



AEROSPACE STANDARD

MA4070

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Pins, Procurement Specification For, Metric

FSC 5315

RATIONALE

MA4070 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE AND FIELD OF APPLICATION:

1.1 Type:

This specification covers aircraft quality metric pins, such as, straight, headless, headed, shouldered, and dowel, in metric sizes.

1.2 Application:

Primarily for use in aerospace propulsion systems requiring metric size pins for use as locks, positioners, guides, plugs, and other similar uses.

2. APPLICABLE DOCUMENTS:

2.1 The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specification (AMS) and Metric Aerospace Standard (MA) shall apply. The applicable issue of other documents shall be as specified in AMS2350.

2.2 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

AMS2350	Standards and Test Methods
AMS2640	Magnetic Particle Inspection
AMS2645	Fluorescent Penetrant Inspection
MA4018	Pin, Straight, Headless, AMS5688, Metric
MA4019	Pin, Straight, Headless, AMS5732, Metric

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2.3 ANSI Publication:

Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

ANSI/ASME B46.1 Surface Texture (Surface Roughness, Waviness and Lay)

2.4 U.S. Government Publications:

Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.4.1 Federal Specification:

PPP-H-1581 Hardware Fasteners and Related Items, Packaging and Packing for Shipment and Storage of

2.4.2 Military Standards:

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

MIL-STD-1312 Fasteners, Test Methods

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Material shall be as specified on the part drawing.

3.2 Dimensions:

The dimensions and geometric tolerances of completed parts, after all processing including plating when required, shall conform to the requirements on the part drawing.

3.3 Surface Texture:

Surface texture of completed parts, prior to plating or coating when required, shall conform to the requirements on the drawing, determined in accordance with ANSI/ASME B46.1.

3.4 Hardness:

When specified on the part drawing, the hardness shall be uniform and tested in accordance with MIL-STD-1312-6.

3.5 Shear Strength:

In lieu of hardness test as in 3.4, parts made from spring temper, cold drawn material shall withstand the minimum double shear load specified in Table I, tested in accordance with DOD-STD-1312-113.

TABLE I - Double Shear Loads, Room Temperature

Nom Dia mm	Area at Nom Dia mm ²	Double Shear Load kN min
1.5	1.77	2.2
2	3.14	3.9
2.5	4.91	6.1
3	7.07	8.8
4	12.57	15.7
5	19.64	24.5
6	28.27	35.3
8	50.27	62.8
10	78.54	98.2

Double shear load is based on two times area at nominal diameter times 625 MPa min shear strength divided by 1000 for load in kN.

3.6 Plating or Coating:

When required, plating or coating shall be as specified on the part drawing.

3.7 Product Marking:

Parts shall be identification marked as specified on the part drawing.

3.8 Quality:

Parts shall be uniform in quality and condition, clean, sound, smooth, and free from burrs and foreign material and external imperfections detrimental to their performance.

3.9 Non-Destructive Inspection:

Parts shall be fluorescent penetrant inspected or magnetic particle inspected as specified on the part drawing. Parts shall show no indication of cracks, cold shuts, seams, machining tears, pipes, grinding checks, or nonmetallic inclusions.

3.9.1 Indications in pins shall not exceed the following limitations:

- 3.9.1.1 There shall be no indications of discontinuities transverse to the grainflow (that is, at an angle of more than 10 deg to the longitudinal axis).
- 3.9.1.2 Longitudinal indications of surface seams and forming laps parallel to grainflow are acceptable within the following limits, provided the separation between indications is not less than 1.6 mm in all directions.
- (a) Sides of Head: A maximum of three surface discontinuities per head is permitted and the length of each indication may be full height of the surface. No indication shall extend over either edge to a depth greater than 0.8 mm.
 - (b) Top of Head and End of Stem: A maximum of three surface discontinuities in each area is permitted provided the length or diameter of any individual indication does not exceed 1.2 mm.
 - (c) Shank or Stem: A maximum of five indications is permitted. The length of any one indication may be the full length of the surface but the total length of all indications shall not exceed twice the length of the surface. No indication shall extend into a fillet or over an edge.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of parts shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing deemed necessary to ensure that the parts conform to the requirements of this specification.

4.2 Classification of Tests:

The inspection and testing of parts are classified as acceptance tests as in 4.3.1, which are to be performed on each production inspection lot.

4.3 Production Inspection Lot:

A production inspection lot shall be all finished parts of the same part number, made from a single heat of alloy, heat treated at the same time to the specified condition, produced as one continuous run, and submitted for vendor's inspection at the same time.

4.3.1 Acceptance Tests: The acceptance tests shall be performed on each production inspection lot. The acceptance tests consist of all the tests specified in Table II.

TABLE II - Summary of Acceptance Tests

Characteristic	Requirement Paragraph	Sample Size	Test Method
Dimensions	3.2	Tables III & IV	Conventional measuring methods
Surface Texture	3.3	Tables III & IV	Per ANSI/ASME B46.1 by visual or fingernail comparison with standard texture specimens. In case of conflict, stylus instrument may be used.
Hardness	3.4	Table V, Col A	MIL-STD-1312-6 when required
Shear Strength	3.5	Table V, Col B	DOD-STD-1312-113 when required
Product Marking	3.6	Tables III & IV	Visual examination
Plating	3.6	Tables III & IV	Non-destructive test of plating thickness per MIL-STD-1312-12 when required
Non-Destructive Inspection	3.9	Tables III & IV	Inspection per AMS2640 or AMS2645
Quality	3.7	Tables III & IV	Visual examination

4.3.2 Acceptance Test Sampling:

4.3.2.1 Non-Destructive Test - Visual and Dimensional: A random sample shall be selected from each production inspection lot; the size of the sample shall be as specified in Table III. The classification of defects for parts shall be as specified in Table IV. Defects not classified in Table IV shall be classified as Minor B defects. All dimensional characteristics are considered defective when out of tolerance.

TABLE III - Sampling Data

Visual and Dimensional Characteristics
Sample Size, Acceptance Number (Ac) and Rejection Number (Re) for
AQL 1.0% and 4.0%

Production Inspection Lot	1.0% AQL			4.0% AQL		
	Sample Size	Ac	Re	Sample Size	Ac	Re
25 & under	13	0	1	3	0	1
26 to 50	13	0	1	13	1	2
51 to 90	13	0	1	13	1	2
91 to 150	13	0	1	20	2	3
151 to 280	50	1	2	32	3	4
281 to 500	50	1	2	50	5	6
501 to 1200	80	2	3	80	7	8
1201 to 3200	125	3	4	125	10	11
3201 to 10000	200	5	6	200	14	15
10001 to 35000	315	7	8	315	21	22
35001 to 150000	500	10	11	315	21	22
150001 to 500000	800	14	15	315	21	22
500001 & over	1250	21	22	315	21	22

Sample sizes listed above are based on single sampling plans for normal inspection per MIL-STD-105. It is permissible to use other sampling plans per MIL-STD-105 which provide the same quality protection. When sample size equals or exceeds the lot size, 100% inspection is required.

TABLE IV - Classification of Defects

Category No.	AQL	Characteristic
Major A 101 102 103	1.0%	Surface discontinuities revealed by either magnetic particle inspection or fluorescent penetrant inspection. Outside diameter. Length.
Major B 201 202 203 204	4.0%	Other dimensional characteristics not listed. Surface texture. Plating or coating when required. Inside diameter when required.

4.3.2.2 Non-Destructive Inspection: Parts shall be fluorescent penetrant inspected in accordance with AMS2645 or magnetic particle inspected in accordance with AMS2640 as specified on the part drawing, and shall meet the requirements in 3.9 through 3.9.1.2.

4.3.2.3 Hardness Test (See 3.4): A random sample shall be selected from each production inspection lot; the size of the sample shall be as specified in Table V, column A. The sample units may be selected from those that have been subjected to and passed the visual and dimensional inspection, with additional units selected at random from the production inspection lot as necessary.

TABLE V - Mechanical and Metallurgical Characteristics

Sample Size (n) and Acceptance Number (AC)

Production Inspection Lot	Sample Size (n)		Acceptance Number (AC)
	Non-destructive	Destructive	
Up to 500	A 8	B 3	0
501 to 3200	13	5	0
3201 to 35000	20	5	0
35001 and over	32	8	0

- 4.3.2.4 Destructive Tests: A random sample shall be selected from each production inspection lot; the size of the sample shall be as specified in Table V, column B. The sample units may be selected from those that have been subjected to and passed the non-destructive tests with additional units selected at random from the production inspection lot as necessary.
- 4.3.3 Shear Test Specimens (See 3.5): Where the finished part is not suitable for shear testing as specified in 3.5, specimens may be taken from the material of the same lot of alloy and processed together with the parts they represent.
- 4.3.4 Acceptance Quality: The acceptance quality level and acceptance number of defectives for the acceptance tests shall be as specified in Tables III and V.

4.4 Reports:

The vendor of parts shall furnish with each shipment a report stating that the chemical composition of the parts conforms to the applicable material specification, showing the results of tests to determine conformance to the room temperature shear property and hardness when specified, and stating that the parts conform to the other technical requirements of this specification. This report shall include the purchase order number, this specification number, contractor or other direct supplier of material, part number, nominal size, and quantity.