



AEROSPACE STANDARD

AS1424™**REV. H**

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Revised 2020-04

Superseding AS1424G

Hose Assemblies, Metal, Medium Pressure,
High Temperature

RATIONALE

Clarification on Fitting Material Classes in Table 1, updated 6.1 Intended Use, and clarified Heat Treat 3.3.4.

1. SCOPE

This SAE Aerospace Standard (AS) covers medium-pressure, high-temperature, flexible, metal-hose assemblies suitable for operation in pneumatic systems up to 800 °F with excursion to 1200 °F for Class "B" and "N" and primarily for use on jet aircraft power plants. See 1.2.1 for recommended usage.

1.1 Types

- a. Type 1: Convolute helical inner tube, seamless or welded and redrawn tube material.
- b. Type 2: Convolute annular inner tube, seamless or welded and redrawn tube material.
- c. Type 3: Convolute helical inner tube, as-welded tube material.
- d. Type 4: Convolute annular inner tube, as-welded tube material.

NOTE: Unless otherwise specified on a design activity controlled drawing, or contract, Type 1, Type 2, Type 3, or Type 4 inner tube construction may be supplied.

1.2 Classes

Hose assemblies furnished under this document may be of the following classes. If no class is defined the class "S" shall be utilized.

- a. Class "A": Corrosion resistant Type 321 convolute inner tube and nickel alloy Type 625 or 718 fitting components.
- b. Class "B": Nickel alloy Type 625 convolute inner tube and nickel alloy Type 625 or 718 fitting components.
- c. Class "N": Nickel alloy Type 625 convolute inner liner and corrosion resistant Type 321 or 347 fitting components.
- d. Class "S": Corrosion resistant Type 321 convolute inner liner and corrosion resistant Type 321 or 347 fitting components.

NOTE: See Table 1 for specific fitting material definition.

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1.2.1 Recommended Usage

- a. Class “A” and “S” hose assemblies are recommended for continuous service use in static applications up to 800 °F maximum.
- b. Class “B” and “N” hose assemblies are recommended for continuous service use in both static and dynamic flexure applications at continuous temperature up to 800 °F with excursions to 1200 °F within the pressure limits as defined in Figure 2.

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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2759	Heat Treatment of Steel Parts General Requirements
AMS2774	Heat Treatment Wrought Nickel Alloy and Cobalt Alloy Parts
AMS5510	Steel, Corrosion and Heat-Resistant, Sheet, Strip and Plate, 18Cr - 10.5Ni - 0.40Ti (SAE 30321) Solution Heat Treated
AMS5556	Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18Cr - 11Ni - 0.70Cb (SAE 30347), Solution Heat Treated
AMS5557	Steel, Corrosion and Heat Resistant, Seamless or Welded Hydraulic Tubing 18.5Cr - 10.5Ni - 0.40Ti (SAE 30321) Solution Heat Treated
AMS5570	Steel, Corrosion and Heat Resistant, Seamless Tubing, 18Cr - 11Ni - 0.40Ti (321), Solution Heat Treated
AMS5571	Steel, Corrosion and Heat Resistant, Seamless Tubing, 18Cr - 10.5Ni - 0.70Cb (Nb) (347), Solution Heat Treated
AMS5581	Nickel Alloy, Corrosion and Heat Resistant, Seamless or Welded Tubing, 62Ni - 21.5Cr - 9.0Mo - 3.7Cb (Nb), Annealed
AMS5589	Nickel Alloy, Corrosion and Heat Resistant, Seamless Tubing 52.5Ni - 19Cr - 3.0Mo - 5.1Cb (Nb) 0.9Ti - 0.5Al - 18Fe Consumable Electrode Remelted or Vacuum Induction Melted, 1775 °F (968 °C), Solution Heat Treated
AMS5599	Nickel Alloy, Corrosion and Heat Resistant, Sheet, Strip, and Plate, 62Ni - 21.5Cr - 9.0Mo - 3.7Cb (Nb), Annealed
AMS5645	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 18Cr - 10Ni - 0.40Ti (321) Solution Heat Treated
AMS5646	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 18Cr - 11Ni - 0.60Cb(Nb) (347) Solution Heat Treated

AMS5662	Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, and Rings 52.5Ni - 19Cr - 3.0Mo - 5.1Cb (Nb) - 0.90Ti - 0.50Al - 18Fe Consumable Electrode or Vacuum Induction Melted, 1775 °F (968 °C), Solution Heat Treated, Precipitation-Hardenable
AMS5663	Nickel Alloy, Corrosion and Heat Resistant, Bars, Forgings, and Rings 52.5Ni - 19Cr - 3.0Mo - 5.1Cb (Nb) - 0.90Ti - 0.50Al - 18Fe Consumable Electrode or Vacuum Induction Melted, 1775 °F (968 °C), Solution and Precipitation Heat Treated
AMS5666	Nickel Alloy, Corrosion and Heat Resistant, Bars, Forgings, Extrusions, and Rings, 62Ni - 21.5Cr - 9.0Mo - 3.65Cb (Nb) Annealed
AMS5680	Steel, Corrosion and Heat Resistant, Welding Wire, 18.5Cr - 11Ni - 0.40Cb (Nb) (SAE 30347)
AMS5689	Steel, Corrosion and Heat Resistant, Wire, 18Cr - 10.5Ni - 0.40Ti (321), Solution Heat Treated
AMS5832	Nickel Alloy, Corrosion and Heat Resistant, Welding Wire, 52.5Ni - 19Cr - 3.0Mo - 5.1Cb(Nb) - 0.90Ti - 0.50Al - 18Fe Consumable Electrode or Vacuum Induction Melted
AMS5837	Nickel Alloy, Corrosion and Heat Resistant, Welding Wire, 62Ni - 21.5Cr - 9.0Mo - 3.7Cb(Nb)
AMS-QQ-S-763	Steel, Corrosion Resistant, Bars, Wire, Shapes, and Forgings
ARP908	Ø Torque Requirements, Installation and Qualification Test, Hose and Tube Fitting
ARP1835	Preparation for Delivery, General Requirements for Hose Assemblies
AS4370	Nut, Fitting, Retained
AS4375	Fitting End, Flareless, Design Standard
AS4395	Fitting End, Flared, Tube Connection, Design Standard
AS7003	Nadcap Program Requirements
AS7112	National Aerospace and Defense Contractors Accreditation Program Requirements for Fluid System Components
AS8879	Screw Threads - UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter
AS21921	Nut, Sleeve Coupling, Flareless
AS85421	Fittings, Tube, Fluid Systems, Separable, Beam Seal, 3000/4000 psi, General Specifications for

2.1.2 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 A580	Stainless and Heat-Resistant Steel Wire - Type 321 or 347, Condition A
ASTM B444	Nickel-Chromium-Molybdenum-Columbium Alloys, Pipe and Tube (UNS 06625)

2.1.3 NAS Publications

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

NAS847	Caps and Plugs, Protective, Dust and Moisture Seal
NAS1760	Fitting End, Flareless Acorn, Standard Dimensions for

2.1.4 U.S. Government Publications

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

AN818	Nut, Tube Coupling, Short
MIL-STD-810	Environmental Test Methods
MIL-HDBK-831	Preparation of Test Reports

2.1.5 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

PD2001	Qualified Product Management Council Procedures for Qualified Products Group
PD2101	Aerospace Quality Assurance, Product Standard, Qualification Procedures, Fluid Systems

2.1.6 AWS Publications

Available from American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672, Tel: 1-800-443-9353 or 305-443-9353, www.aws.org.

AWS A5.9	Corrosion-resisting chromium & chromium-nickel steel bare & composite metal cored & standard arc welding electrodes & rods
AWS A5.14	Nickel & nickel alloy bare welding rods and electrodes
AWS D17.1	Specification for Fusion Welding for Aerospace Applications

2.1.7 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME Y14.100	Engineering Drawing Practices
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2.2 Hose Assembly Procurement Documents

See AS1424SUP1 for a listing of applicable hose assembly procurement standards applicable to this document.

3. TECHNICAL REQUIREMENTS

3.1 Qualification

Hose assemblies supplied in accordance with this document shall be representative of products which have been subjected to and which have successfully passed the qualification tests specified in this standard.

3.1.1 Manufacturer Qualification

A manufacturer producing a product in conformance to this procurement specification shall be accredited in accordance with the requirements of PD2101, AS7003, and AS7112, and shall be listed in a Performance Review Institute (PRI) Qualified Manufacturers List (QML).

3.1.2 Product Qualification

All products defined in AS1424SUP1 shall conform to the requirements of this procurement specification and shall be approved in accordance with the requirements of PD2001, and PD2101, for listing in a Performance Review Institute (PRI) Qualified Parts List (QPL). When this procurement specification is specified on design activity controlled drawings, the approved sources of supply shall be defined by the design activity.

3.2 Material

The hose assembly materials shall be uniform in quality, free from defects, suitable for use in continuous ambient and/or fluid temperatures up to 800 °F with temperature excursions up to 1200 °F for class "B" and "N", consistent with good manufacturing practices, and in conformance with the applicable specifications and the requirements specified herein. Materials used in these hose assemblies shall be selected from those listed in Table 1. Inner tube physical properties may vary from the requirements of Table 1 as required to achieve a convoluting grade of material.

Table 1 - Hose assembly materials

Component	Material Description	Specification
Flexible metal hose inner tube	Class "A" or "S" - 321 corrosion resistant steel	AMS5557 (Type 1 or 2) AMS5510 (Type 3 or 4)
	Class "B" or "N" - nickel alloy Type 625	AMS5581 (Type 1 or 2) AMS5599 (Type 3 or 4)
Hose reinforcement wire	321 corrosion resistant steel	ASTM A580 or AMS5689
Braid retainers	321 or 347 corrosion resistant steel	AMS5556, AMS5557, AMS5570, AMS5571, AMS5645, AMS5646, or AMS-QQ-S-763
All fitting components	Class "N" or "S" - corrosion resistant steel Type 321 or 347	AMS5556, AMS5557, AMS5570, AMS5571, AMS5645, AMS5646, or AMS-QQ-S-763
	Class "A" or "B" - nickel alloy Type 625 or 718	AMS5581, AMS5589, AMS5662, AMS5663, or AMS5666
Nut retaining wire	321 or 347 corrosion resistant steel	ASTM A580 or AMS-QQ-S-763
Identification bands	300 series corrosion resistant steel	AMS-QQ-S-763
NOTE: Other fitting materials may be qualified providing they meet all of the applicable performance requirements of this specification.		

3.3 Design and Construction

The hose assembly shall consist of a seamless, or welded and redrawn convoluted, stabilized, corrosion-resistant alloy, pressure-carrying tube for Type 1 or 2 inner tube, or corrosion-resistant alloy strip welded into a convoluted, stabilized, pressure-carrying tube for Type 3 or 4 inner tube, uniform in size and wall thickness; reinforced with stabilized, corrosion-resistant steel, braided wire and having stabilized, corrosion-resistant alloy end fittings and nuts. End fittings shall be attached to the hose by welding.

3.3.1 End Fitting

All standard end fittings shall be a single piece construction from the mating surface to the convoluted tube attachment fitting. If welding is required in construction, welded butt joints shall be used. Fittings shall conform to applicable requirements in Tables 1 and 2. Standard hose assemblies shall have flared end fitting outlet design to mate with AS4395, flareless end fitting outlet dimensional design per NAS1760 to mate with AS4375, or beam seal end fitting outlet design to mate with AS85421, as applicable.

3.3.1.1 Coupling Nuts

When required, AN818, AS21921, or AS4370 type coupling nuts or functional equivalents shall be used. Wire retained coupling nuts, when used, shall have the retaining wire inserted in a clockwise direction when viewed from the open end of the nut.

3.3.1.2 Screw Threads

All fitting threads shall be Class 3 in accordance with AS8879 (ISO 3161). A thread tolerance increase of 10% after assembly or testing shall not be a cause for rejection.

3.3.2 Hose

3.3.2.1 Inner Tube Construction

The inner tube shall be either a Type 1 Helical, or a Type 2 Annular convoluted flexible tube design, made from seamless, or butt-welded and redrawn tubing or a Type 3 Helical, or a Type 4 Annular convoluted flexible tube design, made from as-welded strip stock. Tubing shall be uniform in size and quality and free from pitting, excessive die marks, and other defects. There shall be no inner tube splices on hose assemblies 3 feet in length or less. One splice is allowed for each additional 3 feet increment of hose assembly length. Splices are undesirable, but if required, shall be low profile welds in accordance with 3.3.3 and Figure 1. After welding, the convolutes shall be closed as shown in Figure 1.

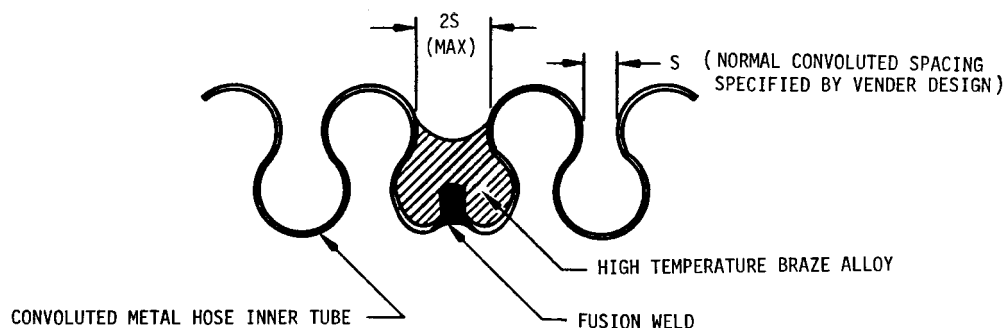


Figure 1 - Inner tube splice configuration

3.3.2.2 Braid

Braid shall be of corrosion-resistant steel wire braided in such a manner as to meet the requirements of this document. There shall be no splices allowed in the braid wire.

3.3.3 Welding

All pressure welds shall be fusion welds per AWS D17.1 Class B and braid attachment weld shall be per Class C. Equivalent or other comparable welding specifications may be substituted on prior approval by the purchaser. Filler wire, if used, shall be per AMS5680 (Type 347) or AWS 5.9 Class ER347, for welding stainless steel components, and AMS5837 (nickel alloy), or AWS A5.14 Class ERNiCrMo-3, for welding nickel alloy to nickel alloy, or nickel alloy to stainless steel components. If welding nickel alloy 718 to nickel alloy 718, AMS5832 nickel alloy filler wire shall be used.

NOTE: When welding CRES 347 material to any other stainless steel, or nickel alloy, material component, appropriate filler wire material shall be used. Any exception to this requirement shall require prior approval from the approval activity based on submittal of appropriate design and process documentation.