



AEROSPACE RECOMMENDED PRACTICE

ARP1897™**REV. A**

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Superseding ARP1897

(R) Clamp Selection and Installation Guide

RATIONALE

Correction to the formula to calculate tube spacing, clamp selection guide redrawn for clarity, and other general updates to align with latest SAE requirements.

1. SCOPE

This document is prepared as an aid in the selection of clamping devices and their use in aerospace equipment for the installation and support of tubing and wiring. For recommended installation practices, refer to ARP994.

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.

AMS3209	Chloroprene (CR) Rubber, Weather Resistant, 65 - 75
AMS3224	Nitrile-Butadiene Rubber Fuel, Fire, and Ozone Resistant 65 - 75
AMS3253	Ethylene Propylene Rubber Phosphate Ester Resistant 65 - 75
AMS3310	Rubber, Silicone Flame Retardant, Low Smoke Density, High Strength 65 - 75 Durometer Color White
AMS3660	Polytetrafluoroethylene (PTFE) Moldings General Purpose Grade, As Sintered
AIR1388	Service Damage Limits for Aircraft Hydraulic Tubing
ARP994	Design of Tubing Installations for Aerospace Hydraulic Systems
ARP1527	Color Coding - Elastomers for Tube Clamp Cushions

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Full document details: [SAE ARP1897A](http://www.sae.org/standards/ARP1897A)

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Documents
Document Sharing Hub

ARP1974	Clamps, Support, Comparative Fatigue Strengths, Test Method
AS5440	Hydraulic Systems, Military Aircraft, Design and Installation, Requirements For
AS5587	Clamp, Loop, Plain, Support, Aircraft
AS5763	Clamp Assembly, Saddle Type, Cushioned, Fuel and Petroleum Based Hydraulic Fluid
AS7351	Clamp, Loop Type Bonding
AS21919	Clamp, Loop Type, Cushioned Support
AS50881	Wiring Aerospace Vehicle
AS85052	Clamp Assembly, Loop Type, Cushioned, General Specification For
AS85052/1	Clamp, Loop, Tube 17-7 PH CRES, 275 °F, Fuel and Petroleum Based Hydraulic Fluid Resistant
AS85052/2	Clamp, Loop, Tube, 17-7PH CRES, 275 °F, Phosphate Ester Fluid Resistant
AS85052/3	Clamp, Loop, Tube 17-7 PH Cres, 500 °F
AS85449	Clamp Assembly, Saddle Type, Cushioned, General Specification For
AS85449/1	Clamp Assembly, Saddle Type, Cushioned, Fuel and Petroleum Based Hydraulic Fluid
AS85449/2	Clamp Assembly, Saddle Type, Cushioned, Phosphate Ester Fluid Resistant
AS85449/3	Clamp Assembly, Saddle Type, Cushioned, High Temperature
AS85449/4	Clamp Assembly, Saddle Type, Cushioned, PTFE
AS85449/5	Clamp Assembly, Saddle Type, Cushioned, Fire Resistance, Low Smoke Density and Toxicity

2.2 Military Specifications

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

AN742	Clamp, Plain, Support, Loop Type, Aircraft
MIL-C-8603	Clamps, Loop Type, SupportMIL-PRF-5606 Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-DTL-25988	Rubber, Fluorosilicone, Elastomer, Oil and Fuel Resistant
MIL-DTL-85052	Clamp, Loop, Cushioned, General Specification for
MIL-DTL-85052/1	Clamp, Loop, Tube-17-7 PH CRES, 275 °F, Fuel and Petroleum Based Hydraulic Fluid Resistant
MIL-DTL-85052/2	Clamp, Loop, Tube-17-7 PH CRES, 275 °F, Phosphate Ester Fluid Resistant
MIL-DTL-85052/3	Clamp, Loop, Tube-17-7 PH CRES, 500 °F
MIL-DTL-85052/5	Clamp, Loop, Aluminum 2024-T42, 275 °F, Ethylene Propylene
MIL-DTL-85052/6	Clamp, Loop, Aluminum 2024-T42, 400 °F, Fluorosilicone
MIL-DTL-85052/7	Clamp, Loop, Aluminum 2024-T42, 212 °F, Chloroprene

MIL-DTL-85052/8	Clamp, Loop, Aluminum 2024-T42, 500 °F, Silicone Rubber, Fabric Reinforced
MIL-DTL-85052/9	Clamp, Loop, Aluminum 2024-T42, 550 °F, Polytetrafluoroethylene (PTFE)
MIL-DTL-85052/10	Clamp, Loop, Aluminum 2024-T42, 275 °F, Nitrile Butadiene Rubber Fuel and Petroleum Based Hydraulic Fluid Resistant
MIL-DTL-85052/11	Clamp, Loop, Stainless Steel, 550 °F, Side Lock, Ethylene Propylene
MIL-DTL-85052/12	Clamp, Loop, Stainless Steel, 400 °F, Fluorosilicone
MIL-DTL-85052/13	Clamp, Loop, Stainless Steel, 212 °F, Chloroprene
MIL-DTL-85052/14	Clamp, Loop, Stainless Steel, 500 °F, Silicone Rubber Fabric Reinforced
MIL-DTL-85052/15	Clamp, Loop, Stainless Steel, 550 °F, Polytetrafluoroethylene (PTFE)
MIL-DTL-85052/16	Clamp, Loop, Stainless Steel, 275 °F, Nitrile Butadiene Rubber Fuel and Petroleum Based Hydraulic Fluid Resistant
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

2.3 NAS Publications

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

NASM85449	Clamp Assembly, Saddle-Type, Cushion, General Specification for
NASM85449/1	Clamp Assembly, Saddle-Type, Cushioned, NBR Rubber, 321 CRES, 275 °F, Fuel Resistant, General Purpose
NASM85449/2	Clamp Assembly, Saddle-Type, Cushioned, EPR Rubber, 321 CRES, 275 °F, General Purpose
NASM85449/3	Clamp Assembly, Saddle-Type, Cushioned, Silicone Rubber, Fabric Reinforced, 321 CRES, 500 °F, General Purpose
NASM85449/4	Clamp Assembly, Saddle-Type, Cushioned, PTFE, 321 CRES, -320 °F to 450 °F, General Purpose

3. CLAMP SELECTION

Clamp selection is primarily dictated by environment, materials, and fluid compatibility, as well as the system or component being installed. Each style clamp listed in the following charted guide has specific areas of use and varieties of cushion materials to produce compatibility with the basic fluids used in aerospace vehicles.

3.1 Clamp Style Selection

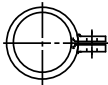
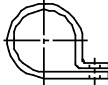
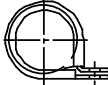
Style selection involves largely a consideration of the size of the item being clamped and the forces experienced at various areas of the system being considered. Also, the available mounting area for the clamping device will often affect the selection. For instance, if the clamping of a small cable or wire bundle is being considered and no surges or high vibrations are involved, an AS21919 loop style clamp may be applicable. On the other extreme, if the same installation was located in the windstream, such as on landing gear or in high vibration areas, the use of AS85052 or MIL-DTL-85052 may be dictated. If the installation involves hydraulic tubing installations, the selection of a clamping device may involve AS85052, MIL-DTL-85052, AS85449, NASM85449, or a type-support block. The use of AS85052 and MIL-DTL-85052 for supporting hydraulic lines is limited to lines with diameters up to 1-1/2 inches. For lines with a diameter greater than 1-1/2 inches, AS5763, AS85449, or NASM85449 should be utilized. Often, AS5763, AS85449, or NASM85449 should be considered for tube diameters smaller than 1-1/2 inches when line surges are apt to result in the loop-style clamp swiveling on its single-point mounting. If high vibration is also a consideration in these cases, a support block may be an even better selection, such as on helicopter installations.

By considering the scopes of the listed clamp specifications and the comparison of the various clamping mediums and their applicable environmental test requirements, a reasonably accurate selection is possible for most applications. However, there are some applications where there are complex circumstances involved that can necessitate supplemental tests to substantiate the style selection. For instance, ARP1974 may be considered.

3.2 Materials Selection

The selection of the clamp band and cushion materials, or in the case of support block, the block and channel materials is primarily a consideration of temperature range, fire resistance, fluid resistance, and in some applications, compatibility with titanium alloys. The maximum temperature ranges for the metal band materials are noted for the bare metal clamps AN735, AN742, and AS5587. For cushion clamps and support block, the elastomer cushion materials are usually the governing factor.

Table 1

CLAMP SELECTION GUIDE										
SPECIFICATION		CONSTRUCTION			ENVIRONMENTAL					
					KEY: NA – Not Applicable NR – Not Req by Spec					
PART SPEC	PROC SPEC	STYLE	CUSHION SPECIFICATION & COLOR CODE	BAND METAL & FINISH	TEMPERATUR E RANGE	FIRE RESISTANCE TEST	VIBRATION TEST	TITANIUM COMPATIBILIT Y TEST	OZONE TEST	RETENTION TEST
AN735	NONE	CENTER MOUNT NO CUSHION 	NA	1010 STEEL CAD PL	+400 °F	NA	NR	NR	NA	NR
AN735D				2024-T42 ALUMINUM NO FINISH	+300 °F	NA	NR	NR	NA	NR
AN735DC				2024-T42 ALUMINUM WITH CHEM FILM COLOR: GOLD	+300 °F	NA	NR	NR	NA	NR
AN735C				302 OR 321 CRES ANNEALED PASSIVATED	+800 °F	NA	NR	NR	NA	NR
AN742	MIL-C-8603	LOOP STYLE (P) NO CUSHION 	NA	1010 STEEL: CAD PL	+550 °F	NA	NR	NR	NA	NR
AS5587D	NONE			2024-T42 ALUMINUM WITH CHEM FILM	+300 °F	NA	NR	NR	NA	NR
AS5587C				321 CRES PASSIVATED	+1200 °F	NA	NR	NR	NA	NR
AS21919DE	NONE	LOOP STYLE (P) WITH CUSHION AND WEDGE	MIL-DTL-85052/2 OR AMS3253 COLOR: PURPLE	2024-T42 ALUMINUM WITH CHEM FILM	-65 °F +275 °F	NR	NR	NR	NR	YES
AS21919DF			MIL-DTL-85052/1 OR AMS3224 COLOR: YELLOW		-65 °F +275 °F	NR	NR	YES	/A/	YES
AS21919DG			AMS3209 COLOR: BLACK WITH BLUE STRIPES		-40 °F +212 °F	NR	NR	NR	/B/	YES
AS21919CE		(WEDGE NOT CONTOURED TO TUBE DIAMETER) 	MIL-DTL-85052/2 OR AMS3253 COLOR: PURPLE	321 CRES ANNEALED PASSIVATED	-65 °F 275 °F	NR	NR	NR	NR	YES
AS21919CF			MIL-DTL-85052/1 OR AMS3224 COLOR: YELLOW		-65 °F +275 °F	NR	NR	YES	/A/	YES
AS21919CG			AMS3209 COLOR: BLACK WITH BLUE STRIPES		-40 °F +212 °F	NR	NR	NR	/B/	YES
AS21919CH			AMS3310 COLOR: WHITE		-65 °F +392 °F	NR	NR	NR	NR	YES
AS21919CJ			MIL-DTL-25988 COLOR: BLUE		-70 °F +392 °F	NR	NR	NR	NR	YES

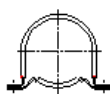
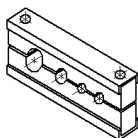
/A/ TEST PER MIL-DTL-85052

/B/ TEST PER AS21919

Table 1B

CLAMP SELECTION GUIDE Cont'd											
SPECIFICATION		CONSTRUCTION			ENVIRONMENTAL						
					KEY: NA – Not Applicable NR – Not Req by Spec						
PART SPEC	PROC SPEC	STYLE	CUSHION	BAND	TEMPERATURE RANGE	FIRE RESISTANCE TEST	VIBRATION TEST	TITANIUM COMPATIBILITY TEST	OZONE TEST	RETENTION TEST	
			SPECIFICATION & COLOR CODE	METAL & FINISH							
AS85052/1	AS85052	LOOP STYLE (P) WITH CUSHION AND FULL CONTOUR EDGE 	AMS3224 COLOR: YELLOW	17-7PH CRES ANNEALED HEAT TREAT TO CONDITION TH1100 AND PASSIVATED	-65 °F +275 °F	YES	YES	YES	YES	YES	
AS85052/2			AMS3253 COLOR: PURPLE		-65 °F +275 °F	YES	YES	YES	YES	YES	
AS85052/3			AMS3316 COLOR: BLUE		-65 °F +500 °F	YES	YES	YES	YES	YES	
M85052/1	MIL-DTL-85052/1 COLOR: YELLOW		17-7PH CRES ANNEALED HEAT TREAT TO CONDITION TH1100 AND PASSIVATED	-65 °F +275 °F	YES	YES	YES	YES	YES		
M85052/2	MIL-DTL-85052/2 COLOR: PURPLE			-65 °F +275 °F	YES	YES	YES	NA	YES		
M85052/3	MIL-DTL-85052/3 COLOR: LIGHT BLUE			-65 °F +500 °F	YES	YES	YES	NA	YES		
M85052/5	MIL-DTL-85052/2 COLOR: PURPLE		2024-T42 ALUMINUM WITH CHEM FILM	-65 °F +275 °F	YES	YES	YES	YES	NA	YES	
M85052/6	MIL-DTL-25988 COLOR: BLUE			-65 °F +400 °F	YES	YES	YES	YES	NA	YES	
M85052/7	AMS3209 COLOR: BLUE STRIPES			-65 °F +212 °F	YES	YES	NR	NR	YES		
M85052/8	MIL-DTL-85052/3 COLOR: LIGHT BLUE			-65 °F +500 °F	YES	YES	YES	YES	NA	YES	
M85052/9	AMS3660 COLOR: WHITE		321 CRES ANNEALED PASSIVATED	-65 °F +550 °F	YES	YES	NR	NR	YES		
M85052/10	MIL-DTL-85052/1 COLOR: YELLOW			-65 °F +275 °F	YES	YES	YES	YES	YES	YES	
M85052/11	MIL-DTL-85052/2 COLOR: PURPLE			-65 °F +275 °F	YES	YES	YES	YES	NA	YES	
M85052/12	MIL-DTL-25988 COLOR: BLUE		-80 °F +400 °F	YES	YES	YES	YES	YES	NA	YES	
M85052/13	AMS3209 COLOR: BLUE STRIPES		-40 °F +212 °F	YES	YES	NR	NR	YES			
M85052/14	MIL-DTL-85052/3 COLOR: LIGHT BLUE		-65 °F +500 °F	YES	YES	YES	YES	YES	NA	YES	
M85052/15	AMS3660 COLOR: WHITE		-80 °F +550 °F	YES	YES	NR	NR	YES			
M85052/16	MIL-DTL-85052/1 COLOR: YELLOW		-65 °F +275 °F	YES	YES	YES	YES	YES	YES	YES	

Table 1C

CLAMP SELECTION GUIDE Cont'd										
SPECIFICATION		CONSTRUCTION			ENVIRONMENTAL					
PART SPEC	PROC SPEC	STYLE	CUSHION	BAND	TEMPERATURE RANGE	FIRE RESISTANCE TEST	VIBRATION TEST	TITANIUM COMPATIBILITY TEST	OZONE TEST	RETENTION TEST
			SPECIFICATION & COLOR CODE	METAL & FINISH						
AS5763	AS85449	SADDLE STYLE CUSHIONED FOR TUBE SIZES -10 (5/8 INCH) THROUGH -48 (3 INCHES)	AMS3224 COLOR: YELLOW	321 CRES ANNEALED PASSIVATED	-65 °F +275 °F	YES	YES	YES	YES	NR
AS85449/1										
AS85449/2			AMS3253 COLOR: PURPLE		-65 °F +275 °F	YES	YES	YES	NA	NR
AS85449/3			AMS3316 COLOR: LIGHT BLUE		-65 °F +500 °F	YES	YES	YES	NA	NR
AS85449/4			AMS3660 COLOR: WHITE OR LIGHT GRAY		+500 °F	NA	YES	YES	NA	NR
AS85449/5			AMS3310 COLOR: WHITE		-65 °F +392 °F	YES	YES	YES	NA	NR
M85449/1	NASM85449		NASM85449/1 COLOR: YELLOW	321 CRES ANNEALED PASSIVATED	-65 °F +275 °F	YES	YES	YES	YES	NR
M85449/2			NASM85449/2 COLOR: PURPLE		-65 °F +275 °F	YES	YES	YES	NA	NR
M85449/3			NASM85449/3 COLOR: BLUE		-65 °F +500 °F	YES	YES	YES	NA	NR
M85449/4			NASM85449/4 COLOR: WHITE		-320 °F +450 °F	YES	YES	YES	NA	NR
ELASTOMERIC TUBE SUPPORT BLOCK	CUSTOM DESIGN		MIL-DTL-85052/1 COLOR: YELLOW	6061-T6 OR 7075-T6511 ALUMINUM	-65 °F +275 °F	YES	NR	YES	YES	NR
			MIL-DTL-85052/2 COLOR: PURPLE		-65 °F +275 °F	YES	NR	YES	YES	NR
			MIL-DTL-85052/3 COLOR: BLUE	321 OR 302 CRES	-65 °F +500 °F	YES	NR	YES	YES	NR