

AEROSPACE STANDARD

SAE AS35411

REV.
A

Issued 2001-05
Revised 2005-05

Superseding AS35411

Fittings, Lubrication

1. SCOPE:

This SAE Aerospace Standard (AS) covers the requirements for threaded lubrication fittings, straights and elbows, to be used for admitting and retaining lubricants supplied by pressure lubricating equipment.

1.1 Purpose:

The purpose of this standard is to replace MIL-F-3541 with a document consistent with the performance requirements of the specification it supersedes.

1.2 Classification:

Lubrication fittings covered by this standard shall be of the following types as specified:

1.2.1 Types: The types of lubrication fittings shall be as follows:

- a. Type I: See AS15001, surface check, 1/4-28 taper threads, carbon steel
- b. Type II: See AS15002, surface check, straight threads, carbon steel
- c. Type III: See AS15003, surface check, 1/8 pipe threads, carbon steel
- d. Type IV: See AS15004, surface check, 1/4-28 taper threads, Ni-Cu alloy
- e. Type V: See AS15005, throat or surface check, 1/8 pipe threads, Ni-Cu alloy
- f. Type VI: See AS15006, leak proof, 1/8 pipe threads, carbon steel
- g. Type VII: See AS15720, throat or surface check, 1/4-28 taper threads, corrosion resistant steel
- h. Type VIII: See AS15721, throat or surface check, 1/8 pipe threads, corrosion resistant steel

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2. 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.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

ARP4784	Performance and Evaluation Criteria, Surface Defects, Requirements for
AS15000	Fittings, Lubrication (Hydraulic), Design Standard
AS15001	Fittings, Lubrication (Hydraulic) Surface Check, 1/4-28 Taper Threads, Steel, Type I
AS15002	Fittings, Lubrication (Hydraulic) Surface Check, Straight Threads, Steel, Type II
AS15003	Fittings, Lubrication (Hydraulic) Surface Check, 1/8 Pipe Threads, Steel, Type III
AS15004	Fittings, Lubrication (Hydraulic) Surface Check, 1/4-28 Taper Threads, Nickel-Copper Alloy, Type IV
AS15005	Fittings, Lubrication (Hydraulic) Throat or Surface Check, 1/8 Pipe Threads, Nickel- Copper Alloy, Type V
AS15006	Fittings, Lubrication (Hydraulic) Leak Proof, 1/8 Pipe Threads, Steel, Type VI

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2.1 (Continued):

AS15720	Fittings, Lubrication (Hydraulic) Throat or Surface Check, 1/4-28 Taper Threads, Corrosion Resistant Steel, Type VII
AS15721	Fittings, Lubrication (Hydraulic) Throat or Surface Check, 1/8 Pipe Threads, Corrosion Resistant Steel, Type VIII
AMS- QQ-P-416	Plating, Cadmium (Electrodeposited)
AMS-QQ-S-763	Steel Bars, Wire, Shapes, and Forgings, Corrosion Resistant

2.2 ASQC Publications:

Available from ASQC, 600 N Plankinton, Avenue, Milwaukee, WI 53203.

ASQC Z1.4	Sampling Procedures and Tables for Inspection by Attributes
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2.3 ASME Publications:

Available from ASME, 22 Law Drive, Box 2900, Fairfield, NJ 07007-2900.

ASME B46.1	Surface Texture (Surface Roughness, Waviness, and Lay)
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2.4 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 108	Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
ASTM A 313	Standard Specification for Stainless Steel Spring Wire
ASTM A 582	Standard Specification for Free-Machining Stainless Steel Bars
ASTM B 166	Standard Specification for Nickel-Chromium-Iron Alloy (UNS N06600, N0606601, N06603, N06690, N06025, and N06045) Nickel-Chromium-Cobalt- Molybdenum Alloy (UNS N06617) Rod, Bar and Wire
ASTM B 633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM E 18	Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

2.5 U.S. Government Publications:

Available from Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

MIL-PRF-10924	Grease, Automotive and Artillery
MIL-PRF-23827	Grease, Aircraft and Instrument, Gear and Actuator Screw, NATO Code Number G-354
QQ-N-281	Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections
VV-G-632	Grease, Industrial, General Purpose
FED-STD-H28	Screw-Thread Standards for Federal Services

3. TECHNICAL REQUIREMENTS:

3.1 Materials:

Materials for the lubrication fittings shall conform to applicable specifications and shall be as specified herein.

3.1.1 Types I, II, III, and VI Fittings:

3.1.1.1 Balls, Bodies, and Tips: Balls, bodies and tips shall be carbon steel conforming to any of the chemical compositions of ASTM A 108, Table 1.

3.1.2 Types IV and V Fittings:

3.1.2.1 Balls, Straight Bodies and Tips: Balls, straight bodies and tips shall be nickel-copper alloy conforming to QQ-N-281.

3.1.2.2 Springs: Springs shall be nickel-chromium-iron alloy conforming to ASTM B 166, UNS N06600, cold worked (as worked).

3.1.2.3 Elbow Bodies: Elbow bodies shall be nickel-copper alloy conforming to QQ-N-281, class B.

3.1.3 Types VII and VIII Fittings:

- 3.1.3.1 Balls: Balls shall be corrosion-resistant steel conforming to AMS-QQ-S-763, Table 2, classes 440A, 440B, or 440C.
- 3.1.3.2 Springs: Springs shall be corrosion-resistant steel conforming to ASTM A 313, Class 302, condition B.
- 3.1.3.3 Elbow Bodies, Straight Bodies and Tips: Elbow bodies, straight bodies and tips shall be corrosion-resistant steel conforming to ASTM A 582 Type 303.

3.2 Design and Fabrication:

The design and fabrication of the fittings shall conform to the requirements specified herein and to the applicable standard.

- 3.2.1 Configuration: The external configuration and dimensions shall conform to the requirements specified herein and the applicable standard, AS15001 through AS15006, AS15720, and AS15721.
- 3.2.2 Fitting Tip Design: The fitting inlet tip design shall conform to a design and associated dimensions as shown on AS15000.
- 3.2.3 Threads: Threads shall be as shown on the applicable standard and shall conform to FED-STD-H28.
- 3.2.4 Wrenching Flats: All fittings shall have hexagonal wrenching flats of sufficient width to provide tip clearance for an end wrench of 0.250 in thickness on each of the six surfaces when the fitting is screwed tightly into a tapped hole on a flat plate. No special tools shall be required for installation or removal of the fittings.
- 3.2.5 Check Valves: All fittings shall be provided with a check valve which shall readily admit lubricant but shall prevent lubricant from escaping through the inlet tip.
 - 3.2.5.1 Types I, II, III, and IV Fittings: Types I, II, III, and IV fittings shall incorporate a surface ball-check valve located at the surface of the inlet tip.
 - 3.2.5.2 Types V, VII, and VIII Fittings: Types V, VII, and VIII fittings shall incorporate either a surface ball-check (see 3.2.5.1), or a throat ball-check valve located in the throat of the fitting.
 - 3.2.5.3 Type VI Fittings: Type VI fittings shall incorporate a synthetic-rubber check valve in the throat of the fitting.

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3.3 Performance:

The fitting, when mounted in any position, shall meet the performance requirements of all tests specified in Section 4.

3.4 Finish:

3.4.1 Types I, II, III, and VI Fittings: All carbon steel fittings shall be cadmium plated in accordance with AMS-QQ-P-416, Type I, Class 3, or zinc coated in accordance with ASTM B 633, Type I, Class 1, except that the salt spray test period for red rust corrosion shall be a minimum of 50 h. Plating or coating shall be as specified in the contract or order (see 6.2).

3.4.2 Types IV, V, VII, and VIII Fittings: Types IV, V, VII, and VIII fittings shall be bright dipped only for cleaning

3.5 Identification of Product:

The fitting shall be marked for identification in accordance with the applicable standard.

3.6 Workmanship:

Remove all burrs and break all sharp edges. Sealing surfaces shall be free of detrimental longitudinal and spiral tool marks as specified in ARP4784. Unless otherwise specified on applicable drawings, sealing surfaces shall be smooth to a finish of 32 $\mu\text{in Ra}$ and all other machined surfaces shall be smooth to 125 $\mu\text{in Ra}$ per ASME B46.1. Unmachined surfaces, such as forging surfaces and bar stock flats shall be free of cracks, laps and seams and smooth to 250 $\mu\text{in Ra}$ per ASME B46.1.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for performing the inspection and test requirements. Except as otherwise specified, the supplier may utilize their own facilities or any commercial laboratory acceptable to the purchaser for the performance of the inspection and test requirements. The purchaser reserves the right to perform any of the inspections and tests set forth in this document, whenever such inspections and tests are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Inspection Lot:

A lot shall consist of all the fittings of a given part number, made from the same batch of material and processed at the same time.

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4.2.1 Material Certification: Records of the chemical composition analysis and mechanical property tests showing conformance to the material requirements of this document shall be available to the procuring activity upon request for each lot of fittings.

4.3 Quality Conformance Inspection:

Quality conformance inspection shall include all the examinations and tests of this specification. Quality conformance inspection shall consist only of sampling inspection.

4.3.1 Quality Conformance Samples: Quality conformance samples shall be selected from each lot of fittings in accordance with the following:

4.3.1.1 Sampling For Examination of Product: The sample size for examination of product shall be determined on the basis of lot size. Samples shall be selected at random in accordance with ANSI/ASQC Z1.4, Inspection Level I, unless otherwise specified by the procuring activity. Sampling for government procurement acceptance shall be as specified in the contract or order.

4.3.1.2 Sampling For Test Methods: The sample size for operation, hardness, leakage, blowout, and accelerated aging tests shall be determined on the basis of lot size. Samples shall be selected at random in accordance with ANSI/ASQC Z1.4, Inspection Level S-2, unless otherwise specified by the procuring activity. Sampling for government procurement acceptance shall be as specified in the contract or order.

4.4 Test Conditions:

4.4.1 Temperature and Pressure: Unless otherwise specified, tests shall be conducted at local ambient temperature of $77^{\circ}\text{F} \pm 18^{\circ}\text{F}$ ($25^{\circ}\text{C} \pm 10^{\circ}\text{C}$) and an ambient barometric pressure of 28 to 32 in of mercury (94.8 to 108.4 kPa).

4.4.2 Test Fluids: Unless otherwise specified, type VI fittings shall be tested only with MIL-PRF-23827 grease. Types I, II, III, IV, V, VII, and VIII shall be tested with grease conforming to MIL-PRF-23827, VV-G-632, or MIL-PRF-10924.

4.4.3 Test Equipment: Unless otherwise specified, the fitting shall be tested utilizing a hand-operated lubricating gun (hand gun), hydraulic coupling (coupling), and a suitable high pressure lubricant source (high pressure hose and lubricant supply system) for all tests.

4.5 Inspection Methods:

4.5.1 Examination of Product: The fitting shall be examined to determine conformance with this document and the applicable standard with respect to material, dimensions, passages, threads, missing parts, surface defects, finish, marking, and workmanship.

4.5.2 Operation:

4.5.2.1 Extreme Angular Position: The fitting shall be assembled into a handgun and coupling. The longitudinal axis of the hand gun and coupling shall be displaced $10 +1$, -0 degrees from the longitudinal axis of the fitting (see AS15000). Operate lubricating hand gun to inject lubricant through the fitting. The fitting shall admit lubricant. This test shall be repeated with the hand gun and coupling realigned to the opposite angular position of $10 +1$, -0 degrees displacement.

4.5.2.2 Opening Pressure: The fitting shall be tested utilizing a test set up similar to Figure 1. Pressure shall be applied to the inlet tip until the check valve open allowing lubricant to flow from the threaded end of the fitting. This pressure shall not exceed the applicable value given in Table 1.

4.5.3 Hardness: The fitting shall be tested for hardness in accordance with ASTM E 18. The hardness shall conform to the applicable value specified in Table 2.

4.5.4 Leakage:

4.5.4.1 Lubricant Leakage: The fitting shall be tested utilizing a test setup similar to Figure 2. Lubricant shall be forced into the fitting until the applicable pressure specified in Table 3 is reached. The coupling shall be disconnected from the fitting tip and rate of lubricant leakage from the tip shall be determined. Leakage from the fitting tip shall not exceed the applicable value given in Table 4.

4.5.4.2 Gasoline Leakage (Type VI Fittings Only): The fitting shall have a static head of 24 in ± 1 in of unleaded gasoline applied to the threaded end for a minimum period of 2 min. Leakage of gasoline from the inlet tip of the fitting shall not exceed 10 drops per minute.

4.5.5 Blowout (All Types Except Type VI): The fitting shall be installed in a test setup similar to Figure 3 and shall be tested as follows:

- a. The power lubrication system shall be charged to a pressure within the applicable pressure range specified in Table 3. The power control valve shall be opened and lubricant shall be discharged through the fitting for a period of 5 s. The coupling shall be disconnected from the inlet tip of the fitting, and the fitting ball-check and spring shall be examined. The ball-check shall have returned to the closed position and there shall be no evidence of loosening, damage or blowout of component parts.
- b. Repeat item a.
- c. The fitting shall be disassembled or sectionalized, as applicable. There shall be no evidence of damage to any component part.

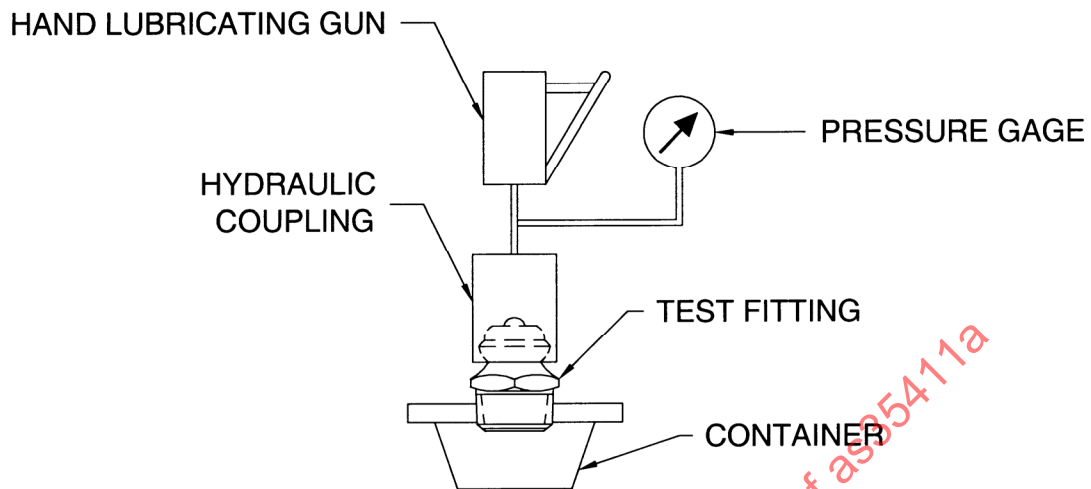


FIGURE 1 - Extreme Angular Position and Opening Pressure Test Setup

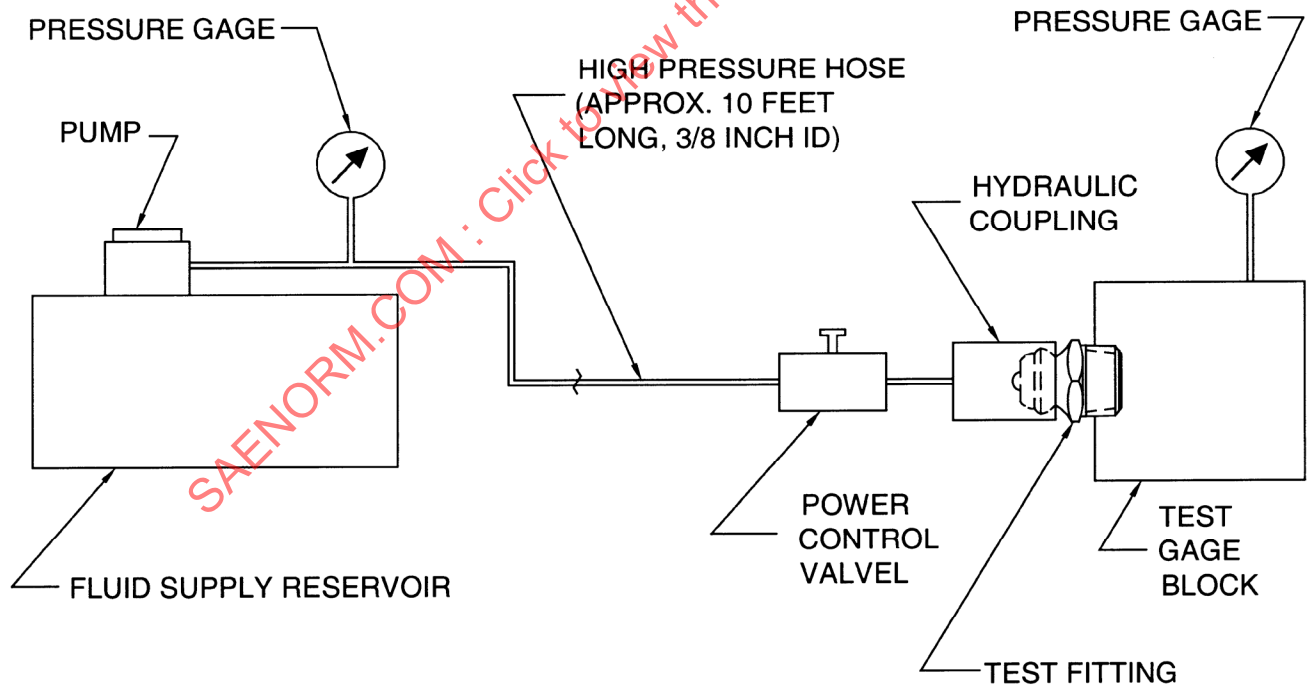


FIGURE 2 - Leakage Test Setup

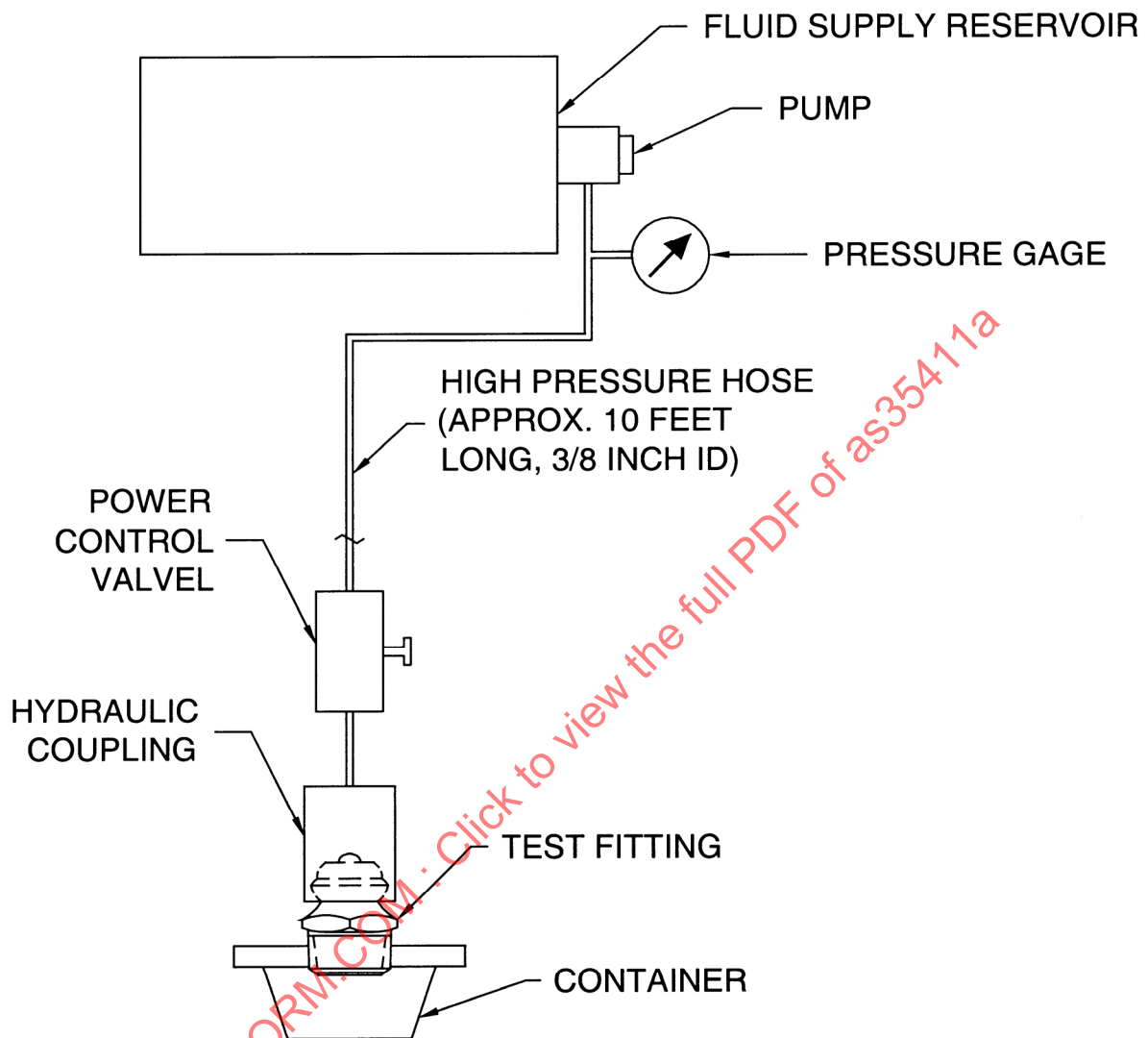


FIGURE 3 - Blowout Test Setup

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TABLE 1 - Opening Pressure

Fitting Type	Maximum Opening Pressure-psig (MPa)
I, II, and III	450 (3.11)
IV, V, VI, VII and VIII	650 (4.42)

TABLE 2 - Hardness

Fitting Type	Fitting Area	Hardness of Fitting Area
I, II and III	Tips (surface making contact with the nozzle or coupling of the lubricating gun) of all fittings	Case hardened to a depth of 0.005 to 0.009 inch (0.127 to 0.227 mm) reading of 83 on 15-N scale of Rockwell superficial hardness test machine
IV and V	Tips of all fittings, and surface of all balls	Minimum Rockwell hardness No. 80 on the "B" scale (100 kilogram load) on end item
VI	Tips of all fittings	Case hardened to a depth of 0.002 to 0.005 inch (0.051 to 0.127 mm) with a minimum reading to 83 on 15-N scale of Rockwell superficial hardness test machine
VII and VIII	Tips of all fittings, and surface of all balls	Balls: Minimum hardness of No. 40 on the Rockwell "C" scale (150 kilogram load) Fitting tips: Minimum hardness of No. 92 on the Rockwell "B" scale

TABLE 3 - Pressure Range

Fitting Type	Allowable Pressure Range - psig (MPa)
I, II and III	8,000 to 8,100 (55.16 to 55.85)
IV, V, VII and VIII	6,000 to 6,100 (41.37 to 42.06)

TABLE 4 - Leakage

Fitting Type	Test Gage Block Pressure psig (MPa)	Leakage
I, II, III, IV, V, VII and VIII	5000 (34.47)	2 cc per minute maximum
VI	3000 (20.68)	Zero