °F, 3000 psi, Hydraulic, Heavyweight
AS614	Hose Assembly, Tetrafluoroethylene, Heavy Duty, High Temperature, High Pressure, 4000 psi, Hydraulic and Pneumatic
AS620	High Temperature Hose Assembly, Convoluted Tetrafluoroethylene, for Aircraft
AIR797	Hose Characteristics and Selection Chart
AS824	Hose Assemblies, Flexible Metal, High Pressure and High Temperature
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, Convoluted Tetrafluoroethylene, 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 (PTFE), Up to 450 °F (232 °C) and 1500 psi (10 500 kPa), Procurement Specification
AS1975	Hose Assemblies, Polytetrafluoroethylene, Aramid Reinforced, 4000lbf/in^2 (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

2.2 U.S. Government Publications:

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

MIL-H-8790	Hose Assembly, Rubber, Hydraulic, High Pressure (3000 psi)
MIL-H-8795	Hose Assembly, Rubber, Hydraulic, Fuel & Oil Resistant
MIL-H-25579	Hose Assembly, Tetrafluoroethylene, High Temperature Medium Pressure, General Requirements for
MIL-H-38390	Hose Assembly, Tetrafluoroethylene, Pneumatic, High Pressure
MIL-H-85800	Hose Assembly, Tetrafluoroethylene, Aramid Fiber Reinforced, 5000 and 8000 psi General Specifications for

2.3 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 (Rubber or Tetrafluoroethylene Tube and Wire Braid Construction)
TSO-C75	Hydraulic Hose Assemblies

3. TECHNICAL REQUIREMENTS:

3.1 Qualification:

Qualification for each Type of hose assembly shall be as specified in the applicable SAE, other industry or military specification(s).

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

TABLE 1 - Reflects Standard Types

AS150[1] Type	Performance Qualification	AS1055[2]
IaB	AS4897	IIaB
II	AS1227 Rev. B[4]	--
IIaA	AS1227 Rev. B	IIaA
IIaB	AS1227 Rev. B	IIaB
IIbB	AS1227 Rev. B	IIbB
III	AS620 Rev. E or MA620	--
IIIaA	AS620 Rev. E or MA620	IIaA
IIIaB	AS620 Rev. E or MA620	IIaB
IIIbA	AS620 Rev. E or MA620	IIbA
IIIbB	AS620 Rev. E or MA620	IIbB
IV	MIL-DTL-8795D (Fuel/Oil)	--
IVaA	MIL-DTL-8795D (Fuel/Oil)	IaA
IVaB	MIL-DTL-8795D (Fuel/Oil)	IaB
V	MIL-DTL-83796	--
VaA	MIL-DTL-83796	IaA
VaB	MIL-DTL-83796	IaB
VI	MIL-H-8790D or MIL-DTL-8795 (Hydraulic)	--
VIaA	MIL-H-8790D or MIL-DTL-8795 (Hydraulic)	IbA
VIaB	MIL-H-8790D or MIL-DTL-8795 (Hydraulic)	IbB
VII	MIL-H-25579E[4] or AS1946 Rev. A or MA2146[4]	--
VIIaA	MIL-H-25579E[4] or AS1946 Rev. A or MA2146[4]	IIaA
VIIaB	MIL-H-25579E[4] or AS1946 Rev. A or MA2146[4]	IIaB
VIIbA	MIL-H-25579E[4]	IIbA
VIII	AS604 Rev. D (formerly MIL-H-38360)	--
VIIIbA	AS604 Rev. D (formerly MIL-H-38360)	IIbA
VIIIbB	AS604 Rev. D (formerly MIL-H-38360)	IIbB
IX	AS1339 Rev. E or MA2007 (formerly MIL-H-38360)	--
IXbA	AS1339 Rev. E or MA2007 (formerly MIL-H-38360)	IIbA
IXbB	AS1339 Rev. E 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)	IIbA
XbB	AS614 Rev. B or MA614 (similar to AS38390)	IIbB
XI	AS4098 Rev. A/MA4098	--
XII	AS4388	--
XIII	AS1975 Rev. B (Aramid reinforced)	--[3]
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. C Metal Hose	--
XVIII	CNX	--
XIX	AS4604 Rev. A	--

[1] Typical flow rate code is shown, either rate/code may be applicable.
[2] AS1055 addresses fire resistance only.
[3] Para Aramid reinforced assemblies are normally limited to 275 °F versus AS1055 Type II implication of 400 to 450 °F.
[4] 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 AS to current FAA TSO typical approvals.

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 x ID^2 versus 1 x ID^2 of this AS and AS1055 through -16 size with 3 x ID^2 for -20 and 1 x ID^2 for -24 for "hydraulic". This AS shall equate these types to "Type...aA of 5 x ID^2" flow rate for 5 min exposure.

3.2.1.3 TS0-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 x 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-H-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.

TABLE 2 - Typical Conversion

TSO	Performance	AS150
TSO-C53a, Type A	MIL-H-8795, Fuel	AS150 Type IV
TSO-C53a, Type B	MIL-H-25579, Class I	AS150 Type VII
TSO-C53a, Type D	MIL-H-25579, CLI, Fire Resistant	AS150 Type VIIaA[1]
TSO-C53a, Type C	MIL-H-8795 (Fuel/Oil)	AS150 Type IVaA[1]
TSO-C53a, Type A	MIL-H-83796	AS150 Type V
TSO-C53a, Type C	MIL-H-83796	AS150 Type VaA[1]
TSO-C75-IB-P	MIL-H-8790 or MIL-H-8795 (Hydraulic)	AS150 Type VI
TSO-C75-IB-P-F	MIL-H-8790 or MIL-H-8795 (Hydraulic)	AS150 Type VIaA[1]
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[1]
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[1]

[1] Typical flow rate code is shown, either rate/code may be applicable.

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:

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.

4.3 Test Report:

Test reports shall be prepared for submission to and approval by the procuring agency or the Department of Transportation, Federal Aviation Administration (FAA). Tested samples shall be retained for a reasonable period of time. Test records shall be retained and available for review by the approving agency(ies).

5. PREPARATION FOR DELIVERY:

Cleaning, packaging, and marking shall be in accordance with the respective procurement standard, purchase order, or contract and 5.1 herein.

5.1 Marking:

5.1.1 Marking shall be in accordance with the procurement/qualification specification and, in addition, shall include Type classification as specified herein. Marking shall be permanently applied to a fitting or metal identification band.

6. NOTES:

6.1 Current Classification System:

Hose assemblies are presently classified by many different methods. Performance, less fire resistance, is generally well established by Military specifications and increasingly by SAE Aerospace Standards. SAE Aerospace Standards often provide for fire resistance testing but make no provision for identification. Many users prepare "Company Standards" but most are based on Military or SAE standards and may also include fire resistance requirements. There are unique applications (pressure, temperature, etc.) that can best be defined by a specific drawing(s). There is no common performance identification system.

6.2 Technical Standard Order:

FAA Technical Standard Orders (TSO) were prepared/revised in the late 1950s and early 1960s as a vehicle to qualify and classify hose assemblies; TS0-C53a and TSO-C75. These TSOs were prepared based on the prevailing standards and have not been updated to take advantage of new hose types and pressure applications, such as AS1227, AS620, AS614, etc.