

AEROSPACE STANDARD

AS1501™
REV. D

Issued 1978-11
Reaffirmed 2013-01
Revised 2020-06

Superseding AS1501C

Hose, Air Duct, Flexible, Nonmetallic, Aircraft

RATIONALE

Add new form 3 that applies to grade E. Add new grade "E" that allows negative internal pressure and increases diameter to 12 inches to expand the usage of AS1505 in the industry. Replace MS33660 (obsolete) with AS5131 (equal replacement).

1. SCOPE

This document covers flexible and semiflexible, reinforced and unreinforced air hoses fabricated from laminated and impregnated fabric, intended for use in aircraft heating, air conditioning, ventilating, defrosting, and/or deicing systems.

1.1 Classifications

Hoses furnished under this document shall be of the following operating temperature classifications and constructions shown in Table 1.

Table 1 - Operating temperature range and construction

Type	Operating Temperature Range	Construction
I	-65 to +250 °F	Chloroprene rubber impregnated fiberglass
II	-65 to +500 °F	Silicone rubber impregnated fiberglass, wire support
III	-65 to +176 °F	Polyurethane rubber impregnated nylon cloth
IV	-65 to +250 °F	Silicone rubber impregnated fiberglass /1/
V	-65 to +250 °F	Chloroprene rubber impregnated Meta-Aramid cloth
VI	-65 to +500 °F	Silicone rubber impregnated Meta-Aramid cloth

/1/ Silicone rubber hoses with nonmetallic wire shall not be used over 250 °F.

1.2 Grades

Grades shall be designated by a letter code as shown in Table 2, and utilized as required on standards and drawings to differentiate hose operating pressures, and to specify hose classification.

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1.3 Forms

The hose shall be wire reinforced in one of the following forms:

- a. Form 1: Helical - wire (metallic or nonmetallic) reinforcement which can be axially compressed, but not elongated beyond its free length.
- b. Form 2: Helical convoluted - wire (metallic) reinforcement, if specified, which can be axially compressed and elongated.
- c. Form 3: Annular convoluted - wire ring reinforcement if required for pressure, which can be axially compressed and elongated.
- d. Form 4: Sleeve - no reinforcement other than fabric which cannot be axially compressed or elongated.

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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS1241	Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft
AS1502	Hose, Air Duct, Flexible, Helical, Metallic Wire, Supported (Exposed), Self Extinguishing
AS1503	Hose, Air Duct, Flexible, Helical, Metallic Wire, Supported (Covered), Self Extinguishing
AS1504	Hose, Air Duct, Flexible, Helical, Nonmetallic Wire, Supported (Exposed), Self Extinguishing
AS1505	Hose, Air Duct, Flexible, Annular Convoluted, Self Extinguishing
AS1506	Hose, Air Duct, Semiflexible, Sleeve Section, Unreinforced, Self Extinguishing
AS1541	Hose, Air Duct, Flexible, Helical Convoluted, Metallic Wire Supported (Covered), Self Extinguishing
AS1542	Hose, Air Duct, Flexible, Helical Convoluted, Self Extinguishing
AS1543	Hose, Air Duct, Semiflexible, Sleeve Section Unreinforced, Self Extinguishing, Nomex
AS1544	Hose, Air Duct, Flexible, Helical, Nonmetallic Wire Supported (Covered), Silicone Rubber, Self Extinguishing
AS1591	Hose, Air Duct, Flexible, Polyurethane-Coated Fabric, 1 psi, External Nylon Helix, Self Extinguishing
AS4546	Hose, Air Duct, Flexible, Silicone Coated Fabric, 1 to -.5psi, External Nylon Helix, Self Extinguishing
AS4774	Hose, Air Duct, Flexible, Silicone-Coated Fabric, 1 psi, External Nylon Helix, Self Extinguishing
AS4804	Hose, Air Duct, Flexible, Silicone-Coated Fabric, External Nylon Helix, Low Noise

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

- ASTM A313 Chromium Nickel Stainless and Heat Resisting Steel, Spring Wire
- ASTM A853 Wire, Steel, Carbon (Round, Bare, and Coated)
- ASTM B117 Salt Spray (Fog) Testing, Method of Test for (ANSI Z118.1-74)
- ASTM B194 Copper-Beryllium Alloy Plate, Sheet, Strip and Rolled Bar (Copper Alloy Numbers 170 and 172)

2.3 AIA Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

- NAS1922 Clamp, Hose, Band, Tangential Worm, Lightweight

2.4 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

- FAR 25.853 Federal Aviation Regulation, Volume III, Part 25
- MIL-H-5606 Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
- MIL-L-6082 Lubricating Oil, Aircraft Reciprocating Engine (Piston)
- MIL-L-6085 Lubricating Oil, Aircraft Instrument, Low Volatility
- MIL-L-7808 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
- MIL-L-23699 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
- MIL-P-5425 Plastic, Sheet Acrylic, Heat Resistant
- MIL-S-18729 Steel Plate, Sheet and Strip, Alloy 4130, Aircraft Quality
- MIL-STD-100 Engineering Drawing Practices
- MIL-STD-129 Marking for Shipment and Storage
- MIL-STD-130 Identification Marking of U.S. Military Property
- MIL-STD-810 Environmental Test Methods
- MIL-T-5624 Turbine Fuel, Aviation, Grades JP-4 and JP-5
- MIL-Y-1140 Yarn, Cord, Sleeving, Cloth, and Tape-Glass
- MS21920 Clamp, Hose (Flat Band, 500 °F)
- MS33660 Tubing End, Hose Connection, Standard Dimensions For
- MS35842 Clamp, Hose: Low Pressure, Type "F"
- QQ-A-250/4 Aluminum Alloy, Plate and Sheet, 2024

QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel
QQ-P-416	Plating, Cadmium (Electrodeposited)
TT-I-735	Fluid, Anti-Icing (Isopropyl Alcohol)
TT-S-735	Standard Test Fluids, Hydrocarbon

3. REQUIREMENTS

3.1 Qualification

Any hose assembly furnished under this document shall be a product identical in construction to the specimens which have been tested and passed the qualification tests specified herein.

3.2 Materials

The hose assembly materials shall be uniform in quality, free from defects, suitable for its intended use, consistent with good manufacturing practices, and in conformance with the applicable specifications and requirements specified herein. Materials used in these hose assemblies shall be selected from those listed in Table 3.

3.3 Design and Construction

Hose furnished under this document shall be in accordance with requirements of AS1502, AS1503, AS1504, AS1505, AS1506, AS1541, AS1542, AS1543, AS1544, AS1591, AS4546, AS4774, and AS4804 and shall comply with the grades of construction and forms of manufacture as specified on the individual standards.

3.3.1 Soft End Couplings (Cuffs)

Soft end couplings (cuffs) shall be formed by omitting the reinforcement wire (metallic or nonmetallic) from the end portion of the hose. See 3.3.3 for termination of wire ends. The inner layer of fabric of the hose shall be continuous for the entire length of the hose and couplings. The soft ends shall have sufficient resilience for a snug fit over a rigid tube end conforming to Type A of AS5131 but shall be resistant to flow deformation to prevent clamp loosening and hose blowoff during service.

3.3.1.1 Cuff External Configuration

For high pressure hose assemblies, a bead shall be added to the soft ends when specified on applicable standard or drawing. The width of the bead shall be 0.12 inch or 0.19 inch for hose diameters 4.00 inches and smaller and 0.25 inch to 0.38 inch for hose diameters 4.25 inches and larger. Height of the bead shall be 0.04 inch minimum above the cuff with shape optional.

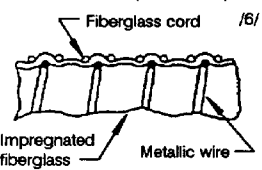
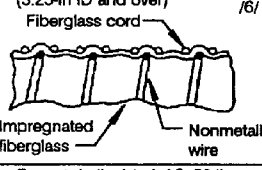
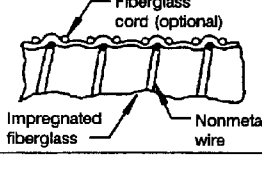
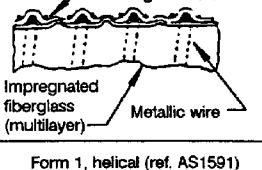
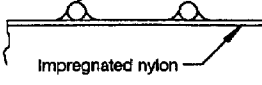
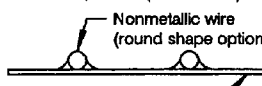
3.3.1.2 Cuff Internal Configuration

Internally molded seal rings shall be added to soft ends when specified on standard or drawing to reduce joint leakage.

3.3.2 Cut Ends

Cut or plain ends shall be the same as the hose body. Reinforcement wire (metal or nonmetallic) ends shall be crimped and/or terminated in such a manner as to prevent damage to the hose. Cut ends shall be used to a minimum extend possible and shall be used in lower pressure systems and where higher joint leakage can be tolerated.

Table 2 - Hose assembly data

Construction	Maximum weight, lb/ft/in dia	Minimum inside bend radius, in	Crush resistance	Maximum hose leakage, SCFM/ft/in dia	Maximum total joint leakage, SCFM/in hose dia	/3/	/4/	Available types
Form 1, helical (ref. AS1502) 	0.10 Grades A and B	0.50 x hose ID	N/A	0.02	0.20	6	N/A	I & II
Form 1, helical (ref. AS1504) (3.25-in ID and over) 	0.07 Grades A and B	2.0 x hose ID	/5/	0.02	0.10	6	N/A	I
Form 1, helical (ref. AS1504) (3.00-in ID and under) 	0.07 Grades A and B	1.0 x hose ID	/5/	0.02	0.10	6	N/A	I
Form 1, helical (ref. AS1503) 	0.16 Grades A and B	1.0 x hose ID	N/A	0.01	0.10	6	N/A	I & II
	0.12 Grades C and D			0.02				
	0.20 Grades E and F			0.02				
Form 1, helical (ref. AS1591) 	.042 Size 2.5-6.0 /9/ Grade A	.075 x hose ID	/5/	0.015	0.10	6	N/A	III
Form 1, helical (ref. AS4546) 	.051 Size 4.0-6.0 /9/ Grade A	0.75 x hose ID	/5/	0.015	0.10	6	N/A	IV

(R)

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Table 2 - Hose assembly data (continued)

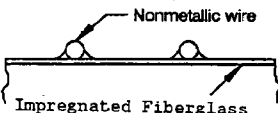
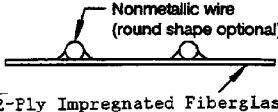
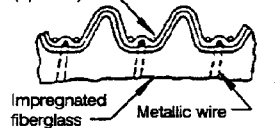
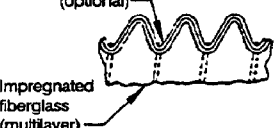
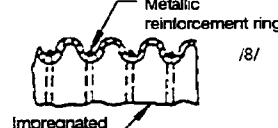
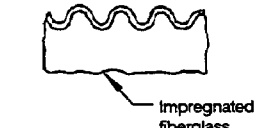
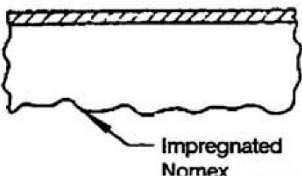
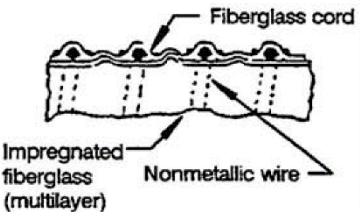
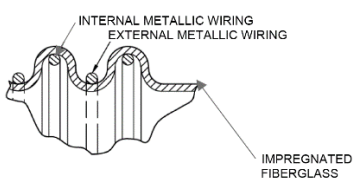
Construction	Maximum weight, lb/ft/in dia	Minimum inside bend radius, in	Crush resistance	Maximum hose leakage, SCFM/ft/in dia	Maximum total joint leakage, SCFM/in hose dia	/3/	/4/	Available types	
Form 1, helical (ref. AS4774)  Nonmetallic wire Impregnated Fiberglass	.048 up to 10 in .051 up to 12 in /9/ Grade A	.075 x hose ID	/5/	0.015	0.10	6	N/A	IV	(R)
Form 1, helical (ref. AS4804)  Nonmetallic wire (round shape optional) 2-Ply Impregnated Fiberglass	.06 up to 4 in .21 up to 12 in /9/ Grade A	1.0 x hose ID	/5/	0.015	0.10	6	N/A	IV	(R)
Form 2, helical (ref. AS1541)  Fiberglass cord (optional) Impregnated fiberglass Metallic wire	0.17 Grades A and B	1.5 x hose ID	N/A	0.01	0.10	6	6	I & II	
Form 2, helical (ref. AS1542)  Fiberglass cord (optional) Impregnated fiberglass (multilayer)	0.09 Grade A	1.0 x hose ID (3-in ID and under) 2 x hose ID (3.25-in ID and over)	N/A	0.02	0.20	20	20	II	(R)
Form 3, annular convoluted (ref. AS1505)  Metallic reinforcement ring Impregnated fiberglass	0.24 Grade A	2.0 x hose ID	N/A	0.01	0.10	6	6	II	(R)
Form 3, annular convoluted (ref. AS1505)  Impregnated fiberglass	0.12 Grades C and D	0.75 x hose ID	N/A	0.015	0.10	10	10	I & II	
	0.18 Grade B	1.0 x hose ID	N/A	0.01	0.10	10	10	II	
Form 4, sleeve (semi-rigid) (ref. AS1506)  Impregnated fiberglass	0.075 Grades C and D	N/A	/7/	0.02	0.10	N/A	N/A	I & II	
	0.10 Grades A and B			0.01	0.10				

Table 2 - Hose assembly data (continued)

Construction	Maximum weight, lb/ft/in dia	Minimum inside bend radius, in	Crush resistance	Maximum hose leakage, SCFM/ft/in dia	Maximum total joint leakage, SCFM/in hose dia	/3/	/4/	Available types
Form 4, sleeve (semi-rigid) (ref. AS1543) 	0.045 Grade B	N/A	/7/	0.02	0.20	N/A	N/A	II
	0.007 Grade A			0.01	0.10			
Form 1, helical (ref. AS1544) /6/ 	0.10 Grade A	1.0 x hose ID (2.75-in ID and under) 2.0 x hose (3.00-in ID and over)	N/A	0.02	0.10	6	N/A	I
Form 3, annular convoluted (ref. AS1505) 	0.36 Grade E	2.0 x hose ID	N/A	0.01	0.10	6	6	II

/1/ Maximum operating pressure (psi) specified on "AS" standards or drawings varies with hose construction and diameter.

/2/ Inside diameter range shall be in accordance with "AS" standard or drawing.

/3/ Compressibility percentage = $\Delta L/L \times 100$. (Where L is the convoluted length less 1.50 in for wire termination.)

/4/ Extensibility percentage = $\Delta L/L \times 100$. (Where L is the convoluted length less 1.50 in for wire termination.)

/5/ The hose shall be able to be flattened a minimum of 50% of its diameter over its entire length without damage or permanent set. The hose shall return to its full diameter after removal of deforming force and without being pressurized.

/6/ Twisted.

/7/ Sleeve-type hose shall be deformable without permanent set.

/8/ Wire ring reinforced rings shall be butt welded or brazed with a smooth joint and shall fit snug to hose convolutions. One ring per convolution except none adjacent to soft end.

(R) /9/ For weights in various sizes see standard.