SAE Aerospace
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AEROSPACE STANDARD

SAE AS1960

Issued 1986-06
Reaffirmed 2013-01

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

RATIONALE

AS1960 has been reaffirmed to comply with the SAE five-year review policy.

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

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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		Burst	
Tube OD	Room Temp. -65 °F	800 °F	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.
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.

TABLE 4 - Combined Loads

TUBE OD	TEST PRESSURE (OPER. AT 800 °F) PSIG	COMBINED LOAD TEST YIELD MOMENT AT TEST PRESS. @ 800 °F IN INCH LBS.	COMBINED LOAD CYCLE BENDING AT 800 °F IN INCH LBS.
1.00	519	350	70
1.25	378	400	90
1.50	290	450	120
1.75	230	500	150
2.00	188	550	190
2.25	158	650	230
2.50	135	700	270
2.75	116	750	320
3.00	102	850	370
3.50	80	1000	490
4.00	66	1150	620
4.50	55	1350	770
5.00	47	1550	930
5.50	41	1700	1100
6.00	36	1950	1300
6.50	32	2150	1500
7.00	29	2400	1700
7.50	26	2600	1900
8.00	24	2900	2200
8.50	22	3150	2400
9.00	20	3400	2700

TABLE 5 - Compressive Load

COMPRESSIVE LOAD - LBS.			
TUBE OD	LOAD	TUBE OD	LOAD
1.00	80	4.00	235
1.25	90	4.50	265
1.50	112	5.00	290
1.75	119	5.50	335
2.00	135	6.00	340
2.25	155	6.50	370
2.50	165	7.00	392
2.75	180	7.50	420
3.00	190	8.00	455
3.50	215	8.50	470
		9.00	495

3.6 Interchangeability:

The joint components shall be completely interchangeable and intermateable between suppliers approved by the user such that a mixed assembly will meet the requirements of this specification.

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 DOD-STD-100.

3.8 Identification of Product:

3.8.1 Coupling: The coupling shall be marked for identification in accordance with MIL-STD-130 and shall include the following as a minimum:

AS Number _____
Supplier Part No._____
Supplier Name or Trademark and FSCM No._____
Date of Manufacture _____
Torque - "Caution. Torque to (see applicable AS drawing) inch-lbs."

3.8.2 Flanges: The flange packaging shall be marked for identification in accordance with the AS drawing and MIL-STD-130 with the AS part number and the supplier's identification.

3.9 Workmanship:

The joint components shall be free from defects and imperfections and manufactured and finished in a thoroughly workmanlike manner.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

4.1.1 Supplier's Responsibility: 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. The supplier's test data, subject to the approval of the user, shall be considered adequate for product qualification.

Rejected joint components shall not be submitted for reinspection without furnishing full particulars concerning previous rejection and measures taken to overcome the defects.

If investigation indicates that the defect causing the rejection may exist in joint components previously supplied to the user, the supplier shall advise the user of this condition, method of identifying these parts, and corrective action or disposition of the rejected parts.

4.1.2 User's Responsibility: The user shall establish adequate inspection procedures to ensure that all requirements of this specification are met. Emphasis shall be placed on the following:

a. Dimensional Configuration
b. Marking
c. Size
d. Functional Capability

4.2 Classification of Tests:

Inspection and testing of joint components shall be classified as:

a. Qualification Test (4.2.1)
b. Quality Conformance Test and Verification (4.2.2)

4.2.1 Qualification Test: Qualification tests specified in Table 6 are intended to qualify a manufacturer's parts. The configuration shall be as described on the standard pages. The witnessing of qualification tests by the user's representative(s) shall be optional. In the event the supplier already has performed the required testing, copies of the test report shall be submitted to the user for approval and shall conform to MIL-STD-831.

TABLE 6 - Qualification Test

Test	Requirement Paragraph	Method Paragraph
Examination	----	4.4.1, 4.5.1
Retainer Strength Test	3.3.1.1	4.5.10
Nut Life	3.3.5	4.5.12
Safety Latch Cycling	3.3.6	4.5.11
Static Leakage	3.5.1	----
Operating Pressure	3.5.2	4.5.1
Proof Pressure	3.5.3	4.5.1
Burst Pressure	3.5.4	4.5.2
Torsional Moment	3.5.5	4.5.3
Sinusoidal Vibration	3.5.6	4.5.4
Pressure Cycling High Temp.	3.5.7	4.5.5
Combined Loads	3.5.8	4.5.6, 4.5.6.1
Angular Misalignment	3.5.9	4.5.7
Thermal Shock	3.5.10	4.5.8
Compressive Load	3.5.11	4.5.9
Disassembly and Inspection	----	4.5.13

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. In the event test data already exist, these data shall be submitted to the user for approval. Any further testing deemed necessary shall be performed by mutual agreement between the user and the supplier.

4.2.1.2 Test Sample Identification: Each component of the joint assembly shall be permanently identified. Marking shall be such that legibility can be maintained throughout the qualification testing. In addition to part identification 3.8, the words "Test Sample (#1, #2, #3, etc)" shall be marked on the test parts.

4.2.1.3 Qualification By Similarity: Qualification of larger joints of the same type and manufacturer will qualify smaller joints of the same type for that manufacturer. Qualification of smaller joints will not qualify the larger joints.

4.2.2 Quality Conformance Test and Verification: All items shall be examined and tested to the extent necessary to verify that all requirements of the AS drawings and this specification have been met.

4.3 Test Conditions:

4.3.1 Pressure and Temperature: Unless otherwise specified, the ambient standard temperature and pressure shall be 75 °F ± 10 °F, and 760 mm Hg ±5%. Elevated temperature shall be as specified in 3.4 and the applicable test paragraph.

4.3.2 Test Assembly: The joint shall be torqued in accordance with the applicable AS drawing. 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 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: The test joint components shall be examined to determine conformance to this specification and the appropriate AS drawing with respect to dimensions, weight, material, workmanship, finish, construction, marking and identification of product. This information shall be noted in the test report.

4.5 Test Methods:

4.5.1 Static Operating and Proof Pressure Leakage Test: The test joint shall be mounted on a test fixture and installed in a temperature chamber as shown in Figure 4. The test joint 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 assembly shall be measured as leakage through the joint. While at ambient temperature, the test joint shall be slowly pressurized to operating pressure of Table 2. After the pressure within the joint has stabilized, the pressure shall be maintained for a period of fifteen (15) minutes. The joint leakage rate shall be monitored and recorded while at operating pressure and ambient temperature.

While at ambient temperature, the internal pressure shall be slowly increased to proof pressure of Table 2. After the pressure within the joint has stabilized, the proof pressure shall be maintained for a period of fifteen (15) minutes. The joint leakage rate shall be monitored and recorded while at proof pressure and ambient temperature.

The internal pressure shall then be reduced to operating pressure. The chamber temperature control shall be adjusted to maintain the elevated operating temperature of 800 °F. An additional soak time of twenty (20) minutes minimum shall be allowed after the chamber temperature has registered the elevated temperature to assure stabilization of the test joint.

The joint leakage rate shall be monitored and recorded while at operating pressure at elevated temperature. The joint internal pressure shall be slowly increased to proof pressure of Table 2 and maintained at that pressure for a period of fifteen (15) minutes. The joint leakage rate shall be monitored and recorded. After completion of the static operating and proof pressure leakage tests, the coupling joint shall be cooled and disassembled and shall be visually examined for evidence of structural damage as a result of the static pressure tests. Any indications of deformation shall be recorded. The joint shall meet the requirements of 3.5.2 and 3.5.3.

4.5.2 Burst Pressure Ultimate Load (Destructive Test): The test assemblies shall be placed in a protective enclosure and subjected to burst pressure as indicated in Table 2. The test pressure shall be applied and held for one minute at 70 °F and one minute at elevated temperature. At the end of this test the joint shall meet the requirements of 3.5.4. Test to failure at room temperature. (Water may be used as the fluid medium.)

4.5.3 Torsional Moment: The test assembly shall meet the requirements of 3.5.5 when subjected to the torsional moment of Table 3 at operating pressure at 70°. Both ends of the test assembly shall be placed in the holding fixture, as shown in Figure 6. One end of the assmebly shall be rigidly clamped to prevent rotation. The other end of the assembly shall be free to rotate in the holding fixture and only secure enough to prevent the introduction of excessive bending moment. The test assembly 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 6 on the side which permits rotation. After the test assembly has been installed the required torque shall be applied. If there is any rotation, the initial breakaway torque shall be observed and recorded. At the end of the rotation the joint shall be tested for leakage. After the leakage test, the nut torque shall be checked for any change. If the latch tension decay has resulted the joint shall be adjusted to the initial full torque condition. This procedure is to be repeated three times and the joint disassembled and inspected for mechanical damage, wear and distortion. The condition of the unit component shall be noted in the test report. Also test until rotation impends or tube is damaged, note results.

4.5.4 Sinusoidal Vibration: The test assembly shall meet the requirements of 3.5.6 when subjected to vibration. The test assembly shall be supported as shown in Figure 7. The direction of induced vibration shall be as shown in Figure 7. The test assembly shall be vibrated as specified in MIL-STD-810 Procedure I as applicable. The vibration sweep shall be surveyed for resonance by slowly varying the applied frequency and note each resonant frequency between 5 and 2000 Hz per Figure 7A while oscillating, for one hour. If no resonant frequency is found, the dwell shall occur at 68 Hz for one million Hz. For propeller driven aircraft, use propeller blade passage frequency, for dwell, in lieu of 68 Hz for one million Hz. The vibration and dwell test shall be conducted at the specified frequency and amplitude, at room temperature and at operating pressure. A leakage test shall be made at room temperature prior to starting the vibration test, and at the conclusion of each test. For the leakage test one end of the assembly shall be unrestrained in the axial direction.

4.5.5 Pressure Cycling: The test assembly shall meet the requirements of 3.5.7 when subjected to 144,000 pressure cycles. The test joint shall be rigidly supported at one end with the other end unrestrained (see Figure 8). The assembly shall have associated equipment necessary to measure leakage and maintain 800 °F. The pressure shall be pulsated, 144,000 cycles. The pressure shall be pulsated from approximately 10% to 100% of the specified internal operating pressure in Table 2 and returning to 10%. This shall constitute one cycle. The rate of cycling shall be such as to maintain the internal air temperature as specified. The pressure cycle shall be applied at a rate not to exceed 50 ± 10 cycles per minute. A leakage test shall be conducted every 6000 cycles.

4.5.6 Combined Loads: The test assembly shall be securely clamped in a holding fixture (see Figure 5) close to the joint. The other half of the assembly shall be supported in a moveable fixture with provisions for applying combined pressure and bending moment forces as specified in Table 4. The T-bolt latch shall be located at the point of maximum stress. With the assembly pressurized, as shown in Table 4 the bending moment forces shall be applied at a rate not to exceed 150 inch pounds per second max., in 10 percent of total moment increments in an axis measured 90° with respect to the horizontal centerline. After each application of bending moment the forces shall be relaxed to zero. The amount of deflection shall be measured as shown in Figure 5 for each increment of bending moment and for the zero relaxed position. The test joint shall meet the requirements of 3.5.8.

4.5.6.1 Combined Load Cycling: The test assembly shall be installed as shown in Figure 5. The T-bolt latch shall be located at the point of maximum stress. The test pressure and test moment shall be as shown in Table 4 @ 800 °F. The test assembly shall be subjected to 50,000 deflection cycles. A deflection cycle shall consist of the deflection load applied down, returning to neutral, applied up and returning to neutral. The joint shall be monitored for leakage at 800 °F at the test pressure and shall be as specified in Table 4. Leakage measurements per 3.6.1 shall be taken at the beginning of the test and every 25,000 cycles at the neutral and full up and full down positions.

4.5.7 Angular Misalignment: The test assembly shall meet the requirements of 3.5.9 when subjected to angular misalignment as shown in Figure 2. The holding fixtures shall be so positioned to cause the flange faces to be in contact on one side; directly opposite the contacting side, a gap shall be measured between the flanges equivalent to 0.015 inch displacement. After the proper gap has been established one of the holding fixtures may be loosened to permit axial movement yet maintaining the displacement. The coupling shall then be installed on the flanges and tightened to the specified torque. The joint shall not be tapped or hammered to aid in seating the coupling. After assembly, the test joint shall be pressurized to proof pressure specified in Table 2 at elevated temperature. A leakage test shall be conducted at the elevated temperature and pressure and recorded.

4.5.8 Thermal Shock: The test assembly shall meet the requirements of 3.5.10 when subjected to 10 cycles of thermal shock. The test joint shall be rigidly supported at one end with the other end unrestrained. The test assembly shall have attached to it, associated equipment necessary to measure leakage through the test assembly, and maintain the desired internal pressure and temperature (see Figure 4). The assembly shall then be placed in a chamber. The ambient air temperature in the test chamber shall be -65 °F. The internal pressure shall be normal operating pressure of Table 2. The internal temperature shall be -65 °F as a result of cold soaking at least one hour. At the end of one hour a joint leakage test shall be made. After completion of the leakage test, the test assembly internal temperature shall be raised as quickly as possible to 800 °F and stabilized while adjusting the internal pressure as specified in Table 2.

A leakage test shall be conducted at the elevated temperature when the assembly temperature has stabilized.

4.5.9 Compressive Load: The fully mated test assembly shall be subjected to 10 compressive load cycles specified in Table 5. The load shall be at a rate not to exceed 100 pounds per second on the unpressurized test assembly at 800 °F. The compressive load shall be applied and held for one minute. At the conclusion, the load shall be relaxed and the assembly shall be pressurized to a operating pressure of Table 2 at 800 °F, a leakage test shall be made at that pressure. This shall constitute one cycle. The test assembly shall meet the requirements of 3.5.11 during and after this test.

4.5.10 Retainer Strength Test: The retainer shall be cut along one leg for a distance of 1/4 circumference or one complete segment may be cut on coupling containing four (4) equal segments. The coupling shall then be installed and subjected to normal operating pressure at 70 °F. The joint shall meet the requirements of 3.3.1.1.

4.5.11 Safety Latch Cycling: The coupling joint shall be engaged using the T-Bolt or a device simulating the T-Bolt. The coupling shall be rigged to the full torque condition. The joint shall then be pressurized at normal operating pressure of the Table 2 at 70 °F. While in the fully torqued condition, the bolt shall be severed or a latch action duplicating bolt severing. This shall constitute one cycle. The procedure shall be repeated for a total of 20 cycles. The joint shall meet the requirements of 3.3.6.

4.5.12 Nut Life: The coupling shall be installed on a mandrel and torqued to the specified torque on the coupling as standard. The nut shall then be cycled off and on 10 times. Any interference, binding, galling, misalignment, permanent set, dimensional discrepancies or excessive nut running torque, shall be noted in the test report.

4.5.13 Disassembly and Inspection: Upon completion of the tests, the coupling shall be disassembled and each part and each tubing or fitting end carefully examined for any permanent deformation. Any permament deformation of any part not previously specified shall be so noted in the test report.

5. PREPARATION FOR DELIVERY:

5.1 Packaging:

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

5.2 Marking of Containers:

Interior and exterior containers shall be marked in accordance with MIL-STD-129. The date of packaging shall be marked on all containers.

PREPARED BY SAE SUBCOMMITTEE G-3A, COUPLINGS
OF COMMITTEE G-3, AEROSPACE FITTINGS, HOSE, AND TUBING ASSEMBLIES

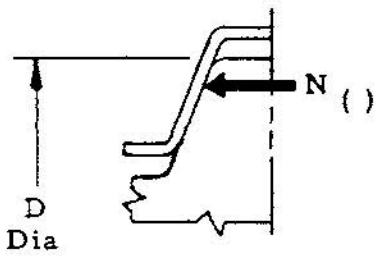

FIGURE 1

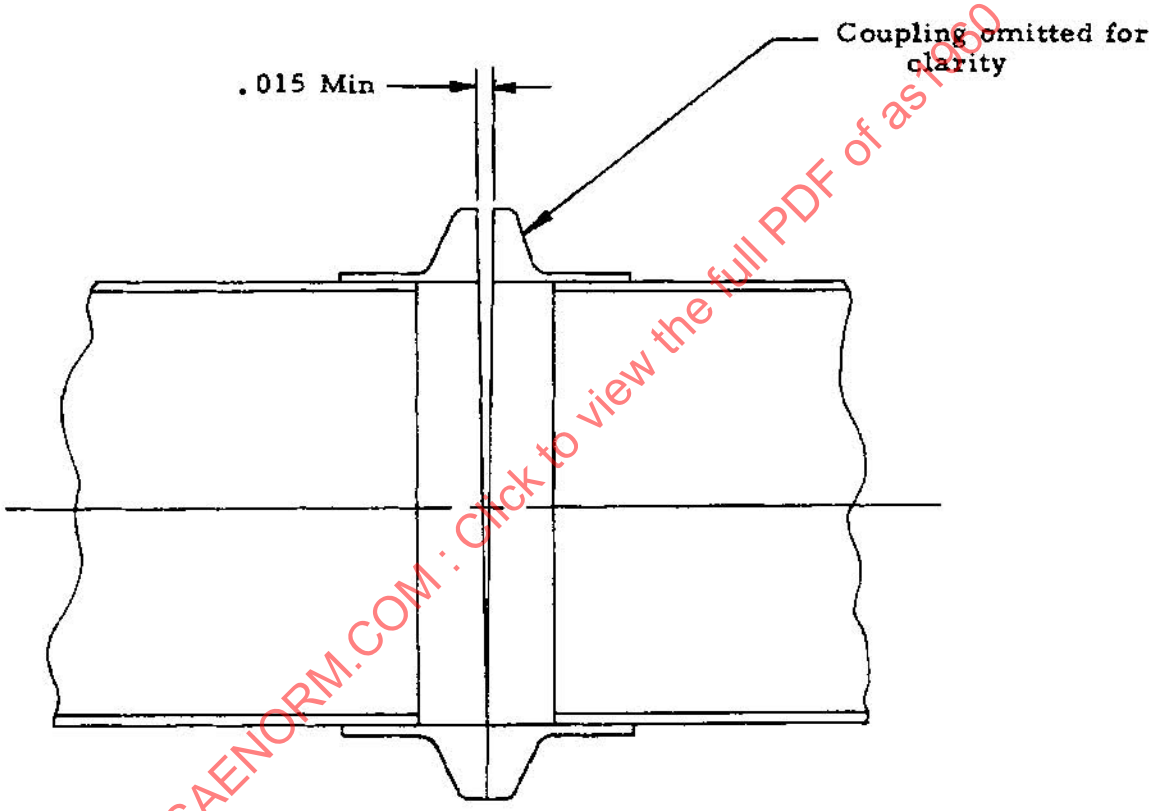

FIGURE 2 - Angular Misalignment

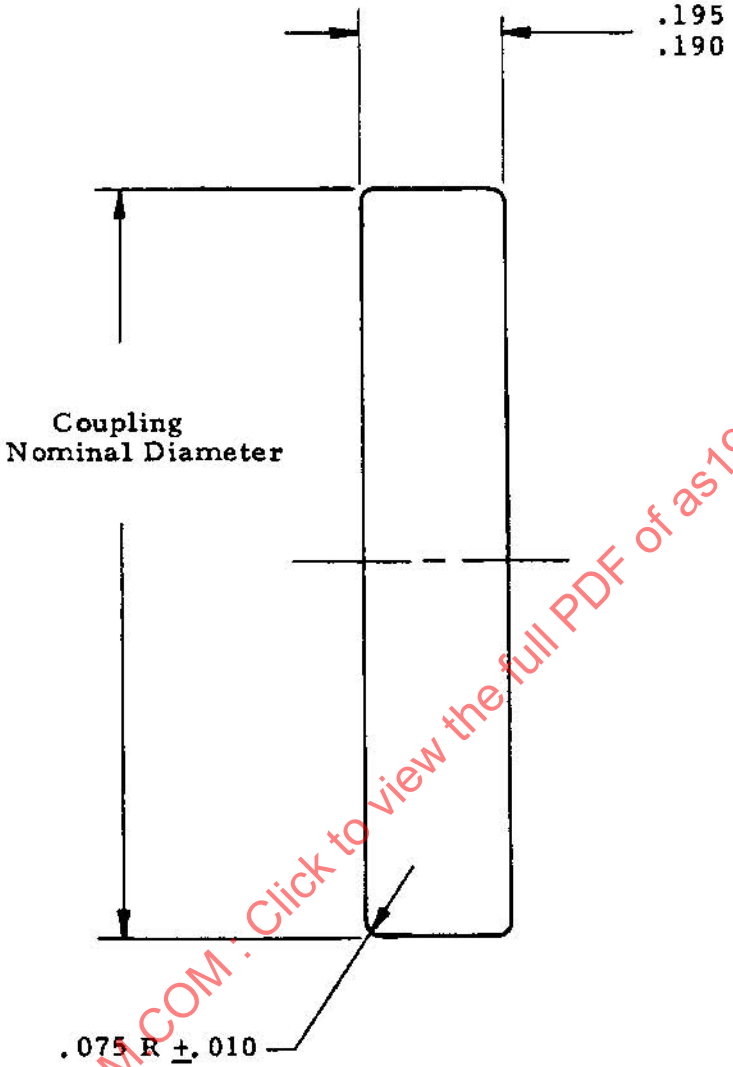

FIGURE 3 - Nominal Diameter Mandrel

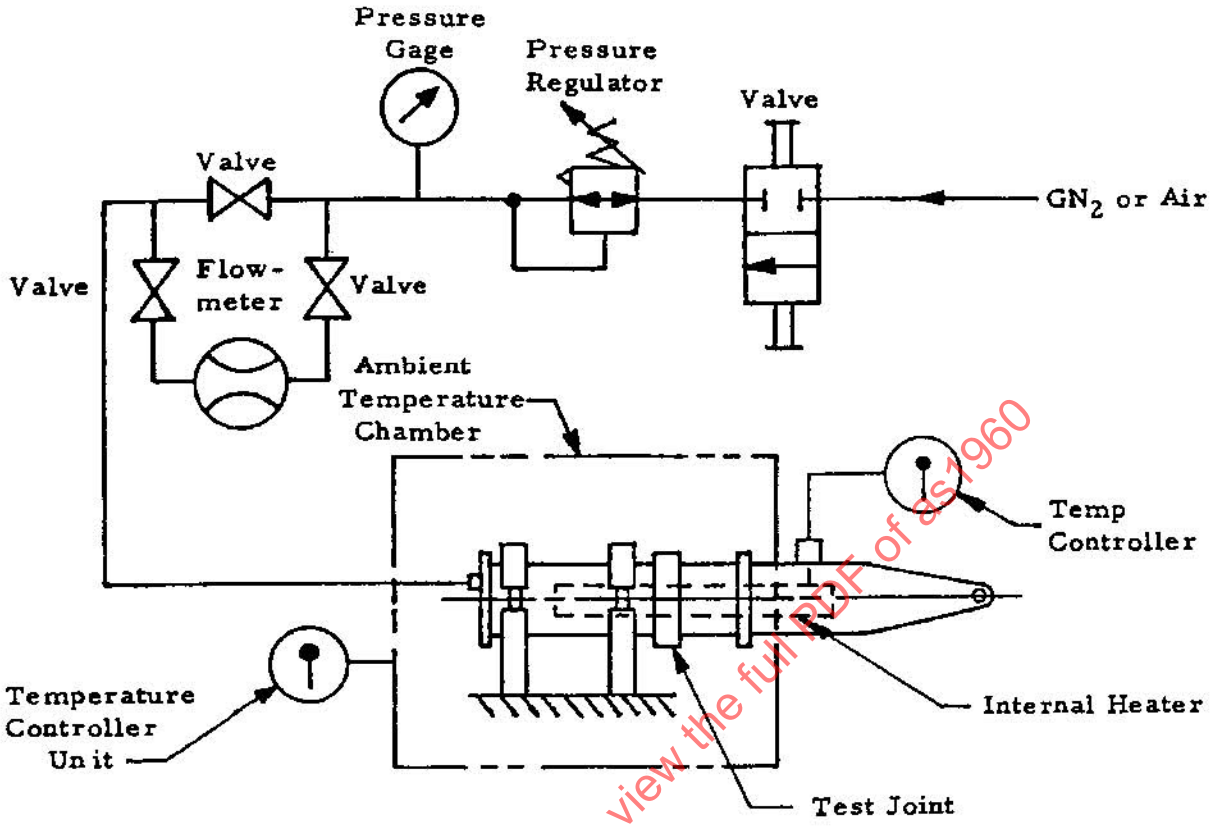

FIGURE 4 - Suggested Schematic Diagram of Static Pressure Test Set-Up