



Specification No.: 381  
 Issue Date: 4-8-93  
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**PRODUCT SPECIFICATION**  
**HI-LITE® ST™ FASTENING SYSTEM, HI-LITE® ST™ COLLAR**

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**REVISION M**

Page 4	BASIC REQUIREMENTS	Para 4	Add washer to collar classification
Page 11	REQUIREMENTS	Table I	Add washers to Discontinuities criteria
Page 16	DISCONTINUITIES LIMITS	Table V	Reword table title and add washer
Page 16	Metallurgical Specimens	Figure 1	Edit and add self aligning collar

**RELEASED**

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U.S. Patents 4,326,825, 4,485,510 and 4,957,401  
 Other U.S. and international patents pending.  
 "Hi-Lite" and "HST" are registered trademarks, and  
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**1.0 SCOPE AND APPLICATION**

1.1 Scope

This specification defines the engineering design and inspection requirements for the Hi-Lite ST collar procured under part numbers listed on Hi-Shear drawings, which refer to this specification. Receiving contractors may reject any lot that does not conform.

1.2 Application

The Hi-Lite ST collar must be used with its mating Hi-Lite ST pin to maintain the integrity of the fastening system and to obtain the strength values specified on applicable drawings.

1.3 Description (Hi-Lite ST Collar)

The collar specified herein is a threaded, self-locking collar with a controlled torque-off feature. This is to be used in a fastener assembly with a threaded tension pin where tension loads are the primary design consideration and with a threaded shear pin where shear loads are the primary design consideration.

**2.0 FUNCTIONAL REQUIREMENTS**

The Hi-Lite ST pin shall be inserted from one side of the assembly with the collar threaded into place from the other.

The assembly of the fastener is completed by utilizing an installation tool whose hex wrench engages the hex socket of the Hi-Lite ST pin, thereby holding the pin stationary while applying torsional force to the Hi-Lite ST collar. The hex wrench is not required when pins are installed with sufficient interference fit. After the tension preload is attained, the driving portion of the collar shears off, thus completing the installation of the Hi-Lite fastener. The installed assembly shall meet the strength requirements specified on the applicable Hi-Lite ST drawings.

**3.0 APPLICABLE DOCUMENTS**

The current revisions of the documents listed herein are a part of this specification to the extent indicated. In case of conflict, the requirements herein take precedence.



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**Federal Specifications**

QQ-A-430 Aluminum Alloy Rod and Wire (2024)  
PPP-B-566 Boxes, Paperboard, Folding  
PPP-B-665 Boxes, Paperboard, Metal Stayed

**Military Specifications**

MIL-N-25027 Nut, Self-Locking  
MIL-T-9047 Titanium Alloy (3Al-2.5V)

**Military Standards**

MIL-STD-129 Marking for Shipment and Storage  
MIL-STD-1537 Electrical Conductivity Test

**National Institute of Standards**

Handbook H-28 Screw Threads Standard for Federal Services

**Aerospace Materials Specifications**

AMS2770 Heat Treatment of Wrought Aluminum Alloy Parts  
AMS2772 Heat Treatment of Aluminum Alloy  
AMS4341 Aluminum Alloy Extrusion (7050)  
AMS4928 Titanium Alloy (6Al-4V)  
AMS4930 Titanium Alloy (6Al-4V)  
AMS4943 Titanium Alloy (3Al-2.5V)  
AMS4967 Titanium Alloy (6Al-4V)  
AMS5640 Steel, Corrosion Resistant (303)  
AMS5643 Steel, Corrosion Resistant (17-4PH)  
AMS5667 Nickel Base Alloy (Inconel X-750)  
AMS5686 Steel Wire, Corrosion Resistant (30305)  
AMS5731 Steel, Corrosion Resistant (A-286)  
AMS5734 Steel, Corrosion Resistant (A-286)  
AMS5736 Steel, Corrosion Resistant (A-286)  
AMS3737 Steel, Corrosion Resistant (A-286)  
AMS-H-6875 Heat Treatment, Steel  
AMS-QQ-A-225/6 Aluminum Alloy Bar, Rod and Wire (2024)  
AMS-QQ-A-225/9 Aluminum Alloy Bar, Rod and Wire (7075)  
AMS-QQ-S-763 Steel, Corrosion-Resisting (305)



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### National Aerospace Standards

NASM1312 Fastener Test Methods

### Aerospace Standard

AS8879 Screw Threads – UNJ Profile, Inch, Controlled Radius Root with Increased Minor Diameter

### American National Standards Institute

ANSI/ASQC Z1.4 Sampling Procedure and Tables for Inspection by Attributes

### American Society for Testing and Materials

ASTM A493 Stainless and Heat-Resisting Steel (302 HQ)  
ASTM A582 Stainless and Heat-Resisting Steel (303 Se)  
ASTM B557 Standard Methods of Tension Testing Wrought and Cast Aluminum and Magnesium Alloys  
ASTM E18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials  
ASTM E29 Using Significant Digits in Test Data to Determine Conformance with Specifications  
ASTM E1417 Inspection, Liquid Penetrant  
ASTM E1444 Inspection, Magnetic Particle  
ASTM G44 Recommended Practice for Alternate Immersion Stress Corrosion Testing in 3.5% Sodium Chloride

### Hi-Shear Specifications

No. 258 Passivation of Corrosion Resistant Alloys  
No. 363 Manufacturer's Identification

## **4.0 BASIC REQUIREMENTS**

The requirements for the manufacture and inspection of the Hi-Lite<sup>®</sup> ST<sup>™</sup> collar/washer are summarized in Table I.

## **5.0 QUALITY CONFORMANCE REQUIREMENTS**

### 5.1 Qualification

Qualification is required to establish the capability of a supplier to manufacture the product and assure conformance to the requirements of this specification.



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5.1.1 Qualification Requirements

Qualification of parts procured under this specification shall be to the requirements in Table I and as described herein.

5.1.2 Qualification Test Parts

Test parts used for qualification shall meet the following requirements:

- 5.1.2.1 Parts will be manufactured in the same manner as regular production for normal procurement.
- 5.1.2.2 Parts will be tested in quantities specified in qualification sampling in Table I.
- 5.1.2.3 Parts submitted for qualification inspection and testing will be selected at random without regard to their quality.

5.1.3 Qualification Inspection

The Hi-Lite ST fastener manufacturer is responsible for all inspection requirements as specified herein. The manufacturer shall maintain inspection records of examination and testing.

5.2 Production Lot Inspection Requirements

Production lot inspection shall consist of tests to determine conformance by a manufacturer to sustain the production of Hi-Lite ST fasteners at a quality level consistent with the requirements of this specification.

5.2.1 Quality Conformance Requirements

Quality conformance must be established for each production lot of fasteners. Quality conformance requirements consist of tests listed in Table I.

5.2.2 Responsibility for Inspection

The Hi-Lite ST fastener manufacturer is responsible for conformance to all requirements as specified herein. Inspection records of the examination and testing shall be maintained and shall be available to the customer on request for a minimum of seven years from shipment date.



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5.2.3 Lot Definition

A production lot is a defined quantity of finished fasteners of identical configuration, fabricated from the same heat or melt of material, produced as one continuous run or order and presented for inspection at the same time.

5.2.4 Sample Definition

A sample consists of one or more units of a product drawn from a production lot. The unit of sample shall be selected at random without regard to quality. The number of units of a product in a sample is the sample size.

5.2.5 Production Lot Inspection Report

Each production lot of fasteners shall have an authorized inspection report on file. This report shall state that the fasteners are from a production lot(s) which were manufactured, inspected and accepted in accordance with requirements of this specification. The report shall contain the part number, production lot numbers(s), material certification, test pin part number and lot number and shall include all actual test results on the certification of conformance. For self-aligning collars, the washer (with lot number) used for certification shall be listed on the certification of conformance.

5.2.6 Test Methods

Test methods for quality conformance shall be as specified in Table I.

5.2.7 Screening

Any lot, which fails acceptance criteria based on lot sampling, may be accepted following a screening operation to remove the defective parts. The screening method may be applied where separation of defective parts can be accomplished by nondestructive methods.

**6.0 PREPARATION FOR DELIVERY**

6.1 Packaging

Fasteners shall be packaged in such a manner as to assure they will not be damaged or exposed to undue weathering or harmful material.



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6.1.1 Unit Packaging

A unit package may include fasteners of only one type, size part number and lot number. Boxes conforming to any of the following specifications may be used:

- Paperboard, Folding -Specification PPP-B-566, Style II.
- Paperboard, Metal Stayed -Specification PPP-B-665, Style C.

6.1.2 Shipment Packaging

Unit packages of fasteners may be consolidated into larger packages for shipment. Packages for shipment must allow economical transportation and must conform to consolidated freight classification rules.

6.2 Marking

Each unit package shall be durably and legibly marked to give the following information: brief descriptive title, complete part number, manufacturer's name or trademark, lot number, purchase order number, quantity in container and patent numbers, per MIL-STD-129. These are minimum identification requirements. Other specifications or regulations, if evoked, may require additional information (for example, FAA TSO-C148).



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**TABLE I. BASIC REQUIREMENTS**

Characteristics	Engineering Requirements	Test Method	Production Lot Sampling	Qualification Sampling	
Material	The collars shall be manufactured in strength requirements and alloy compositions specified in Table II and applicable Hi-Lite ST drawings.	-----	-----	-----	
Configuration Control	Configuration and geometry shall conform to applicable Hi-Lite ST drawing requirements below (see Note 1).	Table III	Table III	40	
Threads	Threads shall conform to AS8879 and Handbook H28. Threads in the locking area may be deformed or displaced in any manner in order to meet the locking torque values in Table IV.	Prior to thread deformation, gauging per AS8879. Finished collars (after thread deformation and finish is applied) must accept thread gauge, per Table IX, for a minimum of ¾ of one revolution.			
Surface Treatment (Coatings, Platings, etc.) (see Note 4)	The surface treatment shall be per applicable Hi-Lite ST drawing. All corrosion resistant alloy collars shall be passivated per HS258 (this is not applicable to plated or coated parts).	Per surface treatment specification on applicable Hi-Lite ST drawing.	Table VIII		
Identification	Manufacturer's identification shall be per HS363 or applicable Hi-Lite ST drawing.	Identification must be legible at 5X magnification or less.	Table III		
Bearing Surface	The bearing surface shall be square to the axis of the pitch diameter within the values of Table V.	When collar is on a stud (per NAS3353 or equivalent), the maximum gap shall not exceed the values specified in Table V.	Table VI		
Heat Treat Condition	Heat Treat condition of finished product shall be per Table II and applicable Hi-Lite ST drawing. Heat treatment shall develop mechanical properties per applicable Hi-Lite drawing without adverse effect on metallurgical properties.	Mechanical and metallurgical properties verify heat treatment.	-----		-----





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**TABLE I. BASIC REQUIREMENTS (Continued)**

Characteristics	Engineering Requirements	Test Method	Production Lot Sampling	Qualification Sampling
Mechanical Properties	Mechanical properties shall conform to the applicable Hi-Lite ST drawing and requirements below (see Note 2).	-----	-----	10
Installation	For qualification only: Collars shall install satisfactorily to torque-off on test pins in minimum grip condition.			
Torque-Off	Torque-off range shall be per applicable Hi-Lite ST drawing.	Torque-off may be determined during any test for locking torque, preload or ultimate tension. The "torque-off" value is the torque at which break-off of the driving elements occurs.	Table VI	
Locking Torque and Breakaway	Locking torque and breakaway shall be as specified in Table IV.	<p>Locking torque and tension preload may be tested during the same set-up. The test bolt, unless otherwise specified, shall be lower 1/3 pitch diameter, alloy steel, cadmium plated with cetyl alcohol lube. The test fixture shall consist of the test bolt, load cell and load recorder.</p> <p><u>Locking Torque</u> The collar shall be torqued onto the test bolt until at least two threads penetrate the collar locking area. The torque values shall be read through each rotation, the locking torque being the highest value read during this procedure. Stop torque before the collar seats.</p> <p><u>Breakaway</u> Reverse the torque. The breakaway torque is the torque required to start collar rotation from the fixed position with no load on the base.</p>		



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**TABLE I. BASIC REQUIREMENTS (Continued)**

Characteristics	Engineering Requirements	Test Method	Production Lot Sampling	Qualification Sampling
Tension Preload	Tension preload of the installed fastener shall meet the requirements in Table IV. For HST1380, HST1382, HST1480 & HST1482, tension preload of the installed fastener shall meet the requirements of Table VII.	Use the test set-up shown in Figure 2 or equivalent. Manually complete the installation of the collar. The installation is complete when the hex portion of the collar is torqued off. After the collar's torque-off, the value on the load cell recorder is the tension preload.	Table VI	10
Ultimate Tension	As specified on applicable Hi-Lite ST drawing	The ultimate tension shall be determined with test bolts or studs strong enough to outperform the collars. The collars shall be installed on the bolt or stud in minimum grip in test fixtures adaptable to standard tension test equipment.  The loading shall be accomplished by increasing the load of the testing machine at the rate of 100,000 psi ( $\pm 10\%$ ) of nominal thread size per minute until final separation of the collar-bolt assembly occurs. The maximum load recorded shall be the ultimate tension provided the fracture occurred in the collar.		
Vibration	Vibration test shall be conducted for qualification only per NASM1312 except assembly torque shall be the collar torque-off. Vibration tests on collars larger than half-inch size are waived provided that half-inch collars and smaller have passed the vibration test. Collars smaller than 3/16" diameter are exempt from the vibration testing.	Per NASM1312 Test 7	-----	5



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**TABLE I. BASIC REQUIREMENTS (Continued)**

Characteristics	Engineering Requirements	Test Method	Production Lot Sampling	Qualification Sampling
Metallurgical Characteristics	Body of collars shall be examined and meet the requirements below (see Note 3).	For CRES, Aluminum, and Titanium collars: Fluorescent penetrant inspection per ASTM E1417, Type I, Method A, B, or D with sensitivity level 2 or greater. Marking of individual parts not required.  For Alloy Steel collars: Magnetic particle inspection per ASTM E1444. Marking of individual parts not required.	Per Table VIII	5
Cracks	The body of the Collar shall be free of cracks in any direction or location. A crack is defined as a clear crystalline break passing through grain or grain boundary without inclusion of foreign elements.			
Discontinuities	Laps, seam, inclusions and tool mark are permitted on the nonbearing surfaces of the body of the collar/self aligning washer provided they do not exceed limits specified in Table V.			
Intergranular Corrosion (Aluminum Only)	Evidence of intergranular corrosion shall not exceed the following on the body of the collar: when five (5) or more samples are examined, average localized intergranular corrosion shall not exceed 0.010 inch in depth; and average general intergranular corrosion shall not exceed 0.006 inch in depth. However no sample examined shall have localized intergranular corrosion exceeding 0.012 inch in depth or general intergranular corrosion exceeding 0.008 inch in depth.	Collars shall be subjected to the accelerated corrosion test as specified in AMS2772. After exposure, collars shall be sectioned as illustrated in Figure 1 and the surface prepared for microscopic examination as specified in AMS2772. Examine microscopically at 100X and 500X.	Sample five pieces per lot for lots smaller than 10,000.  Sample ten pieces per lot for lots of 10,000 and larger.	5



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**TABLE I. BASIC REQUIREMENTS (Continued)**

Characteristics	Engineering Requirements	Test Method	Production Lot Sampling	Qualification Sampling
Hydrogen content (Titanium Only)	Hydrogen content shall not exceed 125 ppm.	Determine hydrogen from material removed from the base of the collar. Use procedure and equipment that are capable of analyzing hydrogen to an accuracy of 10 ppm. Plating and lubricant shall be removed.	1 pc/lot If the test indicates hydrogen content in excess of 125 ppm, a second sample per Table VI may be selected at random for retest. All of the retests must be below 125 ppm for lot acceptance.	1
Stress Corrosion (7075 Aluminum Only)	No cracks permitted on the body of the collar.	30 day alternate immersion per ASTM G44, installed on pins with "AP" finish. Specimen per Figure 4.	-----	5
Hot, Wet Environment (7075 Aluminum Only)	No cracks permitted on the body of the collar	60 days exposure to 80°C and 95% relative humidity, installed on pins with "AP" finish. Specimen per Figure 4.	-----	5
Conductivity and Yield Strength (7075 Aluminum Only)  <b>OR</b> Conductivity and Hardness (7075 Aluminum Only)	Conductivity equal 38-43% IACS. Yield strength in KSI equal to or less than % IACS times 2 minus 14.  YTS KSI ≤ 2 (%IACS) -14. See Figure 3.	Bar from same heat-lot of material used to make the collars. Bar to be processed with the collars through heat treat.  Conductivity per MIL-STD-1537. Yield strength per ASTM B557 (offset equal 0.2%).	1 Test Bar per Lot	1 Test Bar per Lot
	Conductivity equal 38.2 to 41.0% IACS. Hardness equal 79.5 to 85 HRB.	Saw cut 0.100 inch thick minimum wafer from the same heat-lot of material used to make the collars. Wafer to be processed with the collars through heat treat.  Conductivity per MIL-STD-1537.  Hardness per ASTM E18	1 Wafer per Lot	1 Wafer per Lot
Overheating	No evidence of overheating on the body of the collar.	Microscopic examination at 500X.	2 per Lot	2 per Lot



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**TABLE I. BASIC REQUIREMENTS (Continued)**

Notes

1. For purposes of determining conformance with this specification, all dimensional values shall be rounded to the nearest unit in the last right-hand digit used in expressing the drawing limit in accordance with the rounding method of ASTM E29.
2. For purposes of determining conformance with this specification, all specified mechanical property limits are absolute limits in accordance with ASTM E29.
3. For purposes of determining conformance with this specification, all specified discontinuity limits per Table V and intergranular corrosion limits per Table I are absolute limits in accordance with ASTM E29.
4. Collars and washers may be deformed after plating to provide self-locking feature or to form captive washer over collar. Plating thickness is waived in the deformed area. Bare or loss of chromate treatment are acceptable in the deformed areas.



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**TABLE II. MATERIAL REQUIREMENTS**

Alloy	Raw Material Specification	Finish Product Heat Treat Condition
2024 Aluminum	QQ-A-430 AMS-QQ-A-225/6	T6 Condition
7050 Aluminum	AMS4341	T73Condition
7075 Aluminum	AMS-QQ-A-225/9	T73 Condition
6A1-4V Titanium	AMS4928 AMS4930 AMS4967	Annealed or Aged to Meet Part UTS
3A1-2.5V Titanium	AMS4943 MIL-T-9047	Annealed or Aged to Meet Part UTS
S30430 Cres	ASTM A-493	Cold worked to meet part UTS
303 Se Cres	ASTM A-582 AMS5640, Type 2	Cold worked to meet part UTS
30305 Cres	AMS5686 AMS-QQ-S-763	Cold worked to meet part UTS
A-286 Cres	AMS5731 AMS5734 AMS5736 AMS5737	Cold worked or aged to meet part UTS.
17-4PH Steel	AMS5643	H-1025 per AMS-H-6875 Rc 34 to 41
Inconel X-750	AMS5667	140KSI Maximum and meet part UTS

Notes

1. All raw material shall have alloy verification performed either by manufacturer or independent laboratory.

**TABLE III. CLASSIFICATION OF DIMENSIONAL DEFECTS**

Sampling and acceptance at random per ANSI/ASQC Z1.4, Level II

DIMENSIONAL CHARACTERISTICS	PROCEDURE	CRITERIA
Threads	Gauging per AS8879, Handbook H28, and Table I	1.5% AQL
Collar Height	Dimensional Measurement	
Base Counterbore	Dimensional Measurement	
Wrenching Element	Dimensional Measurement	
Surface Texture	ANSI B46.1	1.5% AQL (except sample size of 80 may be used for lots over 1,200 pieces)
Spherical Radius	Comparator Measurement	Table VIII
Identification	Visual and Table I	Table VIII
Collar Base Diameter	Dimensional Measurement	2.5% AQL
All Other Dimensions	Dimensional Measurement or Comparator Measurement, as applicable	2.5% AQL or Table VIII, as applicable



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**TABLE IV. LOCKING TORQUE & TENSION PRELOAD REQUIREMENTS**

Dash No.	Locking Torque Inch-Lbs.		Tension Preload Lbs. Min.	
	Maximum	Minimum Breakaway	Shear Collars	Tension Collars
-4	5	1.0	500	----
-5	7	1.5	700	1,150
-6	12	2.0	800	1,375
-8	17	3.5	1,500	2,500
-10	35	6.5	2,500	4,150
-12	40	9.5	3,500	6,350
-14	60	14	4,725	9,500
-16	85	18	6,250	12,750
-18	110	24	7,250	14,500
-20	130	32	9,000	16,000
-24	185	50	13,750	21,000
-28	245	70	18,750	31,000
-32	305	90	25,000	42,000

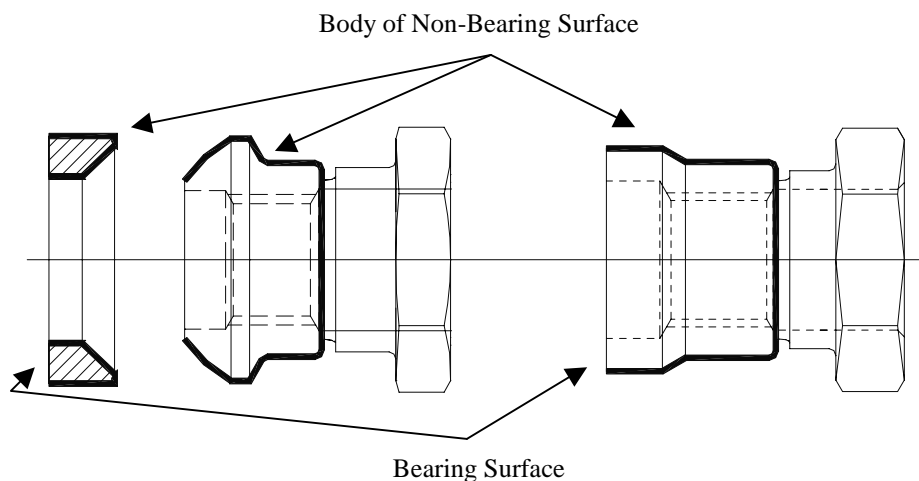
1. Test bolts shall be used only once.

**TABLE V. ACCEPTABLE DISCONTINUITY LIMITS AND FOR BEARING SURFACE SQUARENESS.**

Characteristic	Dash Number												
	-5	-6	-7	-8	-10	-12	-14	-16	-18	-20	-24	-28	-32
Bearing Surface Squareness Max. Gap	.004	.005	.005	.005	.006	.006	.007	.007	.008	.009	.010	.011	.012
Body Section of the collar/self aligning washer's non bearing surface- Discontinuities (Laps, Seams, Inclusions and Tool Marks) Max. Depth	.005	.005	.005	.005	.006	.006	.007	.007	.008	.009	.010	.011	.012

**TABLE VI. SAMPLING FOR BEARING SURFACE SQUARENESS AND TORQUE AND TENSION TEST**

Quantity in Job or Lot	Test Sample Size	Accept Number	Reject Number
Under 500	2	0	1
500 to 2,500	4	0	1
2,501 to 10,000	5	0	1
10,001 to 50,000	10	0	1
50,001 to 100,000	15	0	1
100,001 and Over	27	1	2



**Figure 1 – Metallurgical Specimen**

Body of collar shall be sectioned longitudinal and cross sectional for cracks, discontinuities, and intergranular corrosion, carburization and decarburization.

Body of collar for stress corrosion and hot wet environment.





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**TABLE VII. REQUIREMENTS FOR  
 HST1380, HST1382, HST1480 & HST1482**

<b>Collar</b>	Material	Aluminum	
	Finish	Anodize Cetyl Alcohol	
<b>Test Bolt</b>	Material	Titanium	
	Finish	Dia. 5-6, and 8-12 IVD Coating & Cetyl Alcohol Dia. 7, 14-20 Anodize & Cetyl Alcohol	
<b>Bearing Surface</b>	Material	7075-T6 Aluminum Alloy	
	Finish	Epoxy Chromate Primer	
<b>Dash No.</b>	<b>Locking Torque Inch-Lbs.</b>		<b>Tension Preload LBS. Minimum</b>
	<b>Max</b>	<b>Min Breakaway</b>	
-5	7	1.5	600
-6	12	2.0	700
-7	15	2.5	1,100
-8	17	3.5	1,600
-10	35	6.5	2,250
-12	40	9.5	3,250
-14	60	14.0	4,500
-16	85	18.0	6,100
-18	110	24.0	7,100
-20	130	32.0	8,100

1. Test bolts shall be used only once.
2. Referee testing shall be accomplished on TB12VCE test bolts for -5, -6 and -8 through -12 diameters and on TB12VF test bolts for -7 and -14 through -20.

**TABLE VIII. SAMPLING FOR NON-DESTRUCTIVE TESTS AND COMPARATOR AND VISUAL MEASUREMENTS**

Sampling plan for visual examination and non-destructive test of coating/plating thickness and penetrant and magnetic examination.	Lot Size	Under 91	91 to 280	281 to 500	Over 500
	Sample Size	8	32	50	80
	Approx. AQL	1.5%	1.5%	1.5%	1.5%
	Acceptance No.	0	1	2	3
Sampling plan for comparator measurement or destructive test of coating/plating thickness.	Lot Size	Under 16	16 to 1,000	1,001 to 3,000	Over 3,000
	Sample Size	3	5	10	15
	Approx. AQL	3.5%	2.0%	1.0%	0.7%
	Acceptance No.	0	0	0	0



**Figure 2. Automatic Test Equipment to Test for Locking Torque, Breakaway Torque, Preload & Torque-Off**

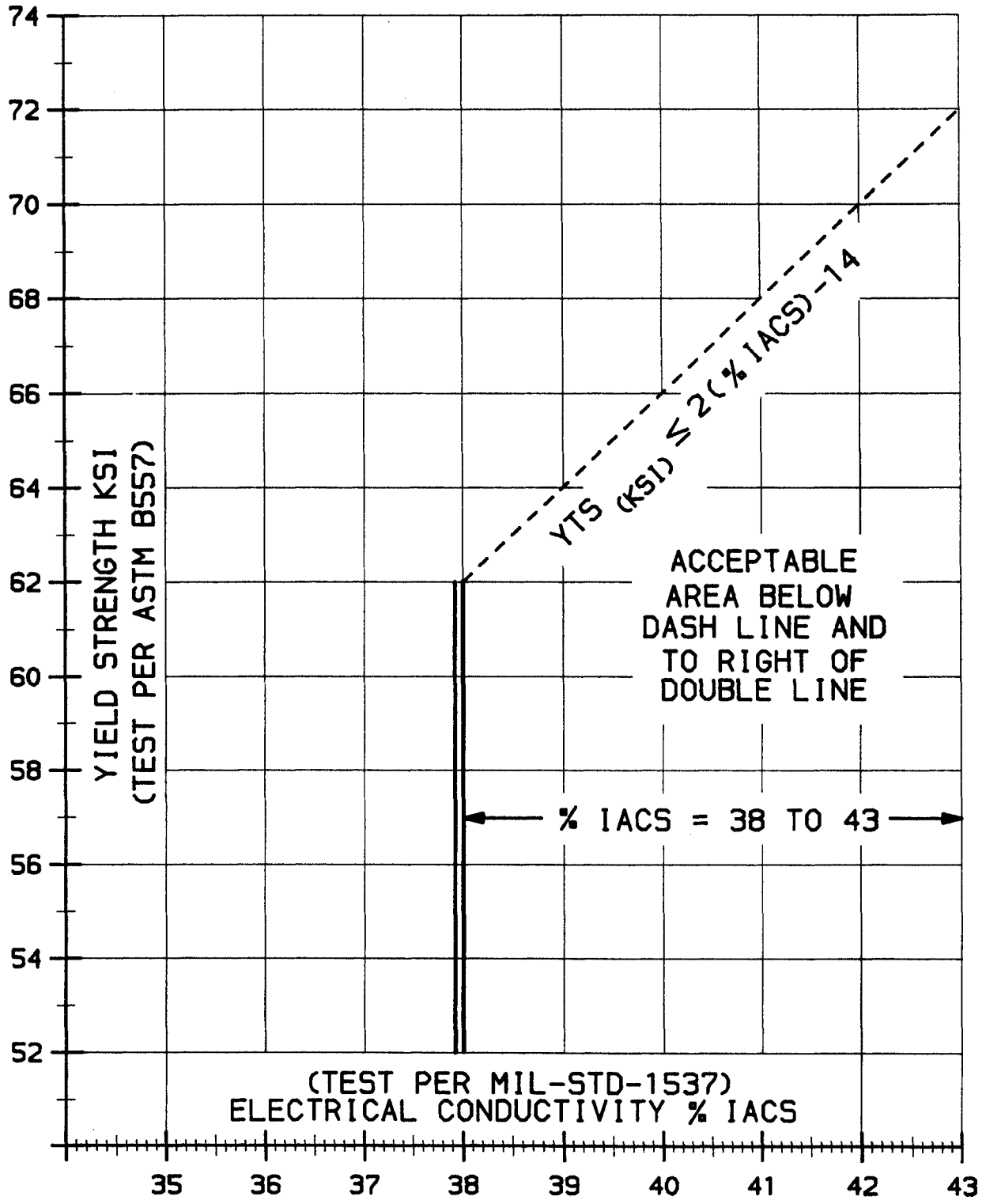
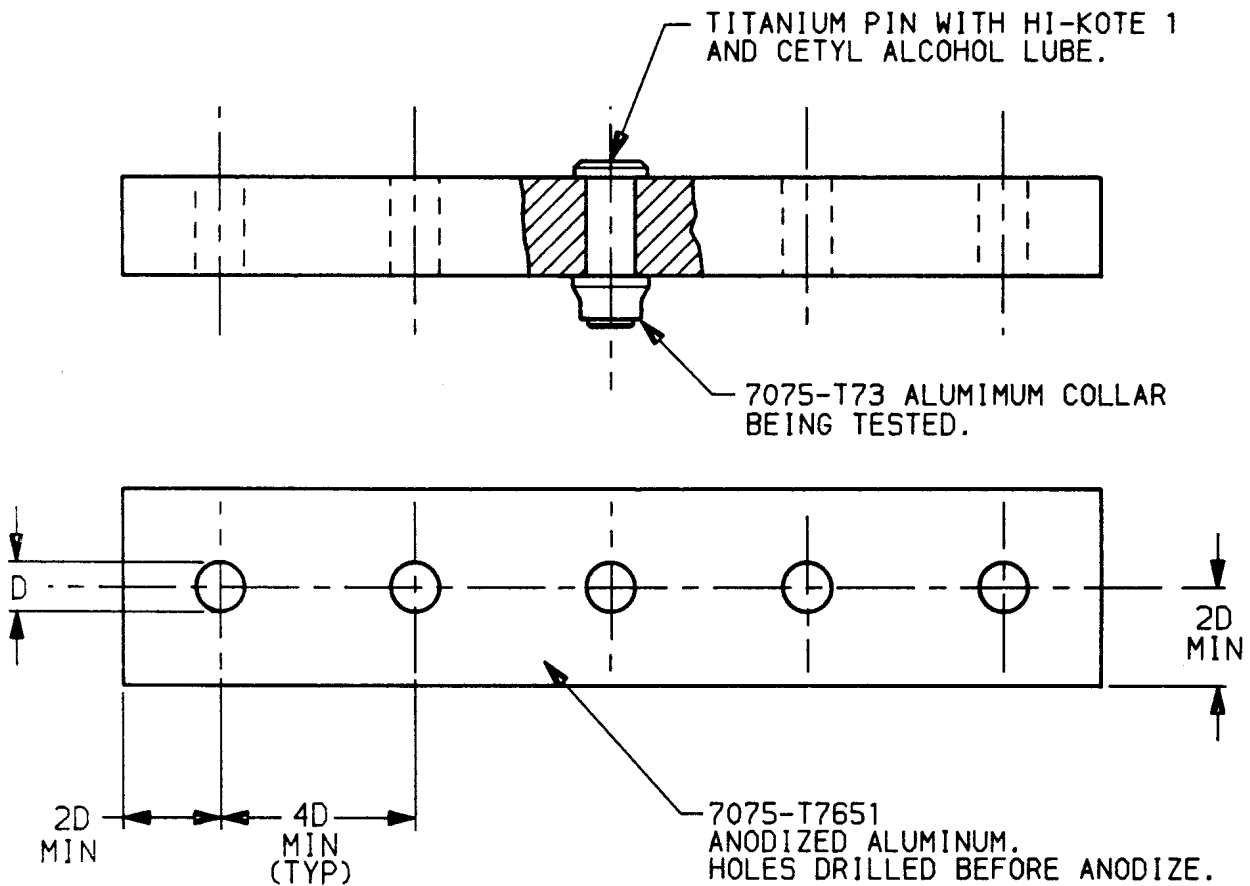


Figure 3  
Yield Strength Vs. %IACS



**Figure 4. Stress Corrosion and Hot-Wet Environment Specimen**



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**TABLE IX. THREAD DIMENSIONS FOR GAUGE TO CHECK COLLAR THREAD START**

THREAD UNJ - 3A MODIFIED	MAJOR DIAMETER		MID 50% PITCH Ø	
	MIN	MAX	MIN	MAX
.1640 – 32	.1570	.1595	.1421	.1432
.1900 – 32	.1810	.1840	.1680	.1691
.2160 – 28	.2070	.2100	.1910	.1922
.2500 – 28	.2410	.2440	.2249	.2262
.3125 – 24	.3020	.3060	.2834	.2847
.3750 – 24	.3640	.3680	.3457	.3472
.4375 – 20	.4260	.4310	.4027	.4042
.5000 – 20	.4880	.4930	.4651	.4667
.5625 – 18	.5500	.5550	.5239	.5256
.6250 – 18	.6120	.6180	.5863	.5880
.7500 – 16	.7370	.7430	.7066	.7085
.8750 – 14	.8610	.8680	.8255	.8276
1.0000 – 12	.9860	.9930	.9426	.9448

Notes:

1. Threads per AS8879, except as tabulated, with a 2.0 pitch maximum incomplete lead thread runout.
2. Threads must be formed from a material with a hardness of HRC36 (160,000 psi tension) or greater.
3. Threads cannot be plated, coated, or lubed. Surface treatments, such as passivation or anodize, are acceptable.