INCH-POUND

MIL-DTL-85052B
30 March 2005
SUPERSEDING
MIL-C-85052A
30 May 1984

DETAIL SPECIFICATION

CLAMP, LOOP, CUSHION, GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the design and test requirements for clamp, loop, cushion, primarily intended for general clamping of tubing for aircraft hydraulic systems.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to the Commander, Naval Air Warfare Center Aircraft Division, Code 491000B120-3, Highway 547, Lakehurst, NJ 08733-5100 or emailed to thomas.omara@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the Assist Online database at http://assist.daps.dla.mil.

AMSC N/A FSC 5340

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance. (Inactive for new design)
MIL-DTL-5624	-	Turbine Fue1, Aviation, Grades JP-4 and JP-5
MIL-PRF-7808	-	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-83282	-	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537
MIL-DTL-85052/1	-	Clamp, Loop, Tube-17-7 PH CRES, 275 ^{o}F, Fuel and Petroleum Based Hydraulic Fluid Resistant
MIL-DTL-85052/2	-	Clamp, Loop, Tube-17-7 PH CRES, 275 ^{o}F, Phosphate Ester Fluid Resistant
MIL-DTL-85052/3	-	Clamp, Loop, Tube-17-7 PH CRES, 500 ^{o}F
MIL-DTL-85052/4	-	Clamp Support - Loop, Clamp

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

ASTM-A582	-	Free-Machining Stainless and Heat - Resisting Steel Bars. (DoD adopted)
ASTM-D235	-	Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent). (DoD adopted)
ASTM-D297	-	Rubber Products - Chemical Analysis. (DoD adopted)
ASTM-D395	-	Rubber Property - Compression Set. (DoD adopted)
ASTM-D412	-	Vulcanized Rubber and Thermoplastic Elastomers – Tension (DoD adopted)

ASTM-D471	-	Rubber Property-Effect of Liquids. (DoD adopted)
ASTM-D624	-	Tear Strength of Conventional Vulcanized Rubber, and Thermoplastic Elastomers. (DoD adopted)
ASTM-D1149	-	Rubber Deterioration-Surface Ozone Cracking in a Chamber. (DoD adopted)
ASTM-D2240	-	Rubber Property - Durometer Hardness. (DoD adopted)
ASTM-D3182	-	Rubber-Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets. (DoD adopted)
ASTM-E18	-	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials. (DoD adopted)
ASTM-G154	-	Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

(Copies of these documents are available online at www.astm.org or the American Society for Testing and Materials (ASTM) International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ-Z1.4	-	Procedures, Sampling, and Tables for Inspection by Attributes. (DoD adopted)

(Copies of this document are available online at www.asq.org or ASQ, P.O. Box 3005, 611 E. Wisconsin Ave, Milwaukee, WI 53201-4606.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE-AMS-QQ-P-35	-	Passivation Treatments for Corrosion - Resistant Steel
SAE-AMS4944	-	Titanium Alloy Tubing, Seamless, Hydraulic 3Al - 2.5V, Cold Worked, Stress Relieved. (DoD adopted)
SAE-AMS4945	-	Titanium Alloy Tubing, Seamless, Hydraulic 3Al - 2.5V, Controlled Contractile Strain Ratio, Cold Worked, Stress Relieved
SAE-AMS4946	-	Titanium Alloy Tubing, Seamless, Hydraulic 3Al - 2.5V, Texture Controlled Cold Worked, Stress Relieved

SAE-AMS5528	-	Steel, Corrosion Resistant, Sheet, Strip, and Plate, 17Cr-7.1Ni, 1.1Al, Solution Heat Treated, Precipitation Hardenable. (DoD adopted)
SAE-AMS5529	-	Steel, Corrosion Resistant, Sheet and Strip, 17Cr-7.1Ni, 1.1Al, Solution Heat Treated and Cold Rolled, Precipitation Hardenable, 0.0015 to 0.050 Inch (0.038 to 1.27 mm) Nominal Thickness. (DoD adopted)
SAE-AMS-H-6875	-	Heat Treatment of Steel Raw Materials. (DoD adopted)
SAE-ARP1527	-	Color Coding - Elastomers for Tube Clamp Cushions

(Copies of these documents are available online at www.sae.org or the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The clamps furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified product list before contract award (see 4.2 and 6.5).

3.2.1 Qualification of molded and extruded cushions. If clamp cushions in sizes -5 and smaller are extruded, two separate cushion qualification procedures shall be completed; one for the extruded cushions and one for molded cushions which have wedges.

3.2.2 Qualification of the assembly. Qualification of clamps includes qualification of the clamp elastomeric cushion and metallic band. After receiving qualification approval, cushion material formulation and curing process shall not be changed or modified without the written approval of the qualifying activity. Clamp band processing shall not be changed after qualification is approved. If there are changes to the cushion material, the curing process or the cushion material supplier, including any change in their plant location, some cushion retests may be required, as directed by the qualifying activity. The qualification required by this specification applies to qualification of the clamp assembly only. It does not infer qualification of clamp installation techniques.

3.3 Materials. Clamp band material and cushion material shall be as specified on the applicable specification sheet.

3.3.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3.2 Hazardous substances and ozone depleting chemicals. The UV exposure and ozone resistance test (see 4.4.4.3) may contain hazardous chemicals. It shall be handled in accordance with Federal regulations and guidelines to perform those tests. For further information about toxic chemicals and hazardous materials list, consult the Environmental Protection Agency web database at www.epa.gov/ebtpages/pollutants.html.

3.4 Design and construction. The design and construction of the clamp shall be as specified herein and in accordance with the applicable specification sheet.

3.4.1 Dimensions and tolerances. Dimensions and tolerances shall be as specified on the applicable specification sheet.

3.5 Performance. Clamp cushions, clamp bands, and clamp assemblies shall conform to the requirements of this specification and the applicable specification sheet when subjected to the applicable tests specified in this specification and the applicable specification sheet.

3.5.1 Clamp cushion performance.

3.5.1.1 Physical properties. The cushion material shall meet the physical property requirements specified in table II of the applicable specification sheet and 4.4.3.1 herein.

3.5.1.2 Compression set. The average compression set value of three cushion material specimens shall be not greater than the value specified in the applicable specification sheet and 4.4.3.2 herein.

3.5.1.3 Flammability. The requirements shall be as specified in the applicable specification sheet. The cushion material shall be tested for flammability in accordance with the applicable specification sheet and 4.4.3.3 herein.

3.5.1.4 Titanium compatibility. There shall be no evidence of cracking or pitting of the titanium tube specimen observed with a 5-10 power magnifying glass when the clamp assembly is tested in accordance with the titanium compatibility test as specified in 4.4.3.4.

3.5.1.5 Color coding. The cushion material shall be color coded in accordance with SAE-ARP1527 as specified on the applicable specification sheet.

3.5.2 Clamp band performance.

3.5.2.1 Clamp band hardness. Clamp band hardness shall be 51-59 hardness reading (HR) Rockwell Superficial Scale, 30N, when tested in accordance with 4.3.3.

3.5.3 Clamp assembly performance.

3.5.3.1 Diametral retention. Each clamp sample as specified in 4.4.4.1 shall be tested in accordance with the diametral retention test both before and after being subjected to the vibration test (see 4.4.4.2.1). The clamp shall withstand an axial mandrel force as specified below:

Clamp Band Thickness	Axial Mandrel Force
0.020"	15-45 lbs
0.032"	25-55 lbs
0.040"	35-65 lbs

3.5.3.2 Vibration and transmissibility. The clamps shall not exhibit any evidence of cushion separation or other deterioration when tested in accordance with 4.4.4.2. There shall be no cracking or separation of metal components. The Transmissibility Ratio shall be recorded (see 4.4.4.2.2).

3.5.3.3 Ozone resistance. When specified on the applicable specification sheet, the clamps shall not exhibit any evidence of cracking on the outside circumference of the cushion visible to the unaided eye when tested in accordance with 4.4.4.3. Cracks in cushion material pinched between the metal band feet shall not cause the test to be considered a failure.

3.5.3.4 Thermal shock. The clamps shall not exhibit evidence of cracking, tackiness, or degradation of the cushion material when tested in accordance with the thermal shock test (see 4.4.4.4).

3.6 Surface texture. All surfaces shall have a smooth finish and shall be free from burrs and sharp edges. The inside edges of the clamp band shall be rolled or provided with a radius to eliminate sharp edges.

3.7 Identification of product.

3.7.1 Identification of clamps. Clamps shall be marked as specified on the applicable specification sheet.

3.8 Workmanship. Workmanship shall be of a sufficiently high grade to ensure that clamps are of uniform quality and free from burrs, slivers, sharp edges, or other defects, which would affect their service and shall be uniform in appearance without any mold flash.

4 VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 Qualification inspection.

4.2.1 Samples. Clamp samples of MIL-DTL-85052/1, MIL-DTL-85052/2, and MIL-DTL-85052/3 shall consist of 12 clamps of each size -2, -4, -6, -8, -10, -12, -16, -20, and -24, plus 20 additional size -16 clamps for each specification sheet. For the MIL-DTL-85052/1 clamp only, submit 20 additional size -2 clamps. Samples for qualification tests on cushion material shall consist of 20 slabs conforming to ASTM-D3182 for each type of cushion material to be tested. Each slab shall identify with the specification sheet number and the direction of weave for fabric reinforced material. Both clamps and material test slabs shall be supplied for each specification sheet to be qualified in the quantities as indicated herein.

4.2.2 Inspection routine. Sample units shall be subjected to the qualification inspection specified in table I in the order specified, conducted on applicable specimens.

TABLE I. Qualification inspection.

Clamp Cushion			
Examination or Test	Requirement Paragraph	Test Paragraph (in sequence)	Number of Samples
Physical properties Compression set Flammability Titanium compatibility	3.5.1.1 3.5.1.2 3.5.1.3 3.5.1.4	4.4.3.1 4.4.3.2 4.4.3.3 4.4.3.4	(see 4.2.1)
Clamp Assembly			
Examination or Test	Requirement Paragraph	Test Paragraph	Number of Samples
Examination of product Diametral retention Vibration and transmissibility Ozone resistance 1/ Thermal shock	3.4 3.5.3.1 3.5.3.2 3.5.3.3 3.5.3.4	4.4.2 4.4.4.1 4.4.4.2 4.4.4.3 4.4.4.4	58 48 48 15 (see 4.2.1) 5 (see 4.2.1)

1/ When specified on applicable specification sheet.

4.2.3 Identification of samples. Samples for each dash number shall be separately packaged and forwarded to the testing facility directed by the qualifying agency (see 6.5). Samples shall be clearly identified by securely attached durable tags marked with the following information:

Sample for qualification test
Specification MIL-DTL-85052 Clamp, Loop, Cushion
Specification sheet number
Manufacturers part number
Name of Manufacturer and Contractor And Government Entity (CAGE) Code
Submitted (date) and reference letter authorizing the test

4.3 Conformance inspection. Conformance inspection shall consist of the tests and inspections specified in table II, conducted in accordance with 4.3.2.

4.3.1 Parts in inspection lot. Parts in an inspection lot shall consist of clamp assemblies or elastomeric cushion molded products. These parts are produced under essentially the same manufacturing conditions and presented for inspection at the same time.

4.3.1.1 Inspection lot for examination of product and clamp band hardness. An inspection lot shall consist of clamp assemblies (elastomeric cushion and metallic band) for a particular size, and material produced under essentially the same manufacturing conditions and presented for inspection at the same time. Examination shall be conducted in accordance with table II requirements.

TABLE II. Conformance inspection.

Examination and Tests	Requirement Paragraph	Test Paragraph	Inspection Level ANSI/ASQ-Z1.4 1/
Examination of product	3.4	4.4.2	I
Clamp band hardness	3.5.2.1	4.3.3	S1
Cushion tensile	3.5.1.1	4.4.3.1	S1
Cushion elongation	3.5.1.1	4.4.3.1	S1
Ozone resistance	3.5.3.3	4.4.4.3	S1

1/ AQL shall be as specified in the contract (see 6.2) or by the qualifying activity.

4.3.1.2 Inspection lot for cushion tensile, cushion elongation, and ozone resistance. An inspection lot shall consist of elastomeric products molded, extruded, and cured under essentially the same conditions from the same batch of raw elastomer. Some mechanical processing may be performed on the elastomeric product after inspection to prepare them for assembly onto clamp bands. Cushions extruded and cured shall be considered separately from cushions molded and cured for purposes of lot identification. The lot of elastomeric product shall be traceable to clamp assemblies for quality reporting and certification. Examination shall be conducted in accordance with table II requirements.

4.3.2 Sampling. A random sample shall be selected from each inspection lot in accordance with ANSI/ASQ-Z1.4. The inspection level shall be as specified in table II. Cushion material test specimens shall be cut from clamp cushions and shall be of sufficient size to be tested in accordance with the test methods specified in the applicable specification sheet.

Tensile and elongation cushion material test specimens may be cut from larger size clamp cushions of the same inspection lot and shall be provided by the manufacturer.

4.3.3 Clamp band hardness test. Samples from each heat treated lot of clamp bands (see 4.3.2) shall be tested in accordance with the Rockwell superficial hardness specified in ASTM-E18. The clamp bands shall meet the requirements specified herein (see 3.5.2.1).

4.4 Test methods.

4.4.1 Test conditions.

4.4.1.1 Environment. Unless otherwise specified, all tests shall be performed at room temperature (60 - 90 °F).

4.4.1.2 Test mandrels. Unless otherwise specified, all test mandrels shall be tool steel drill rod in accordance with ASTM-A582. Unless otherwise specified, all dimensions shall be as specified in table IV with surface texture of 32 micro inches maximum. Spacing A and B shall be as shown on figure 1.

4.4.2 Examination of product (qualification inspection). Clamps shall be carefully examined to determine compliance with the requirements of this specification and applicable specification sheet with respect to material, workmanship, configuration, marking, and dimensions as specified in 3.4. Any variation beyond the dimensions, plus allowable tolerances, shall be classified as major or minor as specified in table III.

4.4.2.1 Examination of product (conformance inspection). For conformance inspection, examination of product shall consist of examining factors outlined in tables II and III.

4.4.3 Clamp cushion tests.

4.4.3.1 Physical properties tests. Tests shall be conducted in accordance with the test methods shown in table II of the applicable specification sheet. Cushion material samples shall meet specified requirements (see 3.5.1.1).

4.4.3.2 Compression set test. Three cushion material test samples shall be air aged at the temperature specified on the applicable specification sheet for 70 hours and tested in accordance with ASTM-D395, Method B. Cushion material samples shall meet the requirements specified in the applicable specification sheet (see 3.5.1.2).

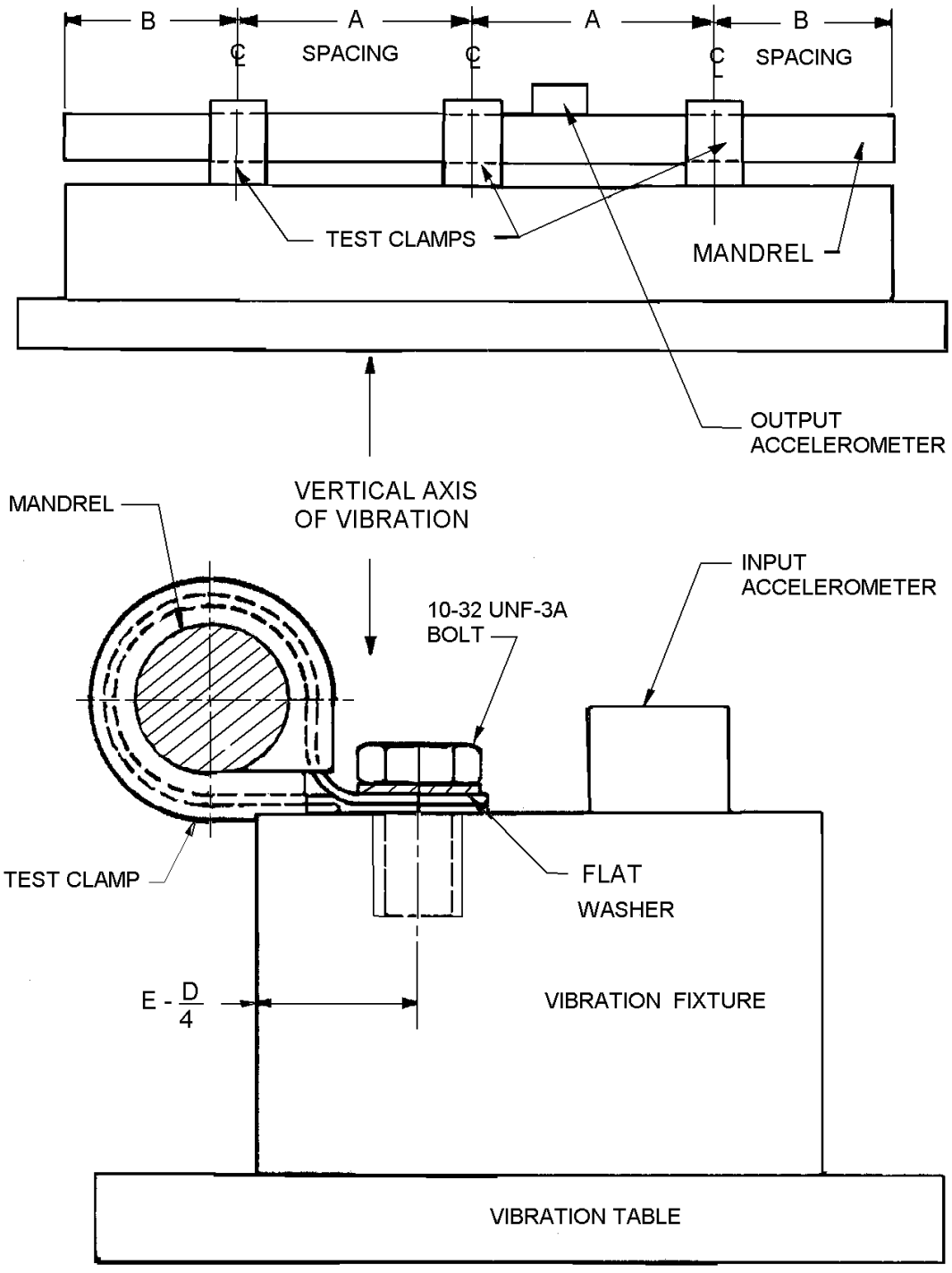
4.4.3.3 Flammability test. The flammability tests shall be performed as specified below. The flame source shall be a Bunsen Burner or similar burner having a nominal tube internal diameter of 0.375 inch. The burner shall be adjusted to provide a 1.5 inches high flame of blue intensity (see figure 2). Verify flame temperature to be a minimum of 1550 ^{o}F, at the center of the flame, with the use of a thermocouple. The clamp assembly shall meet the requirements specified in the applicable specification sheet (see 3.5.1.3).

TABLE III. Classification of defects (qualification inspection).

Test	ANSI/ASQ-Z1.4, Inspection Level I	
	Major	Minor
Examination of product (see 4.4.2)	1/	1/
A. Dimensions (see applicable specification sheet)		
1. Clamp cushion		
a. Material thickness	X	-
b. Inside width	X	-
c. Color (see applicable specification sheet)	X	-
2. Clamp band		
a. Material thickness	X	-
b. Width	X	-
c. Bolt hole diameter	-	X
d. Edge de-burring	-	X
3. Clamp assembly		
a. Loop diameter D (see 4.4.4.1)	-	X
b. Centerline of loop to centerline of bolt hole E	-	X
B. Workmanship and marking	-	X

1/ AQL for major and minor shall be as specified in the contract (see 6.2) or by the qualifying activity.

4.4.3.3.1 Flammability preconditioning. All specimens shall be preconditioned in an oven at 70 ± 5 °F and 50 ± 5 percent relative humidity for a period of 24 hours prior to testing. Clamps used for the vertical burn test shall be uncurled until straight before being placed in the preconditioning chamber. The cushion shall not be removed from the clamp band.



SEE MIL-DTL-85052/1 THRU MIL-DTL-85052/3 FOR E & D VALUES

FIGURE 1. Mounting clamp for vibration and transmissibility test.

TABLE IV. Dimensions for mandrel and clamp spacing.

Clamp Size	Mandrel		Clamp Spacing (see figure 1)	
	Dia ± .001 (Inches)	Length ± .015 (Inches)	A (Inches)	B (Inches)
-2	.125	6.000	-	-
-4	.250	17.500	6.00	2.75
-6	.375	21.000	8.00	2.50
-8	.500	23.000	9.00	2.50
-10	.625	25.000	10.00	2.50
-12	.750	29.000	12.00	2.50
-16	1.000	29.000	12.00	2.50
-20	1.250	22.500	2.75	8.50
-24	1.500	22.500	2.75	8.50

4.4.3.3.2 Vertical burn test. Three -16 clamps shall be used for the vertical burn test (see 4.4.3.3.1). Remove the specimens one at a time from the preconditioning chamber immediately before performing test. Slide the cushion to one end of the clamp band. Position the specimen in the vertical position with the centerline of the cushion material 0.75 inch above the top edge of the burner tube. Apply flame for 12 seconds and then remove. Testing shall be performed in a draft free environment. The average burn time of the three samples after removal of flame shall be not greater than 15 seconds. The average burn length shall be less than the length of one of the cushion specimens. Drippings from the burning specimens shall not continue to flame for more than five seconds after falling (see figure 2).

4.4.3.3.3 Horizontal burn test. Three specimens of any sizes fabricated in accordance with ASTM-D3182 shall be used for the horizontal burn test. The specimens shall be removed one at a time from the preconditioning chamber and positioned so that the centerline of the edge being burned shall be 0.75 inch above the top edge of the burner tube. The flame shall be applied for 15 seconds and then removed. Permit a minimum of 1.5 inches to burn to calculate the burn rate. The burn rate shall be not greater than 2.5 inches per minute. Record burn rate (see figure 2).

4.4.3.4 Titanium compatibility test. Mount five -16 clamps on a piece of titanium alloy tubing conforming to SAE-AMS4944, SAE-AMS4945, or SAE-AMS4946 with no spacer between the feet. The tubing with clamps mounted shall be filled with MIL-PRF-83282 fluid and exposed to the clamp maximum rated service temperature as specified in the applicable specification sheet for 12 days. Pressure in the tube shall be maintained at 3000 PSI during the 12-day exposure. The test apparatus shall be removed and placed in an atmosphere of 158 ^{o}F and 95 percent relative humidity for 20 days. Performance requirements shall be as specified herein (see 3.5.1).

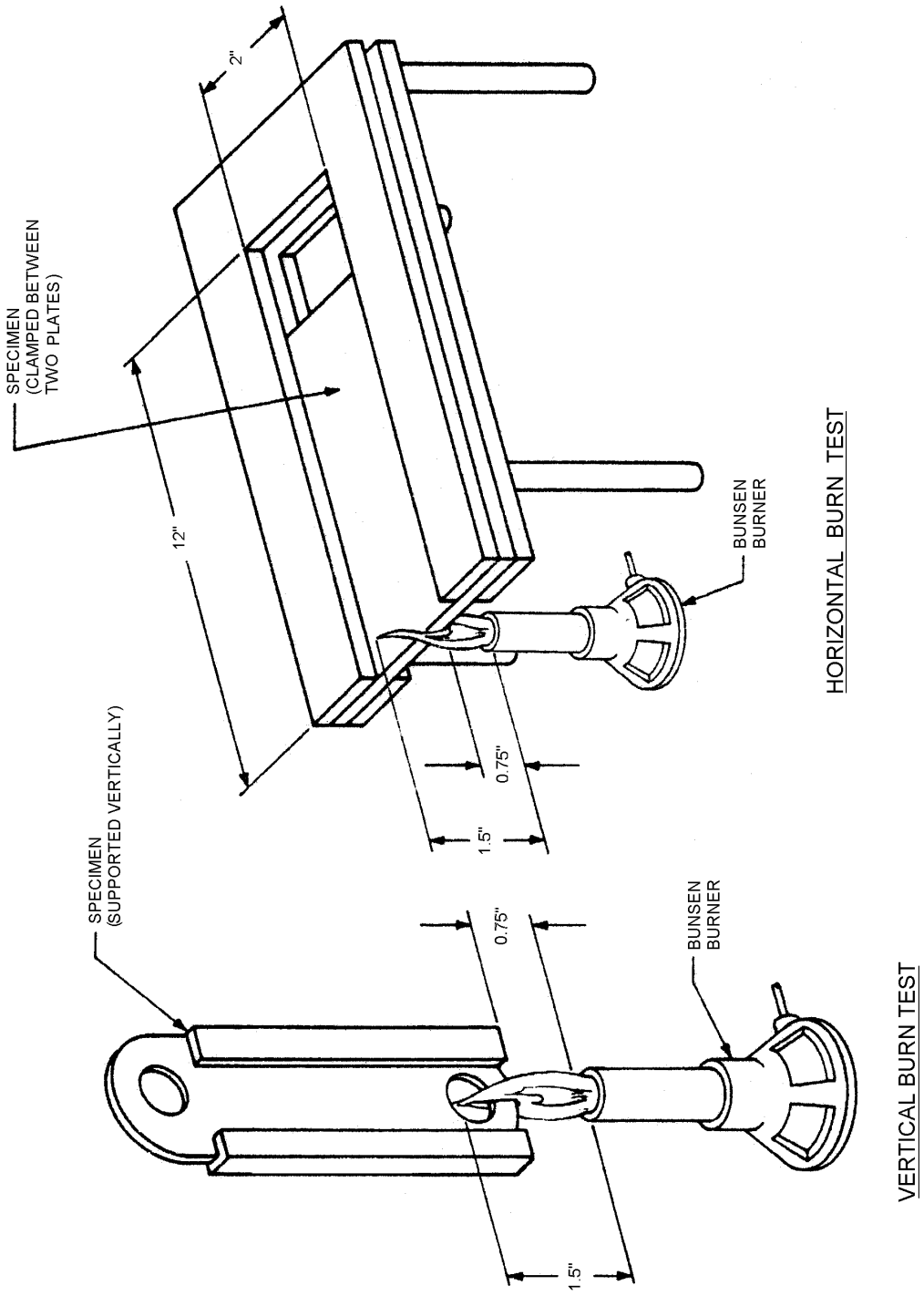


FIGURE 2. Flammability test set up (typical).

4.4.4 Clamp assembly tests.

4.4.4.1 Diametral retention test. Unless otherwise specified, six clamps of each size -4, -6, -8, -10, -12, -16, -20, -24 shall be subjected to this test, both before and after the vibration test (see 4.4.4.2.1). The test clamp shall be installed on a clean, dry mandrel conforming to 4.4.1.2 (a shorter length may be used). Mount the clamp with a 10-32 UNF-3A bolt, free running nut, and a .0625 ± .0005 inch thick spacer between the clamp feet. Tighten the bolt to a 30 lb-in torque. The mandrel shall be slowly forced to slide longitudinally through the clamp as shown on figure 3. The cushion shall not roll or slip off the band. The force to move the mandrel one inch shall be recorded. The clamps shall meet the requirements specified in 3.5.3.1.

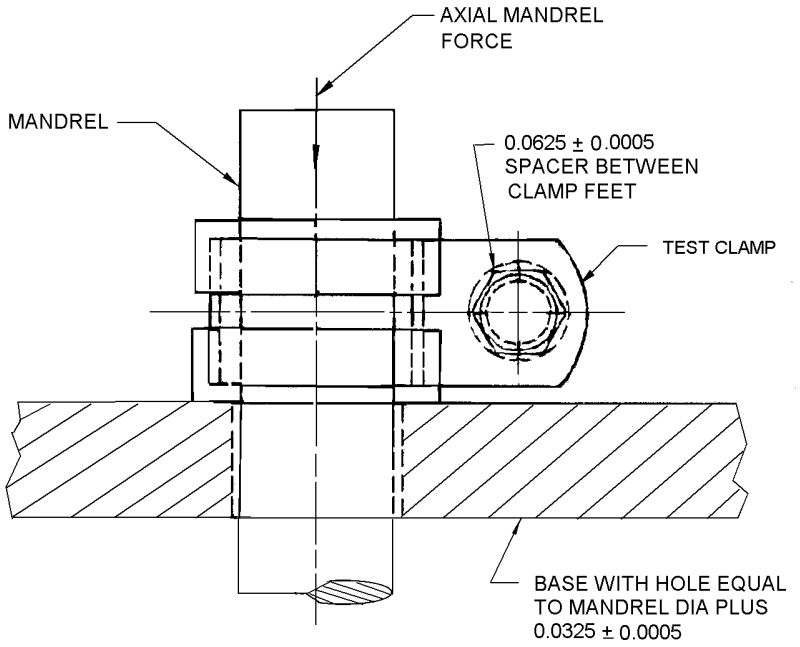


FIGURE 3. Clamp set up for diametral retention test.

4.4.4.2 Vibration and transmissibility test.

4.4.4.2.1 Vibration test. Three clamps of each size of -4, -6, -8, -10, -12, -16, -20, -24 shall be tested. Mount the clamps on a mandrel conforming to 4.4.1.2 with spacing and dimensions as specified in table IV, and as shown on figure 1. The assembly shall be installed on a vibration fixture and vibration table as shown on figure 1. Clamps shall be mounted flat on the vibration fixture with 10-32 UNF-3A bolts (160 KSI or higher strength). A flat washer shall be used beneath the head of the mounting bolt with smooth edge against the clamp foot. An input measuring accelerometer shall be mounted on the vibration fixture adjacent to but not

touching the center clamp (see figure 1). A second output measuring accelerometer shall be mounted on the test mandrel adjacent to but not touching the center clamp (see figure 1). The test assembly shall be subjected to simple harmonic motion having a vibratory input of 2g. The input acceleration shall sweep through a frequency range of 50 to 500 to 50 Hz. The sweep rate shall be logarithmic, requiring 5 minutes/cycle. One frequency cycle shall consist of 50 to 500 to 50 Hz. A resonance search shall be made and each resonance recorded (frequency and acceleration peak).

4.4.4.2.2 Transmissibility. Transmissibility Ratio (TR = g output/g input) shall be calculated for each resonance peak and recorded. The clamps shall then be dwelled at the most severe resonance peak for 30 minutes at a constant sinusoidal vibratory input of 10g as measured at the input accelerometer. All clamps shall meet the requirements specified herein (see 3.5.3.2). The vibration test shall be repeated with 3 new clamps of the same size as specified. Upon completion of vibration test, each clamp shall be subjected to the diametral retention test as specified herein (see 4.4.4.1).

4.4.4.3 Ozone resistance test for qualification. When specified on the applicable specification sheet, fifteen test samples of size -2 shall be separated into 3 sets of five. Each set of five shall be assembled with appropriate fasteners around 0.125 $\pm$ 0.001 diameter steel mandrels. The first set shall be exposed to ultraviolet light as specified in 4.4.4.3.1. The second set shall be conditioned for 70 hours at 212 ^{o}F. The third set shall not be subject to any preconditioning prior to the ozone test. The three mandrels with the five clamps each shall be immersed in an ozone environment of 600 parts per hundred million (PPHM) concentration for 6 hours at 125 ^{o}F. Clamps shall meet the requirements specified herein (see 3.5.3.3).

4.4.4.3.1 Ultraviolet exposure. The sample shall be exposed to ultraviolet (UV) light in accordance with ASTM-G154 without water exposure for 72 hours at 125 ^{o}F. The ultraviolet light source shall be UVA-340 lamps as specified in ASTM-G154. See 6.3 for recommended UV exposure equipment.

4.4.4.3.2 Ozone resistance test for conformance inspection only. The ozone resistance test conducted for qualification inspection (see 4.4.4.3) shall be conducted for the conformance test. When cushions larger than size -2 are being tested, the larger cushions shall be cut to length and assembled on a size -2 band for mounting on the mandrel.

4.4.4.4 Thermal shock test. Five test-clamps of size -16 shall be mounted on a test mandrel conforming to 4.4.1.2. The mandrel with clamps installed shall be exposed to 5 cycles of 30 minutes exposure at -65 ^{o}F, 15 minutes rest at room temperature, followed by 30 minutes exposure at the maximum rated service temperature (see applicable specification sheet). Clamps shall meet the requirements specified herein (see 3.5.3.4).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of the materiel is to be performed

by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The clamps are intended for use in general clamping of hydraulic tubing, electrical systems, and rigid tubing. The clamps may be used within the cushion temperature classifications established (see applicable specification sheet). The clamps are designed to be used in highly corrosive and high temperature environments and are unique for military applications.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Clamp part number (see MIL-DTL-85052/1 through MIL-DTL-85052/4).

c. Qualification (see 4.2 and 6.5).

d. Packaging requirements (see 5.1).

e. Acceptance Quality Limits (AQL) for conformance test (see 6.6).

f. Acceptance Quality Limits (AQL) for examination of products (see 6.7).

6.3 UV exposure equipment. The recommended UV exposure equipment is Q-PANEL LAB PRODUCTS, Cage Code 1PX28, Model QUV/Basic, or similar.

6.4 Recommended mounting methods. Mounting methods affect the vibration capabilities of these clamps. Typical mounting methods and vibration ratings are shown on figures 4, 5, and 6. The method shown on figure 5 is recommended whenever possible. The method shown on figure 6 should only be used in very high vibration areas or as necessary.

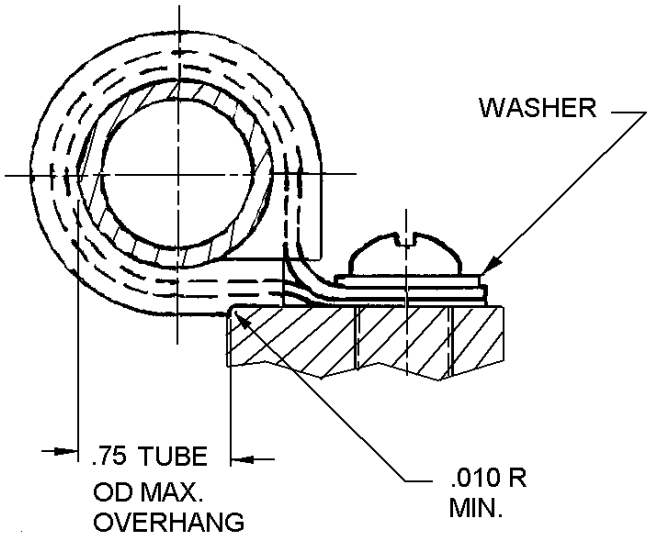


FIGURE 4. Recommended mounting of clamp at low to medium vibration areas.

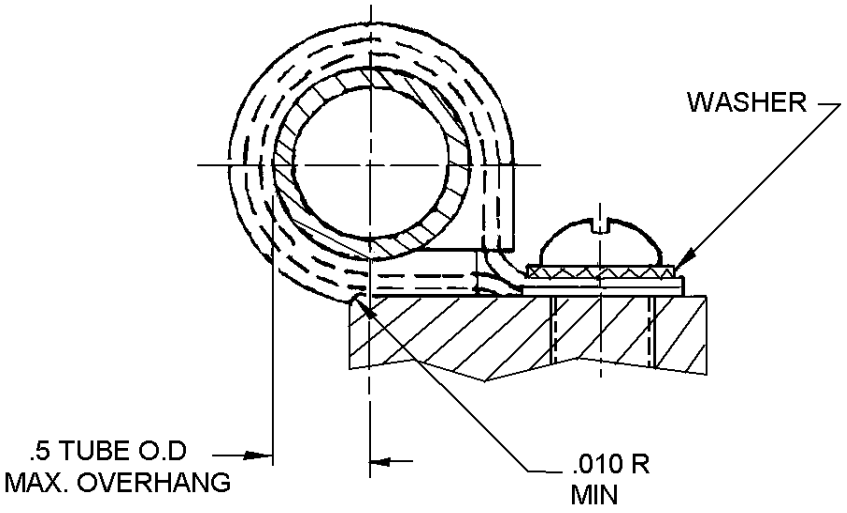
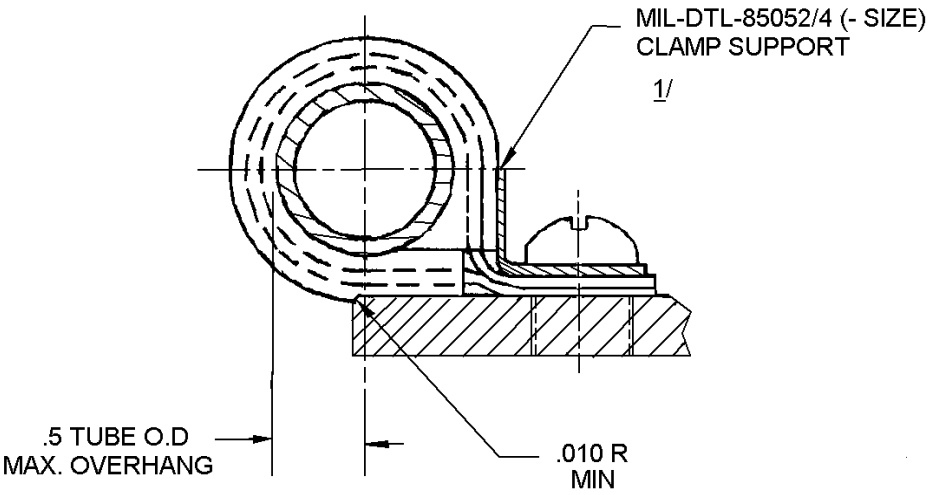


FIGURE 5. Recommended mounting of clamp at low to high vibration areas.



1/ If MIL-DTL-85052/4 clamp supports are used, the maximum tube overhang shall be 0.5 tube. This clamp support can be detrimental if the clamp is not fully supported.

FIGURE 6. Recommended mounting of clamp at very high vibration areas.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 85052 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Commander, Naval Air Systems Command, Code 4.3.5.2, Building 2187, Room 3320C3, 48110 Shaw Road, Patuxent River, MD 20670 or email james.magno@navy.mil.

6.6 Acceptance Quality Limits (AQL) for quality conformance inspection. For conformance inspection in Table II, 1.0 percent AQL per ANSI/ASQ-Z1.4 was used in the previous revision for Clamp band hardness, Cushion tensile, Cushion elongation, and Ozone resistance with inspection level S1.

Test requirements	Inspection Level ANSI/ASQ-Z1.4	AQL In percent
Clamp band hardness	S1	1.0
Cushion tensile	S1	1.0
Cushion elongation	S1	1.0
Ozone resistance	S1	1.0

6.7 Acceptance Quality Limits (AQL) for examination of products. For examination of products in Table III, 1.0 percent AQL for major defects and 4.0 percent AQL for minor defects were used in the previous revision with inspection level I.

6.8 Subject term (key word) listing.

Clamping cables
Clamping tubing
Fastening aircraft hydraulic lines
Fastening device
Ozonized air
Rubber cushion
Ultraviolet (UV) radiation

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army-AV
Navy-AS
Air Force-99

Preparing activity:
Navy-AS

(Project No. 5340-2732)

Review activities:
Navy-MC, SA, SH
Air Force-11, 71
DLA-IS

Industry Association:
SAE-G3E

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.