



SURFACE VEHICLE STANDARD

J1453™-1

JUN2019

Issued 2007-02
Revised 2019-06

Superseding J1453-1 MAY2012

Specification for O-Ring Face Seal Connectors: Part 1 - Tube Connection Details
and Common Requirements for Performance and Tests

RATIONALE

This document was revised to clarify the requirements for nuts and sleeves in 4.1.3, contour in 4.3.6 and corrosion protection in 4.4.3.

FOREWORD

The JUN2002 edition of SAE J1453 was published as a single document covering the requirements for inch O-ring face seal connectors with SAE J1926-2 inch stud ends. In 1995, ISO 8434-3 was published covering the requirements for O-ring face seal connectors with ISO 6149-2 metric stud ends. This revision of SAE J1453 adopts the parts covered within ISO 8434-3 and the rationalized dimensions from ISO 8434-3 for both the inch and metric stud end face seal connectors. SAE J1453 has been organized into three sections as follows:

1. SAE J1453-1: Specification for O-Ring Face Seal Connectors: Part 1 - Tube Connection Details and Common Requirements for Performance and Tests
2. SAE J1453-2: Specification for O-Ring Face Seal Connectors: Part 2 - Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Braze-on Tube Ends, Caps, and Connectors with ISO 6149-2 Metric Stud Ends and ISO 6162 4-Bolt Flange Heads
3. SAE J1453-3: Specification for O-Ring Face Seal Connectors: Part 3 - Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Caps, and Connectors with SAE J1926-2 Inch Stud Ends

SAE J1453-2 parts are technically equivalent to ISO 8434-3 parts; SAE J1453-3 parts are technically equivalent to SAE J1453 JUN2002 parts. Parts supplied to SAE J1453 JUN2002 shall now be supplied to SAE J1453-3.

NOTE: A common face seal connection between SAE J1453 and ISO 8434-3 standards provides for manufacturing efficiency. This revision of SAE J1453 provides for this commonality.

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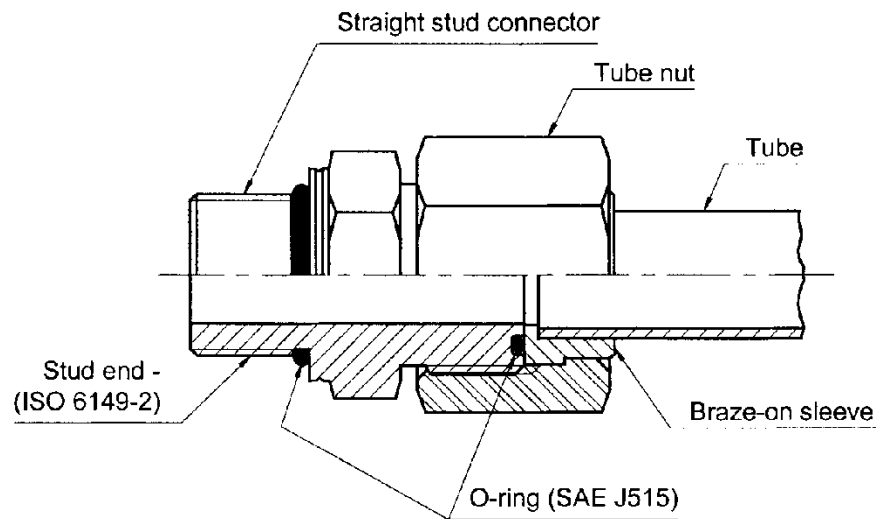


Figure 1 - Typical representation of O-ring face seal (ORFS) connector with metric stud end

Refer to SAE J1453-2 for ISO 6149-2 stud end connectors and SAE J1453-3 for SAE J1926-2 stud end connectors. See Figure 2 for typical tube and hose connections.

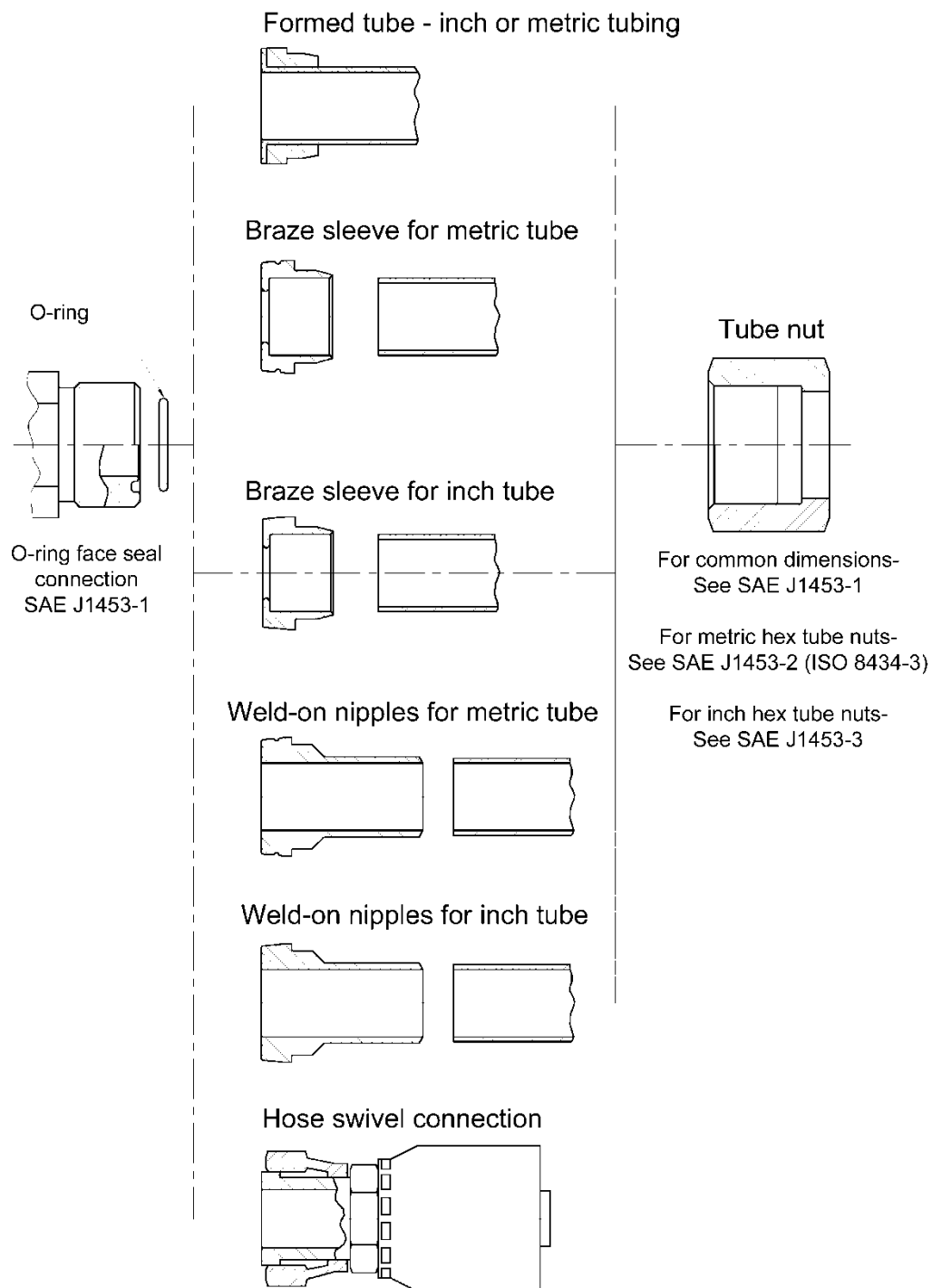


Figure 2 - Typical O-ring face seal connections to inch or metric tubing or hose

Table 1 - Quick reference chart: tube OD to metric port stud end sizes, hex nut sizes, qualification test torques, and connector working pressures

NOTE: In cases of conflict, values shown in the body of SAE J1453-2 and ISO 6149-2 take precedence.

Metric Tube OD ⁽¹⁾ mm	Inch Tube OD Dash Size ⁽¹⁾	Inch Tube OD mm	O-Ring Face Seal End Thread Inch	O-Ring Face Seal and Swivel End Tube Nut Hex mm	O-Ring Face Seal End Qualification Test Torque ⁽²⁾ N·m	Port Stud End ISO 6149-2 Thread ⁽⁴⁾ mm	Port Stud End ISO 6149-2 Nut Hex mm	Port Stud End ISO 6149-2 Qualification Test Torque ⁽²⁾ N·m	Connector Working Pressure, Face Seal ⁽³⁾ and Nonadjustable Stud End MPa	Connector Working Pressure, Adjustable Stud End MPa
6	- 4	6.35	9/16-18	17	25	M12X1.5	17	35	63	40
8	- 5	7.94	5/8-18	19	30	M14X1.5	19	45	63	40
10	- 6	9.52	11/16-16	22	40	M16X1.5	22	55	63	40
12	- 8	12.7	13/16-16	24	55	M18X1.5	24	70	63	40
16	-10	15.88	1-14	30	60	M22X1.5	27	100	40	40
20	-12	19.05	1-3/16-12	36	90	M27X2	32	170	40	40
22	-14	22.23	1-5/16-12	41	115	M30X2	36	235	40	35
25	-16	25.4	1-7/16-12	41	125	M33X2	41	310	40	35
30	-20	31.75	1-11/16-12	50	170	M42X2	50	330	25	25
38	-24	38.1	2-12	60	200	M48X2	55	420	25	20
50	-32	50.8	2-1/2-12	75	510	M60X2	65	500	21	16

⁽¹⁾ The size symbol for all tube sizes shall be the tube OD or nominal hose ID in millimeters, except dash size symbols may be used for braze sleeve and weld nipple for inch tubing.

⁽²⁾ Torque values listed in Table 1 are for controlled testing to establish compliance to the performance requirements as set forth in 4.2. Recommended assembly torques by manufacturers may vary from those shown.

⁽³⁾ This covers unions, caps, bulkheads, swivels and plugs.

⁽⁴⁾ Screw threads on the port end of the connectors shall be metric per ISO 261.

Table 2 - Quick reference chart: tube OD to inch port stud end sizes, hex nut sizes, qualification test torques and working pressures

(CAUTION: In case of conflict, values shown in the body of SAE J1453-3 and SAE J1926-2 take precedence.)

Inch Tube OD Dash Size ⁽¹⁾	Inch Tube OD Inch	Inch Tube OD mm	Metric Tube OD mm	O-Ring Face Seal End Thread ⁽²⁾ Inch Ref	O-Ring Face Seal and Swivel End Tube Nut Hex Inch	O-Ring Face Seal End Qualification ⁽³⁾ Test Torque N·m	Port Stud End SAE J1926-2 (ISO 11926-2) Thread ⁽³⁾ Inch Ref	Port Stud End SAE J1926-2 (ISO 11926-2) Adjustable Inch Nut Hex Inch	Port Stud End SAE J1926-2 (ISO 11926-2) Qualification ⁽³⁾ Test Torque N·m	Connector Working Pressure ⁽⁴⁾ , Face Seal and Nonadjustable Stud End MPa	Connector Working Pressure, Adjustable Stud End MPa
- 4	0.250	6.35	6	9/16-18	11/16	25	7/16-20	5/8	20 ⁽⁵⁾	63	41.3
- 6	0.312	7.94	8	5/8-18	3/4	30	1/2-20	11/16	40	63	41.3
- 6	0.375	9.52	10	11/16-16	13/16	40	9/16-18	3/4	45	63	41.3
- 8	0.500	12.7	12	13/16-16	15/16	55	3/4-16	15/16	85	63	41.3
-10	0.625	15.88	16	1-14	1-1/8	60	7/8-14	1-1/16	100	41.3	41.3
-12	0.750	19.05	20	1-3/16-12	1-3/8	90	1-1/16-12	1-3/8	170	41.3	41.3
-14	0.875	22.22	22	1-5/16-12	1-1/2	115	1-3/16-12	1-1/2	235	41.3	38
-16	1.000	25.4	25	1-7/16-12	1-5/8	125	1-5/16-12	1-5/8	270	41.3	34.5
-20	1.250	31.75	30	1-11/16-12	1-7/8	170	1-5/8-12	1-7/8	285	27.5	27.5
-24	1.500	38.1	38	2-12	2-1/4	200	1-7/8-12	2-1/8	370	27.5	20.7
-32	2.000	50.8	50	2-1/2-12	2-7/8	510	2-1/2-12	2-3/4	540	21	17.5

⁽¹⁾ The dash size symbol applicable to all tube ends and straight thread O-ring boss ends shall consist of the number of sixteenth inch increments contained in the outside diameter of the tubing (nominal OD) or inside diameter of the hose (nominal hose ID).

For example: -4 = 4/16 = 0.25 = 6.35 mm inch tube size or hose, or corresponding port.

⁽²⁾ See 4.3.8 for screw thread information.

⁽³⁾ Torque values listed in Table 2 are for controlled testing to establish compliance to the performance requirements set forth in paragraph 4.2. Recommended assembly torques by manufacturers may vary from those shown.

⁽⁴⁾ This covers unions, caps, bulkheads, swivels and plugs.

⁽⁵⁾ For -4 only, adjustable torque is given. For nonadjustable torque is 35 N·m.

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1. SCOPE

1.1 Purpose

The three parts of SAE J1453 cover material, dimensional, and performance requirements of steel O-ring face seal (ORFS) connectors for tubing and the O-ring face seal interface and nut portion of hose stem assemblies for nominal tube diameters of 6 through 50 mm.

1.2 Field of Application

These connectors are intended for general application and hydraulic systems on industrial equipment and commercial products, where elastomeric seals are acceptable to overcome leakage and variations in assembly procedures. These connectors are capable of providing leak-proof full flow connections in hydraulic systems operating from 95 kPa vacuum to the working pressures shown in Tables 1 and 2. Since many factors influence the pressure at which a hydraulic system will or will not perform satisfactorily, these values should not be construed as guaranteed minimums. For any application, it is recommended that sufficient testing be conducted and reviewed by both the user and manufacturer to ensure that required performance levels are met.

For use of these connectors in conditions outside the pressure and temperature limits specified, the manufacturers shall be consulted.

Both metric and inch tubing can be accommodated by changing only the sleeve to match the tube diameters. In the past, these connectors have been used predominantly with inch tubing. For new designs, the use of metric tubing should be considered.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

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.

AS568	Aerospace Size Standard for O-Rings
SAE J356	Welded Flash-Controlled Low-Carbon Steel Tubing Normalized for Bending, Double Flaring, and Beading
SAE J515	Specification for O-Ring Materials Used with Hydraulic Connectors
SAE J524	Seamless Low-Carbon Steel Tubing Annealed for Bending and Flaring
SAE J525	Welded and Cold Drawn Low-Carbon Steel Tubing Annealed for Bending and Flaring
SAE J846	Coding Systems for Identification of Fluid Conductors and Connectors
SAE J1453-2	Specification for O-Ring Face Seal Connectors: Part 2 - Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Braze-on Tube Ends, Caps, and Connectors with ISO 6149-2 Metric Stud Ends and ISO 6162 4-Bolt Flange Heads
SAE J1453-3	Specification for O-Ring Face Seal Connectors: Part 3 - Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Caps, and Connectors with SAE J1926-2 Inch Stud Ends
SAE J1926-2	Connections for General Use and Fluid Power - Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing - Part 2: Heavy-Duty (S Series) Stud Ends
SAE J2593	Information Report for the Installation of Fluid Conductors and Connectors



2.1.2 ANSI Accredited Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ANSI B4.2 Preferred Metric Limits and Fits

2.1.3 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 B1.1 Unified Inch Screw Threads

ASME B46.1 Surface Texture (Surface Roughness, Waviness and Lay)

2.1.4 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 B633 Standard Specifications for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM B117 Method of Salt Spray (Fog) Test

2.1.5 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 48 Vulcanized Rubbers - Determination of Hardness (Hardness Between 30 and 85 IRHD)

ISO 68-2 ISO General Purpose Screw Threads - Basic Profile - Part 2: Inch Screw Thread

ISO 2768-1 General Tolerances - Part 1: Tolerances for Linear and Angular Dimensions without Individual Tolerances Indications

ISO 3304 Plain End Seamless Precision Steel Tubes, Technical Conditions of Delivery

ISO 3305 Plain End Welded Precision Steel Tubes

ISO 3448 Industrial Liquid Lubricants - ISO Viscosity Classification

ISO 4397 Fluid Power Systems and Components - Connectors and Associated Components - Outside Diameters of Tubes and Inside Diameter of Hoses

ISO 5598 Fluid Power Systems and Components - Vocabulary

ISO 5864 ISO Inch Screw Threads - Allowances and Tolerances

ISO 6149-2 Connections for Fluid Power and General Use - Part 2: Heavy Duty (S) Series Stud Ends - Dimensions, Design, Test Methods and Requirements

ISO 6508 Metallic Materials - Hardness Test - Rockwell Test (Scales A - B - C - D - E - F - G - H - K)

ISO 6803 Rubber or Plastic Hoses and Hose Assemblies - Hydraulic Pressure Impulse Test Without Flexing

ISO 8434-3 Metallic Tube Connections for Fluid Power and General Use - Part 3: O-Ring Face Seal Connectors

ISO 9227	Corrosion Tests in Artificial Atmospheres - Salt Spray Tests
ISO 11926-2	Connections for General Use and Fluid Power - Ports and Stud Ends with ISO 725 Threads and O-Ring Sealing - Part 2: Heavy Duty (S) Series Stud Ends
ISO 19879	Metallic Tube Connections for Fluid Power and General Use - Test Methods for Hydraulic Fluid Power Connections

3. DEFINITIONS

For this part of SAE J1453, the definitions given in ISO 5598 and the following definitions shall apply:

3.1 FLUID POWER

(From ISO 5598) Means by which energy is transmitted, controlled, and distributed using a pressurized fluid as the medium.

3.2 CONNECTOR

(From ISO 5598) Leak-proof device to connect pipelines (conductors) to one another, or to equipment.

3.3 FASTENING THREAD

Terminal thread of a complete connector.

3.4 RUN

Two axially aligned outlets of a tee or cross. See Figure 3.



Figure 3 - Run and branch illustration

3.5 BRANCH

Side outlet(s) of a tee or cross connector.

3.6 CHAMFER

Removal of a conical portion at the entrance of a thread to assist assembly and prevent damage to the start of the thread.

3.7 TORQUES

3.7.1 ASSEMBLY TORQUE

The maximum torque to be applied in order to achieve a satisfactory final assembly.

3.7.2 QUALIFICATION TEST TORQUE

The torque used to verify conformance of the connector to the requirements of this standard.

3.7.3 OVERTORQUE

The torque the nut shall withstand without deformation that renders it unusable.

3.8 WORKING PRESSURE

(From ISO 5598) Pressure at which the apparatus is being operated in a given application as shown in SAE J1453-2 and SAE J1453-3.

3.9 ADJUSTABLE STUD END

A stud end connector that allows for connector orientation before final tightening of the locknut to complete the connection. This type of stud end is typically used on shaped connectors (e.g., tees, crosses, and elbows).

3.10 NONADJUSTABLE STUD END

A stud end connector that does not require specific orientation before final tightening of the connection because it is only used on straight connectors.

3.11 PREFERRED

Commonly used readily available parts.

3.12 NON-PREFERRED

Parts which are low volume, considered specials and their use requires special consideration. Dimensions for non-preferred parts are given to provide standardization within the industry.

3.13 JUMP SIZE CONNECTOR

Connectors with unpaired end connections, for example, M14 stud end with 12 mm tube end.

3.14 SIZE DESIGNATION

Connector sizes are designated by the nominal outside diameter of the tubing or nominal inside diameter of hose. Refer to SAE J846 for specific size details.

4. REQUIREMENTS

4.1 Material

4.1.1 Connector Bodies

Bodies shall be manufactured from carbon steel that will provide the minimum pressure/temperature requirements specified for each component or assembly. They shall have characteristics that make them suitable for use with fluid to be conveyed and to provide an effective joint. Weld-on components shall be made from a material that is suitable for welding.

4.1.2 Component Construction

Connectors may be made by forging, cold forming or machining from bar stock. Carbon steel connectors made from multiple components shall be bonded together with materials having a melting point of not less than 1000 °C.

4.1.3 Nuts and Sleeves

Where sleeves are brazed, nuts and sleeves can become annealed, reducing their strength. Nuts and sleeves for brazed assemblies shall be made of a suitable strength material to meet the performance requirements. If high strength nuts (Style B) are necessary, they shall be identified by a turned diameter, d14, as shown in Figure 7, Nut Style B. The nut and sleeve must meet or exceed the minimum performance requirements of the assembly.

4.1.4 For materials other than steel, contact the manufacturer.