AEROSPACE STANDARD

AS1895™	REV. F

Issued 1985-12
Reaffirmed 2007-08
Revised 2024-02

Superseding AS1895E

Coupling Assembly, V-Retainer, High Pressure High Temperature, Pneumatic Tube

RATIONALE

General cleanup of specification. Remove 6.50 through 7.50 diameter standard profile from QPL, leave as reference only. Add AMS5737 to nut material, clarify silver plating and DFL. Bolt - remove AS4108/3, add 160 ksi and quality conformance. Seals - remove passivation per AMS2700.

1. SCOPE

1.1 This SAE Aerospace Standard establishes the requirements for a V-retainer coupling, flanges, and seal suitable for joining high-pressure and high-temperature ducting in aircraft bleed air systems. The rigid coupling joint assembly, hereafter referred to as “the joint,” shall operate within the temperature range of -65 to +1200 °F.

1.2 Types

The joint shall be classified into two basic flange profiles:

1.2.1 Type I

Standard Profile - Per AS24563 Type 2 (1.50 to 7.50 inch duct size), AS1895/12, and AS1895/13

1.2.2 Type II

Low Profile - Per AS24563 Type 1 (1.00 to 7.50 inch duct size), AS1895/14, and AS1895/15

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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For more information on this standard, visit
https://www.sae.org/standards/content/AS1895F

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR869 V-Couplings, Including V-Band and V-Retainer Coupling Assemblies, Flange and Seal Design, Application of

ARP699 High Temperature Pneumatic Duct Systems for Aircraft

AS478 Identification Marking Methods

AS4108 T-Bolt and Eye Bolt, A286 CRES, 1000 °F Fatigue Rated

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

AS24563 Flange Profiles, V-Coupling, Design Standard

2.1.2 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME Y14.100 Engineering Drawing Practices

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D3951 Standard Practice for Commercial Packaging

2.1.4 AWS Publications

Available from American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672, Tel: 1-800-443-9353 or 305-443-9353, www.aws.org.

AWS D17.1 Specification for Fusion Welding for Aerospace Applications

AWS D17.2 Specification for Resistance Welding for Aerospace Applications

2.1.5 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM7873 Nut, Self-Locking, 1200 °F

2.1.6 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

PD1100 NADCAP Program Requirements

PD2001 Qualified Product Management Council Procedures for Qualified Products Group

PD2101 Aerospace Quality Assurance, Product Standards, Qualification Procedure, Fluid Systems

AC7112 Fluid Systems Manufactures Audit Criteria

2.1.7 U.S. Government Publications

Copies of these documents are available online at https://quicksearch.dla.mil.

MIL-STD-129 Military Marking for Shipment and Storage

MIL-STD-130 Identification Marking of U.S. Military Property

2.2 Definitions

2.2.1 OPERATING LOAD

The highest ambient temperature load per inch of circumference as defined in 3.5.2.1 due to the combined effects of pressure, bending, and axial loading. The operating load is calculated using the highest operating temperature, pressure, bending, and axial loading values corrected to an ambient temperature equivalent load using the temperature correction factors specified herein.

2.2.2 LIMIT LOAD

Limit load is two times operating load. Permanent deformation in excess of 0.2% residual strain of parts is not allowed except for dimensional increase across coupling retainer legs, and allowable leakage rate of air shall not exceed 0.06 SCFM per inch diameter.

2.2.3 ULTIMATE LOAD

Ultimate load is three times operating load. Allowable leakage of air may be exceeded, deformation of parts may occur, but the joint shall remain connected.

2.2.4 BREAK LOOSE TORQUE

The torque required to produce nut rotation from the seated condition.

2.2.5 BREAKAWAY TORQUE

The torque required to produce nut rotation in the unseated condition. Usually one full turn minimum from the seated condition.

2.2.6 RUNNING TORQUE

Sometimes called “prevailing torque,” it is the torque required to produce continuous nut rotation. This torque is used to measure nut drag caused by the self-locking device.

2.2.7 MAXIMUM SELF-LOCKING TORQUE

The maximum acceptable running torque value (40 lb-in).

2.2.8 INSTALLATION TORQUE

The required nut torque to properly install the coupling.

2.2.9 GAS MEASUREMENT UNIT, STANDARD CUBIC FOOT PER MINUTE (SCFM)

Gas must be defined to have identity. The most widely accepted unit of measurement in the United States is the standard cubic foot, fixed at 60 °F (519.7 °R) and 14.696 psia (760 mm or 29.92 in Hg). A dry cubic foot of air at these conditions weighs 0.0763 pound. It is common practice to accept the basic condition as 14.70 psia and 60 °F.

2.2.10 SUPPLIER

The manufacturer of the items described herein. The supplier is responsible for qualification testing (QPL placement) and accredited manufacturer approval (QML placement).

2.2.11 USER

The user is the activity procuring the qualified items described herein.

3. TECHNICAL REQUIREMENTS

3.1 Qualification

The parts tested to meet this qualification document shall be representative of production hardware shipped against their respective design standards. Parts, design, and installation standards covered by this document are listed in Table 1 with the part QML and QPL requirements.

3.1.1 Manufacturer Qualification

A manufacturer producing a product in conformance to this procurement specification shall be accredited in accordance with the requirements of OP2007 Appendix G3, PD100, and AC7112, and shall be listed in a Performance Review Institute (PRI) Qualified Manufacturer's List (QML).

3.1.2 Product Qualification

All QPL accredited products shown in Table 1 shall conform to the requirements of this procurement specification and shall be approved in accordance with the requirements of PD2000 and OP2007 Appendix G3 for listing in a PRI QPL.

3.2 Materials

The joint materials shall be uniform in quality, free from defects, suitable for service, consistent with good manufacturing practices, and in conformance with the applicable specifications and requirements stated herein. Specific materials used in the joint components shall be specified on the applicable AS1895 part standard. Cadmium and zinc plating shall not be used.

Table 1 - Joint control numbers

Joint Type	General Description	Accreditation	Standard
I	Standard Profile Coupling, Single Latch 1.50-6.00 Dia	QPL	AS1895/1
I	Standard Profile Coupling, Single Latch 6.50-7.50 Dia	QML***	AS1895/1
I	Standard Profile Seam Welded Male Flange	QML	AS1895/2
I	Standard Profile Seam Welded Female Flange	QML	AS1895/3
II	Low Profile Coupling, Single Latch	QPL	AS1895/4
II	Low Profile Seam Welded Male Flange	QML	AS1895/5
II	Low Profile Seam Welded Female Flange	QML	AS1895/6
I & II	Seal	QPL	AS1895/7
II	Low Profile Butt Weld Male Flange	QML	AS1895/8
II	Low Profile Butt Weld Female Flange	QML	AS1895/9
I	Standard Profile Butt Weld Male Flange	QML	AS1895/10
I	Standard Profile Butt Weld Female Flange	QML	AS1895/11
I	Standard Profile Male Flange End*	N/A*	AS1895/12
I	Standard Profile Female Flange End*	N/A*	AS1895/13
II	Low Profile Male Flange End*	N/A*	AS1895/14
II	Low Profile Female Flange End*	N/A*	AS1895/15
II	Low Profile Male Flange Integral Weld Ring	QML	AS1895/16
II	Low Profile Female Flange Integral Weld Ring	QML	AS1895/17
I	Standard Profile Male Flange Integral Weld Ring	QML	AS1895/18
I	Standard Profile Female Flange Integral Weld Ring	QML	AS1895/19
II	Low Profile Coupling Double Latch	QPL	AS1895/20
I & II	Installation, V-Retainer Coupling Assembly**	N/A**	AS1895/21
I	Standard Profile Coupling Double Latch 4.00-6.00 Dia	QPL	AS1895/22
	Standard Profile Coupling Double Latch 6.50-7.50 Dia	QML***	AS1895/22
I & II	High Conformance Seal	QPL	AS1895/23

* Design standards only; referenced by /12, /13, /14, /15 standards.
** Installation standard only; referenced by /21 standard.
*** Standard profile sizes 6.50 through 7.50 tube diameter are not covered by the QPL. Users of these sizes are advised to control source approval(s) by standard supplement sheets or similar means.

3.3 Design and Fabrication

The Type I (standard profile) and Type II (low profile) joints consisting of couplings, flanges, and seals as listed in Table 1 shall fulfill all design and performance requirements of this document. Mating flange profiles shall conform to AS24563 Type 2 (AS1895/12 and AS1895/13) for Type I and AS24563 Type 1 (AS1895/14 and AS1895/15) for Type II.

3.3.1 Coupling

The material of the coupling shall be corrosion- and heat-resistant alloy as specified on the applicable AS1895 part standard. The coupling shall be fabricated with integral lugs for coupling hinge and latch. No welding is allowed. The coupling half shall be wrought, forged, or fully machined. The inside surface of the V-retainer shall be coated with dry film lubricant capable of meeting the requirements specified herein.

3.3.1.1 Coupling Half Strength

The coupling shall maintain joint integrity at operating pressure in the event of coupling half failure. The coupling shall be so designed that three-fourths of the coupling half circumference shall be sufficient to maintain joint integrity while at ambient temperature while at operating pressure of Table 2.

Table 2 - Testing loads at ambient temperature

Tube OD in Inches	Standard Profile Type I N lb/in (cir)	Standard Profile Type I Operating Pressure ±5 psig /1/	Standard Profile Type I Bending Moment ±10 lb-in /2/	Low Profile Type II N lb/in (cir)	Low Profile Type II Operating Pressure ±5 psig /1/	Low Profile Type II Bending Moment ±10 lb-in /2/
1.00	--	--	--	559	2070	1110
1.25	--	--	--	541	1630	1440
1.50	686	1960	3310	531	1350	1820
1.75	690	1680	4020	537	1180	2310
2.00	693	1470	4800	538	1040	2830
2.25	697	1310	5670	533	920	3370
2.50	700	1180	6610	526	820	3940
2.75	694	1060	7520	514	730	4490
3.00	702	980	8660	521	680	5260
3.25	700	900	9750	522	630	6030
3.50	705	840	11020	517	580	6780
4.00	885	918	17210	655	645	10900
4.50	877	806	20660	665	583	13610
5.00	887	732	24900	659	521	16275
5.50	895	670	29510	655	471	19200
6.00	888	608	33975	658	434	22575
6.50	825	520	34600	620	379	23600
7.00	770	450	35850	580	329	25350
7.50	720	385	38020	540	280	26790

/1/ Maximum operating pressure is determined when joint is subjected to internal pressure only at ambient temperature, see 4.3.1 temperature 70 °F ± 15 °F.

/2/ Maximum bending moment is determined when joint is subjected to ambient temperature bending only (no internal pressure, torsion or axial load applied).

/3/ For elevated temperatures, use with Table 3.

3.3.2 Flanges

The material of the flanges (male and female) shall be corrosion- and heat-resistant alloy as specified on the applicable AS1895 part standard shown in Table 1. The flange shall be designed for resistance seam, butt, or integral ring butt weld to tubing. The seam, butt, and integral ring butt weld flanges shall be intermateable. All flanges must fully conform to the appropriate AS1895 part standard prior to and after welding. The flatness shall conform before and after welding, without additional machining of flanges after welding to tubing. The tube to flange (seam, butt, integral ring butt) weld joint configurations are interchangeable within, material, size, profile type, and qualification by similarity may be used provided that welding flatness requirements are met.

3.3.3 Seal

The material of the seal shall be corrosion- and heat-resistant alloy as specified on the applicable AS1895 part standard. Plating, to enhance sealing capability, shall be allowed, provided it is within the limits specified on the applicable AS1895 part standard specified in Table 1. The plating, if used, shall be free from blistering, flaking, chipping, or scaling at temperatures from -65 to 1200 °F for not less than 1000 hours. The seal geometry shall be such that the seal, for a specific duct size, will fit the standard and low-profile flanges and be retained as specified. Seals shall be designed to provide enough flexibility to allow hand latching of the coupling while installed on maximum material flanges. The seal shall be elastically compressed with minimal permanent deformation when installed in a completed joint and subjected to the loads imposed by the requirements stated herein. The seal shall be reusable, under normal conditions, for the life of the joint, under normal assembly conditions per AS1895/21. However, if a seal must be replaced during the coupling qualification testing, the reason for replacement shall be noted in the test report.

NOTE: Qualification testing shall be done with AS1895/7 or AS1895/23 high conformance seals. Qualification tests run using AS1895/7 or AS1895/23 seals qualify only those seals used in the test program. Qualification of an AS1895/7 seal does not qualify an AS1895/23 by similarity. Qualification of an AS1895/23 seal does not qualify an AS1895/7 by similarity.

3.3.4 Duct Material

The duct material shall be corrosion- and heat-resistant nickel alloy 625 or 718 at supplier's discretion. The flanges, when welded to the ducting, shall meet the requirements of 3.3.5.1. Non-stabilized corrosion-resistant duct material alloys shall not be used.

NOTES:

1. Duct Specimen Test Length: Recommended length of each duct, between flange and end cap, is 1.5 X duct diameter.

2. Duct Specimen Thickness: The recommended thickness for each duct is the thickness of the flange end, or the closest duct stock thickness.

3.3.5 Welding

Resistance or fusion welding of flanges to ducting shall be in accordance with AWS D17.2 or AWS D17.1. Coupling designs shall contain no weldment.

3.3.5.1 Flange Flatness After Welding

All flanges, Type I and Type II conforming to their corresponding applicable AS1895 part standard from Table 1, mated to AS1895/7 seals shall, after welding, be flat within the following limits:

a. 1.00 to 4.50 inch tube outside diameter = 0.005 FIM

b. 5.00 to 7.00 inch tube outside diameter = 0.007 FIM

c. 7.50 inch tube outside diameter = 0.008 FIM

Type I flanges mated to AS1895/23 seals shall, after welding, be flat within the following limits:

a. 1.50 to 3.50 inch tube outside diameter: Overall flange flatness 0.015; no change in flatness greater than 0.011 in any linear inch of circumference.

b. 4.00 to 7.50 inch tube outside diameter: Overall flange flatness 0.020; no change in flatness greater than 0.012 in any linear inch of circumference.

Type II flanges mated to AS1895/23 seals shall, after welding, be flat within the following limits:

a. 1.00 to 3.50 inch tube outside diameter: Overall flange flatness 0.0125; no change in flatness greater than 0.0085 in any linear inch of circumference.

b. 4.00 to 7.50 inch tube outside diameter: Overall flange flatness 0.026; no change in flatness greater than 0.018 in any linear inch of circumference.

3.3.6 Bolt

Bolt material shall be as specified on the applicable AS1895 part standard, with an ultimate tensile strength of 160 ksi minimum. Bolt threads shall conform to AS8879 and shall be lubricated using an anti-seize high-temperature lubricant per the applicable AS1895 part standard.

3.3.7 Nut

The nut shall be a corrosion- and heat-resistant self-locking type double hexagon (12-point) nut with a running torque of 6.5 to 40 lb-in and the finish as specified on the applicable AS1895 part standard. The material shall be as specified on the applicable AS1895 part standard. The nut shall have a minimum life of 15 seating torque cycles and be capable of complete removal from the eye bolt on each cycle.

3.3.8 Safety Latch

The coupling shall have a safety latch as shown on applicable AS1895 part standard AS1895/1, /4, /20, and /22. The safety latch shall be a permanent part of the coupling and shall engage and maintain joint integrity in the event of primary bolt failure. Joint leakage shall not be in excess of 6.0 SCFM per inch of tube diameter at operating pressure of Table 2 while being supported only by the safety latch (failed bolt case). The safety latch shall not require any tools for its operation or release. The safety latch shall be manually positioned when the clamp is installed. The safety latch must be designed to function as illustrated in Figure 11B, and so that failure of the primary bolt is clearly evident on visual inspection.

3.3.8.1 Optional Fool Proof Feature

When so specified by code letter, the safety latch shall have a special feature to prevent installation without engaging the safety latch. The feature may be provided even if not specified by part number.

3.4 Temperature

The joints shall meet the requirements of this document under any combination of internal/fluid temperature exposure, within the range of -65 to +1200 °F except as noted; see 3.5.2.1.4 and Table 3 for temperature correction factors.

3.5 Performance

The values specified herein shall define the requirements for satisfactory performance and shall apply to performance under the conditions as specified in 3.4 at ambient and elevated temperature.

3.5.1 Static Leakage

The joint, consisting of the coupling, flanges, and seal noted in 3.3, shall show no evidence of leakage in excess of 0.01 SCFM (0.000765 pound dry air per minute) per inch of tube outside diameter when subjected to the testing specified in 4.5 or evidence of external wetting sufficient to form a drop (for hydrostatic tests methods 1 and 2).

3.5.2 Hydrostatic Pressure Loading

The joint shall show no evidence of permanent deformation or permanent set when subjected to the pressures of Table 4 in accordance with 4.5.1 and Figures 8 and 9 at ambient temperature with water or hydraulic oil as a fluid medium. An axial load equivalent to the load produced by the internal pressure may be used.

3.5.2.1 Equivalent Axial Load

The equivalent axial load “N” is determined in accordance with the following relationship in Equation 1:

$$N = N_p + N_b + N_a \quad \text{(Eq. 1)}$$

where:

N_p = load, pounds per inch of circumference due to pressure

N_b = load, pounds per inch of circumference due to bending

N_a = load, pounds per inch of circumference due to axial loading

3.5.2.1.1 Pressure

The load per inch of circumference due to pressure shall be determined from the following relationship in Equation 2:

$$N_p = PD_s^2/4D_p \quad \text{(Eq. 2)}$$

where:

N_p = load, pounds per inch of circumference due to pressure

P = internal pressure, psig

D_s = diameter at seal line, in inches; see Figure 8

D_p = theoretical contact line of V-retainer to flange, in inches; see Figure 8

3.5.2.1.2 Bending

The load per inch of circumference due to bending shall be determined from the following relationship in Equation 3:

$$N_b = 4M/\pi D_p^2 \quad \text{(Eq. 3)}$$

where:

N_b = load, pounds per inch of circumference due to bending (limit)

M = bending moment in inch pounds

D_p = theoretical contact line of V-retainer to flange, in inches; see Figure 8

3.5.2.1.3 Axial Load

The load per inch of circumference due to axial loading shall be determined from the following relationship in Equation 4:

$$N_a = E/\pi D_p \quad \text{(Eq. 4)}$$

where:

N_a = load, pounds per inch due to axial load

E = axial tension load in pounds

D_p = theoretical contact line of V-retainer to flange, in inches

3.5.2.1.4 Rated Load

Limit (Proof) = two times operating load

Ultimate = three times operating load - leakage in 3.5.1 may be exceeded. Deformation may occur, but the joint shall remain permanently connected.

N operating load shown in Table 2 is at ambient temperature and must be corrected for elevated temperature per Table 3.

EXAMPLE: N Load for 3.00 Type I joint is 702 lb-in. At 600 °F, N = 702 x 0.73 = 572 lb-in.

Table 3 - Temperature correction factor Type I and II joints

Temperature °F	Correction Factor CRES A-286	Correction Factor Nickel Alloy 718
70	1.00	1.00
100	0.97	0.99
200	0.89	0.96
300	0.84	0.96
400	0.79	0.92
500	0.76	0.92
600	0.73	0.89
700	0.71	0.88
800	0.70	0.87
900	0.68	0.87
1000	0.68	0.85
1100	0.68	0.81
1200	0.68	0.73

3.5.3 Pneumatic Pressure

3.5.3.1 Operating Pressure

The joint shall show no evidence of deformation or leakage in excess of that stated in 3.5.1 when subjected to the operating pressure of Table 2.

3.5.3.2 Proof Pressure

The joint shall show no evidence of residual strain in excess of 0.2% of any part or leakage in excess of 0.06 SCFM per inch of tube diameter when subjected to two times the operating pressure of Table 2 for 15 minutes.

3.5.3.3 Burst Pressure

The joint shall not rupture and shall remain intact when subjected to three times the operating pressure of Table 2 for 2 minutes. Deformation shall be allowed.

3.5.4 Torsional Moment

The joint shall not permanently deform or rotate when subjected to torsional moment specified in Table 5 at operating pressure of Table 2. Leakage shall be within the limits of 3.5.1.

Table 4 - Hydrostatic proof pressure expansion values

Type II Low Profile			
Part Number	Nominal Tube Size	Test Pressures (psig) +5/-2 %	Fixture or Coupling Half Axial Expansion Max in Inches See Figures 8 and 9
AS1895/4 -100	1.00	3950	0.007
AS1895/4 -125	1.25	3200	0.007
AS1895/4 -150	1.50	2650	0.007
AS1895/4 -175	1.75	2250	0.007
AS1895/4 -200	2.00	2000	0.007
AS1895/4 -225	2.25	1800	0.007
AS1895/4 -250	2.50	1650	0.007
AS1895/4 0-275	2.75	1500	0.007
AS1895/4 -300	3.00	1400	0.007
AS1895/4 -325	3.25	1300	0.007
AS1895/4 -350	3.50	1200	0.007
AS1895/4 & 20-400	4.00	1050	0.007
AS1895/4 & 20-450	4.50	900	0.007
AS1895/4 & 20-500	5.00	800	0.007
AS1895/4 & 20-550	5.50	750	0.007
AS1895/4 & 20-600	6.00	700	0.007
AS1895/4 & 20-650	6.50	650	0.007
AS1895/4 & 20-700	7.00	600	0.007
AS1895/4 & 20-750	7.50	560	0.007

Type I Standard Profile			
Part Number	Nominal Tube Size	Test Pressures (psig) +5/-2 %	Fixture or Coupling Half Axial Expansion Max in Inches See Figures 8 and 9
AS1895/1 -150	1.50	4100	0.017
AS1895/1 -175	1.75	3800	0.017
AS1895/1 -200	2.00	3500	0.017
AS1895/1 -225	2.25	3250	0.017
AS1895/1 -250	2.50	3000	0.017
AS1895/1 -275	2.75	2750	0.017
AS1895/1 -300	3.00	2500	0.017
AS1895/1 -325	3.25	2250	0.017
AS1895/1 -350	3.50	2000	0.017
AS1895/1 & 22-400	4.00	1750	0.017
AS1895/1 & 22-450	4.50	1500	0.017
AS1895/1 & 22-500	5.00	1300	0.017
AS1895/1 & 22-550	5.50	1200	0.017
AS1895/1 & 22-600	6.00	1150	0.017
AS1895/1 & 22-650	6.50	1040	0.017
AS1895/1 & 22-700	7.00	900	0.017
AS1895/1 & 22-750	7.50	800	0.017

Table 5 - Torsional moment

Standard Profile Type I Tube OD in Inches	Standard Profile Type I Torsional Moment in lb-in ±10 lb-in
--	--
--	--
1.50	2200
1.75	2600
2.00	3200
2.25	3600
2.50	4100
2.75	4600
3.00	5200
3.25	5800
3.50	6500
4.00	9600
4.50	13600
5.00	18000
5.50	21000
6.00	26000
6.50	TBD*
7.00	TBD*
7.50	TBD*

Low Profile Type II Tube OD in Inches	Low Profile Type II Torsional Moment in lb-in ±10 lb-in
1.00	600
1.25	800
1.50	1000
1.75	1200
2.00	1800
2.25	2000
2.50	2500
2.75	2900
3.00	3600
3.25	4200
3.50	5100
4.00	8000
4.50	11900
5.00	17200
5.50	20000
6.00	25000
6.50	28000
7.00	32000
7.50	35000

*Torsion values for these sizes have not been developed.

3.5.5 Sinusoidal Vibration

The joint shall maintain joint integrity and show no evidence of leakage in excess of that specified in 3.5.1 during or after exposure to vibration levels per 4.5.4.1 with a 10-minute dwell at resonant frequencies at operating pressure of Table 2 and at ambient temperature.

3.5.6 Pressure Cycling

The joint shall not permanently deform or show evidence of fatigue failure after being subjected to 200000 pressure impulse cycles per 4.5.5 at operating pressure of Table 7. Leakage during or after pressure cycling shall not exceed that specified in 3.5.1.

3.5.7 Flexure Cycling

The joint shall not permanently deform, or show evidence of fatigue failure, and shall not exceed the leakage requirements of 3.5.1 during and after subjection to flexure cycling for a minimum of 200000 cycles in accordance with 4.5.5 and Table 7.

3.6 Interchangeability

Couplings, seals, and flanges defined by this specification are designed to be interchangeable between approved products of all suppliers.

3.7 Part Numbering of Interchangeable Parts

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. Item identification, part numbers, and changes shall be in accordance with ASME Y14.100.

3.8 Identification of Product

3.8.1 Coupling

The coupling shall be marked for identification in accordance with the applicable AS1895 part standard.

3.8.2 Seal and Flanges

The seal and flange packaging shall be marked for identification in accordance with the applicable AS1895 part standard and MIL-STD-130 with the AS part number and the supplier's identification. Flange marking shall be on the flange skirt as close as possible to the radius, with the 20-degree angle surface.

3.9 Workmanship

The quality in workmanship shall be to the degree that the joint components are free from defects and imperfections which violate the requirements of this standard and respective AS1895 part standard or interfere with the function of a specific AS1895 product or assembled joint.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The supplier is responsible for the performance of all quality assurance provisions as specified herein. Accurate records of the testing shall be maintained by the supplier and shall be available to the user for inspection on request.

Table 6 - Qualification test - coupling (testing may be performed in any order)

Test	Requirement Paragraph	Method Paragraph
Examination	--	4.4.1
Static Leakage	3.5.1	--
Hydrostatic Pressure	3.5.2	4.5.1
Operating Pressure	3.5.3.1	4.5.2
Proof Pressure	3.5.3.2	4.5.2
Burst Pressure	3.5.3.3	4.5.12
Torsional Moment	3.5.4	4.5.3
Sinusoidal Vibration	3.5.5	4.5.4
Pressure Cycling	3.5.6	4.5.5
Flexure Cycling	3.5.7	4.5.5
Coupling Half Strength Test	3.3.1.1	4.5.6
Nut Life	3.3.7	4.5.7
Safety Latch	3.3.8	4.5.8
Fool Proof Safety Latch	3.3.8.1	4.5.8.1

Table 6A - Qualification test - seal (testing may be performed in any order)

Test	Requirement Paragraph	Method Paragraph
Examination	--	4.4.1
Static Leakage	3.5.1	--
Operating Pressure	3.5.3.1	4.5.2
Proof Pressure	3.5.3.2	4.5.2
Burst Pressure	3.5.3.3	4.5.12
Sinusoidal Vibration	3.5.5	4.5.4
Pressure Cycling	3.5.6	4.5.5
Flexure Cycling	3.5.7	4.5.5

NOTE: Testing conditions for Table 6A are to be that of the standard profile joint configuration.

4.2 Classification of Tests

Inspection and testing of joint components shall be classified as:

a. Qualification test (see 4.2.1)

b. Quality conformance test and verification (see 4.2.2)

4.2.1 Qualification Test

Qualification tests shall consist of the examinations and tests specified in Table 6 for coupling qualification or Table 6A for seal only qualification. The configuration shall be as described on the applicable AS1895 part standard.

4.2.1.1 Sampling Instruction

Unless otherwise specified, one joint minimum of the size specified by the user, or, if not specified, the maximum size shall be subjected to the qualification test by the supplier.

Coupling Qualification: Standard Profile - The manufacturer shall test the largest size they will qualify. Material qualification by similarity is described in 4.2.1.3. Low Profile - If the manufacturer plans to qualify sizes 4.00 inches or larger, the 3.50 inch shall also be tested due to the change in material in order for sizes 3.50 inches and smaller to be qualified.

Seal Qualification: Seal qualification must use the standard profile couplings and flanges due to the seal cavity deflections. The largest size of the standard profile joint using a coupling with A286 coupling halves will qualify all smaller sizes below.

NOTE: For the seal qualification, the standard profile flanges and coupling do not need to be qualified but must conform dimensionally and use the material indicated in their corresponding AS1895 part standard. The coupling halves must use A286 as the material.

4.2.1.2 Test Sample Identification

Each component of the joint assembly shall be permanently and distinctly identified. Marking shall be such that legibility can be maintained throughout the qualification testing. Seal identification may be maintained external to the part.

4.2.1.3 Qualification by Similarity

Qualification of larger couplings of the same type (standard or low profile), material, and manufacturer shall qualify smaller couplings of the same type and material for that manufacturer. Qualification of smaller couplings shall not qualify the larger couplings. Qualification of standard profile couplings shall not qualify low profile couplings. Qualification of low-profile couplings shall not qualify standard profile couplings. Qualification of lower strength alloy couplings shall qualify higher strength alloy couplings of the same cross section and size. Qualification of single latch couplings shall not qualify double latch couplings and double latch couplings shall not qualify single latch couplings. Qualification of a seal in a standard profile joint configuration at the largest size shall qualify all sizes below of that same type. AS1895/7 seals shall not qualify AS1895/23 seals, and AS1895/23 seals shall not qualify AS1895/7 seals.

4.2.2 Quality Conformance Test and Verification

Production AS1895 products shall be examined and tested to the extent necessary to verify that the requirements of the AS1895 standard and this document have been met.

4.2.2.1 Couplings

Quality conformance testing and verification requirements shall consist of examination of product in accordance with 4.4.1 and 100% hydrostatic pressure testing in accordance with 4.5.1.

4.2.2.2 Flanges

Quality conformance testing and verification requirements shall consist of examination of product in accordance with 4.4.1 and 100% penetrant inspection as specified in the respective AS1895 part standard.

4.2.2.3 Seals

Quality conformance testing and verification requirements shall consist of examination of product in accordance with 4.4.1 and leakage testing as specified in the respective AS1895 part standard.

4.3 Test Conditions

4.3.1 Temperature

Unless otherwise specified, the ambient standard temperature shall be 75 °F ± 15 °F.

4.3.2 Test Assembly

The joint shall be assembled per AS1895/21 and torqued in accordance with the applicable AS1895 parts standard. The ducting shall be free to move axially to accommodate end loads due to internal pressure and temperature.

4.3.3 Fluid Medium

The fluid medium for pneumatic tests specified herein shall be dry air (ambient lab air) or gaseous nitrogen unless otherwise specified.

4.4 Examination

4.4.1 Examination of Product

Qualification test joint components and production products shall be examined to determine conformance to this standard and respective AS1895 part standard with regard to dimensions, weight, material, quality of workmanship, finish, construction, marking, and identification of product.

4.5 Test Methods

4.5.1 Hydrostatic Pressure

Prior to performing any pneumatic pressure testing, the test specimen shall be enclosed in a protective enclosure and hydrostatically pressurized to the test pressure of Table 4 and 3.5.2 at ambient temperature per either of the following two procedures. An axial load equivalent to the load produced by the internal pressure may be used for both test options.

4.5.1.1 Hydrostatic Pressure-Alternate Test and Acceptance Test: Alternate Test 1

The coupling shall be assembled on the flanges (including a seal) and the assembly shall be filled with water or hydraulic fluid. The coupling shall be torqued to the value specified on the coupling standard. As an alternative to the specified self-locking nuts, free running brass nuts may be used. The coupling shall be pressurized to one-half the test pressure specified in Table 4. The pressure shall then be released. The coupling half expansion of each segment shown in Figure 8 (labelled “expansion max”) shall be measured and noted. The joint shall be repressurized to the values in Table 4 and the coupling half expansion measured again. The differential expansion shall not exceed the values in Table 4. The pressure shall be released. The coupling half expansion shall again be measured and shall not exceed the initial measured expansion. Since the parts are not serialized, the measured expansions are only required for each piece acceptance and need not be permanently recorded.

4.5.1.2 Hydrostatic Pressure-Alternate Test and Acceptance Test: Alternate Test 2

The coupling shall be assembled on the test fixture per Figure 9 and the assembly filled with water or hydraulic fluid. The coupling shall be torqued to the value specified on the coupling standard. As an alternative to the specified self-locking nut, free running brass nuts may be used. The assembly shall be pressurized to one-half the test pressure specified in Table 4. The pressure shall then be released. The coupling half expansion of each segment shown in Figure 8 (labelled “expansion max”) shall be measured and noted. An initial measurement of the fixture at “X,” Figure 9, shall be made and noted. The joint shall be repressurized to the values in Table 4 and the expansion of the test fixture as shown in Figure 9 shall be measured again at “X” while the joint remains pressurized. The differential expansion of the test fixture shall not exceed the values in Table 4. The pressure shall be released. The midspan coupling half width shall be remeasured and shall not exceed the initial measurement value. Since the parts are not serialized, the measured expansions are only required for each piece acceptance and need not be permanently recorded.

4.5.2 Static Operating and Proof Pressure Leakage Test

The test specimen shall be mounted on a test fixture and installed as shown in Figure 1. The test specimen shall be pressurized with air or gaseous nitrogen by allowing the pressurizing medium to flow through a flowmeter while maintaining the required test pressures by means of a manually operated control valve placed between the pressure source and pressure gage. Any flow occurring after the required pressure has been reached, within the test specimen, shall be measured as leakage through the specimen. While at ambient temperature, the test specimen shall be slowly pressurized to operating pressure of Table 2. After the pressure within the specimen has stabilized, the pressure shall be maintained for a period of 15 minutes. The specimen leakage rate shall be monitored and recorded while at operating pressure and ambient temperature.

The internal pressure shall be slowly increased to two times the operating pressure of Table 2. After the pressure within the specimen has stabilized, the proof pressure shall be maintained for a period of 15 minutes. The specimen leakage rate shall be monitored and recorded while at proof pressure and ambient temperature.

The internal pressure shall then be reduced and maintained at operating pressure. The internal temperature control within the specimen shall be adjusted to maintain the elevated operating temperature of 1200 °F ± 15 °F.

NOTE: During heating, the pressure may climb above the proof pressure requirement and, therefore, should be monitored or bled off during heating for safety purposes.

An additional soak time of 20 minutes minimum shall be allowed after the temperature has been reached to assure stabilization of the test specimen.

The specimen leakage rate shall be monitored and recorded while at the operating pressure of Table 2 and at elevated temperature. The specimen internal pressure shall be slowly increased to two times the operating pressure of Table 2 (corrected per Table 3) and maintained at that pressure for a period of 15 minutes. The specimen leakage rate shall be monitored and recorded. After completion of the static operating and proof pressure leakage tests, the coupling components shall be allowed to cool and visually examined for evidence of structural damage as a result of the static pressure tests. Any indications of deformation shall be recorded. The specimen shall meet the requirements of 3.5.3.1 and 3.5.3.2.

4.5.3 Torsional Moment

The test specimen shall meet the requirements of 3.5.4 when subjected to the torsional moment of Table 5 at operating pressure of Table 2. Both ends of the test specimen shall be placed in the holding fixture as shown in Figure 2; other orientations may be used as long as the required torsion load is applied. One end of the specimen shall be rigidly clamped to prevent rotation. The other end of the specimen shall be free to rotate in the holding fixture and only secure enough to prevent the introduction of excessive bending moment. The test specimen shall be fitted with lugs, sockets, or similar fittings suitable for use with torque devices. The lugs, etc., shall be located as shown in Figure 2 on the side which permits rotation. The test specimen internal temperature shall be 1200 °F ± 15 °F. After temperature stabilization, the internal pressure shall be adjusted to the operating pressure of Table 2 (corrected per Table 3). While at operating pressure of Table 2 and 1200 °F ± 15 °F, a torsional moment of 0 lb-in to the value noted in Table 5 shall be slowly applied to one end of the test specimen. The specimen leakage rate shall be monitored and recorded prior to applying the torsional moment and after application of torsional moment. No visible (unaided eye) rotation allowed.

4.5.4 Vibration-Performance

The test specimen shall be installed as shown in Figure 3. The vibration test shall be conducted along three mutually perpendicular axes as shown in Figure 3 with the test specimen pressurized at operating pressure of Table 2 while at ambient temperature. The test specimen shall be subjected to one cycle of sinusoidal vibration with the frequency varying between 5 and 2000 Hz for each axis. The rate of change of frequency shall be approximately logarithmic and shall be such that a complete cycle (5 to 2000 to 5 Hz) will consume approximately 15 minutes. The test amplitude shall be that given by Curve 2 of Figure 4.

4.5.4.1 Vibration-Structural Integrity

The test specimen shall be installed as shown in Figure 3 and shall be subjected to sinusoidal vibration with the frequency varying between 5 and 2000 Hz. The rate of change of frequency shall be approximately logarithmic and shall be such that a complete cycle (5 to 2000 to 5 Hz) will consume approximately 15 minutes. The test amplitude shall be that given by Curve 1 of Figure 4.

4.5.4.2 Resonance Search

The test specimen shall be installed as shown in Figure 3 and subjected to a vibration sweep (5 to 2000 Hz) with each resonance being measured and recorded. The sweep shall be held at the resonant frequency while oscillating for 10 minutes. If more than four resonant frequencies are found, dwell shall occur at the four most severe for 10 minutes at each resonant frequency. If no resonant frequency is found, the dwell shall occur at 2000 Hz for 10 minutes. A resonance is defined as a magnification of output to input levels by a factor of two or more. The test specimen shall be subjected to sinusoidal vibration and searched for resonance while at the operating pressure of Table 2 at ambient temperature. Cyclic vibration shall be conducted with the frequency varying between 5 and 2000 Hz. The rate of change shall be approximately logarithmic and shall be such that a complete cycle (5 to 2000 to 5 Hz) will consume approximately 15 minutes. The test amplitude shall be that given by Curve 1 of Figure 4. The test shall continue for a minimum of 60 minutes per axis. Upon completion of the test, the specimen components shall be visually examined for any mechanical failures, excessive wear, or loosened parts. For seal qualification only - the joint shall show no evidence of leakage prior to and after testing in excess of that stated in 3.5.1 when subjected to the ambient temperature operating pressure of Table 2. The specimen condition shall be noted.

4.5.5 Flexure Cycling with Pressure Pulsations

The specimen shall meet the requirements of 3.5.7 after being subjected to the two steps of flexure cycling as shown in Table 7 at the test pressure of Table 7.

4.5.5.1 Flexure Cycling with Pressure Pulsations Step 1

The test specimen shall be mounted on a test fixture as shown in Figure 6, Position A, and Figure 7. The specimen shall be pressurized to the test pressure of Table 7 and produce an internal temperature of 1200 °F ± 15 °F. A cyclic bending moment load per Table 7 shall be applied to the test specimen. One flexure cycle is defined as 0 lb-in, plus maximum bending moment, 0 lb-in, minus maximum bending moment, plus 0 lb-in. After the flexure cycle is completed, the pressure shall be reduced to 0 psig +10/-0 psig and then restored to the pressure of Table 7 for the start of the next cycle. The cycling rate shall not exceed 60 cpm. This flexure cycle test shall be continued for a total of 100000 cycles with the specimen internal pressure maintained at test pressure of Table 7 and at elevated temperature. The leakage rate and test specimen pressure shall be monitored frequently throughout the flexure cycle test to assure specimen integrity. The specimen leakage rate shall be recorded prior to the first flexure cycle and after every 20000-cycle interval. The joint may be disassembled and the seal and flange sealing surfaces cleaned after every 40000 cycles. The joint must be reassembled with the coupling bolt in the original orientation with respect to the original position of the flange and seal. All components are to be reassembled in the original orientation.

4.5.5.2 Flexure Cycling with Pressure Pulsations Step 2

After completion of the flexure cycle test step 1, the test specimen shall be removed from the test fixture and the coupling rotated 90 degrees so the coupling bolt is positioned as shown in Figure 6, Position B, and remounted on the test fixture. The specimen shall be pressurized to the test pressure of Table 7 and produce an internal temperature of 1200 °F ± 15 °F, and the test per 4.5.5.1 shall be repeated for an additional 100000 cycles. The specimen leakage rate shall be recorded prior to the first flexure cycle and after every 20000-cycle interval. The joint may be disassembled and the seal and flange sealing surfaces cleaned after every 40000 cycles. The joint must be reassembled with the coupling bolt in the original orientation with respect to the original position of the flange and seal. All components are to be reassembled in the original orientation.

4.5.6 Coupling Half Strength Test

The coupling half shall be cut at the corner of the apex, along one leg, for a distance of one-fourth circumference with regard to the nominal diameter (see Figure 10). The coupling shall then be installed in a protective enclosure and pressurized to operating pressure of Table 2, 3.5.3.1. The specimen shall meet the requirements of 3.3.1.1.

Table 7 - Flexure cycling pressure and bending moment

Specimen Tube Size	Standard Profile Bending Moment (lb-in) ±10%	Standard Profile Test Pressure (psig)	Low Profile Bending Moment (lb-in) ±10%	Low Profile Test Pressure (psig)
100	--	--	491	300
125	--	--	605	300
150	1092	500	723	300
175	1095	500	864	300
200	1179	500	991	300
225	1408	500	1073	300
250	1427	500	1132	300
275	1345	500	1115	300
300	1270	500	1156	300
325	1083	500	1137	300
350	812	500	1039	300
400	6709	350	5170	200
450	6992	350	6071	200
500	7694	350	6662	200
550	7995	350	7164	200
600	7619	350	7734	200
650	8164	300	8091	175
700	7484	275	6860	175
750	6344	250	6908	150

4.5.7 Safety Latch Evaluation

The coupling specimen shall be engaged using the bolt or a device simulating the bolt. The coupling shall be positioned with the safety latch at the bottom of the specimen such that the safety latch will tend to unhook due to gravity. The coupling shall be rigged to the full torque condition. The specimen shall then be pressurized to operating pressure of Table 2 at 70 °F. While in the full torque condition, the bolt shall be severed, or a bolt action duplicating bolt severing may be used. This shall constitute one cycle. The procedure shall be repeated for a total of ten cycles with a new bolt and a new failsafe latch after each cycle, as required. The specimen shall meet the requirements of 3.3.8 for each cycle. Examine fail-safe latch for damage and replace if necessary. Record replacement history and extent of damage.

4.5.7.1 Fool Proof Safety Latch Evaluation

The test shall be conducted in sizes 5 inches or over. The locknut shall be engaged over at least three threads of the eye bolt. Using a gage plate representing maximum machining tolerances per Figure 12A, the latch shall be installed using hand force. The coupling shall then be installed on a gage plate of minimum machining tolerances per Figure 12B, attempting to misinstall the latch. This must include removal of the nut and positioning the safety latch as shown in Figure 11A, followed by reinstallation of the nut. The coupling shall then be installed per Figure 11B on minimum ferrules or a gage plate per dimensions in Figure 12B, and the nut tightened to 150 in-lb ± 5 in-lb overtorque.

NOTE: Plastic or elastic deformation of the safety latch is not permissible.

4.5.8 Nut Life

The coupling shall be installed on the flanges and seal. The nut shall be torqued at a rate not to exceed 25 rpm and a maximum nut temperature of 70 °F over ambient to the torque value specified on the applicable coupling standard. The latch gap shall be measured and recorded. The nut shall then be removed from the eye bolt. The installation and breakaway torque shall be recorded. The minimum acceptable value shall be 6.5 lb-in. The breakaway torque shall be read at one turn after the break loose torque has been achieved. The maximum self-locking torque shall be read and recorded, and it shall not exceed 40 lb-in. This sequence constitutes one cycle. The nut shall be installed and removed a total of 15 full on-off cycles. The nut shall meet the requirements of 3.3.7.

4.5.9 Disassembly and Inspection

The test specimen, after all testing (except burst testing), shall be disassembled, and the specimen components shall be inspected for conformance to the dimensions of the detail drawing. Any change in dimensions from the initial dimensions recorded during examination of product (see 4.4), deviations from allowable drawing dimensions, or visible structural damage shall be recorded.

4.5.10 Burst Pressure

The test specimen (see Figure 1) shall be placed in a protective enclosure, and its temperature shall be increased to 1200 °F by heating internally or raising the ambient temperature, until stabilization. The pressure shall be increased to burst pressure which is three times the operating pressure of Table 2 corrected for 1200 °F ± 15 °F using Table 3. Burst pressure shall be held for 2 minutes. No leakage measurements shall be taken during this test. At the conclusion of the test, the sample parts shall be visually examined. The physical condition shall be noted. The test specimen shall meet the requirements of 3.5.3.3.

5. PREPARATION FOR DELIVERY

5.1 Packaging

Packaging shall be as necessary to insure delivery of components in a clean and undamaged condition.

5.1.1 Government Packaging

5.1.1.1 Commercial

Preservation, packaging, and packing shall be in accordance with ASTM D3951.

5.1.1.2 Military

Preservation, packaging, and packing shall be as specified in the contract or order.

5.2 Marking of Containers

Interior and exterior containers shall be marked in accordance with MIL-STD-129 or as specified in the contract order. The date of packaging shall be marked on all containers.

6. NOTES

6.1 Intended Use

The rigid coupling joints specified herein are intended for use in aircraft engine bleed air, environmental control, environmental protection, and other pneumatic systems. Operating temperature range for the joint is -65 to +1200 °F. The leakage rate for the joint shall not exceed 0.01 SCFM per inch of tube diameter at any pressure up to operating pressure.

6.2 Design Use

As a design guide, the joint shall be capable of carrying the total limit load “N” in accordance with AIR869. Joint “N” values are listed in Table 2. For elevated temperatures, “N” values shall be reduced by the factors listed in Table 3.

6.3 Joint Installation

Recommended procedure for joint installation is as specified in ARP699, AIR869, and AS1895/21.

6.4 Revision Indicator

A change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

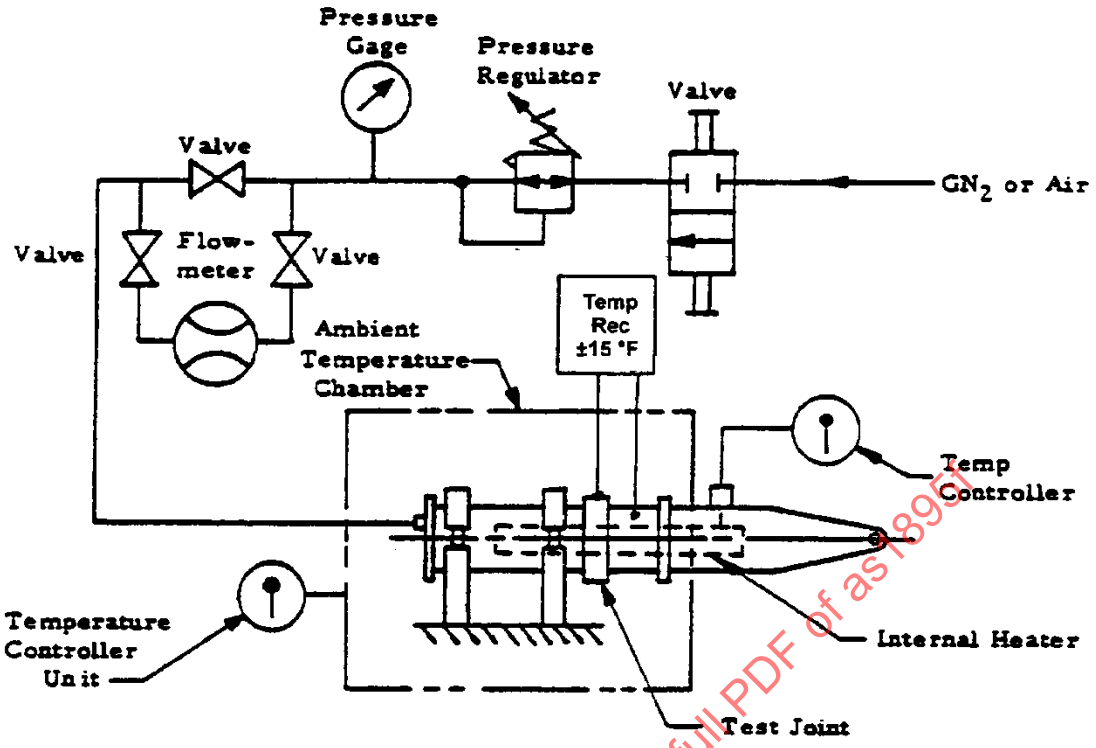

Figure 1 - Schematic diagram of static pressure test setup

NOTE: Test specimen orientation may vary at the manufacturer's option.

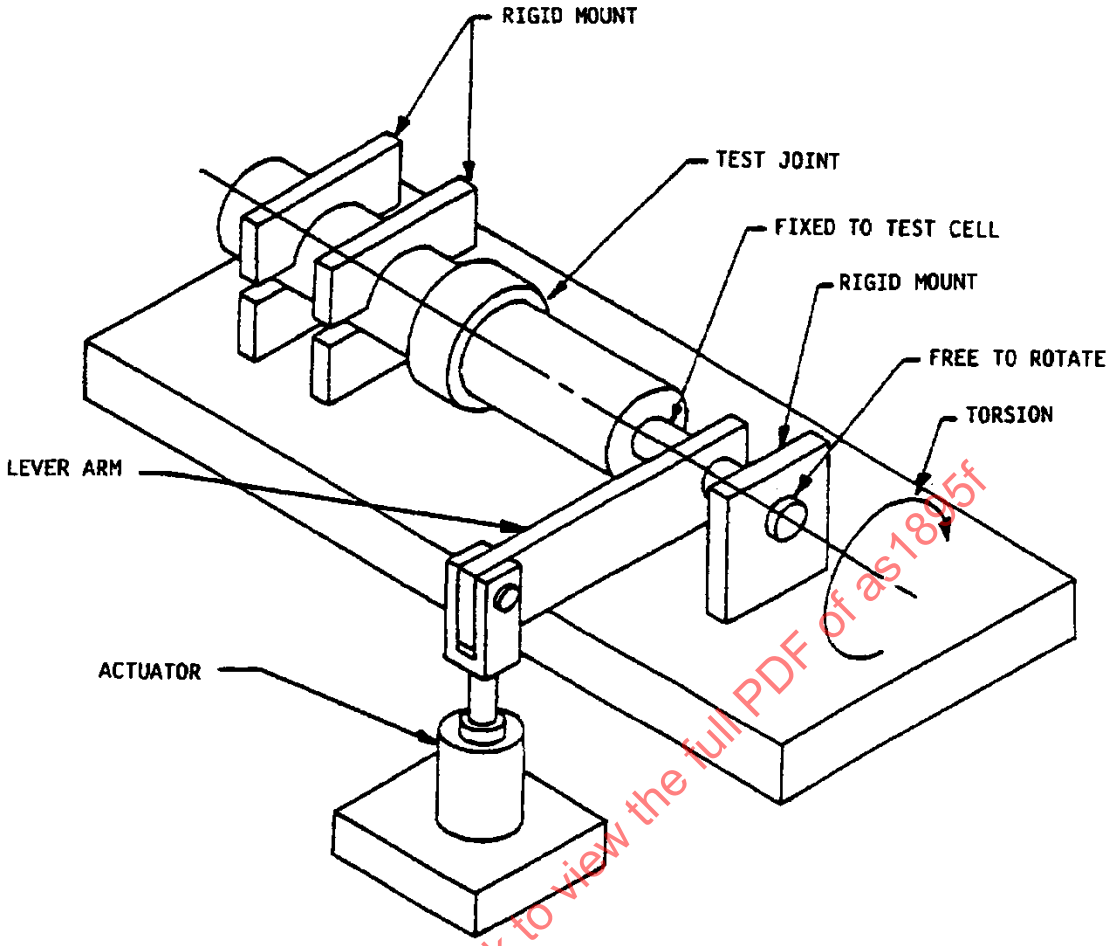

Figure 2 - Schematic diagram of torsion test setup

NOTE: Test specimen orientation may vary at the manufacturer's option

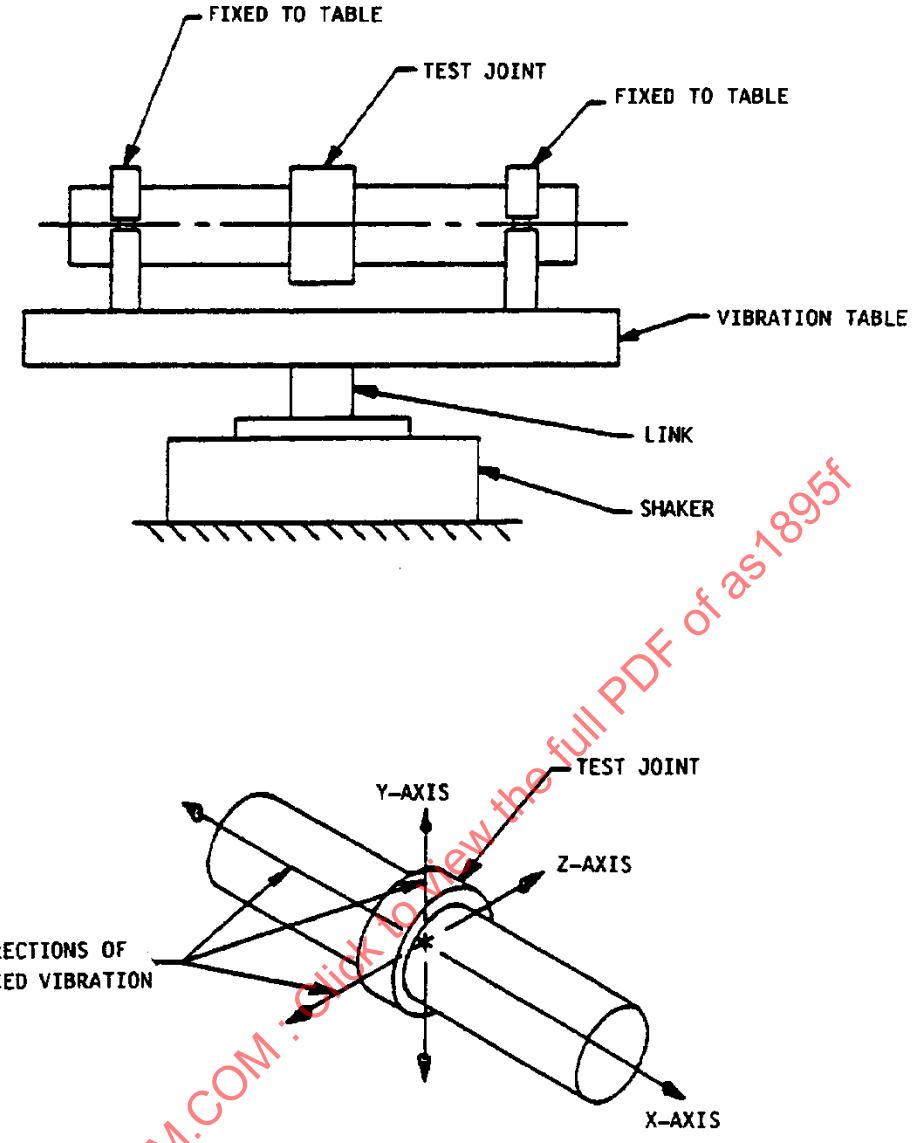

Figure 3 - Vibration/resonance search test setup

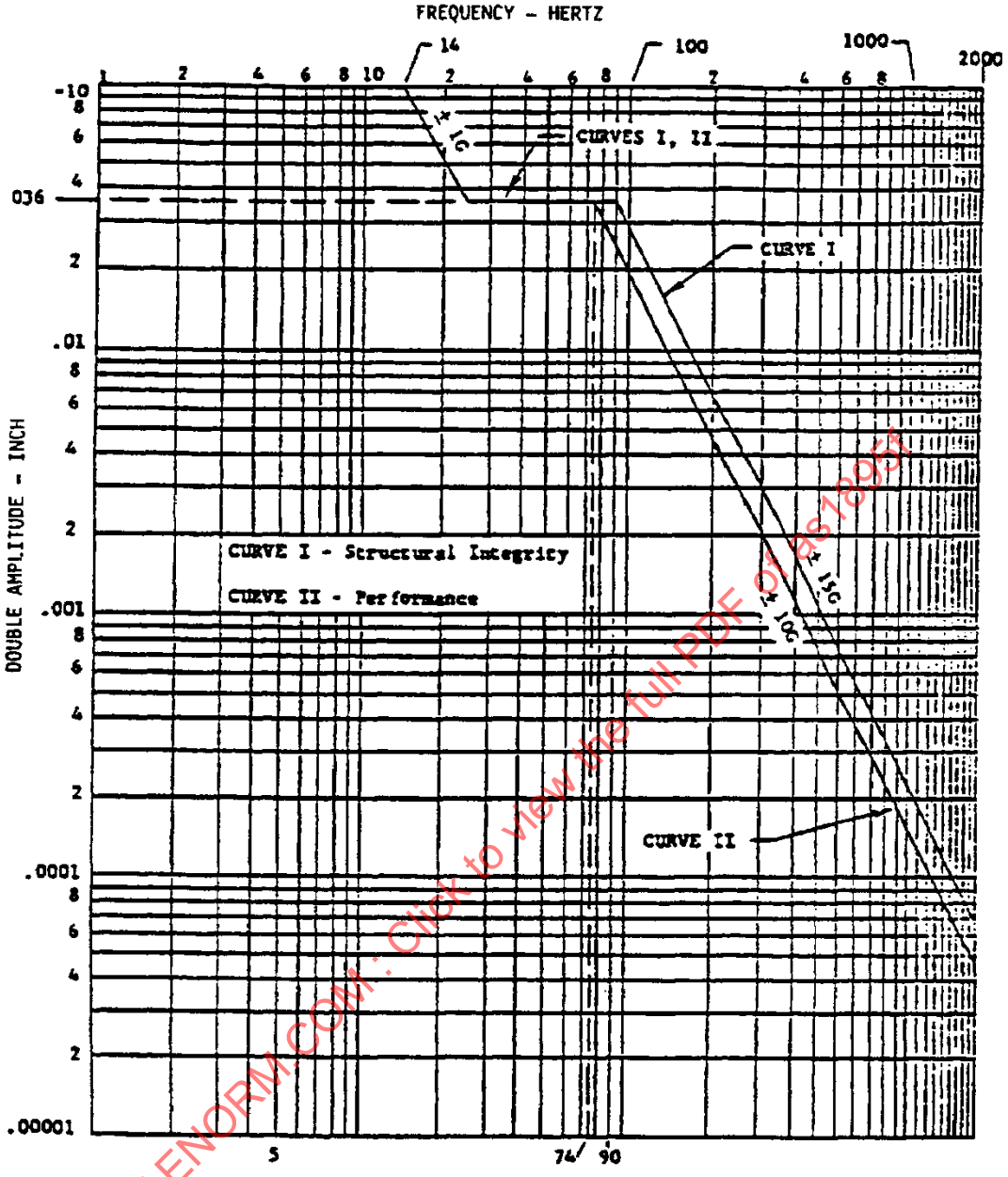

Figure 4 - Vibration requirements

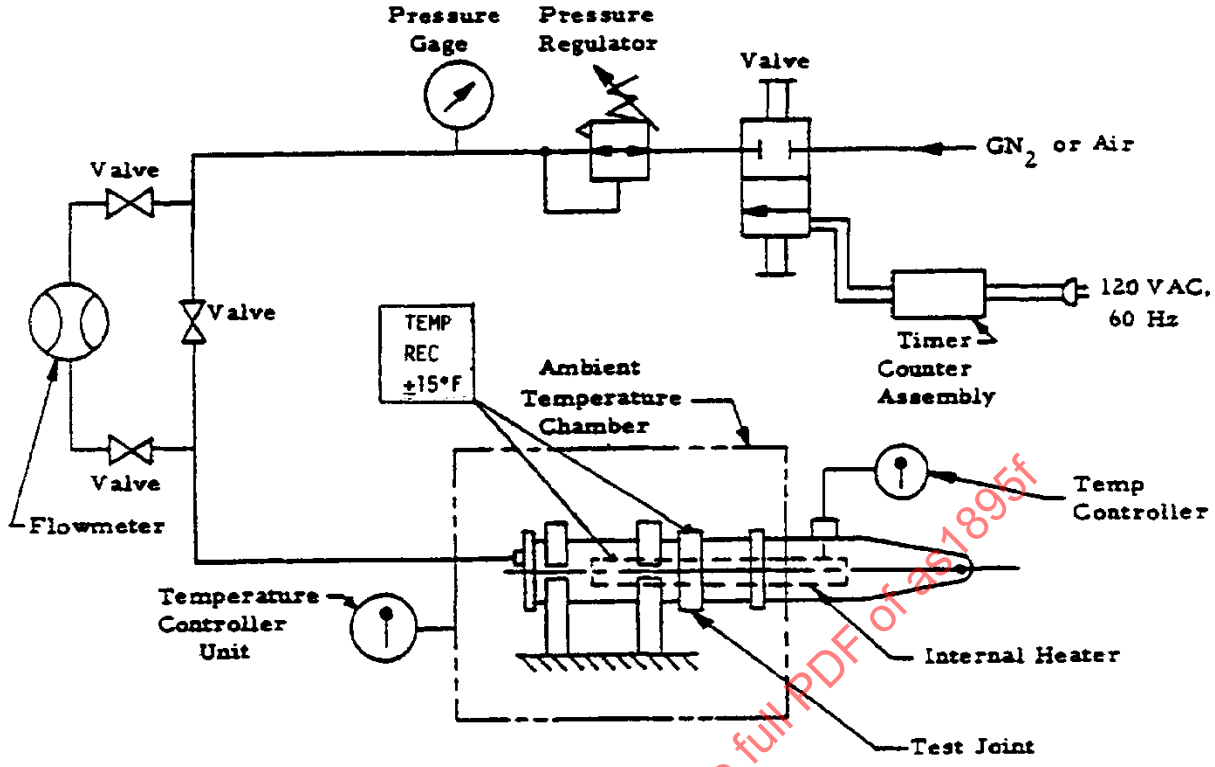

Figure 5 - Basic schematic diagram of pressure cycle test setup

NOTE: Test specimen orientation may vary at the manufacturer's option.

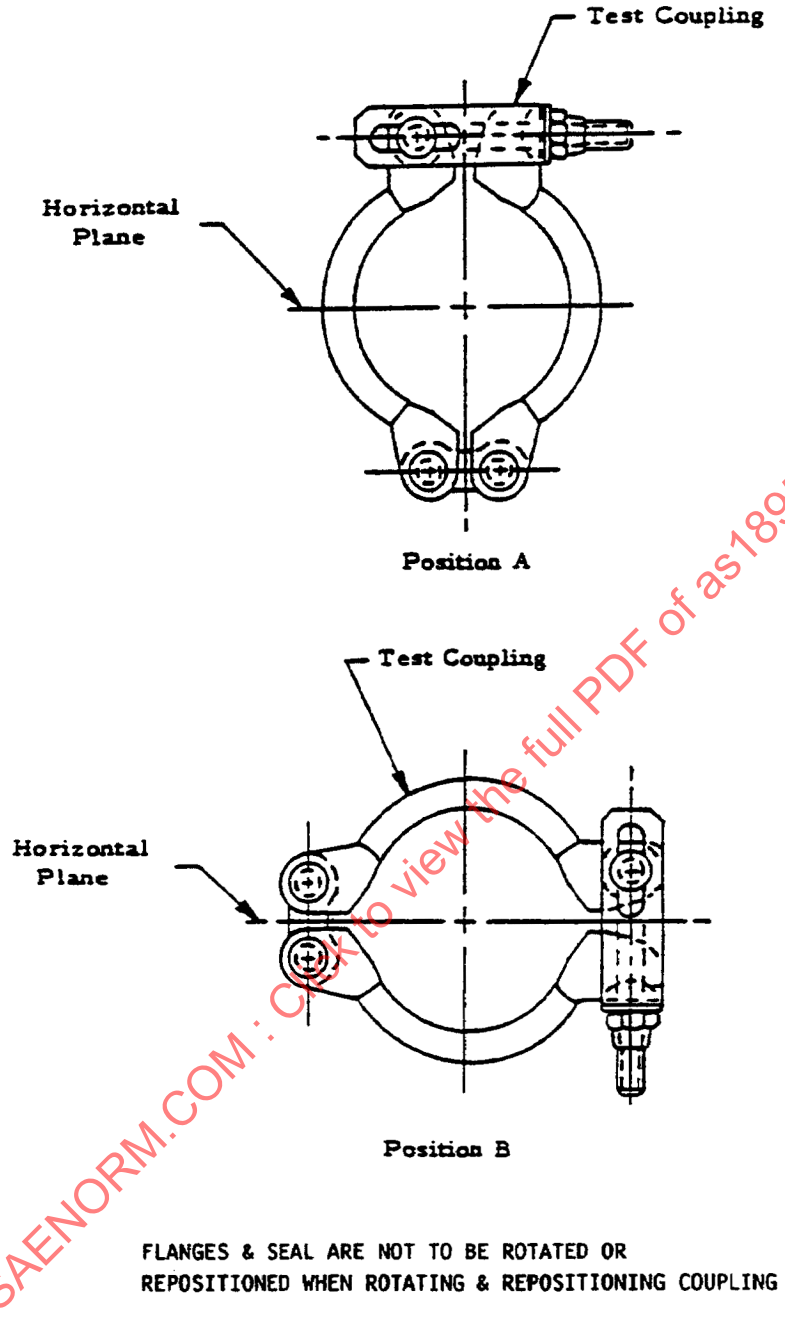

Figure 6 - Coupling bolt positioning for flexure cycling test

NOTE: Test specimen may be mounted with its axis in the vertical plane at the manufacturer's option.