

MIL-C-6985B
2 March 1966
Superseding
MIL-C-6985A
30 July 1951
Amendment 2
10 Aug 1953

MILITARY SPECIFICATION

CLAMP, HOSE

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

1. SCOPE

1.1 *Scope.* This specification establishes the requirements for flat band clamps.

1.2 *Classification.* Hose clamps covered by this specification shall be of the types and sizes designated by the part numbers in AN 737.

2. APPLICABLE DOCUMENTS.

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposals form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

QQ-P-416 Plating, Cadmium (Electrodeposited)

Military

MIL-H-775 Hose, Rubber or Fabric (including tubing and fittings) Nozzle and Strainers Packaging of
MIL-H-6000 Hose, Rubber, Fuel, Oil, Coolant, Water and Alcohol MIL-L-6082 Lubricating Oil,
Aircraft, Reciprocating Engine (Piston)

STANDARDS

Military

MIL-STD-105 Sampling Procedure and Tables for Inspection by Attributes

FSC 4730

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MIL-STD-130	Identification Marking of U. S Military Property
MIL-STD-143	Specifications and Standards, Order of Procedure For the Selection of
MIL-STD-831	Test Report, Preparation of
MS33660	Tubing End, Hose Connection, Standard Dimensions For

Air Force-Navy Aeronautical Standards

AN737	Clamp, Hose
AN840	Adapter Hose to Pipe Thread
AND10065	Connection Assembly, Flexible, Fluid, Standard Design Of
AND10106	Tubing, Standard Sizes For Aluminum Alloy (5250) Round

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Bureau of Standards

Handbook H28 Screw Thread Standards for Federal Services

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

3. REQUIREMENTS

3.1 Qualification. The clamps furnished under this specification shall be products which have been tested and passed the qualification tests specified herein and have been listed on or approved for listing on the applicable qualified products list.

3.1.1 Components. The clamp assembly shall consist of a clamping band, a saddle, an adjusting screw (worm type for the tangential worm screw type clamp) and a machine screw and nut (applicable to the radial and tangential machine screw type clamps). All components shall be attached to the clamp band in such a manner to assure a satisfactory integral clamp assembly.

3.2 Material. Unless otherwise specified the clamp assembly shall be made of corrosion resistant steel except that the adjusting screw and the screw nut may be made of non-corrosion resistant steel provided that the non-corrosion resistant parts are suitably threaded to resist corrosion.

3.2.1 Selection of material. Specifications and standards for all material, parts and Government certification and approval of process and equipment which are not specifically designated herein and which are not specifically designated herein and which are necessary the execution of this specification shall be selected in accordance with MIL-STD-143.

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3.2.2 *Standard parts.* Military standard (MS) parts shall be used wherever they are suitable for the purpose and shall be identified on the contractors drawing by the applicable NS part number. Commercial utility parts may be used provided they possess the suitable properties and they are replaceable with the standard MS part without alteration.

3.3 Design and construction.

3.3.1 *General.* The clamps shall be standard, single or multiple sizes, and shall be suitable for use with hose conforming to MIL-H-6000. The use of special tools shall not be required for installing the clamp or tightening the adjusting screw.

3.3.2 *Design.* The design dimensions shall be within the envelope limits specified in AN737.

3.3.3 *Welding.* When spot or projection welding is used in construction of the clamp assembly, only certified welding machines shall be employed. The welded products shall be subjected to the qualification test requirements specified herein.

3.3.4 *Adjusting screw.* The clamp adjusting mechanism shall incorporate a thumb type screw which may be either a machine type screw and nut or a worm type screw. The screw shall not require the use of special tools for tightening the clamp.

3.3.4.1 *Machine screw and nut.* The adjusting screw and nut used on the radial and tangential machine screw type clamps shall have the unified thread form, conforming to Handbook H-28.

3.3.4.2 *Worm Screw.* The adjusting screw used on the tangential worm screw type clamp shall have extremely coarse threads, approximately 10 threads per inch for 1/4 to 3/8 inch diameter screws.

3.3.5 *Adjustment range.* All clamps, single and multiple sizes, shall have sufficient adjustment range (minimum and maximum) to tighten uniformly around the periphery of bars equal in diameter to the minimum and maximum bar sizes listed in Table I. The maximum gap between the clamp and the bar at any point shall not exceed the thickness of the clamp band when the adjusting screw is lightened to a maximum of 15 inch pounds torque.

3.4 *Identification of product.* Each clamp shall be marked in accordance with MIL-STD-130 with the applicable part number, the manufacturer's name or trade mark and the date of manufacture in quarter and year (i.e., 3/65).

3.4.1 *Use of AN or MIL designations.* Only products which have been tested, accepted and approved for listing on the approved qualified products list shall be identified with AN or MIL designations.

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TABLE I. Adjustable Ranges

Clamp Dash No.	Maximum Bar Size (Inches)	Minimum Bar Size (Inches)	Inside Diameter of Clamp Must Open To (Inches)
-22	5/8	7/16	11/16
-24	11/16	1/2	3/4
-26	3/4	9/16	13/16
-30	7/8	11/16	15/16
-34	1	13/16	1- 1/16
-38	1- 1/8	15/16	1- 3/16
-44	1-21/64	61/64	1- 3/8
-46	1- 3/8	1	1- 7/16
-48	1-29/64	1- 5/64	1- 1/2
-56	1-45/64	1-21/64	1- 3/4
-58	1- 3/4	1- 3/8	1-13/16
-66	2	1- 5/8	2- 1/16
-74	2- 1/4	1- 7/8	2- 5/16
-82	2- 1/2	2- 1/8	2- 9/16
-91	2-25/32	2-13/32	2-27/32
-98	3	2- 5/8	3- 1/16
-107	3- 9/32	2-29/32	3-11/32
-114	3- 1/2	3- 1/8	3- 9/16

MULTIPLE SIZE CLAMPS			
26-30	7/8	9/16	15/16
34-38	1- 1/8	13/16	1- 3/16
44-48	1-29/64	61/64	1- 1/2
56-66	2	1-21/64	2- 1/16
74-91	2-25/32	1- 7/8	2-27/32
98-114	3- 1/2	2- 5/8	3- 9/16

3.5 Finish. All non-corrosion resistant parts shall be plated in accordance with QQ-P-416 Class 1, Type II.

3.6 Workmanship. All clamps shall be free from burrs, sharp edges, irregular surfaces on the clamp band, and all other defects which could be detrimental to and cause failure of, the hose on which the clamp is used.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may use his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth herein where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

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4.1.1 Components and material inspection. *In accordance with 4.1 the supplier is responsible for insuring that components and materials used are manufactured, tested and inspected in accordance with the requirements of referenced subsidiary specifications and standards to the extent specified herein, or if none, in accordance with this specification.*

4.2 Classification of tests. *The inspection and testing shall be classified as follows:*

- a. *Qualification tests. 4.3*
- b. *Acceptance tests. 4.4*

4.3 Qualification tests.

4.3.1 Test samples. *The test samples shall consist of 16 clamps of each size and type for which qualification is desired. When specified by the qualifying activity all samples that were tested and one untested clamp of each size and type shall be furnished to the qualifying activity. Each sample shall be identified by a securely attached durable tag marked with the clamp name, this specification number, the AN part number, the manufacturer's name or trademark and the date that tests were performed.*

4.3.2 Tests. *The qualification tests shall consist of all the tests described herein. At the option of the qualifying service qualification tests may be supplemented by tests under actual service conditions.*

4.3.3 Test report. *When the tests are conducted at a location other than the laboratory of the procuring activity two copies of the test report prepared in accordance with MIL-STD-831 shall be furnished to the procuring activity.*

4.4 Acceptance tests. *Acceptance tests shall consist of the following:*

- a. *Examination of product.*
- b. *Periodic sampling tests.*

4.4.1 Lot. *A lot shall consist of all clamps of the same size and type, made from the same material and processed at one time.*

4.4.2 Sampling for examination of product. *Clamps taken at random in accordance with MIL-STD-105 at inspection level II shall be subjected to examination of product described in 4.5.1. The AQL shall be 4.0 percent defective.*

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4.4.3 Periodic sampling tests. Clamps taken at random in accordance with MIL-STD-105 at inspection level S-4 shall be subjected to the following tests. The AQL shall be 1.0 percent defective.

- a. Free torque. 4.6.1
- b. Wrenching torque. 4.6.2
- c. Release torque. 4.6.3
- d. Strap ductility. 4.6.4
- e. Deformation. 4.6.5

4.4.4 Rejection and retest. When one or more clamps from a lot fails to meet the test requirements of this specification no clamps still on hand or later produced shall be accepted until the extent and cause of failure are determined and appropriately corrected. Full particulars concerning the rejection and the action taken to correct the defects shall be furnished to the procuring activity before resubmitting the lot for tests.

4.4.5 Test condition. Unless otherwise specified herein the adjusting screw shall not be worked, manipulated or lubricated to increase the freedom of movement prior to conducting tests.

4.5 Test method.

4.5.1 Examination of product. Each clamp selected in accordance with 4.4.2 shall be examined for compliance with the requirements specified herein with respect to material, dimensions, workmanship and marking.

4.6 Periodic sampling tests. Samples taken in accordance with 4.4.3 shall be subjected to the following tests.

4.6.1 Free torque. Each test sample shall be checked for free movement of the adjusting screw. The torque required to turn the adjusting screw, measured over the complete range of adjustment, while the clamp is in an uninstalled condition, shall not exceed 10 inch pounds.

4.6.2 Wrenching torque versus load. The clamp shall be installed on a portion of hose conforming to MIL-H-6000 which has been split along the longitudinal axis and mounted on the radius blocks of a clamp tester similar to Figure 1. Before applying hydraulic pressure to the piston and while the radius blocks are in a fully closed position, the stretch indicator shall be adjusted to a minimum pre-load of 0.015 inch and the graduated dials rotated to indicate a zero reading. Sufficient hydraulic pressure shall then be applied to the piston to separate the radius blocks 0.150 + 0.050 - 0.000 inch. The clamp band shall contact the full periphery of the hose uniformly when the adjusting

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screw is tightened to a maximum of 10 inch pounds torque. The shut-off valve between the hydraulic pump and the piston shall be closed and the adjusting screw tightened to 20 and 40 inch pounds torque. Record the corresponding load and the applied torque. The load shall be not less than 250 and 500 respectively. When necessary, to maintain a minimum distance of 0.015 to 0.150 inch between the radius blocks, the shut-off valve may be opened and additional pressure applied to the piston.

4.6.2.1 Load resistance. At the conclusion of the "wrenching torque versus load" (4.6.2) and before releasing the adjusting screw or reducing the hydraulic pressure, the stretch indicator reading shall be set at zero and the hydraulic pressure increased to 1,000 pounds. Continue to increase the pressure gradually in 100 pound increments until the clamp fails. Record the corresponding stretch indicator reading and the applied pressure at which the clamp fails. The clamp shall withstand 1,600 pounds pressure when the adjusting screw is tightened to 40 inch pounds torque, with a minimum yield of 1,300 pounds. This test will determine the direct yield, ultimate strength and deflection of the clamp.

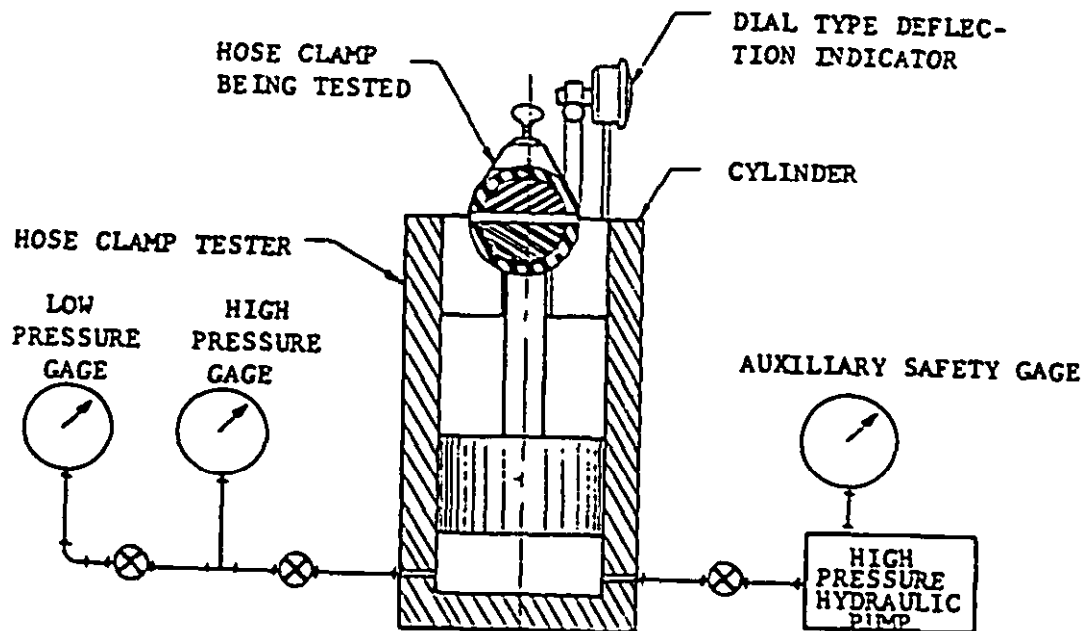


FIGURE 1. Hose Clamps Test Set-Up

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4.6.3 Release torque. The clamps shall be installed on a tube to hose connection and tightened to 25 inch pounds torque and released immediately. The screw thread may be either dry or lubricated.

4.6.3.1 Machine screw type. The minimum torque required to loosen the machine screw type clamp shall be not less than 9 inch pounds torque.

4.6.3.2 Worm screw type. The minimum torque required to loosen the worm screw type clamp shall be not less than 6 inch pounds torque.

4.6.4 Strap ductility. The clamp band shall be straightened and subjected to 180 degree bending, in the direction of the original bend, over a 3/16 inch diameter arbor and then restraightened. Two bends shall be made, one at opposite ends of the band. If the band is serrated the bends shall be made in the serrated portion. The band shall not crack, break or show any indications of failure.

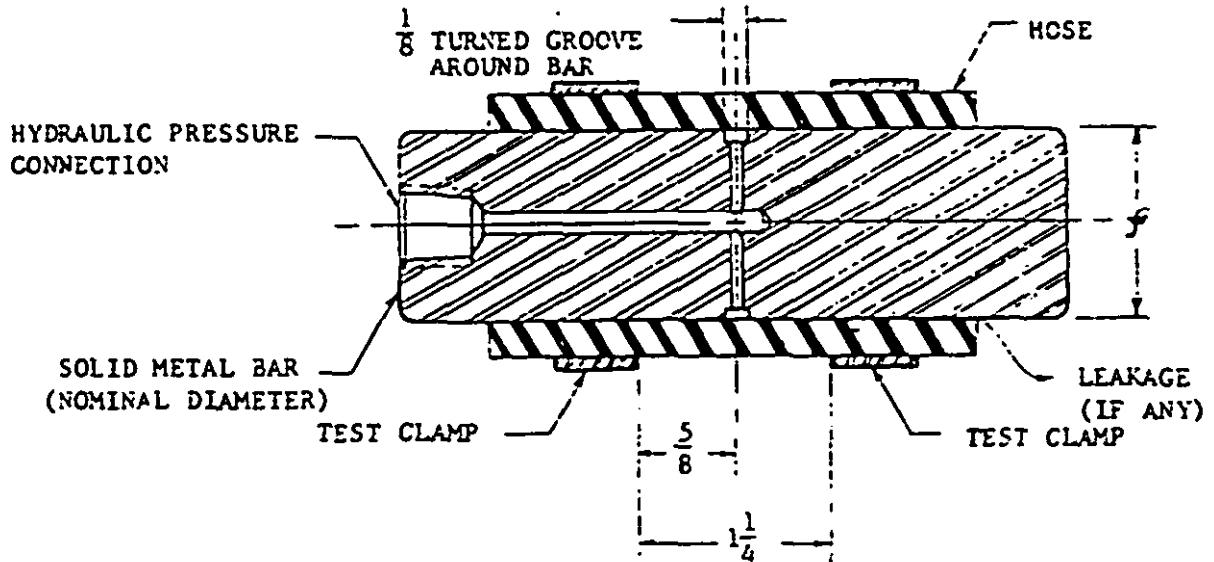
4.6.5 Deformation. Install the clamp on a 3 inch length of internally lubricated hose conforming to MIL-H-6000 which in turn is centered on a 3 inch length of tubing conforming to AND10106. Locate the clamp in the center of the hose and tube assembly and tighten the adjusting screw to 40 inch pounds torque. The maximum decrease of the inside diameter of the tubing shall be not more than 0.025 inch at any point. The wall thickness of the tubing shall be 0.035 inch for sizes up to and including 5/8 inch, 0.049 inch for sizes up to and including 3/4 inch and 0.062 for all larger sizes.

4.7 Additional qualification tests,

4.7.1 Overtightening torque. One clamp of each size and type shall be subjected to this test. The clamp shall be installed on a 3 inch length of hose conforming to MIL-H-6000 which has been centered on an arbor as shown in Figure 2. Tighten the clamp adjusting screw until failure occurs. Record the torque value required to cause clamp failure. Clamp sizes dash 22 through dash 30 shall withstand a minimum of 50 inch pounds torque and sizes dash 34 through dash 114 shall withstand a minimum of 60 inch pounds torque without failure of any part of the clamp assembly.

4.7.2 Leakage pressure. Two clamps of each size and type shall be installed on a 3 inch length of hose (one clamp on each end) conforming to MIL-H-6000 which has been centered on an arbor as shown in Figure 2. The clamps shall be tightened to 5 inch pounds torque and hydraulic pressure applied to the arbor until leakage occurs under either clamp. Continue to tighten the clamp in 5 pound increments and each time increase the hydraulic pressure until leakage occurs. Record the applied torque at each increment and the corresponding pressure at which leakage occurred. The pressure required to cause leakage at 20 and 40 inch pounds torque shall be not less than the corresponding pressures shown in Table II.

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Figure 2. Leakage Pressure Test Set-Up

TABLE II. Leakage Pressures

Clamp Nominal Size Inches	Hose ID	Leakage Pressure - psi	
		20 lb-in. Torque Applied	40 lb-in. Torque Applied
3/4 and less	5/16 and less	600	600
13/16 to 61/64	3/8 to 1/2	470	600
61/64	1/2	350	600
1- 5/64	5/8	280	350
1- 7/32 to 1-15/32	3/4 to 1	235	350
1-15/32	1	175	350
1-45/64 and 1-57/64	1-1/8 and 1-1/4	150	300
2- 1/64 and 2- 9/64	1-3/8 and 1-1/2	150	300
2-25/64	1-3/4	125	250
2-41/64	2	125	250
2-29/32	2-1/4	100	200
3- 5/32 and over	2- 1/2 and over	100	200

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4.7.3 Thread durability. One clamp of each size and type shall be subjected to this test. The clamp shall be installed on a portion of hose conforming to MIL-H-6000 which has been split along the longitudinal axis and mounted on the radius blocks of a tester similar to the fixture shown in Figure 1. Apply sufficient hydraulic pressure to the tester to separate the radius blocks $0.150 + 0.050 - 0.000$ inch. Adjust the clamp to contact the periphery of the hose uniformly and tighten the adjusting screw to 40 inch pounds torque. release the torque until the clamp is free to move on the radius blocks and repeat the tightening and loosening cycle for fourteen times. Record the torque and the corresponding pressure at 10 inch pounds increments on the first and fourteenth cycles. After the fourteenth cycle the adjusting screw shall be tightened until failure occurs and the torque value which caused the failure shall be recorded. Clamp sizes dash 22 through dash 30 shall withstand 50 inch pounds torque and all sizes larger than dash 30 shall withstand 60 inch pounds torque.

4.7.4 Vibration resistance. Six clamps of each size and type, made up into three assemblies as shown in Figure 3 shall be subjected to this test. The adjusting screws shall be tightened to 25 inch pounds torque and the position of the adjusting screws, in relation to their respective saddles, shall be marked to readily detect any change of position during the vibration test. The assembly shall be placed in the vibration testing machine and one end of the assembly vibrated at 1/4 inch double amplitude at 1,800 cycles per minute (CPM) for 25 hours. Oil conforming to MIL-L-6082, having a maintained temperature of $250^{\circ}\text{F} \pm 5^{\circ}\text{F}$ shall be circulated through the assembly at 50 ± 5 pounds per square inch (psi) for the entire testing period. After completion of the 25 hour test the hose portion of the assembly shall be examined for cuts or other damage caused by the clamp. The clamp shall also be examined to determine if the adjusting screw position has changed during the vibration test. Reduce the adjusting screw torque to 15 inch pounds and check all connections for leakage. The clamp shall seal adequately at 15 inch pounds torque. shall not damage the hose during the test and the adjusting screw shall not vibrate loose.

4.8 Examination of preparation for delivery. The preservation packaging, packing and marking shall be examined for compliance with the requirements of Section 5.

5. PREPARATION FOR DELIVERY

5.1 Preparation. Preservation packaging- packing and marking shall be in accordance with MIL-H-775.

5.1.1 Level packaging. The level of preservation packaging shall be A or C as specified. (See 6.2)

5.1.2 Level packing. Packing shall be level A, B or C as specified. (See 6.2)

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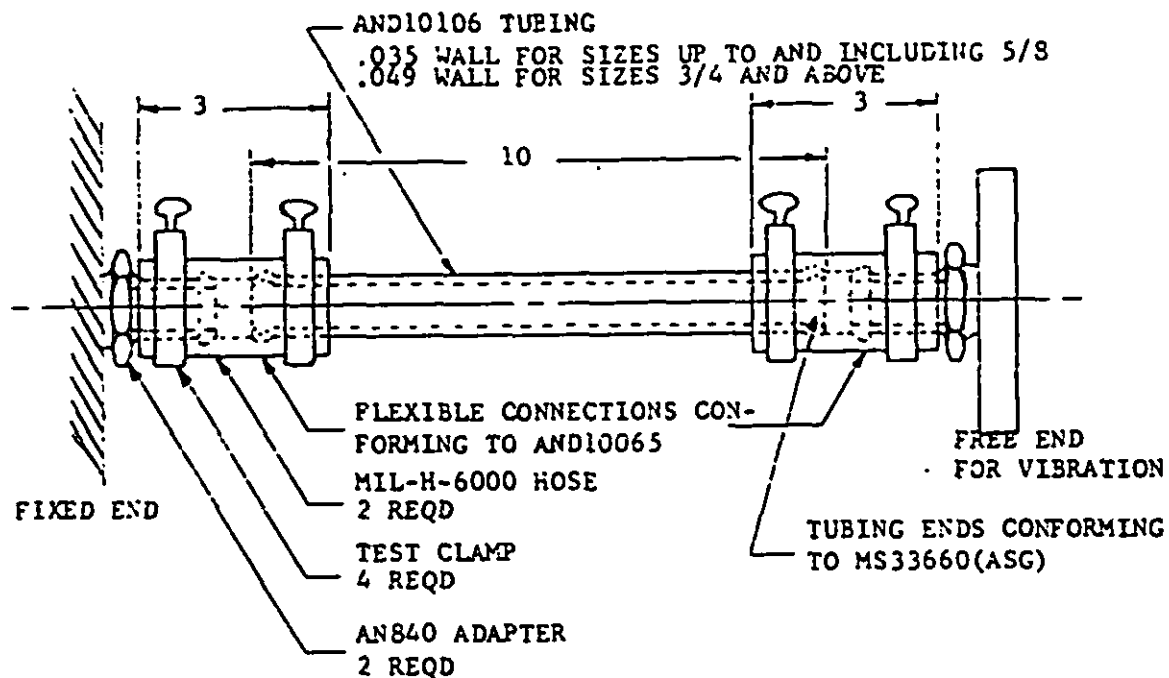


FIGURE 3. Vibration Resistance Test Set-Up

6. NOTED

6.1 Intended use. Hose clamps covered by this specification are intended for use on all types of hose used on aircraft, except on hose which is specifically designed for use with detachable end fittings.

6.2 Ordering data. Procurement documents shall specify the following:

- a. Title, number and date of this specification.
- b. Size and part number of clamp.
- c. Level of packaging and packing required.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to

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this requirement, 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. The activity responsible for the Qualified Products List is MOAMA(MONEB) Brookley AF3 Ala 36615, and information pertaining to qualification of products may be obtained from that activity.

6.4 Definitions

6.4.1 *Yield.* The yield of a clamp is defined as the load at which the load deflection curve departs appreciable from a straight line.

6.4.2 *Radial type clamp.* A radial type clamp is defined as one in which the compressive forces are applied by means of a screw mechanism at right angles to the longitudinal axis of the clamp.

6.4.3 *Tangential type clamp.* A tangential type clamp is defined as one in which the compressive forces are applied by means of a screw mechanism attached tangent to the circumference of the clamp.

Custodians:

Air Force - 69
Army - MO
Navy - WP

Preparing Activity:

Air Force - 69

Project No. 4730-0356

Review Activity:

Army - MO
DSA - CS
Air Force - 69

User Activity:

Army - M1