SEALTH AERO MARINE

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SEALTH PROCESS SPECIFICATION

SPS-510 WORKMANSHIP (MANUFACTURING)

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Revision F

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1. Purpose

Workmanship: “The quality imparted to an item in the process of being made”; or, “The art or skill of a workman”.

The purpose of this specification is to attempt, as best as possible, to define and explain the “Standards” or “Minimum Requirements” necessary to produce items by and for Sealth Aero Marine.

2. Scope

This specification is applicable to all items produced by and for Sealth Aero Marine and is to be considered a part of each Engineering Drawing, Purchase Order and Work Order.

Where specific dimensional or finish criteria are listed on a Drawing or Purchase Order, that characteristic shall take precedence over the criteria in this specification.

The criteria listed in this specification apply to all “end user” visible areas of a part and areas where other “mating” parts interact or function with the part being reviewed.

3. Responsibilities

Employees and Inspectors performing work by and for Sealth Aero Marine are responsible for verifying that their work meets the requirements established by this specification.

Sealth Aero Marine supervisory and Inspection personnel are required to be familiar with the requirements of this specification and are required to assure that all work leaving their areas of responsibility comply with the requirements within.

4. Reference Documents

SPD-110 Material Specifications

5. Notes

This release contains workmanship or manufacturing standards for Sealth Aero Marine hardware. This document may be expanded to include all applicable requirements as they are required.

6. Definitions & Acronyms

For this Specification, the definitions in the referenced documents shall apply

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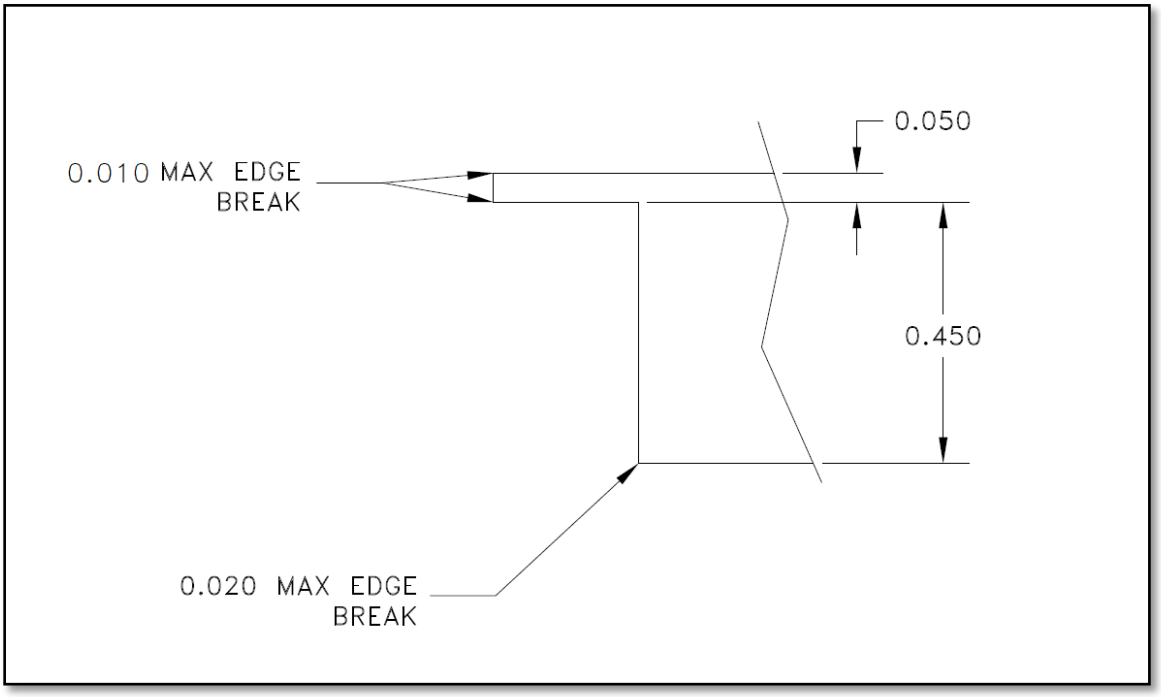
7. General Manufacturing

7.1 Edges

7.1.1 Break Edges

Unless otherwise stated on the drawing, the standard to which sharp edges must be broken is from 0.005 to 0.020 inch or no greater than 1/5 the intersecting surfaces widths. Any method may be used to break such edges, provided a radius or a flat without sharp corners is produced within the tolerance given.



A sharp-cornered flat or a concave radius at the edge is not acceptable. If a sharp corner is required, the drawing will so specify. Dimensions to intersecting surfaces shall be made before breaking or shall be measured to the intersections, which existed before breaking. On sheet metal parts of 1/32 inch (0.03125) thickness or less, the breaking of edges is not mandatory; however, such edges shall be free from burrs. The breaking of edges does not apply to elastomers such as rubber and soft plastics.

A “broken edge” will be smoothed to the extent that fingernails will slide over the edges without getting stick or caught, and hands or fingers will not be cut. Electrical wires, mating parts or clothes will not score or fray in any way if in contact with the edge.

7.1.2 Deburr Edges

Burrs shall not be present on edges of manufactured parts. In situations where breaking the edge is not possible, the edge must be free from burrs.

A “deburred edge” will be smoothed to the extent that fingernails will slide over the edges without getting stuck or caught.

7.2 Dimensions

7.2.1 Standard Tolerances (MFG)

Unless otherwise specified on the drawing field or title block the standard tolerances shall be as followed for manufactured product.

LINEAR	
X.	0.125
X.X	0.030
X.XX	0.010
X.XXX	0.005
X.XXXX	0.002

ANGULAR	
X.	2º
X.X	1º
X.XX	½º
SURFACE ROUGHNESS	
See 7.3.3	

7.2.2 Approximate Dimensions

Approximate dimensions are dimensions that little to no effect on final fit or function. Dimensions marked with approx. should be within ±.062 of the displayed dimension. Angular tolerance shall be within ± 10º

7.2.3 Reference / Stock Dimensions

Dimensions marked with either Reference or Stock are dimensions that are typically carried through from a previous requirement. Either another detailed drawing or standard manufacturing tolerances or extruded material.

7.2.4 Dimensions and Finishes

Unless otherwise specified, all dimensions on detail components shall be measured prior to all finishing operations. Processes such as heat-treating, stress relieving, aging and passivation are not considered “finishes” for this purpose.

Since the product may be either finished or unfinished, processed such as plating, painting, dry-lube, sand blasting, graining, and buffing shall be performed following the final dimensional inspection. If these operations are required to maintain dimensional stability, this shall be specified on the drawing.

Note: Any product that receives an abrasive cosmetic finish such as graining or buffing, machine all cosmetic surfaces (typically flange thickness, countersink diameters, overall diameters) to the higher end of the tolerance to allow for material removal

7.3 Surface Finish

7.3.1 Surface Transitions

Connecting curved surfaces or curved and plain surfaces shown as a tangent must blend smoothly (See 7.4). Attention is drawn to any drawing radius dimension and tolerance call-out which are required to be maintained.

7.3.2 Mismatch of Machined Surfaces

When two or more machining cuts are required to produce a surface delineated on the drawing as being a theoretical single surface, the maximum misalignment between intersecting or adjacent surfaces shall not exceed 24 times the largest surface texture value specified for the features. Surfaces shall also fall within the tolerance of size or form for the features. See Table

Specified Ra (micro-inches)	Maximum Mismatch (inches)
8	0.0002
16	0.0004
32	0.0008
63	0.0016
125	0.003
250	0.006
500	0.013

7.3.3 Surfaces Roughness

Sealth Aero Marine produces decorative, interior parts. The surface roughness and finish are of the utmost importance. Unless otherwise specified, the following table shall be used for surface roughness and finish minimum requirements.

Surface Type	Roughness, Maximum Ra (in micro inches)
When specified for plated parts, on the cosmetic surfaces	32
Surface/Stitch Milled, shaped splines, rolled serrations, reamed holes	63
Spot face or counter bore flats, broached splines or holes, countersinks	125
Finished turned surfaces, milled surfaces, drilled holes of 1/4inch diameter or less	125
Machined surfaces not listed above or otherwise limited by drawing notes (this is not applicable to pierced or sheared surfaces)	125

7.4 Materials

The final product shall incorporate the materials specified on the drawing and modified by any specific process, such as heat treatment, anodizing, plating, etc.…, as applicable.

For material manufacturing specifications see SPD-110 for acceptable manufacturing standards for any given material type.

Note: A36 steel is interchangeable with the steel series designated AISI 1018 to AISI 1025.

7.5 Radii

Unless otherwise specified on the drawing, radii are to be full and tangent to intersecting geometry. Unless surface finishes are designated on small radii or changes in contour, the finish is to be equivalent to the lowest Ra or surface finish required on adjoining surfaces

7.6 Cleanliness

7.6.1 General Cleanliness

Parts for which no cleaning specification is specified on the drawing shall be sufficiently cleaned to be used for the application intended. Such parts shall be free of cutting oil, dirt, chips, and scale. Particular attention shall be given to parts having threads, recesses, or cavities, to ensure that these areas are clean and free from burrs.

7.6.2 Surface Cleanliness

The surface of material of parts that are subjected to heat treatment, welding, or both, shall be clean and free of markings from lead pencils, wax crayons, grease pencils, carbon, and other foreign substances.

7.7 Drilled Holes

Where the engineering drawing specifies a hole size and does not specify a diameter tolerance other than the general tolerance in the title block, the tolerance specified in the table below shall apply.

Drill Size - inch -	Drill Size - mm -	Allowable Tolerances - inch - (mm)
#80 (0.014) to #30 (0.129)	0.36 to 3.28	+0.004 / -0.001 (+0.10 / -0.03)
#29 (0.136) to E or 1/4 (0.250)	3.45 to 6.35	+0.005 / -0.001 (+0.13 / -0.03)
F (0.257 to 1/2 (0.500)	6.53 to 12.70	+0.006 / -0.001 (+0.15 / -0.03)
33/64 (0.516 to 3/4 (0.750)	13.11 to 19.05	+0.008 / -0.001 (+0.20 / -0.03)
49/64 (0.766) to 1 (1.000)	19.46 to 25.40	+0.010 / -0.001 (+0.25 / -0.03)
1-1/64 (1.016) to 2-1/2 (2.500)	25.81 to 63.50	+0.012 / -0.001 (+0.31 / -0.03)

7.7.1 Blind Holes

Unless otherwise specified on the drawing, the depth of blind holes is the depth of the full diameter, including spotfaces. Standard drill points for blind holes are 135º, and where permitted 118º drill points can be used. Blind holes that require flat bottoms will be annotated on the drawing.

7.7.2 Countersunk Holes

Unless otherwise specified on the drawing, countersink diameters will take precedence over hole diameters on thin features where both conditions cannot be met. Holes made oversized by the countersink shall be deburred or drilled oversized to leave an apparent flat, (approximately 0.002 to 0.005).

When a countersunk hole is called out by fastener size, the following table shall be used to determine the dimensional requirements of the countersunk hole.

Fastener Size	Fastener OD	TPI	Hole Thru		Deg	Countersink Dia	
			MIN	MAX		MIN	MAX
#0	0.0600	80	0.0630	0.0730	100º	0.119	0.155
#1	0.0730	64/ 72	0.0810	0.0890		0.146	0.182
#2	0.0860	56 / 64	0.0890	0.1065		0.172	0.208
#3	0.0990	48 / 56	0.1040	0.1200		0.199	0.235
#4	0.1220	40 / 48	0.1360	0.1470		0.225	0.253
#6	0.1380	32 / 40	0.1610	0.1720		0.280	0.308
#8	0.1640	32 / 36	0.1910	0.2030		0.335	0.365
#10	0.1900	24 / 32	0.2180	0.2290		0.390	0.420
1/4	0.2500	20 / 28	0.2790	0.2910		0.515	0.545
5/16	0.3125	18 / 24	0.3420	0.3540		0.645	0.677
3/8	0.3750	16 / 24	0.3860	0.4062		0.762	0.798
7/16	0.4375	14 / 20	0.4531	0.4844		0.890	0.926
1/2	0.5000	13 / 20	0.5156	0.5469		1.017	1.053

7.7.3 Counterbored Holes

Unless otherwise specified on the drawing, counter bore depths will be determined from the same plane that the holes originate from. Counter bores should be concentric to their corresponding holes within 0.003 inch.

When a counterbored hole is called out by fastener size, the following table shall be used to determine the dimensional requirements of the counterbored hole.

Fastener Size	Fastener OD	TPI	Hole Thru		C'Bore Depth	Counterbore Dia	
			MIN	MAX		MIN	MAX
#0	0.0600	80	0.0630	0.0730	0.060	0.125	0.135
#1	0.0730	64/ 72	0.0810	0.0890	0.073	0.156	0.168
#2	0.0860	56 / 64	0.0890	0.1065	0.086	0.188	0.204
#3	0.0990	48 / 56	0.1040	0.1200	0.099	0.203	0.219
#4	0.1220	40 / 48	0.1360	0.1470	0.112	0.219	0.238
#6	0.1380	32 / 40	0.1610	0.1720	0.138	0.282	0.306
#8	0.1640	32 / 36	0.1910	0.2030	0.164	0.313	0.336
#10	0.1900	24 / 32	0.2180	0.2290	0.190	0.375	0.402
1/4	0.2500	20 / 28	0.2790	0.2910	0.250	0.478	0.461
5/16	0.3125	18 / 24	0.3420	0.3540	0.313	0.532	0.551
3/8	0.3750	16 / 24	0.3860	0.4062	0.375	0.625	0.645
7/16	0.4375	14 / 20	0.4531	0.4844	0.438	0.719	0.749
1/2	0.5000	13 / 20	0.5156	0.5469	0.500	0.813	0.844

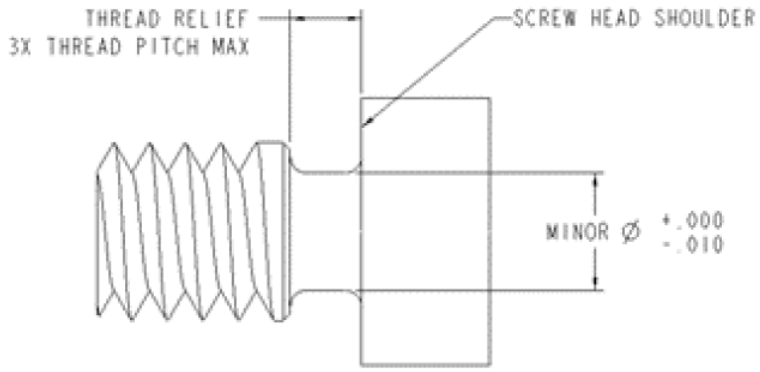
7.8 Threads

7.8.1 Thread Lengths

The tread length dimensions indicated on the drawing are the gauging length or the length of thread having full form. Three perfect or imperfect threads are allowable beyond such limit for lead of tap where hole depth permits.

Note: The above rule also applies to external threads where a thread relief is not used.

A drawing delineating full threads to the screw head shoulder, with no relief depicted or defined in accordance with a separate specification, shall be manufactured so that the gage will thread tightly to the shoulder without interference. A thread relief shall be permitted so that the gauge will thread tightly to the shoulder without interference. Thread reliefs shall not exceed 3x the pitch and no deeper than the minor diameter of the threads.



7.8.2 Chamfers for Internal Threads

Unless otherwise specified on the drawing, a chamfer with an included angle of 80 to 120 degrees shall be used at internal thread start. The minimum diameter of the chamfer shall be the major diameter of the thread. The maximum diameter of the chamfer shall be the major diameter of the thread plus 0.020 inch.

7.8.3 Chamfers for External Threads

Chamfers shall be provided at the ends of externally threaded parts. The chamfer shall extend to the minor diameter of the thread. The angle of the chamfer shall be 45 ± 3º. The minimum length of the chamfer shall be the height of the external thread.

7.8.4 Thread Classes

Unless otherwise specified, threads shall be manufactured to class 2A or 2B as applicable. Sealth Aero Marine uses Go / No-Go gages to determine thread acceptability.

7.9 3D Datasets / Engineering

Unless specified on the drawing, 3D CAD files supplied by SAM are to be used as reference only aid in manufacturing. When part geometry is defined by the 3D file, all geometry shall be basic and held to the three decimal tolerance found on the drawing. Dimensions featured on the drawing take precedence over the 3D files. The revision of the drawing and the 3D file shall be the same.

7.10 Non-Conventional Manufacturing and Inspection Methods

Parts shall be manufactured using conventional machining methods unless otherwise specified. Non-conventional methods that could impact structural characteristics, or compromise the cosmetic appearance such as thermal cutting, laser cutting, electrical discharge machining (EDM), abrasive water jet cutting, and chemical milling shall be approved by Sealth Aero Marine engineering or unless otherwise specified.

Parts to receive visual inspection. Parts that have other inspection techniques such as liquid penetrant inspection, magnetic particle inspection, etc.… must be specified

8. General Assembly

8.1 Dimensions

8.1.1 Standard Tolerances (ASY)

Unless otherwise specified on the drawing field or title block the standard tolerances shall be as followed for assembled product.

LINEAR	
X.	0.125
X.X	0.050
X.XX	0.030
X.XXX	0.010
X.XXXX	0.005

ANGULAR	
X.	2º
X.X	1º
X.XX	½º
SURFACE ROUGHNESS	
N/A	

8.1.2 Install Reference vs Required

Dimensions shown on final assemblies that are referenced on lower detail drawings are for installation or procurement reference. These dimensions, once validated on the detailed drawings, do not require a second validation at final assembly.

All dimensions that measure mating components and how they interface together must be validated at final assembly inspection for drawing conformity. These dimensions will be recorded on all FAI required documents.

8.2 Screws and Bolts

8.2.1 Screw / Bolt Installation

If the drawing does not specify a specific torque value, hand tighten using standard hand or power tools may be done using the following procedures.

Bolt and Nuts: Tighten the nut or bolt snug to remove gaps and to a point where firm resistance is felt. Once snug, make an additional rotation of the hex nut or bolt by one flat (60º) max.

Machine Screws: Tighten the screw snug to remove any gaps and to a point where firm resistance is felt. Once snug, make an additional rotation of the head by approximately 45º

Clutch settings on all power tools need to be set in accordance with the hand tightening procedure to prevent over torquing.

Machine screws installed into aluminum threads without a lock-type insert may have locking sealant applied to the threads at installation.

8.2.2 Screw Lengths and Engagement

At assembly, threaded engagements shall be equal to or greater than one diameter of the screw diameter. In situations where tolerances may prevent a fastener from reaching is minimum engagement or seating properly, the next fastener length, up or down, may be used in place of the required fastener.

8.2.3 Countersunk Screws

Countersunk screw shall be installed near flush with the top surface. Screw heads shall not protrude more than .010in or sit recessed more than .030in. Screws shall seat with 360º contact with the mating material. Uneven contact may be a result of mis-aligned components or improper countersinks.

8.2.4 Fastener Torque Specifications

When no torque specification is specified on the drawing, the following chart shows the suggested maximum torque values for threaded parts. Fasteners installed using the methods in 8.2.1 should not exceed these values.

Size	18-8 CRES	316 CRES	Brass	AL 2024 / 7075	AL 6061-T6
2-56	2.5	2.6	2.0	1.4	1.1
4-40	5.2	5.5	4.3	2.9	2.3
4-48	6.6	6.9	5.4	3.6	2.9
6-32	9.6	10.1	7.9	5.3	4.2
6-40	12.1	12.7	9.9	6.6	5.3
8-32	19.8	20.7	16.2	10.8	8.6
8-36	22.0	23.0	18.0	12.0	9.6
10-24	22.8	23.8	18.6	13.8	11.0
10-32	31.7	33.1	25.9	19.2	15.4
1/4-20	75	78.8	61.5	45.6	36.5
1/4-28	94	99	77	57	45.6
5/16-18	132	138	107	80	64.0
5/16-24	142	147	116	86	68.8
3/8-16	236	247	192	143	114
3/8-24	259	271	212	157	125
7/16-14	376	393	317	228	182
7/16-20	400	418	357	242	193
1/2-13	517	542	422	313	250
1/2-20	541	565	443	328	262
9/16-12	682	713	558	413	330
9/16-18	752	787	615	456	364
5/8-11	1110	1160	907	715	572
5/8-18	1244	1301	1016	798	638

8.3 Part Mark

When no location is specified on the drawing, part mark shall be placed in a non-cosmetic location. Parts with a configuration that does not accommodate a part mark shall have the part mark on the packaging.

Parts are ***not*** to be engraved without written authorization from SAM representative, when authorization is given only the part number shall be engraved.

8.3.1 Part Marking Minimum Requirements

- Complete Part Number
- Revision Level
- SAM Work Order or Purchase Order Number

Note: Reference SAM Task (140-030-001) for additional Part Marking requirements.

8.4 Threaded Inserts

8.4.1 Insert Installation

Threaded inserts shall be installed either with a pneumatic drive tool or by manual hand cranked tool. Final installation requirements shall be met, regardless of which tool is used for installation.

Threaded inserts shall be installed in the orientation or view shown on the drawing, unless otherwise specified. Insert shall be installed to a depth .5-2 threads below flush.

8.4.2 Installation Trouble

If there is difficulty installing threaded inserts, first check to be sure that the correct Go / No-Go gage threads freely to the bottom of the threads. If there is a gritty feel to the threads, debris may be causing problems and should be cleaned out with alcohol or chasing with a tap.

If the thread is undersize of deformed, an NCR shall be written, and disposition provided before any rework to threads may be done.

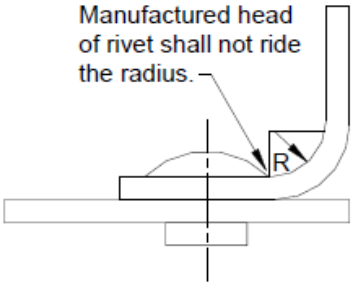
8.4.3 Insert Tab

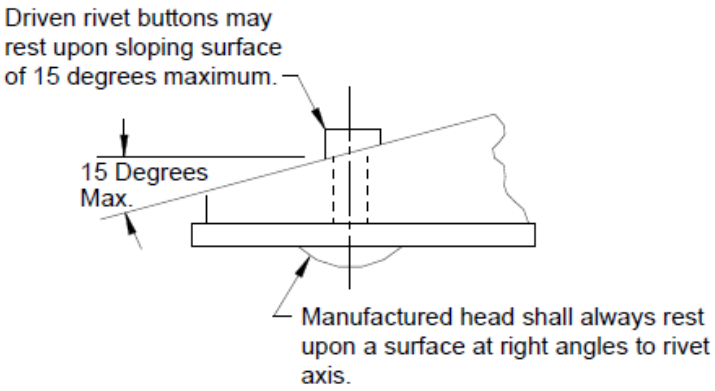
After installation, the install tab of the threaded insert shall be removed on all inserts installed into a through hole. Install tabs are not required to be removed on inserts that are installed into, blind holes unless otherwise specified.

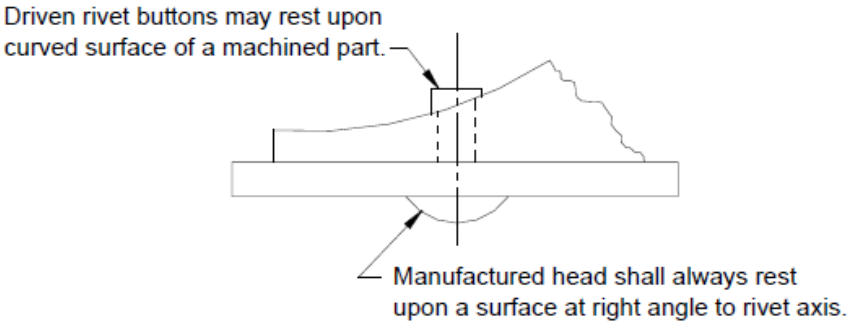
8.5 Rivets

8.5.1 Hole Location

Rivet manufactured heads and driven rivet buttons may be located as indicated in below.





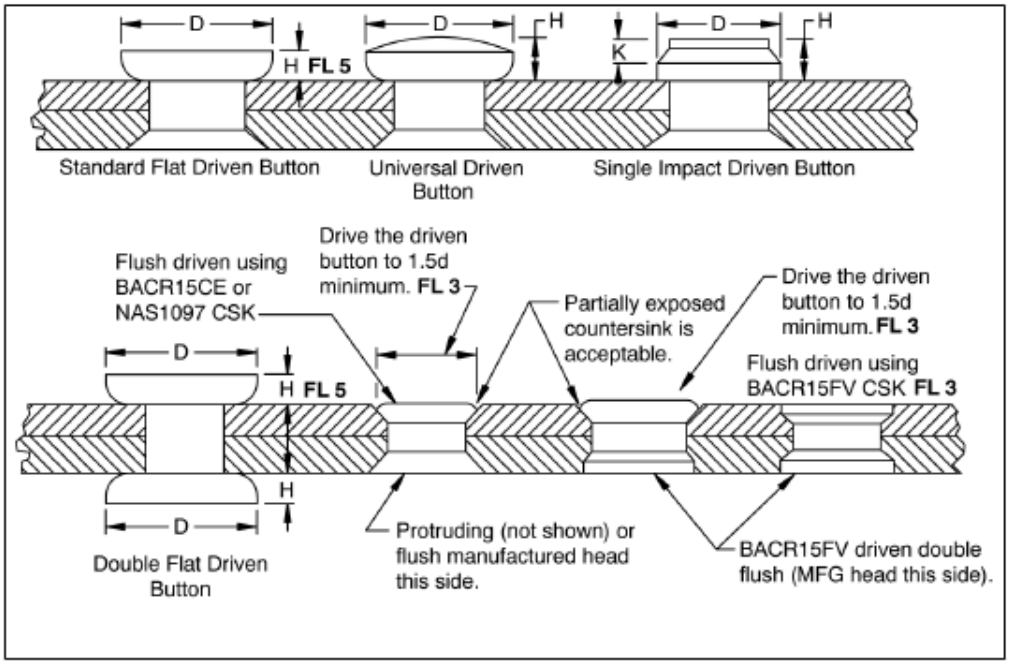


8.5.2 Head Flushness

Unless otherwise specified on the engineering data, countersunk rivet heads on non-aerodynamic surfaces shall be flush within the following limits.

- BACR15GF, BACR15CE and NAS1097 rivets shall be flush within +0.005, -0.000”
- All other countersunk rivets shall be flush within +0.010, -0.002”

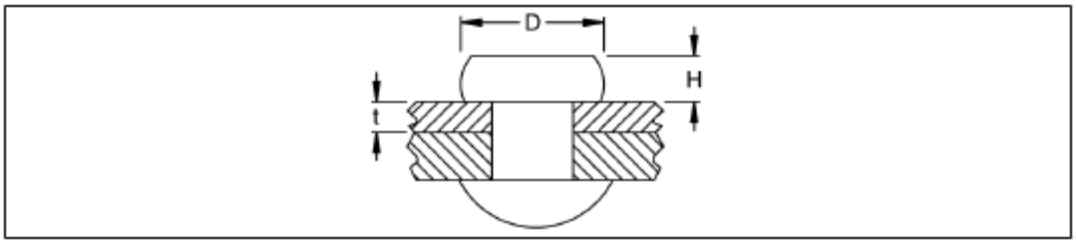
8.5.3 Standard Rivet Driven Button Dimensions for all Aluminum Rivets



RIVET DIA. CODE	NOMINAL RIVET DIA.	D MINIMUM DRIVEN RIVET BUTTON DIAMETER			H DRIVEN RIVET BUTTON THICKNESS OR HEIGHT			
		ALL RIVETS EXCEPT AS NOTED	BACR15GF, AND HAND DRIVEN 7050 ALUMINUM ALLOY RIVETS	MACHINE DRIVEN AND SQUEEZED 7050 ALUMINUM ALLOY RIVETS	BACR15GF, BACR15CE, BACR15DS, BACR15FV NASM14218, NAS1097 MINIMUM	ALL OTHER RIVETS MIN.	FL 4 MAXIMUM RECOM-MENDED	K MAXIMUM
		1.3d	1.4d	1.5d				
2	1/16	0.081	0.088	0.094	0.025	0.025	0.040	- - -
3	3/32	0.122	0.131	0.141	0.038	0.038	0.060	- - -
4	1/8	0.165	0.175	0.188	0.050	0.050	0.080	0.030
5	5/32	0.203	0.219	0.234	0.050	0.062	0.100	0.037
6	3/16	0.245	0.264	0.282	0.060	0.075	0.120	0.045
61 FL 1 FL 2	13/64	- - -	0.284	0.305	0.065	- - -	0.130	0.049
7 FL 1	7/32	0.285	0.311	0.333	0.070	0.085	0.140	0.052
71 FL 1	15/64	- - -	0.332	0.351	0.075	- - -	0.150	0.056

RIVET DIA. CODE	NOMINAL RIVET DIA.	D MINIMUM DRIVEN RIVET BUTTON DIAMETER			H DRIVEN RIVET BUTTON THICKNESS OR HEIGHT			
8	1/4	0.325	0.350	0.375	0.080	0.100	0.160	0.060
81 FL 1 FL 2	17/64	- - -	0.372	0.398	0.085	- - -	0.170	0.064
9 FL 1	9/32	0.365	0.397	0.425	0.090	0.110	0.180	0.067
91 FL 1	19/64	- - -	0.417	0.445	0.105	- - -	0.190	0.071
10	5/16	0.406	0.438	0.465	0.125	0.125	0.200	0.075
11 FL 1	11/32	0.450	0.481	0.515	0.135	0.135	0.210	0.082
12	3/8	0.488	0.525	0.562	0.150	0.150	0.210	0.090
13 FL 1	13/32	0.530	0.569	0.609	0.165	0.165	0.215	0.097

8.5.4 Driven Rivet Button Dimensions for CRES Rivets



NOMINAL RIVET DIAMETER	THICKNESS (t) OF MATERIAL ADJACENT TO RIVET BUTTON	DRIVEN RIVET BUTTON THICKNESS OR HEIGHT H MIN.	DRIVEN RIVET BUTTON DIAMETER D MIN.
3/32	0.016 to 0.050 0.050 and above	0.023 0.038	0.113 0.122
1/8	0.016 to 0.050 0.051 and above	0.030 0.050	0.150 0.163
5/32	0.016 to 0.050 0.051 and above	0.035 0.062	0.180 0.203
3/16	0.016 to 0.050 0.051 and above	0.040 0.075	0.222 0.244
1/4	0.016 to 0.050 0.051 and above	0.050 0.087	0.275 0.325

8.5.5 Manufactured Heads

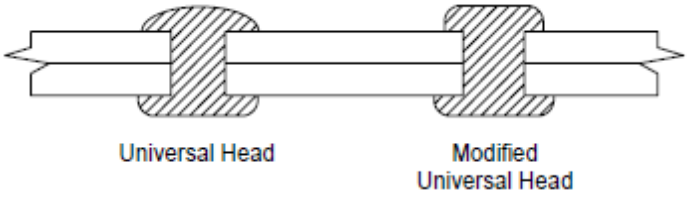
A deformation of the manufactured head caused by the mating cupped die is acceptable provided there are no sharp discontinuities in the deformed surfaces. (See Below)

Damage to the structural surface, resulting from the use of a rivet die with too large a radius as shown below is a rejectable condition.

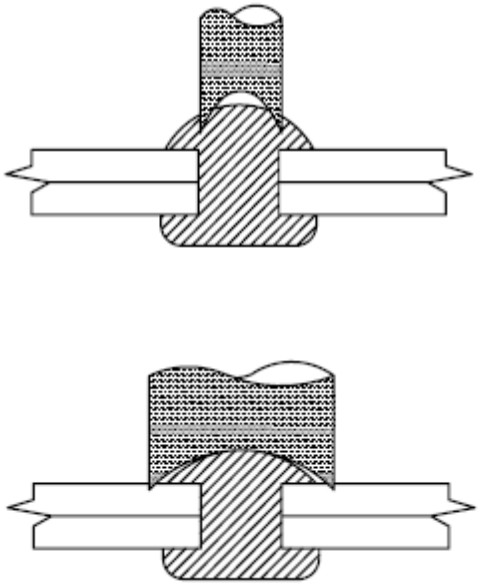
Cracks in the manufactured heads after installation are not allowed

Flattened head height of the manufactured protruding head shall not be less than those values of the table in this section.

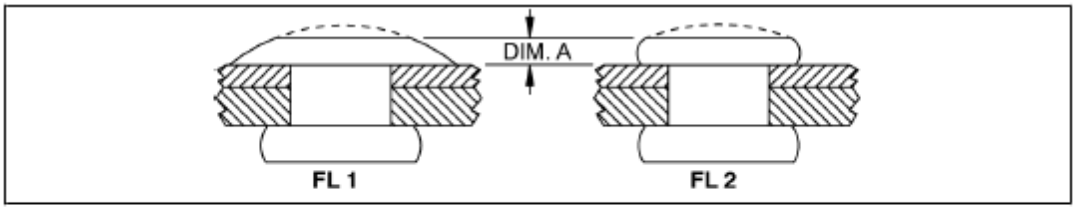
Acceptable Deformation of the Manufactured Head



Deformation not Acceptable



Minimum Universal Head Height



NOMINAL RIVET DIAMETER	MINIMUM UNIVERSAL HEAD HEIGHT, DIM. A
1/8	0.030
5/32	0.040
3/16	0.050
7/32	0.050
1/4	0.060
9/32	0.060
5/16	0.080
11/32	0.080
3/8	0.100
13/32	0.100
7/16	0.120

FL 1 Universal head.

FL 2 Modified universal head.

8.5.6 Diagonal Cracks

Solid rivet driven button diagonal cracks are defined to be those cracks that run at an angle (other than 90 degrees) to the flat surface of the top of the button. When diagonal cracks occur, riveting operations shall be investigated for possible errors in rivet heat-treat condition or rivet lengths. Diagonal cracks are unacceptable.

8.5.7 Vertical Cracks

Solid rivet driven button vertical cracks and axial discontinuities run perpendicular to the flat surface of the top of the button. Vertical cracks are the result of overheating during heat treatment. Axial discontinuities are from a pre-existing condition in the rivet material. Vertical cracks are unacceptable. Axial discontinuities that exceed a depth of .004 inch are unacceptable.

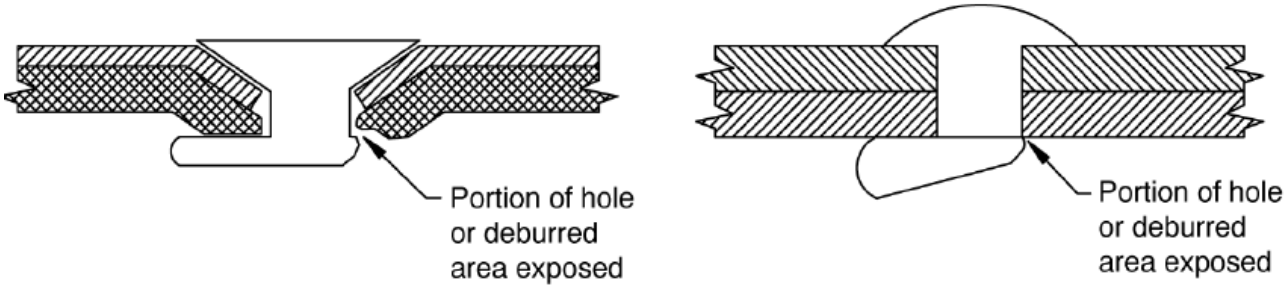
8.5.8 Deformed Driven Button

Clinched or bent-over buttons are not acceptable if the hole of deburred area is visible.

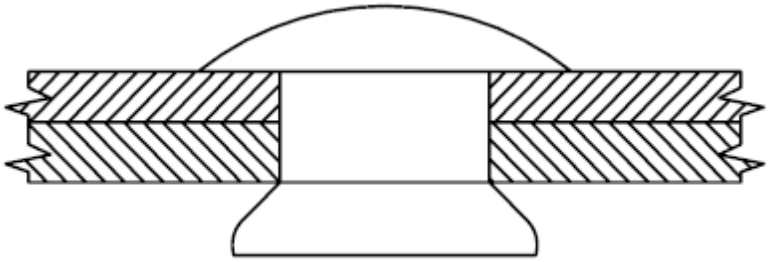
Bell shaped rivet buttons denote incomplete driving and are not acceptable. (See Below)

Out of round rivet driven buttons should be judge by the minimum diameter. Out of round and tipped rivet driven buttons are acceptable if the button dimesons meet those listed in the table in 8.5.3 and 8.5.4. Cut heads are unacceptable

Clinched Rivets not Acceptable



Bell Shaped Rivets not Acceptable



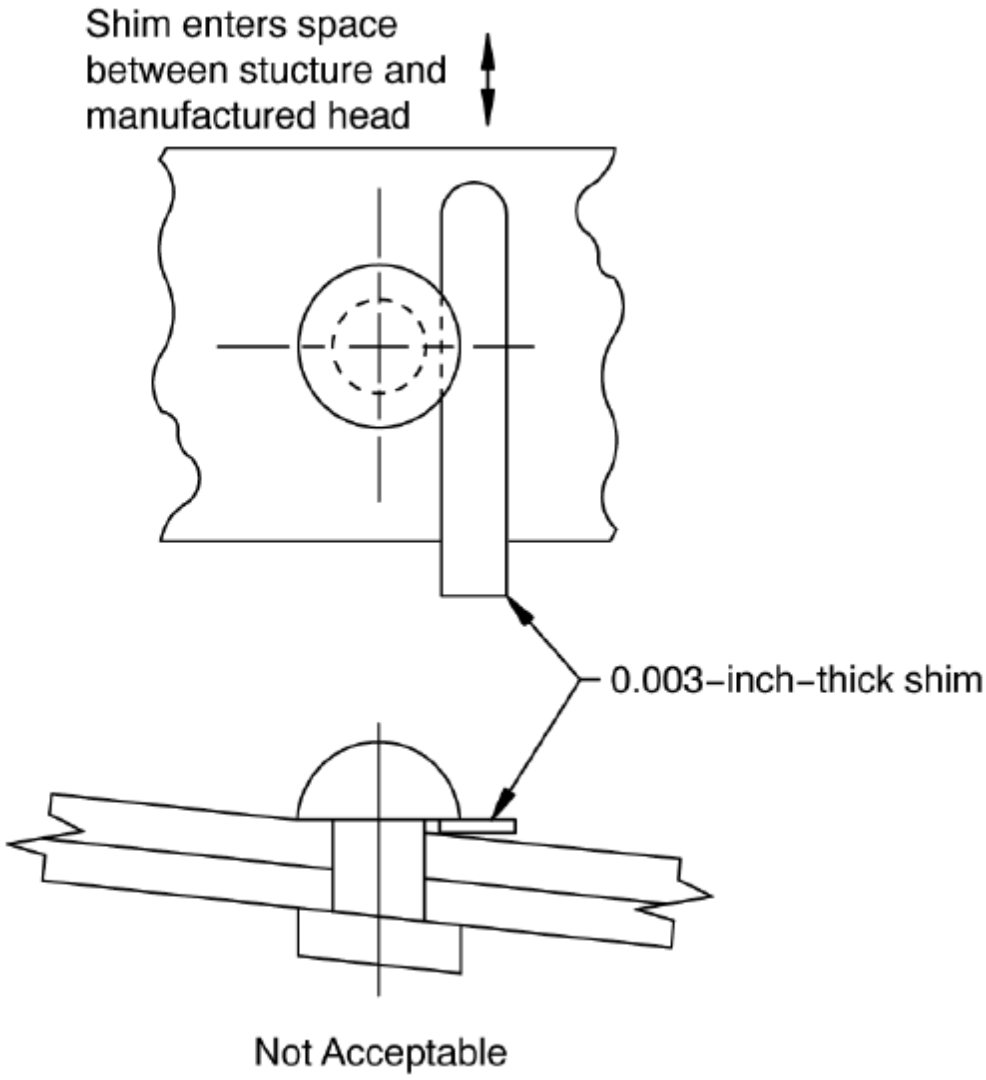
8.5.9 Gapped Rivets

There shall be no measurable gap between the driven button of an installed solid shank rivet and the countersink hole, when driven flush.

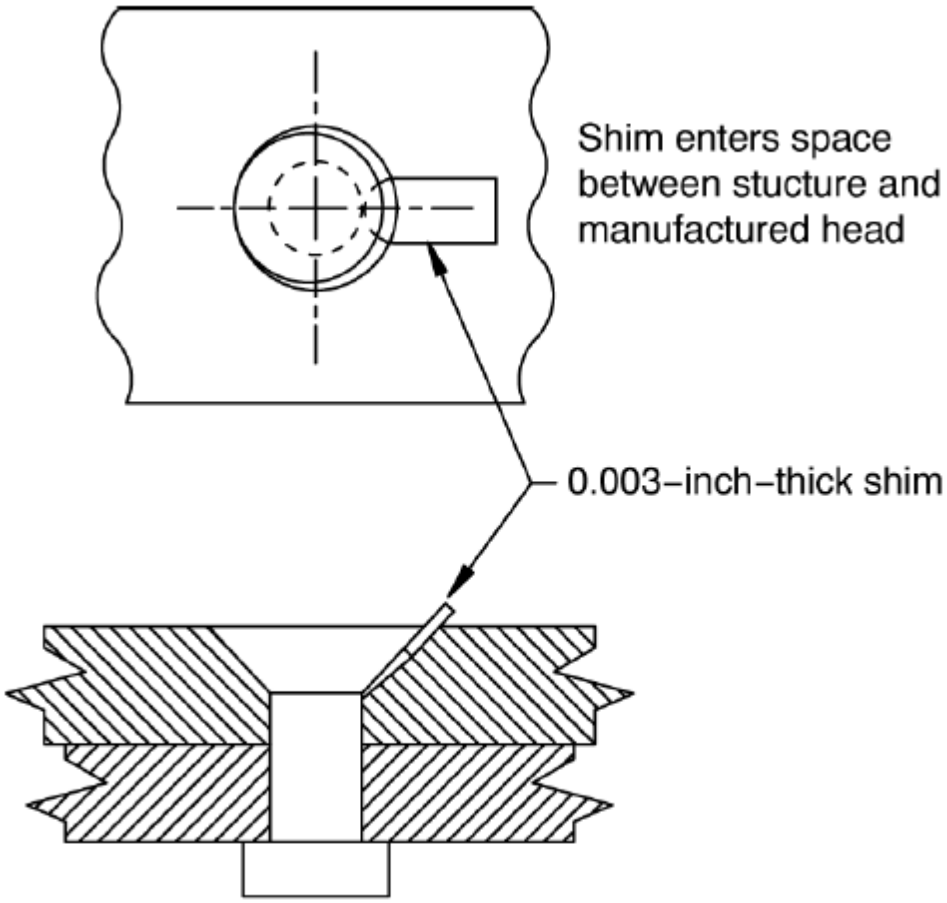
The manufactured heads of all protruding head fasteners shall seat such that a 0.003-inch shim as shown does not enter between the structure and the manufactured head.

The manufactured heads of all flush head fasteners shall seat such that the radius tip of a 0.003-inch shim as shown cannot be inserted between the fastener and the countersink when inspected as shown.

Protruding Head Gap Checking Method



Flush Head Gap Checking Method



Not Acceptable

8.5.10 Rivet Length

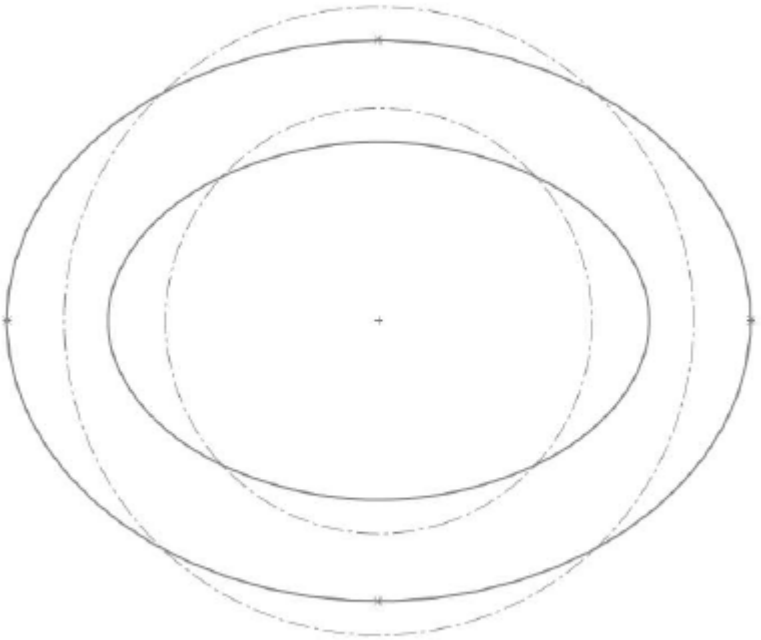
In situations where tolerances may prevent a fastener from reaching is minimum or maximum grip length, the next fastener length, up or down, may be used in place of the required fastener.

Cutting or shaving the length of a rivet prior to installation is also acceptable if all requirements are met in section 8.5.3 and 8.5.4.

8.6 Pins

8.6.1 Pivot Pins

Pivot pins shall be “staked” or deformed on both end after installation. Pins shall be deformed in a manner that the diameter in one direction is greater than the pivot hole. Assemblies sold in a raw or unfinished state shall be lightly staked or deformed on both ends in a manner that the diameter in one direction is equal to the through hole diameter.



8.6.2 Hinge Pins

8.6.2.1 Pin Lengths

Hinge pins shall be issued in 36-inch lengths and trimmed to length unless otherwise specified. The hinge pin shall engage into the final lug with a minimum 0.050in engagement. On hinges longer than 36 inches, two or more pins shall be used. The hinge pins shall meet at the approx. midpoint of a lug and shall keep the required minimum engagement in the lugs.

Hinge pins shall be sufficiently short (0.05 - 0.250) to allow for the hinge end to be swaged or crimped for pin retention. Note that minimum pin engagement is still required.

Hinges with cosmetic caps installed must have the pin additionally trimmed to allow for installation of the caps.

Hinges installed with a dampener, will need to be cut so that one end is flush with the lug or against the dampener, while the other end meets the above requirements.

8.6.2.2 Pin Retention

The hinge lug shall be swaged from the non-cosmetic (visible side) of the hinge deforming the hole and preventing the pin working out. The hole shall be 0.80D ±0.10D after swaging.

Example: 0.093 Diameter Pin Hole

0.074 ± 0.009 after swaging

Hinges with cosmetic caps shall have the end cap and hinge swage together from the non-cosmetic (visible side) of the hinge. The swage shall be made with 0.050 ±.0.015 dia swage tool and at a depth of 0.30D ±.0.030 into the lug diameter. If a swage is performed too deep, the integrity of the cap can be compromised, and the stem of the cap may become severed and fall from the lug.

Example: 0.188 Diameter Lug

0.056 Depth of swage.

8.6.3 Split / Spring Pins

Pins shall be installed to MS / AMS recommended standard holes. Pins shall not protrude more than .005 from the installed hole.

8.7 Retaining Rings

Retaining rings for shafts 0.125 inch or smaller shall not be re-installed once removed.

8.8 Surface Touch-up

8.8.1 Anodized Surfaces

Aluminum surfaces that are bare shall be touched up with Alodine RTU solution prior to final assembly inspection. Alodine shall only be used on 10% or less of the surface area. If greater coverage is required, the parts must be re-anodized.

8.8.2 Painted Surfaces

Painted surfaces shall be touched up by SAM employees when only when exposed surfaces are less than 0.032 in diameter or scratches that are less than 0.250 in length. Touch up of paint shall be done in accordance with any specifications for application on the drawing.

8.8.3 Primered Surfaces

Primered surfaces shall be touched up by SAM employees when only when exposed surfaces are less than 0.125 in diameter or scratches that are less than 0.750 in length. Touch up of primer shall be done in accordance with any specifications for application on the drawing.

8.8.4 Dry Film Surfaces

Components with dry film lubricant shall be touched up using aerosol spray slip plate or equivalent. Slip plate shall only be used on 20% or less of the surface area. Aerosol Slip Plate shall be applied per manufacturer's directions. If greater coverage is required, the parts must be stripped and re-finished.

8.9 Precious Metal Plating

8.9.1 Surface Protection

Prior to assembly, cosmetic surfaces of precious metal plated parts shall be protected with clear film. Once assembly is complete, film shall be removed, and part inspected for possible damage caused during assembly.

8.9.2 Cleaning

Parts shall be wiped down with a non-scratch towel and cleaning solution to remove any fingerprints or residue from assembly.

8.9.3 Packaging

All plated parts shall be wrapped in non-scratch towels and sealed in thick plastic bags to prevent any damage during transportation or storage.

RECORD OF REVISIONS

Rev. No.	Issue Date	By	Description
IR	APR 27/15	R Hughes	
A	SEP 16/15	R Hughes	
B	OCT 21/16	C Carlson	
C	DEC 19/17	DSM	Workmanship standard was rewritten. Sections 7.7, 8, 9, 10 and are new to the workmanship standard.
D	MAR 06/19	DSM	Added General assembly section and thread class. Added table of contents.
E	Aug 28/19	DSM	Updated part mark section, and revised pin cut length section.
F	MAY 24/21	DSM	Added Max torque spec table. Added 8.3.1 Part Mark Requirements. Added RA to general tolerances, added drill size tolerances to drilled holes section. Add Countersink and Counterbore Charts.