



SURFACE VEHICLE STANDARD	J516™	NOV2021
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Superseding J516 MAR2019		
Hydraulic Hose Fittings		

RATIONALE

Figure 20 is incorrect. The note on the drawing currently states “HEX OPTIONAL.” The correct wording is “HEX SIZE OPTIONAL.”

1. SCOPE

This SAE Standard provides general and dimensional specifications for the most common hose fittings used in conjunction with hydraulic hoses specified in SAE J517 and utilized in hydraulic systems on mobile and stationary equipment.

The general specifications contained in Sections 1 through 17 are applicable to all hydraulic hose fittings and supplement the detailed specifications for the 100R-series fittings contained in the later sections of this document.

This document shall be utilized as a procurement document only to the extent agreed upon by the manufacturer and user.

Refer to SAE J517 for specifications of hose and information on hose assemblies. SAE J1273 contains information on application factors affecting hose fittings, hose, and hose assemblies.

The rated working pressure of a hose assembly comprising SAE J516 fittings and SAE J517 hoses shall not exceed the lower of the two working pressure rated values.

The following are hose fitting types contained in this document:

- Section 18 O-ring face seal hose fittings shall be as shown in Figures 4 to 7 and in Tables 2 to 5.
- Section 19 Flareless 24-degree cone hose fittings shall be as shown in Figures 9 to 10 and in Tables 7 to 8.
- Section 20 Four-bolt split flange hose fittings shall be as shown in Figures 11 to 17 and in Tables 9 to 15.
- Section 21 Straight thread O-ring hose fittings shall be as shown in Figure 18 and in Table 16.
- Section 22 37-degree flare hose fittings shall be as shown in Figures 19 to 22 and in Tables 17 to 20.
- Section 23 Dryseal pipe thread hose fittings shall be as shown in Figure 23 and in Table 21.

Male and female 45-degree flare hose fittings shall be as shown by the 37-degree flare figures and tables.

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SAE WEB ADDRESS:

It is recommended that where step sizes or additional types of fittings are required, they be designed to conform with the specifications of this document insofar as they may apply. The following general specifications shall supplement the dimensional data contained in the tables with respect to all unspecified detail.

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.

SAE J476	Dryseal Pipe Threads
SAE J512	Automotive Tube Fittings
SAE J514	Hydraulic Tube Fittings
SAE J517	Hydraulic Hose
SAE J518	Hydraulic Flanged Tube, Pipe, and Hose Connections, Four-Bolt Split Flange Type
SAE J846	Coding Systems for Identification of Fluid Conductors and Connectors
SAE J1273	Recommended Practices for Hydraulic Hose Assemblies
SAE J1453-1	Specification for O-Ring Face Seal Connectors: Part 1 - Tube Connection Details and Common Requirements for Performance and Tests
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 J1926-3	Connections for General Use and Fluid Power - Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing - Part 3: Light-Duty (L Series) Stud Ends

2.1.2 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 B117 Method of Salt Spray (Fog) Testing

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), 001-800-846-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B1.1 Screw Thread

2.1.4 ISO Publications

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

ISO 4759-1	Tolerances for Fasteners - Part 1: Bolts, Screws, Studs and Nuts - Product Grades A, B and C
ISO 9227	Corrosion Tests in Artificial Atmospheres - Salt Spray Tests
ISO 12151-1	Connections for Hydraulic Fluid Power and General Use - Hose Fittings - Part 1: Hose Fittings with ISO 8434-3 O-Ring Face Seal Ends
ISO 12151-2	Connections for Hydraulic Fluid Power and General Use - Hose Fittings - Part 2: Hose Fittings with ISO 8434-1 24-Degree Cone Connector Ends with O-Rings
ISO 12151-3	Connections for Hydraulic Fluid Power and General Use - Hose Fittings - Part 3: Hose Fittings with ISO 6162-1 And ISO 6162-2 Flange Ends
ISO 12151-4	Connections for Hydraulic Fluid Power and General Use - Hose Fittings - Part 4: Hose Fittings with ISO 6149 Metric Stud Ends
ISO 12151-5	Connections for Hydraulic Fluid Power and General Use - Hose Fittings - Part 5: Hose Fittings with ISO 8434-2 37-Degree Flared Ends

3. SIZE DESIGNATIONS

The hose fitting size is generally designated by the SAE dash sizes in accordance with SAE J846, as follows:

- 3.1 The hose dash size is equivalent to the number of 1/16-inch increments in the hose size, except in the case of SAE 100R5 and 100R14 hose, where it is equivalent to the number of 1/16-inch increments in the outside diameter of tubing having approximately the same inside diameter as the hose.
- 3.2 The pipe thread dash size is the number of 1/16-inch increments in the nominal pipe thread size.
- 3.3 The O-ring boss, 37-degree and 45-degree flared, and flareless type thread SAE dash sizes correspond to the number of 1/16-inch increments in the outside diameter of the tubing with which they are designed to be used.
- 3.4 The four-bolt split flange SAE dash size is the number of 1/16-inch increments in the flange size.

4. HOSE FITTING (CONNECTOR) IDENTIFICATION

All hose fittings, permanently attached and field attachable styles, shall be legibly and permanently marked with the manufacturer's name or logo, to allow for positive identification. Additional permanent marking is also required to provide a means to identify the proper hose to be used with the hose fitting. Other markings, such as the customer's assembly number, date code, etc., is permissible as agreed upon by the supplier and user.

5. DIMENSIONS AND TOLERANCES

Tabulated dimensions shall apply to the finished parts, plated or otherwise processed, as specified by the purchaser. Details of internal construction of the attaching portion of fittings are not specified and shall be optional with the manufacturer, providing the fittings, properly assembled onto the appropriate hose, meet the qualification requirements when the assemblies are subjected to the various tests specified in SAE J517.

The maximum and minimum across flat dimensions shall be within the commercial tolerance of bar stock from which the fittings are produced. Formed or upset hexagon contours shall fit standard wrench size openings. The minimum across corners dimensions of external hexagons shall be 1.092 times the nominal width across flats, but shall not result in a side flat width of less than 0.43 times the nominal width across flats. Tolerance on all dimensions not otherwise listed shall be ± 0.40 mm. Fitting seats shall be concentric with straight thread pitch diameters within 0.25 mm as measured by full indicator reading (FIR).

Angular tolerance on the bend of elbow hose fittings shall be ± 3 degrees.

6. PASSAGES

The tabulated d_2 dimensions reflect the minimum bore at any point through the fitting prior to assembly to the hose. For SAE 100R5 and SAE 100R14 hose fittings, the d_2 dimension can be 0.2 mm smaller than the values listed in the tables. The after-assembly bore reduction will be a maximum of 10%. The reduction must be in the general shape of a venturi. Where passages in straight fittings are machined from opposite ends, the offset at the meeting point shall not exceed 0.40 mm. On angle fittings, the cross-sectional area at the junction of fluid passages shall not be less than that of the smallest passage. This assembly passage definition does not apply to bent tubes.

7. CONTOUR

Details of contour shall be optional with the manufacturer, providing the tabulated dimensions are maintained and serviceability of fittings is not impaired.

8. STRAIGHT THREADS

Unified Standard Class 2A external and Class 2B internal threads shall apply to plain finish (unplated) fittings having straight threads. For externally threaded parts with additive finish, the maximum diameters of Class 2A may be exceeded by the amount of the allowance; that is, the basic diameters (Class 2A maximum diameters plus the allowance) shall apply to an externally threaded part after plating. For internally threaded parts with additive finish, the Class 2B diameters apply after plating.

The pitch diameter tolerance shall be the same as the corresponding diameter-pitch combination and class of the Unified Fine and 12 thread series. Refer to ASME B1.1.

Where external threads are produced by roll threading and the body is not undercut, the unthreaded portion adjacent to the shoulder may be reduced to the minimum pitch diameter.

External threads shall be chamfered, and internal threads shall be countersunk, as specified in the dimensional tables.

9. THREAD ECCENTRICITY TOLERANCES

The various thread elements of Class 2A external and Class 2B internal threads on hose fittings shall be concentric within the limitations specified under General Specifications in SAE J512.

10. PIPE THREADS

Taper pipe threads shall conform to the Dryseal American Standard Taper Pipe Thread (NPTF). Specifications are given in detail in SAE J476.

External pipe threads shall be chamfered from the diameters tabulated in Table 1 to produce the specified length of chamfered or partial thread. Internal pipe threads shall be countersunk 90 degrees, included angle, to the diameters specified in Table 1.

Table 1 - Pipe thread dimensions

Dimensions are in millimeters

Nominal Inch Pipe Thread Size	External Chamfer Dia ^(a) Max	External Chamfer Dia ^(a) Min	Thread Length of Chamfered or Partial Thread Max	Thread Length of Chamfered or Partial Thread Min	Internal Thread Counter-sink Dia ^(a) Max	Internal Thread Counter-sink Dia ^(a) Min
1/16	5.8	5.4	0.5	0.3	8.8	8.4
1/8	8.1	7.6	1.4	1.0	11.2	10.7
1/4	10.7	10.2	2.1	1.4	14.5	14.0
3/8	14.0	13.4	2.1	1.4	18.0	17.5
1/2	17.3	16.8	2.7	1.8	22.1	21.6
3/4	22.6	22.1	2.7	1.8	27.4	26.9
1	28.4	27.7	3.3	2.2	34.8	34.0
1-1/4	37.1	36.3	3.3	2.2	43.4	42.7
1-1/2	43.2	42.4	3.3	2.2	49.5	48.8
2	55.1	54.4	3.3	2.2	61.2	60.7

^(a) Tabulated diameters conform with SAE J476, Appendix A.

11. MATERIAL

Fittings shall be made from materials of good quality, capable of withstanding the stresses resulting from hydraulic pressures equal to the minimum burst pressure of the applicable hose size and type to which they are assembled without failure.

12. CORROSION PROTECTION

The external surfaces and threads of all carbon steel parts shall be plated or coated with a suitable material that passes a salt spray test in accordance with ISO 9227 or ASTM B117. The following requirements shall apply:

- No appearance of corrosion products of the protective coating before 96 hours.
- No appearance of corrosion products of the base metal before 144 hours.

The following exceptions shall apply:

- All internal fluid passages.
- Edges such as hex points, serrations, and crests of threads where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects.
- Areas where there is mechanical deformation of the plating or coating caused by crimping, flaring, bending, and other post-plate metal forming operations.
- Areas where the parts are suspended or affixed in the test chamber where condensate can accumulate.

Parts manufactured to this standard shall not be cadmium plated and shall not use hexavalent chromate coatings. Internal fluid passages shall be protected from corrosion during storage and shipping. Changes in plating or coating shall be re-qualified to ensure assembly torque is not affected.

13. WORKMANSHIP

Workmanship shall conform to the best commercial practice to produce high-quality fittings. Fittings shall be free from all hanging burrs, loose scales, and slivers which might become dislodged in usage, sharp edges, and all other defects that might affect their serviceability. All sealing surfaces must be smooth, except that annular tool marks up to 2.5 µm maximum, unless specified otherwise, shall be permissible.