



AEROSPACE STANDARD

AS1960™**REV. A**

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Superseding AS1960

Coupling Assembly, V-Band, Sheet Metal Flange, Pneumatic Tube

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1. SCOPE:

- 1.1 This specification defines the requirements for a grooved clamp coupling and flanges suitable for joining intermediate pressure and temperature ducting in aircraft air systems. The rigid coupling joint assembly, hereafter referred to as "the joint", shall operate within the temperature range of -65 °F to +800 °F.

2. APPLICABLE DOCUMENTS:

The following documents of the issues in effect on the date of invitation for bid or request for proposal shall form a part of this specification to the extent specified herein.

2.1 Specifications:

2.1.1 Military:

MIL-W-6858	Welding, Resistance, Aluminum Magnesium, Nonhardening Steels or Alloys, Nickel Alloy, Heat Resisting Alloys, and Titanium Alloy, Spot and Seam
MIL-W-8611	Welding, Metal Arc and Gas, Steels and Corrosion and Heat Resistant Alloys; Process for
MIL-S-8879	Screw Threads, Controlled Radius Root with Increased Minor Diameter: General Specification for

2.2 Standards:

2.2.1 Military:

DOD-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-810	Military Standard Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of

3. REQUIREMENTS:

3.1 Qualification:

The joint furnished under this specification shall be a product identical to specimens which have successfully passed the tests specified in Section 4 of this specification.

3.2 Materials:

The joint component 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 AS standard drawing.

3.2.1 Duct Material: Duct materials will be stainless steel and titanium. The coupling joint shall meet the requirements herein when assembled on stainless or titanium flanges.

3.2.2 Equipment Flanges: Equipment flange materials may be stainless steel, titanium or aluminum. The flange may be solid, machined, forged or cast shape. For an aluminum flange joint, the maximum temperature is +260 °F.

3.3 Design and Construction:

The joint consisting of coupling and flanges listed in Table 1 shall fulfill all design and performance requirements of this specification.

3.3.1 Coupling: The material of the coupling shall be corrosion resistant alloy as specified on the applicable AS drawing noted in Table 1.

3.3.1.1 Coupling Retainer Strength: The coupling shall maintain joint integrity at operating pressure in the event of coupling retainer failure. The coupling shall be so designed that 3/4 of the coupling retainer circumference shall be sufficient to hold the joint and leakage shall not exceed 0.03 SCFM per inch of diameter at operating pressure of Table 2 at 800 °F.

- 3.3.2 Flanges: The material of the flanges shall be corrosion resistant alloy as specified on the applicable AS drawing shown in Table 1.

TABLE 1 - Joint Component Control Numbers

Description	AS Number
V-Band Coupling Standard Latch	AS1960/1
V-Band Coupling Quick Release Latch	AS1960/2
Sheet Metal Flange	AS1960/3
Solid Flange End Design Standard	AS1960/4

- 3.3.3 Welding: Resistance or fusion welding shall be in accordance with MIL-W-6858 or MIL-W-8611.
- 3.3.4 Bolt: Bolt material shall be as specified on the applicable AS drawing, with an ultimate tensile strength of 160,000 psi.
- 3.3.4.1 Bolt Threads: Bolt threads shall conform to MIL-S-8879, and may be lubricated using an anti-sieze high temperature lube.
- 3.3.5 Nut: The nut shall be a self locking type with a running torque of 1.8 to 30 inch lbs. The material shall be as specified on the applicable coupling drawing. The nut shall have a minimum life of ten (10) complete full on-off cycles without damage to the bolt or nut or threads when installed within 120 rpm on the bolt.
- 3.3.6 Safety Latch: The safety latch, when specified 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 0.03 (SCFM) per inch of 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 automatically positioned when the clamp is installed, and must be designed so that failure of the primary bolt is clearly evident on visual inspection.
- 3.3.7 Duct Installation: The coupling joint shall be so designed as to permit removal of a single duct section without moving mating ducting axially. Each joint must be self aligning during assembly. The self aligned joint may have a total of .06 transverse mismatch and must meet the requirements herein.

TABLE 2 - Minimum Rated Limit Load Capability

"N" LBS/INCH (Limit)		Pressure PSIG (with no bending moment applied)							
		Normal Operating				Proof			
		70 °F & -65 °F Fluid Temp.	800 °F Fluid Temp.	70 °F & -65 °F Fluid Temp.	800 °F Fluid Temp.	70 °F & -65 °F Fluid Temp.	800 °F Fluid Temp.	70 °F & -65 °F Fluid Temp.	800 °F Fluid Temp.
Tube OD	Room Temp. -65 °F	800 °F							
1.00	589	393	774	519	1549	1038	2332	1557	
1.25	501	334	567	378	1134	756	1701	1134	
1.50	437	293	434	290	868	580	1302	870	
1.75	391	261	344	230	688	460	1032	690	
2.00	355	237	282	188	564	376	846	564	
2.25	326	219	235	158	470	316	705	474	
2.50	303	203	200	135	400	270	600	405	
2.75	283	190	173	116	347	232	521	348	
3.00	267	179	152	102	304	204	456	306	
3.50	241	162	120	80	240	160	360	240	
4.00	221	149	98	66	196	132	294	198	
4.50	206	139	82	55	164	110	246	165	
5.00	193	131	70	47	140	94	210	141	
5.50	183	123	61	41	122	82	183	123	
6.00	175	118	53	36	106	72	159	108	
6.50	167	113	47	32	94	64	141	96	
7.00	161	109	42	29	84	58	126	87	
7.50	155	105	38	26	76	52	114	78	
8.00	150	102	35	24	70	48	105	72	
8.50	146	199	32	22	64	44	96	66	
9.00	142	197	30	20	60	40	90	60	

3.4 Temperature:

The joints shall meet the requirements of this specification under any combination of ambient/fluid temperature exposure within the range of -65 °F to +800 °F.

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.

3.5.1 Static Leakage: The joint, consisting of the coupling and flanges noted in 3.3. shall show no evidence of leakage in excess of 0.01 SCFM (.000765 lbs. dry air per minute) per inch of diameter when subjected to the requirements specified herein.

3.5.2 Rated Limit and Ultimate Load: The coupling joint shall be capable of carrying the total limit load "N" as a minimum, see Figure 1, specified in Table 2 without deformation or exceeding the leakage requirement of 3.5.1 with respect to the following relationship:

$$N = N_p + N_b + N_a$$

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 Pressure: The rated load per inch of circumference due to pressure shall be determined from the following relationship:

$$N_p = \frac{PD}{4}$$

Where:

N_p = Load - pounds per inch of circumference due to pressure

P = Pressure in psi

D = Flange outside diameter in inches

- 3.5.2.2 Bending: The rated load per inch of circumference due to bending shall be determined from the following relationship:

$$N_b = \frac{4M}{D^2}$$

Where:

N_b = Load pounds per inch of circumference due to bending (limit)
 M = Bending moment in inch pounds.
 D = Flange outside diameter in inches.

- 3.5.2.3 Axial Load: The rated load per inch of circumference due to axial loading shall be determined from the following relationship:

$$N_a = \frac{E}{D}$$

Where:

N_a = is in pounds per inch due to axial load
 E = Axial tension load in pounds.
 D = Flange outside diameter in inches.

- 3.5.2.4 Rated Load:

Limit = 2.0 Times operating load (proof load)
Ultimate = 3 Times operating load (burst load)
3.5.1 may be exceeded. Deformation may occur but the joint shall remain permanently connected.

- 3.5.3 Proof Pressure: The joint shall show no evidence of deformation or leakage in excess of 3.5.1, when subjected to the proof pressure of Table 2.
- 3.5.4 Burst Pressure: The joint shall not rupture and shall remain intact when subjected to the burst pressure of Table 2 for 2 minutes. Deformation shall be allowed.
- 3.5.5 Torsional Moment: The joint shall not rotate or deform when subjected to the torsional moment specified in Table 3 at operating pressure of Table 2 at 70 °F. The joint may rotate to 90° but shall not leak in excess of the rate specified in 3.5.1.

TABLE 3 - Torsional Load

TUBE OD	TORSIONAL MOMENT INCH LBS	TUBE OD	TORSIONAL MOMENT INCH LBS
1.00	333	4.00	1330
1.25	415	4.50	1500
1.50	500	5.00	1665
1.75	585	5.50	1835
2.00	665	6.00	2000
2.25	750	6.59	2170
2.50	830	7.00	2330
2.75	915	7.50	2500
3.00	1000	8.00	2670
3.50	1165	8.50	2830
		9.00	3000

- 3.5.6 Vibration: The joint, when pressurized to operating pressure of Table 2 at 70 °F shall show no evidence of leakage in excess of that specified in 3.5.1 during or after exposure to vibration levels per applicable portions of MIL-STD-810, Procedure I and paragraph 4.5.4 of this specification. There shall be no cracking, or chipping of parts.
- 3.5.7 Pressure Cycling: The joint shall not permanently deform, or show evidence of fatigue failure after being subjected to 144,000 operating pressure impulse cycles per Table 2 and 4.5.5, at 800 °F. Leakage shall not exceed that specified in 3.5.1.
- 3.5.8 Combined Load & Combined Load Cycling: The joint shall not permanently deform, or show evidence of fatigue failure, and shall meet the leakage requirements of 3.5.1 during and after subjection to combined loads per 4.5.6 and/or 4.5.6.1 at pressures and temperatures of Table 4.
- 3.5.9 Angular Misalignment: The joint shall not show permanent deformation, or evidence of leakage greater than that specified in 3.5.1 when pressurized at proof pressure of Table 2 at 800 °F after being assembled at an angular misalignment as shown in Figure 2.
- 3.5.10 Thermal Shock: The joint shall not permanently deform and shall meet the leakage requirements of 3.5.1 during and after subjection to a minimum of 10 thermal shock cycles of -65 °F to 800 °F at operating pressure of Table 2.
- 3.5.11 Compressive Load: The joint shall not take a detrimental set when subjected to compressive loads of Table 5. Leakage shall not exceed that specified in 3.5.1.