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INTERNATIONAL
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AEROSPACE STANDARD

SAE AS150 | REV. A

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Submitted for recognition as an American National Standard

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 1.2.4 for examples.)

1.2.1 (R) 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:

1.2.2.1 Suffix Using Lowercase Letters "a" and "b":

a. "a" indicates a fluid flow rate of 5 x ID^2 [generally fuel and lube oil applications]

1.2.2.1 (Continued):
(R)

b. "b" indicates a fluid flow rate of 1 x ID^2 [generally hydraulic (pressure and return) applications]

c. No suffix indicates no requirement/qualification for fire resistance.

d. See 1.2.3.3, 3.2.2.5.1, and Table 1 for TSO-C42.

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" and "B":
(R)

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

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

c. No suffix indicates no requirement/qualification for fire resistance.

d. See 1.2.3.3, 3.2.2.5.1, and Table 1 for TSO-C42.

1.2.3 Special, suffix using the letter "S" to designate an exception.

1.2.3.1 "S" may replace any or all standard codes per 1.2.1 and 1.2.2.

1.2.3.2 "S" may indicate special pressure, special temperature, special flow rate, etc. (See also 3.1.2.3 and 3.1.2.4.)

1.2.3.3 Type XX, equivalent to TSO-C42, is a unique designation.
(R)

1.2.4 Type Classification, Examples:

a. Type IV a A
MIL-H-8775 (Fuel)
- a: 5 x ID^2 Flow Rate
- A: Fire Resistant (5 min)

b. Type VIII b B
AS604
- b: 1 x ID^2 Flow Rate
- B: Fireproof (15 min)

c. Type VII S B
MIL-H-25579
- S: Zero Flow Rate
- B: Fireproof (15 min)

Identification must include, as minimum: For Type VII with zero flow rate (special) for 15 min.

a. "1500 psi" OPS Pressure
b. "450 °F" OPS Temperature
c. "0 GPM Flow/CL-B" or "OGPM Flow/15 min"

1.2.5 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.

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:

2.1 SAE Publications:
(R)

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, 4000 lbf/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-C42	Propeller Feathering Hose Assemblies (Rubber and Wire Braid Construction)
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.

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 (3.1.1) 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.

(R) TABLE 1 - Reflects Standard Types

AS150[1] Type	Performance Qualification	AS1055[2]	TSO[3/4]
IaB	AS4897	IaB	--
II	AS1227[7]	--	--
IIaA	AS1227	IIaA	--
IIaB	AS1227	IIaB	--
III	AS620 or MA2079	--	--
IIIaA	AS620 or MA2079	IIaA	--
IIIaB	AS620 or MA2079	IIaB	--
IV	MIL-H-8795 (Fuel/Oil)	--	C53aA
IVaA	MIL-H-8795 (Fuel/Oil)	IaA	C53aC
IVaB	MIL-H-8795 (Fuel/Oil)	IaB	--
V	MIL-H-83796	--	C53aA
VaA	MIL-H-83796	IaA	C53aC
VaB	MIL-H-83796	IaB	--
VI	MIL-H-8790 or MIL-H-8795 (Hydraulic)	--	C75-IB-P
VIaA	MIL-H-8790 or MIL-H-8795 (Hydraulic)	IbA	C75-IB-P-F
VIaB	MIL-H-8790 or MIL-H-8795 (Hydraulic)	IbB	--
VII	MIL-H-25579 or AS1946 or MA2146[7]	--	C53aB
VIIaA	MIL-H-25579 or AS1946 or MA2146	IIaA	C53aD
VIIaB	MIL-H-25579 or AS1946 or MA2146	IIaB	--
VIII	AS604 (formerly MIL-H-38360)	--	C75-IIIB-S/P
VIIIbA	AS604 (formerly MIL-H-38360)	IIbA	C75-IIIB-S/P-F
VIIIbB	AS604 (formerly MIL-H-38360)	IIbB	--
IX	AS1339 or MA2007 (formerly MIL-H-38360)	--	C75-IIIB-S/P
IXbA	AS1339 or MA2007 (formerly MIL-H-38360)	IIbA	C75-IIIB-S/P-F
IXbB	AS1339 or MA2007 (formerly MIL-H-38360)	IIbB	--
X	AS614 or MA2140 (similar to MIL-H-38390)	--	5
XbA	AS614 or MA2140 (similar to MIL-H-38390)	IIbA	--
XbB	AS614 or MA2140 (similar to MIL-H-38390)	IIbB	--
XI	AS/MA4098	--	--
XII	AS4388	--	--
XIII	AS1975 (Aramid reinforced)	--[6]	--
XIV	AS4623	--	--
XV	MIL-H-85800, Class 5000 (Aramid reinforced)	--	--
XVI	MIL-H-85800, Class 8000 (Aramid reinforced)	--	--
XVII	AS1424 Metal Hose	--	--
XVIII	AS824 Metal Hose	--	--
XIX	AS4604	--	--
XX1	TSO-C42 Type 1	--	--
XX2	TSO-C42 Type 2	--	--
XX3	TSO-C42 Type 3	--	--

1 Typical flow rate code is shown, either rate/code may be applicable.
2 AS1055 addresses fire resistance only.
3 TSO includes "system" performance as well as fire resistance.
4 TSO-C75 Type IA, IIA, or IIIA option may also be qualified where TSO-C53a is the normal qualification for 1500 psi and less. See 3.2.1.2.
5 TSO-C75 Type IIIB does not differentiate 4000 psi, etc., operating pressure from 3000 psi. ("B" is "Greater than 1500 psi up to and including 3000 psi", TSO Table 1 Type Designations.)
6 Aramid reinforced assemblies are normally limited to 275 °F versus AS1055 Type II implication of 400 to 450 °F.
7 For type(s) with two or more temperature classes shall identify temperature limit.

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 of a higher temperature Type product can be used as a lower temperature "Type" product provided that all other performance requirements of the lower temperature product specification have been met.

3.2 TSO Equivalency:

3.2.1 (R) AS150 Type Equivalencies to Technical Standard Order (TSO): Table 1 lists Type classification(s) of this AS to current FAA TSO typical approvals.

3.2.1.1 (R) 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 (R) 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 (R) TSO-C75 Type IA and IIA "Standards" are not shown in Table 1, as TSO-C53a Types A and C are more common and are 5 x ID^2 flow.

3.2.2 (R) Converting a TSO-CXX Type to AS150 Type Designation: As noted in various footnotes of Table 1 and 6.2, a specific hose assembly (type) may have "qualified" and been approved to various TSO's or TSO types. Table 1 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 (R) 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. TSO-C42 specifies performance per MIL-H-8790 or MIL-H-8795 except hydraulic impulse test is not required; see Type XX.

3.2.2.2 (R) 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. TSO-C42 is unique (see 3.2.2.5).

3.2.2.3 (R) 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. TSO-C42 is unique (see 3.2.2.5).

3.2.2.4 (R) Examples: See Table 2.

(R) TABLE 2

TSO	Performance	AS150
TSO-C53a, Type A[1]	MIL-H-8795, Fuel	AS150 Type IV
TSO-C53a, Type A[2]	AS620	AS150 Type III
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] Also may qualify to TSO-C42, impulse not required by either TSO.
[2] As approved by one region, but denied by another.

3.2.2.5 (R) TSO-C42:

3.2.2.5.1 (R) TSO-C42 is unique in requiring:

a. Type 1:
   (1) 150 psi; 1.3 qt/min (max); 4-1/2 min (4.30) flame exposure
   (2) 1650 psi; 14 qt/min (max) 1/2 min (:30) flame exposure
b. Type 2: 30 psi (min); 1.3 qt/min (max); 5 min flame exposure
c. Type 3: Same as Type 1 except 15 min total flame exposure

3.2.2.5.2 (R) Performance qualification is indistinguishable between assemblies "per MIL-H-8790, nominal pressure rating 3000 psi" and "per MIL-H-8795, nominal pressure rating 1000 psi (fuel)".

3.2.2.5.3 (R) TSO-C42 is assigned a unique Type designator herein, see Table Type XX.

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.

4.1.3 Any "Special application/qualification" shall be addressed in relation to 1.2.3, 3.1.2.3, and 3.1.2.4.

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.

5.1.2 For each assembly designated "Type...S" the maximum operating pressure, maximum operating temperature, fire test flow rate, and fire resistance test duration (5 or 15 min) shall be identified on each hose assembly. "Class A" or "CL-A" or "Class B" or "CL-B" may be used for fire test/resistance designation for specials.

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.