



AEROSPACE STANDARD

MA2150

Issued 1993-02
Reaffirmed 2015-08

Clamps, Loop or P Style, Single Point Mount, Multiple Shapes, Metric

RATIONALE

MA2150 has been reaffirmed to comply with the SAE five-year review policy.

Changes in this reaffirm are format/editorial only.

1. SCOPE:

1.1 This aerospace specification establishes the requirements for metric loop or "P" style clamps used for systems installation in aerospace equipment.

1.2 Product Classification:

The clamp assemblies covered by this document all incorporate a single mounting point, but may be bare or cushioned, and vary in shape such as fully round, partially round, or rectangular.

1.3 Field of Application:

Use of these clamp assemblies is primarily for the support of fluid systems tubing and components but may be used for other general purpose applications such as wire, cable, wave guide tubes, and system grounding, as determined applicable by the design activity. Installation and selection is recommended per ARP1897.

2. REFERENCES:

2.1 Applicable Documents:

The following documents form a part of this document to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS), Metric Aerospace Standards (MA), and Aerospace Recommended Practices (ARP) shall apply.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2015 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE MA2150

SAE values your input. To provide feedback on this Technical Report, please visit <http://www.sae.org/technical/standards/MA2150>

Documents

Document Sharing Hub

2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 5510	Wrought, Corrosion, and Heat Resistant Alloy, Sheet, Strip, and Plate, 18Cr, 10.5Ni, 0.40Ti, Solution Heat Treated
AMS 5528	Wrought, Corrosion, and Heat Resistant Alloy, Sheet, Strip, and Plate, 17Cr, 7.1Ni, 1.1Al, Solution Heat Treated
AMS 4944	Titanium Alloy, Tubing, Seamless, Hydraulic, 3.0Al, 2.5V, Cold Worked and Stress Relieved
AMS 4945	Tubing, Seamless, Hydraulic, 3.0Al, 2.5V, Texture Controlled, 105,000 psi (724 MPa) Yield Strength
AS478	Identification Marking Methods
ARP1527	Color Coding, Elastomers for Tube Clamp Cushions
ARP1897	Clamp Selection and Installation Guide
MA2150/1	Clamp, Loop Style, Cushioned with Wedge, Hydrocarbon Fluid Resistant, Metric
MA2150/2	Clamp, Loop Style, Cushioned with Wedge, Phosphate Ester Fluid Resistant, Metric
MA2150/3	Clamp, Loop Style, Cushioned With Wedge, High Temperature, Metric
MA2150/4	Clamp Support, Loop Clamp, Metric
MA2150/5	Clamp, Loop Style, With Insert, Phosphate Ester Fluid Resistant, Metric
MA2150/6	Clamp, Loop Style, With Insert, Phosphate Ester Fluid Resistant, Metric
MA2150/7	Clamp, Loop Style, With Insert, High Temperature, Metric
MA2152/1	Clamp, Center Mount, Bare Metal, Aluminum, Metric
MA2152/2	Clamp, Center Mount, Bare Metal, Stainless Steel, Metric
MA2153/1	Clamp, Loop Type, Bare Metal, Aluminum, Metric
MA2153/2	Clamp, Loop Type, Bare Metal, Stainless Steel, Metric
MA2155/1	Clamp, Rectangular Loop, Cushioned With Wedge, Hydrocarbon Fluid Resistant, Aluminum, Metric
MA2155/2	Clamp, Rectangular Loop, Cushioned With Wedge, Hydrocarbon Fluid Resistant, Stainless Steel, Metric
MA2155/3	Clamp, Rectangular Loop, Cushioned With Wedge, Phosphate Ester Fluid Resistant, Aluminum, Metric
MA2155/4	Clamp, Rectangular Loop, Cushioned With Wedge, Phosphate Ester Fluid Resistant, Stainless Steel, Metric
MA2155/5	Clamp, Rectangular Loop, Cushioned With Wedge, High Temperature, Stainless Steel, Metric
MA2156/1	Clamp, Center Mount, Cushioned, Hydrocarbon Fluid Resistant, Metric
MA2156/2	Clamp, Center Mount, Cushioned, Phosphate Ester Fluid Resistant, Metric
MA2156/3	Clamp, Center Mount, Cushioned, High Temperature, Metric

2.1.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 582	Free Machining Stainless Steel and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished
ASTM D 395	Rubber Property, Compression Set
ASTM D 412	Rubber Properties in Tension
ASTM D 471	Rubber Property, Effect of Liquids
ASTM D 624	Rubber Property, Tear Resistance
ASTM D 1149	Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimen)
ASTM D 2240	Rubber Property - Durometer Hardness
ASTM D 3182	Rubber - Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanizing Sheets
ASTM E 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

2.1.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

A-A-711	Dry Cleaning Solvent
QQ-P-35	Passivation Treatments for Corrosion Resisting Steel
PPP-B-566	Box, Folding, Paperboard
PPP-B-576	Box, Wood, Cleated, Veneer, Paper Overlaid
PPP-B-585	Box, Wood, Wirebound
PPP-B-591	Boxes, Shipping, Fiberboard, Wood Cleated
PPP-B-601	Boxes, Wood, Cleated Plywood
PPP-B-621	Box, Wood, Nailed and Locked-Corner
PPP-B-636	Box, Shipping, Fiberboard
PPP-B-640	Box, Fiberboard, Corrugated, Triple-Wall
PPP-B-665	Boxes, Paperboard, Metal Edged and Components
PPP-B-676	Boxes, Setup
MIL-P-116	Preservation, Methods of
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-H-6088	Heat Treatment of Aluminum Alloys, Process for
MIL-H-6875	Heat Treatment of Steels (Aircraft Practice), Process for
MIL-L-7808	Lubrication Oil, Aircraft Turbine Engine, Synthetic Base
MIL-H-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft
MIL-STD-100	Engineering Drawing Practices
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-831	Test Reports, Preparation of

2.2 Order of Precedence:

In the event of conflict between the text of this document and the references cited herein, the text of this document shall take precedence.

3. TECHNICAL REQUIREMENTS:

3.1 Part Standards:

The individual item requirements shall be as specified herein and in accordance with the applicable part standards. In the event of conflict between the requirements of this document and the part standard, the requirements of the part standard shall govern.

3.2 Qualification:

The items furnished under this document shall be products which have been subjected to and successfully passed the qualifications specified in Section 4 of this document. Manufacturers qualified for document MIL-C-85052 need not requalify.

- 3.2.1 The qualification required by this document relates to qualification of the clamp only. It does not infer qualification of clamp installation techniques.

3.3 Materials:

Clamp band materials and cushioning material shall be as specified on the applicable part standard.

3.4 Design and Fabrication:

The design and construction of the clamp shall be as specified herein and in accordance with the applicable part standard.

- 3.4.1 Dimensions and Tolerances: Dimensions and tolerances shall be as specified on the applicable part standard.

3.5 Performance:

Clamp cushions, clamp bands, and clamp assemblies shall conform to the requirements of this document and the applicable part standard when subjected to the applicable tests specified in this document and the applicable part standard.

3.5.1 Clamp Cushion Performance:

- 3.5.1.1 Physical Properties: The cushion material shall meet the physical property requirements (Table 3) specified in the applicable part standard (see 4.5.3.1).

3.5.1.2 Compression Test: The average compression set value of three cushion material specimens shall not exceed the value specified in the applicable part standard (see 4.5.3.2).

3.5.1.3 Flammability: The cushion material shall be tested for flammability in accordance with the applicable part standard and as specified herein (see 4.5.3.3).

3.5.1.4 Titanium Compatibility: There shall be no evidence of cracking or pitting of the titanium tube specimen when observed with a 5 to 10 power magnifying glass (see 4.5.3.4).

3.5.2 Clamp Band Performance:

3.5.2.1 Clamp Band Hardness: Clamp band hardness shall be as specified in Note 3 of the applicable part standard.

3.5.3 Clamp Assembly Performance:

3.5.3.1 Retention: As required by the part standard each clamp shall be tested in accordance with 4.5.4.1 both before and after being subjected to the vibration test (see 4.5.4.2). When tested in accordance with 4.5.4.1, each clamp shall withstand an axial mandrel force as specified in Table 1:

TABLE 1 - Clamp Band Thickness Versus Axial Force

Clamp Band Thickness	Axial Force
0.51 mm	6.80 to 20.41 kg
0.81 mm	11.34 to 24.95 kg
1.02 mm	15.88 to 29.48 kg

3.5.3.2 Vibration: The clamps shall not exhibit any evidence of cushion separation or other deterioration. There shall be no cracking or separation of metal components. The transmissibility ratio shall be recorded (see 4.5.4.2.1). See the part standard for those parts requiring vibration testing for qualification.

3.5.3.3 Ozone Resistance (When Specified on Applicable Part Standard): The clamps shall not exhibit any evidence of cracking visible to the unaided eye or distortion of the cushion material (see 4.5.4.3).

3.5.3.4 Thermal Shock: The clamps shall not exhibit evidence of cracking, tackiness, or degradation of the cushion material (see 4.5.4.4).

3.6 Surface Texture:

All surfaces shall have a smooth finish and 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.