Eaton® Aeroquip®
Fluid Conveyance Master Catalog

Competing at the edge of change

The new standard for fluid conveyance

EATON
Powering Business Worldwide

There's a spirited energy at Eaton.

It comes from the alignment of some of the most respected names in fluid power to build a brand you can trust to meet the world's demand for high-efficiency hydraulic systems.

Our goal is simple: To provide unique fluid power solutions across a range of mobile and stationary markets that keep businesses competing at the leading edge of change.

So, why partner with Eaton?

After all, we know you have choices. You partner with Eaton because every aspect of our business is focused on ensuring your continued success:

- Focused manufacturing that anticipates the needs of a global business environment
- Streamlined product commercialization that deploys tested and qualified products that meet or exceed industry standards
- Product features and attributes that deliver improved performance at a good value
- Safety is treated as a priority within our culture, and yours. Crimp with confidence knowing that Eaton pairs its hoses and fittings after rigorous qualification and testing procedures.
- Dedicated people, who focus daily on meeting your needs
- Engaging marketing and sales programs designed to educate and enable growth in partnership with Eaton

Aeroquip® core hydraulic products

Hose products

Our new core premium hoses for OEM or aftermarket use exceed industry standards for pressure, temperature and abrasion resistance, with options adapted to handle your toughest jobs. Look for Triple Crown Advantage hoses for the highest pressure and temperature ratings to extend the life of your hose. Available in braided and spiral hose constructions.

Look for the Triple Crown Advantage

Specialty hose

NG-TW hose

35NG hose

Certified by:

Fittings

TTC Series

One-piece "Bite-the-wire" style hose fitting that is qualified with virtually all Aeroquip® one and two wire braided hydraulic hoses, and features DuraKote™ plating technology.

4S/6S Spiral Series

A higher performing spiral hose assembly for the most demanding applications while using a simple more user-friendly hose and hose fitting assembly process, featuring DuraKote™ plating technology.

Tooling

ET1187 Portable Variable Crimp Machine

Eaton® ProCrimp® ET1187 crimp machine with the micrometer feature: It's as simple as turning the collar to the correct color to match the layline on the hose.

- Color-coded collar matches core hose layline for easy set-up
- TTC fittings and applicable hoses in sizes 1/4" through 1"
- TTC12/4S fittings and applicable hoses in sizes 3/8"through 5/8"
- 4S fittings and applicable hoses in sizes 3/4" through 1"

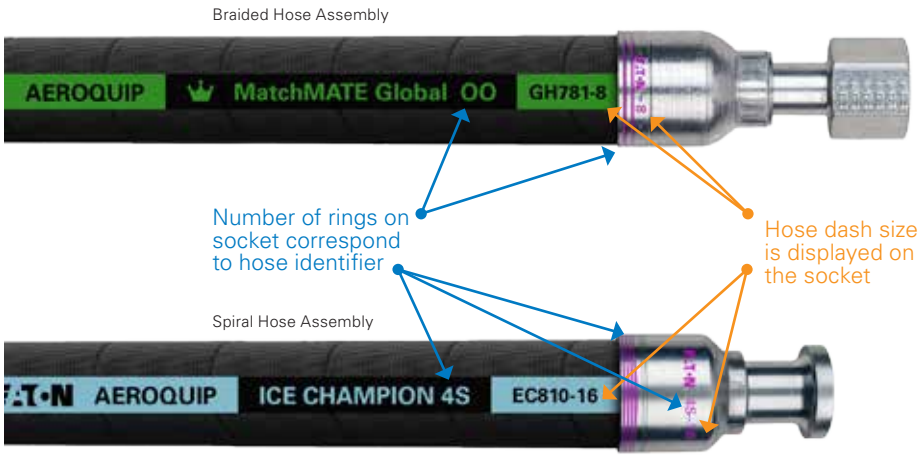
Micrometer

Aeroquip provides confidence in hose assembly, corrosion and leakage protection.

Engineered Assemblies

Eaton's Aeroquip hoses and fittings are engineered and qualified to work as a system ensuring your confidence in a high quality hose assembly. The 4-Step **MatchMate™** system for braided and spiral hose assemblies ensure proper mating of hose and qualified fittings.

4 Step Hose Identification System



DURA-KOTE™ Plating Technology

Hose fittings that will now offer 3x the corrosion protection on carbon steel fittings as compared to competitive hose fittings. Eaton's DURA-KOTE fittings provide up to 1000 hours of corrosion protection. This is a huge step forward in metal fitting corrosion protection.

3X Carbon Steel Corrosion Protection

Corrosion of current carbon steel adapters after 650 hours of exposure to salt spray testing.

DURA-SEAL™ Technology

This patent-pending innovation from Eaton eliminates hose assembly cool-down leakage, while extending hose assembly life, reducing equipment down-time.

Class 0 Cool-Down Leakage Protection

4S/6S Fitting

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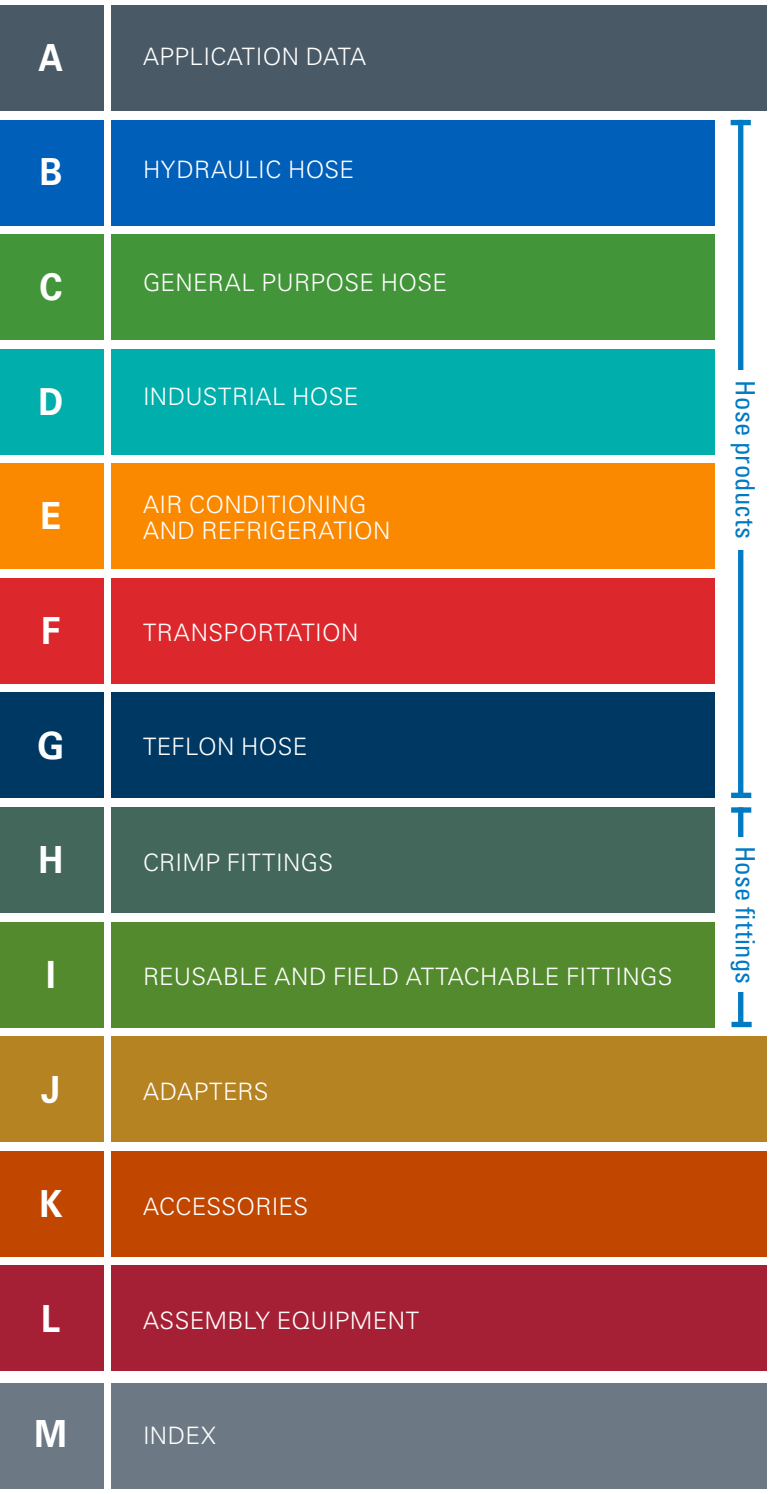

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Assembly product warning and How to order

Eaton's Aeroquip Hose and Fitting Assembly Product Warning

Flexible hose lines offer many advantages over rigid tubing including routing ease, vibration absorption, sound deafening and the ability to accommodate movement of connected components. However, hose lines require caution in use not only to provide long service, but also to guard against potentially dangerous failure.

Important

The user should carefully observe the precautions listed in this catalog, including the recommendations on the selection of hose and fittings on the relevant pages, and the pages on fluid compatibility. In addition, care should be taken not to exceed the minimum bend radius listed for each hose size and type in the hose section. Maximum operating pressure should not exceed pressures listed in the hose data. Instructions for assembling fittings to different hose should be followed carefully to ensure the performance of the completed assembly.

⚠ **WARNING** Eaton fitting tolerances are engineered to match Eaton's Aeroquip hose tolerances. The use of Eaton fittings on hose supplied by other manufacturers and/or the use of Eaton's Aeroquip hose with fittings supplied by other manufactures may result in the production of unreliable and unsafe hose assemblies and is neither recommended nor authorized by Eaton or any of its affiliates or subsidiaries.

⚠ **WARNING** Application considerations must be observed in selecting appropriate components for the application of these products contained herein. The failure to follow the recommendations set forth in this catalog may result in an unstable application which may result in serious personal injury or property damage.

EATON OR ANY OF ITS AFFILIATES OR SUBSIDIARIES SHALL NOT BE SUBJECT TO AND DISCLAIMS ANY OBLIGATIONS OR LIABILITIES (INCLUDING BUT NOT LIMITED TO ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES) ARISING FROM TORT CLAIMS (INCLUDING WITHOUT LIMITATION NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES OF LAW WITH RESPECT TO ANY HOSE ASSEMBLIES NOT PRODUCED FROM GENUINE AEROQUIP HOSE FITTINGS, HOSE AND AEROQUIP APPROVED EQUIPMENT, AND IN CONFORMANCE WITH EATON'S AEROQUIP PROCESS AND PRODUCT INSTRUCTIONS FOR EACH SPECIFIC HOSE ASSEMBLY.

Failure to follow these processes and product instructions and limitations could lead to premature hose assembly failures resulting in property damage, serious injury or death.

Routing

If the user follows the recommendations on hose line routing and installation as provided herein, improved safety and longer service life of any hose installation will result.

Hose Installation

Proper installation of the hose is essential to the proper operation and safe use of the hose and related equipment. Improper installation of the hose can result in serious injury or property damage caused by spraying fluids or flying projectiles. In order to avoid serious bodily injury or property damage resulting from improper installation of the hose, you should carefully review the information in this catalog regarding hose installation.

Some of the factors you must consider in installing the hose properly are:

- Changes in length
- Proper bend radius
- Protection from high temperature sources
- Elbows and adapters to relieve strain
- Rubbing or abrasion
- Twisting
- Improper hose movement

These factors and the other information in this catalog regarding hose installation should be considered by you before installing the hose. If you have any questions regarding proper hose installation, please contact Eaton Technical Support at 1-888-258-0222.

Hose Maintenance

Proper maintenance of the hose is essential to the safe use of the hose and related equipment. Hose should be stored in a dry place. Hose should also be visually inspected. Any hose that has a cut or gouge in the cover that exposes the reinforcement should be retired from service. Hoses should also be inspected for kinking or broken reinforcement. If the outside diameter of the hose is reduced by 20% at the spot where it is bent then the hose should be retired from service. Inadequate attention to maintenance of the hose can result in hose leakage, bursting, or other failure which can cause serious bodily injury or property damage from spraying fluids, flying projectiles, or other substances.

How to order

Accurate processing and prompt delivery of your order depends on easy identification of your requirements. Please order Aeroquip brand parts using correct part numbers as described in this catalog. Inquiries and orders should be directed to your Aeroquip distributor or:

Eaton
14615 Lone Oak Road
Eden Prairie, MN 55344
952-937-9800;
888-258-0222;
Fax: 952-974-7722
www.eaton.com/hydraulics

Part numbers and dash sizes

Dash size designates the nominal size in 16th of an inch. This number immediately follows the part number and is separated from it with a dash.

Dimensions

Dimensions given in this catalog for Aeroquip products are approximate and should be used for reference only. Exact dimensional information for a given product is subject to change and varying tolerances; contact Eaton directly for full current information.

⚠ **WARNING**

Hose assemblies

Eaton manufactures the terminal ends of our hose fittings to the appropriate requirements established by the SAE. Therefore, the performance ratings of these hose fittings meet the SAE requirements. It is possible to order a hose assembly with a fitting terminal end that has a performance rating lower than the hose rating. When ordering hose assemblies, please keep the connecting end performance rating in mind since this may affect overall hose assembly performance. Hose assembly components (hose and fittings) are easily assembled in the field. However, factory assembled reusable and crimped hose assemblies are available. For complete information,contact Eaton.

Selection, installation and maintenance of hose and assemblies

The following recommendations on selection, installation and maintenance of hose assemblies were established by the SAE in 1991. Please read these general instructions carefully. More detailed information on many of these subjects is covered in this catalog.

1. Scope

Hose (also includes hose assemblies) has a finite life and there are a number of factors which will reduce its life. This recommended practice is intended as a guide to assist system designers and/or users in the selection, installation, and maintenance of hose.

The designers and users must make a systematic review of each application and then select, install, and maintain the hose to fulfill the requirements of the application. The following are general guidelines and are not necessarily a complete list.

⚠ **Warning: improper selection, installation, or maintenance may result in premature failures, bodily injury, or property damage.**

2. References

2.1 Applicable documents

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

2.1.1 SAE publications

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

J516—Hydraulic hose fittings

J517—Hydraulic hose

3. Selection

The following is a list of factors which must be considered before final hose selection can be made.

3.1 Pressure

After determining the system pressure, hose selection must be made so that the recommended maximum operating pressure is equal to or greater than the system pressure. Surge pressures higher than the maximum operating pressure will shorten hose life and must be taken into account by the hydraulic designer.

3.2 Suction

Hoses used for suction applications must be selected to insure the hose will withstand the negative pressure of the system.

3.3 Temperature

Care must be taken to insure that fluid and ambient temperatures, both static and transient, do not exceed the limitations of the hose. Special care must be taken when routing near hot manifolds.

3.4 Fluid compatibility

Hose selection must assure compatibility of the hose tube, cover and fittings with the fluid used. Additional caution must be observed in hose selection for gaseous applications.

3.5 Size

Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage to the hose due to heat generation or excessive turbulence.

3.6 Routing

Attention must be given to optimum routing to minimize inherent problems.

3.7 Environment

Care must be taken to insure that the hose and fittings are either compatible with or protected from the environment to which they are exposed. Environmental conditions such as ultraviolet light, ozone, salt water, chemicals, and air pollutants can cause degradation and premature failure and, therefore, must be considered.

3.8 Mechanical loads

External forces can significantly reduce hose life. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel-type fittings or adapters may be required to insure no twist is put into the hose. Unusual applications may require special testing prior to hose selection.

3.9 Abrasion

While hose is designed with a reasonable level of abrasion resistance, care must be taken to protect the hose from excessive abrasion which can result in erosion, snagging and cutting of the hose cover. Exposure of the reinforcement will significantly accelerate hose failure.

3.10 Proper end fitting

Care must be taken to insure proper compatibility exists between the hose and coupling selected based on the manufacturer's recommendations substantiated by testing to industry standards such as SAE J517. End fitting components from one manufacturer are usually not compatible with end fitting components supplied by another manufacturer (i.e., using a hose fitting nipple from one manufacturer with a hose socket from another manufacturer). It is the responsibility of the fabricator to consult the manufacturer's written instructions or the manufacturer directly for proper end fitting componentry.

3.11 Length

When establishing proper hose length, motion absorption, hose length changes due to pressure, as well as hose and machine tolerances must be considered.

3.12 Specifications and standards

When selecting hose, government, industry and manufacturers' specifications and recommendations must be reviewed as applicable.

3.13 Hose cleanliness

Hose components vary in cleanliness levels. Care must be taken to insure that the assemblies selected have an adequate level of cleanliness for the application.

3.14 Electrical conductivity

Certain applications require that hose be nonconductive to prevent electrical current flow. Other applications require the hose to be sufficiently conductive to drain off static electricity. Hose and fittings must be chosen with these needs in mind.

4. Installation

After selection of proper hose, the following factors must be considered by the installer.

4.1 Pre-installation inspection

Prior to installation, a careful examination of the hose must be performed. All components must be checked for correct style, size and length. In addition, the hose must be examined for cleanliness, I.D. obstructions, blisters, loose cover, or any other visible defects.

Selection, installation and maintenance of hose and assemblies

The following recommendations on selection, installation and maintenance of hose assemblies were established by the SAE in 1991. Please read these general instructions carefully. More detailed information on many of these subjects is covered in this catalog.

4.2 Follow manufacturers' assembly instructions

Hose assemblies may be fabricated by the manufacturer, an agent for or customer of the manufacturer, or by the user. Fabrication of permanently attached fittings to hydraulic hose requires specialized assembly equipment. Field attachable fittings (screw style and segment clamp style) can usually be assembled without specialized equipment although many manufacturers provide equipment to assist in the operation.

SAE J517 hose from one manufacturer is usually not compatible with SAE J516 fittings supplied by another manufacturer. It is the responsibility of the fabricator to consult the manufacturer's written assembly instructions or the manufacturers directly before intermixing hose and fittings from two manufacturers. Similarly, assembly equipment from one manufacturer is usually not interchangeable with that of another manufacturer. It is the responsibility of the fabricator to consult the manufacturer's written instructions or the manufacturer directly for proper assembly equipment. Always follow the manufacturer's instructions for proper preparation and fabrication of hose assemblies.

4.3 Minimum bend radius

Installation at less than minimum bend radius may significantly reduce hose life. Particular attention must be given to preclude sharp bending at the hose/fitting juncture.

4.4 Twist angle and orientation

Hose installations must be such that relative motion of machine components produces bending of the hose rather than twisting.

4.5 Securement

In many applications, it may be necessary to restrain, protect, or guide the hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

4.6 Proper connection of ports

Proper physical installation of the hose requires a correctly installed port connection while insuring that no twist or torque is put into the hose.

4.7 Avoid external damage

Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage, or damage to sealing surfaces are corrected or eliminated.

4.8 System check out

After completing the installation, all air entrapment must be eliminated and the system pressurized to the maximum system pressure and checked for proper function and freedom from leaks.

Note: Avoid potential hazardous areas while testing.

5. Maintenance

Even with proper selection and installation, hose life may be significantly reduced without a continuing maintenance program. Frequency should be determined by the severity of the application and risk potential. A maintenance program should include the following as a minimum.

5.1 Hose storage

Hose products in storage can be affected adversely by temperature, humidity, ozone, sunlight, oils, solvents, corrosive liquids and fumes, insects, rodents and radioactive materials. Storage areas should be relatively cool and dark and free of dust, dirt, dampness and mildew.

5.2 Visual inspection

Any of the following conditions requires replacement of the hose:

a. Leaks at fitting or in hose (leaking fluid is a fire hazard)
b. Damaged, cut, or abraded cover (any reinforcement exposed)
c. Kinked, crushed, flattened, or twisted hose
d. Hard, stiff, heat cracked or charred hose
e. Blistered, soft, degraded, or loose cover
f. Cracked, damaged, or badly corroded fittings
g. Fitting slippage on hose

5.3 Visual inspection

The following items must be tightened, repaired, or replaced as required:

a. Leaking port conditions
b. Clamps, guards, shields
c. Remove excessive dirt buildup
d. System fluid level,fluid type, and any air entrapment

5.4 Functional test

Operate the system at maximum operating pressure and check for possible malfunctions and freedom from leaks.

Note: Avoid potential hazardous areas while testing.

5.5 Replacement intervals

Specific replacement intervals must be considered based on previous service life, government or industry recommendations, or when failures could result in unacceptable down time, damage, or injury risk.

A

Numbering system

Numbering system

Cut length hose

Cut lengths of hose should be ordered as shown below by specifying lengths in inches.

For numeric part numbers: **2651- 10- 00484**

Hose type — **2651**
Hose size (in 16th of an inch) — **10**
Cut length (in inches) — **00484**
last digit is in 1/8th of an inch 00484 = 48 1/2 inches

For alpha-numeric part numbers: **FC300- 08- 00484**

Hose type — **FC300**
Hose dash size — **08**
Cut length (in inches) — **00484**
last digit is in **1/8th** of an inch **00484** = **481/2 inches**

Bulk hose

Bulk hose should be ordered by specifying length in feet as shown below. **500 ft.- 2651- 10**

Complete number quantity (in feet) — **500 ft.**
Hose type — **2651**
Hose size (in 16ths of an inch) — **10**

Notes: Length tolerance for hose, assemblies and sleeves is:
Up to and including 12 inches: ±1/8"
Above 12 inches to and including 18 inches: ±3/16"
Above 18 inches to and including 36 inches: ±1/4"
Above 36 inches: ±1% of length

Hose selection

Agency listings

Agency listings

Government agencies

DOT/FMVSS US Department of Transportation,Federal Motor Vehicle Safety Standard

FDA US Food and Drug Administration (tubes only)

MIL/DOD US Military Specification, Dept. of Defense

MSHA US Mine Safety and Health Administration

USCG/MMT US Coast Guard, Merchant Marine Technical (SAE J1942 has replaced USCG approval)

DNV Det Norske (Norwegian) Veritas

CGA Canadian Gas Association

Industry agencies

AAR American Association of Railroads

DIN Deutsche (German) Industrial Norme (Replaced by EN)

EN Committee for European Normalization

ABS American Bureau of Shipping

SAE Society of Automotive Engineers

UL Underwriters Laboratories

ISO International Standards Organization

✦ Approved details available from Eaton

The listings below are intended only as guides in identifying which Aeroquip® hoses comply with requirements of various agencies. For current and complete information,contact Eaton.

*Listing may vary by hose style and size, some hoses may require firesleeve or special procedures depending on specific applications, contact Eaton for details.

		Government							Industry						
Hose part no.	**Page**	**DOT/ FMVSS**	**CGA**	**DNV**	**FDA***	**MIL/DOD**	**MSHA**	**USCG/ MMT***	**ISO**	**EN**	**DIN**	**AAR**	**ABS**	**SAE**	**UL**
1503	C-9	106 Type all	-	-	-	-	-	-	-	-	-	-	-	100R5, J1402	-
1531	F-15	-	-	-	-	-	-	-	-	-	-	M618	-	-	-
15CA	F-5	106	-	-	-	-	-	-	-	-	-	-	-	SAE J844 Type B	-
2550	F-15	106 Type all	-	-	-	-	-	✦	-	-	-	-	-	J1402	-
2554	F-15	-	-	-	-	-	-		-	-	-	-	-	J1402	-
2556	C-5	-	-	✦	-	-	✦	-	-	-	-	-	-	20R2 Type 1	-
2565	C-5	-	-	-	-	MIL-H-13444 Type I	-		-	-	-	-	-	20R2	-
2570	F-14	106 Type all	-	-	-	-	-	✦	-	-	-	-	-	J1402	-
2580	C-8	-	-	-	-	MIL-H-24136/3	✦	✦	-	-	-	-	-	-	-
2583	C-7	-	-	-	-	-	✦	-	-	EN 854 Type R3	-	-	-	100R3	-
2651	C-10	-	-	✦	-	-	✦	✦	-	-	-	-	-	100R5	-
2661	B-43	-	-		-	-	✦	✦	-	-	-	-	✦+	100R4	-
2681	B-29	-	-	✦	-	-	✦	✦	1436 Type 1ST	EN 853 Type 1ST	20 022 Type 1ST	-	-	100R1A	-
2781	B-30	-	-	✦	-	-	✦	✦	1436 Type 1ST	EN 853 Type 2ST	20 022 Type 2ST	-	-	100R2A	-
2807	G-8	-	-	✦	-	-	-	✦	-	-	-	-	-	100R14A	-
30CT	B-49,52	-	-	-	-	-	-		-	-	-	-	-	100R18	-
3130	B-44,52	-	-	-	-	-	-		-	-	-	-	-	100R7	-
3740	B-45	-	-	-	-	-	-		-	-	-	-	-	100R7	-
3E80	B-48	-	-	-	-	-	-		-	-	-	-	-	100R8	-
3R80	B-47	-	-	-	-	-	-		-	-	-	-	-	100R8	-
3SCE	F-5	106	-	-	-	-	-		-	-	-	-	-	J844 Type B	-
3V10	B-50	-	-	-	-	-	-		-	-	-	-	-	-	-
3VE0	B-51	-	-	-	-	-	-		-	-	-	-	-	-	-
35FH	F-13	-	-	-	-	-	-		-	-	-	-	-	J30R6, J30R9, J30R11, J1527B1	-
35NG	F-27	-	-	-	-	-	-		-	-	-	-	-		-
37AL	B-46,52	-	-	-	-	-	-		-	-	-	-	-	100R7	-

Hose tube identification chart

1. Synthetic rubber
2. PTFE
3. Thermoplastic
4. AQP
5. Special application hose
6. EPDM

* Listing may vary by hose style and size, some hoses may require firesleeve or special procedures depending on specific applications, contact Eaton for details.

Agency listings

		Government							Industry						
Hose part no.	Page	DOT/ FMVSS	CGA	DNV	FDA*	MIL/DOD	MSHA	USCG/ MMT*	ISO	EN	DIN	AAR	ABS	SAE	UL
3270	F-8	106	-	-	-	-	-		-	-	-	-	-	J844 Type B, J1131, J2494-3	-
4245	F-6	106	-	-	-	-	-		-	-	-	-	-	J844 Type A, J1131, J2494-3	-
4247	F-7	106	-	-	-	-	-		-	-	-	-	-	J844 Type A, J1131, J2494-3	-
4294	F-9	-	-	-	-	-	-		-	-	-	-	-	-	-
4297	F-10	-	-	-	-	-	-		-	-	-	-	-	-	-
8000	G-9	-	-	-	-	-	-		-	-	-	-	-	-	-
8500	G-9	-	-	-	-	-	-		-	-	-	-	-	-	-
CR170	F-26	-	Type III	-	-	-	-	-	-	-	-	-	-	-	-
EC230	B-35	-	-	-	-	-	-	-	-	-	-	-	-	100R2AT Type S	-
EC502	B-33	-	-	-	-	-	-	-	-	EN 853 Type 2SN		-	-	100R2 Type S	-
EC525	B-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EC600	B-20	-	-	-	-	-	-	-	18752-DC	-	-	-	-	100R15	-
EC810	B-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EC850	B-21	-	-	-	-	-	-	-	-	-	-	-	-	100R15	
EC910	B-41	-	-	-	-	-	-	-	7751	EN1829	-	-	-	-	-
EH225	F-16	-	-	-	-	-	-	-	-	-	-	-	-	J20 R3 Class A	-
EH226	F-17	-	-	-	-	-	-	-	-	-	-	-	-	J20 R1 Class A	-
EH227	F-18	-	-	-	-	-	-	-	-	EN412, EN2240	-	-	-	-	-
FC234	F-24	-	-	✦	-	-	✦	✦	-	-	-	-	-	J1527 Type A1	-
FC254	B-36	-	-	✦	-	-	✦	✦	-	EN 856 4SP	-	-	✦	100R11	-
FC273B	B-18	-	-	-	-	-	-	-	3862 Type R13	EN 856 Type R13	-	-	-	100R13	-
FC300	F-22	106 Type all	-	✦	-	-	-	✦	-	-	-	-	✦	100R5, J1019, J1402	-
FC310	B-26	-	-	-	-	-	✦	✦	-	EN 857 Type 1SC	-	-	✦	100R16	-
FC321	F-25	-	-	-	-	-	✦	-	-	-	-	-	-	-	UL21
FC332	C-4	-	-		-	-	-	-	-	-	-	-	✦ +	-	-
FC350	F-21	106 Type all	-	✦	-	-	-	✦	✦	-	-	-	✦	J1402	-
FC355	F-20	106 Type all	-	-	-	-	-	-	-	-	-	-	✦	J1402	-
FC466	C-7	-	-	-	-	-	-	-	-	EN 854 Type R6	-	-	-	100R6	-
FC498	C-6	-	-	-	-	-	✦	-	-	EN 854 Type R6	-	-	-	100R6	-
FC500	B-17	-	-	✦	-	-	✦	✦	-	-	-	-	-	100R13	-
FC510	B-27	-	-	-	-	-	✦	✦	-	EN 857 Type 1SC	-	-	✦	100R2AT	-
FC555	E-6	-	-	-	-	-	-	-	-	-	-	-	-	J2064	
FC579	B-34	-	-	-	-	-	✦	-	-	-	-	-	-	-	-

Hose selection

Agency listings

A

Hose tube identification chart

1. Synthetic rubber
2. PTFE
3. Thermoplastic
4. AQP
5. Special application hose
6. EPDM

* Listing may vary by hose style and size, some hoses may require firesleeve or special procedures depending on specific applications, contact Eaton for details.

Agency listings

		Government							Industry						
Hose part no.	Page	DOT/ FMVSS	CGA	DNV	FDA*	MIL/DOD	MSHA	USCG/ MMT*	ISO	EN	DIN	AAR	ABS	SAE	UL
FC598	C-6	-	-	-	-	-	-	-	-	-	-	-	-	100R6	-
FC606	B-38	-	-	-	-	-	-	-	-	-	-	-	-	100R15	
FC611	B-31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC619	B-42	-	-	-	-	-	✦	-	-	-	-	-	✦ +	100R4	-
EC038	F-14	106 Type all	-	-	-	-	-	-	-	-	-	-	-	J1402	-
FC636	B-40	-	-	-	-	-	-	-	-	-	-	-	-	100R12	-
FC639	B-22	-	-	-	-	-	✦	-	-	-	-	-	✦	100R17	-
FC647	C-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC650	F-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC693	B-32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC699	F-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC735	B-11	-	-	-	-	-	-	-	11237-1 Type 2SC	1436 Type 2SN§	20 022 Type 2SN	‡	-	100R16	-
FC736	B-15	-	-	-	-	-	-	-	-	3862 Type R12	EN856 Type R12	-	-	100R12	-
FC740	G-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC800	E-5	-	-	-	-	-	-	-	-	-	-	-	-	J2064	-
FC802	E-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC839B	B-8	-	-	-	-	-	-	-	-	-	-	-	-	100R17	-
FC849	B-24	-	-	-	-	-	✦	✦	-	-	-	-	✦	100R19	-
FC849B	B-25	-	-		-	-	-	-	-	-	-	-		100R19	-
GH001	E-3	-	-	-	-	-	-	-	-	-	-	-	-	J2064 Type E	-
GH100	F-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GH101	F-19	-	-	-	-	-	-	-	-	EN412, EN2240	-	-	-	-	-
GH120	B-13	-	-	-	-	-	✦	-	-	EN 857 Type 2SC	-	-	-	100R16	-
GH134	E-4	-	-	-	-	-	-	-	-	-	-	-	-	J2064 Type E Class 1	-
GH194	B-9	-	-	✦ +	-	-	✦	-	1436 Type 1SN	EN 853 Type 1SN	20 022 Type 1SN	-	✦	100R1AT	-
GH195	B-12	-	-	-	-	-	✦	✦	1436 Type 2SN	EN 853 Type 2SN	20 022 Type 2SN	-	✦	100R2AT	-
GH466	B-39	-	-	-	-	-	✦	-	-	EN 45545-2	-	-	-	100R15	-
GH493	B-14	-	-	✦	-	-	✦	✦	3862 Type R12	EN 856 TypeR12	-	-	✦	100R12	-
GH506	B-37	-	-	✦	-	-	✦	-	3862 Type 4SH	EN856 Type 4SH	20 023 Type T2	-	✦	-	-
GH663	B-23	-	-	✦	-	-	✦	✦	1436 Type 1SN	EN 853 Type 1SN	20 022 Type 1SN	-	✦	100R1AT	-
GH681	B-7	-	-	-	-	-	✦	-	-	EN 853 Type 1	DIN 20 022 Type 1	-	-	-	-
GH781	B-10	-	-	✦	-	-	✦	✦	11237-1 Type 2SC	EN 857 Type 2SC	-	-	✦	100R16	-
GH793	B-28	-	-	✦	-	-	✦	-	1436 Type 2SN	EN 853 Type 2SN	20 022 Type 2SN	-	✦	100R2AT	-
H057	F-12	-	-	-	-	-	-	-	-	-	-	-	-	30R7	-
H201	C-3	-	-	-	-	-	-	-	-	-	-	-	-	J2064	-
S-Series	G-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S-TW	G-5	-	-	-	-	-	-	-	-	-	-	-	-	100R14A	-
SC-Series	G-4	-	-	-	✦	-	-	-	-	-	-	-	-	-	-
SC-TW Series	G-6	-	-	-	✦	-	-	-	-	-	-	-	-	100R14B	-

Hose dash size to maximum operating pressure

This table is intended as a guide in the selection of hose by maximum operating pressure. It is not a guarantee. Final selection is further dependent on fluid and ambient temperature,concentration of fluid, intermittent or continuous exposure, etc. For further details on a specific hose see the respective catalog pages or contact Eaton.

Hose tube ID chart

1. Synthetic rubber
2. PTFE
3. Thermoplastic
4. AQP
5. Special application hose
6. EPDM

† Pressure rating with reusable style fittings.
‡ Pressure rating with global crimp style fittings.
§ 10,000 psi for static jack hose applications. See hose page for details.

* See hose page for dash sizes not listed.
†† 50 psi max with band clamp style fittings.
***Based on 2:1 safety factor.

Hose part number	Page	Tube	Hose -02	-03	-04	-05	-06	-08	-10	-12	-16	-20	-24	-32	-40	-48
EH225	F-16	5	-	-	400/28	300/21	250/17	250/17	250/17	200/14	-	-	-	-	-	-
EH226	F-17	5	-	-	-	1080/75	1060/73	872/60	797/55	764/53	-	617/43	521/36	442/31	379/26	317/22
2550	F-15	5	-	-	-	-	225/16	-	-	-	-	-	-	-	-	-
2554	F-15	5	-	-	-	-	225/16	-	-	-	-	-	-	-	-	-
2570	F-14	5	-	-	-	-	225/16	225/16	225/16	-	-	-	-	-	-	-
EC038	F-14	6	-	-	-	-	225/16	225/16	-	-	-	-	-	-	-	-
GH100	F-19	1	-	-	400/28	-	400/28	400/28	350/24	350/24	-	-	-	-	-	-
FC647	C-4	1	-	-	360/25	-	300/21	300/21	250/17	250/17	-	-	-	-	-	-
2556	C-5	1	-	-	360/25	-	300/21	300/21	250/17	250/17	-	-	-	-	-	-
FC332	C-4	4	-	-	250/17	-	250/17	250/17	250/17	250/17	-	-	-	-	-	-
2565	C-5	1	-	-	300/21	-	250/17	200/14	175/12	125/9	-	-	-	-	-	-
1531	F-15	5	-	-	-	-	-	-	300/21	300/21	300/21	300/21	-	-	-	-
2661*	B-43	4	-	-	-	-	-	-	-	300/21††	250/17††	200/14††	150/10††	100/7††	62/4	56/4
FC619	B-42	1	-	-	-	-	-	-	-	300/21††	250/17††	200/14††	150/10††	100/7††	62/4	56/4
CR170	F-26	5	-	-	350/24	-	350/24	350/24	-	350/24	-	-	-	-	-	-
FC321	F-25	5	-	-	350/24	350/24	350/24	350/24	350/24	350/24	350/24	-	-	-	-	-
FC498	C-6	4	-	-	400/28	-	400/28	400/28	350/24	350/24	-	-	-	-	-	-
FC598	C-6	4	-	-	400/28	-	400/28	400/28	350/24	350/24	-	-	-	-	-	-
FC466	C-7	1	-	-	400/28	-	400/28	400/28	350/24	350/24	-	-	-	-	-	-
FC699	F-23	5	-	-	400/28	-	400/28	400/28	350/24	350/24	250/17	-	-	-	-	-
2580	C-8	1	-	-	1000/69	-	650/45	625/43	600/41	550/38	500/34	450/31	400/28	350/24	-	-
2583	C-7	1	-	-	1250/86	-	1125/78	1000/69	-	750/52	565/39	375/26	-		-	-
FC650	F-23	4	-	-	1000/69	-	1000/69	1000/69	1000/69	1000/69	-	-	-		-	-
FC355	F-20	4	-	-	1500/103	1500/103	1500/103	1250/86	1250/86	750/52	400/28	300/21	250/17	200/14	-	-
FC234	F-24	5	-	-	-	1500/103	1500/103	1250/86	1250/86	750/52	400/28	-	-	-	-	-
FC350	F-21	4	-	-	2000/138	1500/103	1500/103	1250/86	1250/86	750/52	400/28	300/21	250/17	-	-	-
2807	G-8	2	-	3000/207	3000/207	3000/207	2500/172	2000/138	1500/103	1200/83	1000/69	625/43	-	-	-	-
S-TW	G-5	2	-	-	3000/207	3000/207	2500/172	2000/138	1500/103	1200/83	1000/69	-	-	-	-	-
FC300	F-22	4	-	-	3000/207	3000/207	2250/155	2000/138	1750/121	1500/103	800/55	625/43	500/34	300/21	300/21	-
FC611	B-31	6	-	-	3000/207	-	2250/155	2000/138	-	1250/86	1000/69	625/43	500/34	375/26	-	-
1503	C-9	1	-	-	3000/207	3000/207	2250/155	2000/138	1750/121	1500/103	800/55	625/43	500/34	350/24	350/24	-
2651	C-10	1	-	-	3000/207	3000/207	2250/155	2000/138	1750/121	1500/103	800/55	625/43	500/34	350/24	350/24	-
FC639/ FC839B	B-22 B-8	1	-		3000/207	-	3000/207	3000/207	3000/207	3000/207	3000/207	-	-	-	-	-
GH681	B-7	1	-	-	3000/207	-	3000/207	3000/207	-	-	-	-	-	-	-	-
GH194	B-9	4	-	-	3250/224	-	3000/207	2500/172	2000/138	1800/124	1300/90	900/62	-	-	-	-
GH663	B-23	1	-	-	3700/255	-	3400/235	2900/200	-	2000/138	1500/103	1000/69	750/52	600/41	-	-
			-	-	2750/190†	-	2250/155†	2000/138†	-	1250/86†	1000/69†	-	-	-	-	-
EC810	B-19	1	-	-	-	-	-	-	-	6100/420	6100/420	6100/420	6100/420	6100/420	-	-
EC600	B-20	1	-	-	-	-	-	-	-	6100/420	6100/420	6100/420	-	-	-	-
EC502	B-33	1	-	-	-	-	-	4250/293	-	3125/215	2500/172	-	-	-	-	-
EC230	B-35	1	-	-	-	-	-	-	-	-	-	-	-	-	1150/79	
FC740	G-10	2		3000/210	3000/210	3000/210	2500/175	2000/140	-	-	-	-	-	-	-	-
3130	B-44	3	2500/172	3000/207	3000/207	2500/172	2250/155	2000/138	-	1250/86	1000/69					
2681	B-29	1	-	4000/276	3250/224	3250/224	3000/207	2500/172	2000/138	1800/124	1300/90	900/62	700/48	600	-	-
EC230	B-35	1	-	-	-	-	-	-	-	-	-	-	-		1150/79	-
FC849/ FC849B	B-24	0	-	-	4000/276	-	4000/276	4000/276	4000/276	4000/276	-	-	-		-	-
FC310	B-26	1	-	-	5000/345	-	4000/276	3500/241	-	-	-	-	-		-	-
FC693	B-32	6	-	-	5000/345	-	5000/345	4500/310	4000/276	3500/241	2800/193	2300/159	2000/138	1500/103	-	-
GH120	B-13	1	-	-	6000/414	-	4000/276	3500/241	2750/190	2250/155	2000/138	1625/112	-	-	-	-

Hose selection

Hose dash size to maximum operating pressure

Hose tube identification chart

1. Synthetic rubber
2. PTFE
3. Thermoplastic
4. AQP
5. Special application hose
6. EPDM

† Pressure rating with reusable style fittings.
‡ Pressure rating with global crimp style fittings.
§ 10,000 psi for static jack hose applications. See hose page for details.
* See hose page for dash sizes not listed.
†† 50 psi max with band clamp style fittings.
***Based on 2:1 safety factor.

Hose part number	Page	Tube	Hose -02	-03	-04	-05	-06	-08	-10	-12	-16	-20	-24	-32	-40	-48
FC510	B-27	4	-	-	5000/345	-	-	-	-	5100/350	5100/350	5100/350	5100/350	5100/350	-	-
FC273(B)	B-18	1	-	-	-	-	-	-	-	4000/276	4000/276	3000/207	2500/172	-	-	-
FC636	B-40	6	-	-	5000/345	-	-	4275/295	3650/250	3125/215	2550/175	2250/155	-	-	-	-
FC735	B-11	1	-	-	-	-	5000/345	5000/345	5000/345	4050/280	4050/280	3050/210	-	-	-	-
FC736	B-15	1	-	-	-	-	5500/380	4000/276‡	4000/276‡	-	-	-	-	-	-	-
			-	-	-	-	4000/276‡	3500/241	-	-	-	1625/112	1250/86	1000/69	-	-
2781	B-30	1	-	-	5000/345	-	4000/276	4250/293‡	3625/250‡	3125/215	2000/138	2250/155‡	1800/124‡	1500/103‡	-	-
			-	-	5750/397‡	-	5000/345‡	3500/241	2750/190	3125/216‡	2500/172‡	1625/112	1750/121	1250/86	-	-
GH195	B-12	4	-	-	5750/397	-	5000/345	4500/310	4000/276	3000/207	2500/172	2500/172	2000/138	1600/110	-	-
GH781	B-10	1	-	-	6500/448	-	5300/366	5000/310	4000/276	3500/241	3000/207	2500/172	2000/138	1600/110	-	-
GH793	B-28	1	-	-	6500/448	-	5800/400	3500/241†	2750/190†	3500/241	3000/207	-	-	-	-	-
			-	-	5000/345†	-	4000/276†	6000/415	6000/415	2250/155†	2000/138†	-	-	-	-	-
GH493	B-14	1	-	-	-	-	6500/448	1250/86	-	55000/380	5100/350	4500/310	4000/275	4000/275	-	-
GH506	B-37	1	-	-	-	-	-	-	-	6100/420	5500/380	5100/350	4350/300	3650/250	-	-
FC500	B-17	1	-	-	-	-	-	-	-	5100/350	5100/350	5100/350	5100/350	5100/350	-	-
EC525	B-16	4	-	-	-	-	-	-	-	5000/345	5000/345	3500/240	3500/240	-	-	-
FC254	B-36	1	-	-	-	-	-	7700/530	-	7200/497	6000/414	5100/350	4350/300	4000/275	-	-
GH466	B-39	1	-	-	-	-	-	-	-	-	-	6100/420	6100/420	6100/420	-	-
FC606	B-38	1	-	-	-	-	-	-	-	-	6100/420	6100/420	6100/420	-	-	-
EC850	B-21	1	-	-	-	-	-	-	7250/500	7250/500	7250/500	7250/500	-	-	-	-
FC579***	B-34	1	-	-	10000/690§	-	10000/690§	-	-	-	-	-	-	-	-	-
EC910	B-41	1	-	-	-	-	-	16000/1100	-	14500/1000	1000/690	-	-	-	-	-
3740	B-45	3	-	-	-	-	-	-	-	1250/86	1000/69	-	-	-	-	-
37AL	B-46	3	-	3000/207	3000/207	3000/207	3000/207	3000/207	-	-	-	-	-	-	-	-
37AL	B-46	3	-	3000/207	2750/190	2500/172	2500/172	2250/155	-	-	-	-	-	-	-	-
3R80	B-47	3	-	5100/350	5100/350	-	4050/280	3550/245	-	2300/157	2050/140	-	-	-	-	-
3E80	B-48	3	-	5100/350	5100/350	-	4050/280	3550/245	-	2300/157	2050/140	-	-	-	-	-
30CT	B-49	3	-	3050/210	3050/210	3050/210	3050/210	3050/210	3050/210	-	-	-	-	-	-	-
3V10	B-50	3	-	10000/689	10000/689	-	8000/552	-	-	-	-	-	-	-	-	-
3VE0	B-51	3	-	10000/689	10000/689	-	8000/551	-	-	-	-	-	-	-	-	-
H201	C-3	5	-	-	300/21	300/21	300/21	300/21	300/21	300/21	200/14	-	-	-	-	-
GH001	E-3	5	-	-	500/35	-	500/35	500/35	500/35	500/35	500/35	-	-	-	-	-
GH134	E-4	5	-	-	-	-	500/35	500/35	500/35	500/35	500/35	-	-	-	-	-
FC802	E-5	5	-	-	500/35	-	500/35	500/35	500/35	500/35		-	-	-	-	-
FC800	E-6	5	-	-	-	-	-	-	-	500/35	500/35	500/35	500/35	-	-	-
FC555	E-6	5	-	-	-	-	-	-	-	500/35	500/35	500/35	-	-	-	-
H057	F-12	5	-	50/3	50/3	50/3	50/3	-	-	-	-	-	-	-	-	-
35FH	F-13	5	-	-	175/12	175/12	175/12	-	-	-	-	-	-	-	-	-
EH227	F-18	5	-	-	477/33	-	477/33	425/29	376/26	325/22	300/20	276/19	249/17	200/14	149/10	87/6
GH101	F-19	5	-	-	400/28	-	400/28	400/28	350/24	-	-	-	-	-	-	-
35NG	F-27	5	-	-	5000/345	-	5000/345	5000/345	-	-	-	-	-	-	-	-
NG-TW	G-28	5	-	-	-	-	435/30	435/30	435/30	-	-	-	-	-	-	-
S-Series	G-4	5	-	3500/241	3000/206	3000/206	2500/172	2000/137	1750/120	1500/103	1000/68	-	-	-	-	-
S-Series	G-4	5	-	-	-	-	-	-	-	-	1250/86	1000/68	-	-	-	-
S-Series	G-4	5	-	-	3000/206	-	2500/172	1500/103	-	1250/86	900/62	-	-	-	-	-
SC-Series	G-4	5	-	3500/241	3000/206	3000/206	2500/172	2000/137	1750/120	1500/103	1000/68	-	-	-	-	-
SC-Series	G-4	5	-	-	3000/206	-	2500/172	1500/103	-	1250/86	900/62	-	-	-	-	-
SC-TW	G-6	5	-	-	3000/207	3000/207	2500/172	2000/138	1750/121	1500/103	1000/69	-	-	-	-	-
SC-TW	G-6	5	-	-	3000/207	-	-	-	-	-	900/62	-	-	-	-	-
Hi-PSI	G-7	5	-	-	5000/345	-	5000/345	5000/345	5000/345	5000/345	5000/345	5000/345	5000/345	-	-	-
8000	G-9	5	-	3000/210	3000/210	3000/210	2500/175	2000/140	1500/105	1200/84	1000/70	625/43	-	-	-	-
8500	G-9	5	-	-	-	-	-	1500/103	-	1250/86	900/62	900/62	750/52	500/35	-	-
FC611	B-31	6	-	-	-	-	-	-	-	1250/87	1000/70	625/43	500/35	375/26	-	-

Thread style pressure performance

Eaton closely follows industry standards in design and in application recommendations. A key principle within ISO, SAE and other standards bodies is that the **maximum dynamic working pressure of the hose or adapter assembly** is the lesser of the hose and end connector(s) used.

The first table below provides excerpts from standard industry pressure rating charts for connector types as published by SAE (Society of Automotive Engineers).

Note: The tables below are applicable for low carbon free machining steels typically used in Fluid Power connections. For port type connections, the material and design of the port must be considered and may reduce expected strength.

For high pressure applications Eaton recommends the use of more robust connector designs such as Code 62 flange or O-Ring face seal.

Selected SAE pressure ratings

Dash size	Inch size	37° JIC SAE J514	Pipe SAE J476	Male ORB SAE J1926 ORS adapt.	Male ORB SAE J1926 non-ORS adapt.	Adjustable ORB SAE J1926 ORS adapt.	Adjustable ORB SAE J1926 non-ORS adapt.	ORS SAE J1453	Male flareless SAE J514	Code 61 SAE J518	Code 62 SAE J518
-2	1/8	5000	5000	-	5000	-	5000	-	5000	-	-
-3	3/16	5000	-	9000	5000	6000	5000	-	5000	-	-
-4	1/4	4500	5000	9000	5000	6000	4500	9000	4500	-	-
-5	5/16	4000	-	9000	5000	6000	4500	9000	4000	-	-
-6	3/8	4000	4000	9000	5000	6000	4000	9000	4000	-	-
-8	1/2	4000	3000	9000	4500	6000	4000	9000	4000	5000	6000
-10	5/8	3000	-	9000	3500	6000	3000	6000	3000	-	-
-12	3/4	3000	2500	6000	3500	6000	3000	6000	3000	5000	6000
-14	7/8	2500	-	6000	3000	6000	2500	6000	2500	-	-
-16	1	2500	2000	6000	3000	5000	2500	6000	2500	5000	6000
-20	1 1/4	2000	1150	4000	2500	4000	2000	3600	2000	4000	6000
-24	1 1/2	1500	1000	4000	2500	3000	2000	3600	1500	3000	6000
-32	2	1125	1000	3000	2000	2500	1500	3000	1125	3000	6000

International pressure rating charts

Maximum working pressure (PSI)

Hose fitting connection	Hose fitting size									
	-04	-05	-06	-08	-10	-12	-16	-20	-24	-32
Male British Pipe (BSP)	5000	-	4000	4000	3500	4000	3500	2500	2,000	2000
Female British Pipe (BSP)	5000	-	4000	4000	3500	4000	3500	2500	2,000	2000
Female Pipe (JIS)	5000	-	5000	5000	-	4000	4000	-	-	-

Maximum working pressure (PSI)

Hose fitting Connection	Hose fitting size									
	-06	-08	-10	-12	-15	-18	-22	-28	-35	-42
DIN light	3625	3625	3625	3625	3625	2325	2325	1450	1450	1450

Hose fitting pressure charts

All Eaton components

With higher pressures it is critical to know the construction materials and manufacturing method to ensure performance. When all components in a system are Eaton supplied, for example an Eaton hose fitting is mated with an Eaton adapter or tube fitting, the combination may be used at higher pressures with confidence. These higher ratings are noted in the chart below.

Maximum dynamic working pressure of the hose or adapter assembly is the lesser of the hose and end connector(s) used.

All Eaton pressure ratings[1]

Dash size	Inch size	37° JIC	Male pipe	Female pipe	Male ORB ORS adapter	Male ORB non-ORS adapter	Adjustable ORB ORS adap	Adjustable ORB non-ORS adapter	ORS	Male flareless	Code 61	Code 62	STC
-2	1/8	-	10000	6000	-	5000	-	5000	-	5000	-	-	-
-3	3/16	-	-	-	9000	5000	6000	5000	-	5000	-	-	-
-4	1/4	7000	9500	5000	9000	5000	6000	4500	9000	4500	-	-	6000
-5	5/16	7000	-	-	9000	5000	6000	4500	-	4000	-	-	-
-6	3/8	5000	8000	4000	9000	5000	6000	4000	9000	4000	-	-	5000
-8	1/2	4000	6000	4000	9000	4500	6000	4000	9000	4000	5000	6000	4250
-10	5/8	3800	-	-	9000	3500	6000	3000	9000	3000	-	-	4000
-12	3/4	3300	5000	3500	6000	3500	6000	3000	6000	3000	5000	6000	4000
-14	7/8	-	-	-	6000	3000	6000	2500	-	2500	-	-	-
-16	1	3500	4000	3000	6000	3000	5000	2500	6000	2500	5000	6000	4000
-20	1 1/4	2500	3000	2000	4000	2500	4000	2000	4500	2000	4000	6000	-
-24	1 1/2	2100	2000	1500	4000	2500	3000	2000	4000	1500	3000	6000	-
-32	2	1750	2000	1500	3000	2000	2500	1500	3000	1125	3000	6000	-

Note:

1) These ratings are based on both brazed and one piece construction, one-piece pressures could be increased. Please contact Eaton in these situations.

2) This rating is for thin walled adapters or fittings, the use of manifolds or oversized female ports would allow full rated male pressures.

Dynamic operating pressure

Dynamic operating conditions refers to cyclic pressure impulses, usually considered to be from near zero to the highest system pressure. Hydraulic standards typically represent these as square waves and expect a component to handle on the order of 200,000 to well over one million such cycles with a burst: operating safety factor of 4:1. The above charts are created with dynamic applications in mind. Most industrial and mobile hydraulic systems fit the dynamic operating pressure profile, for example hydraulic work circuits on construction equipment or on injection molding equipment.

Static operating pressure

Static operating conditions typically range from zero to operating pressure, but with far fewer cycles expected for the system life – perhaps 30,000 to 50,000 cycles and sharp pressure spikes are not expected, allowing a burst: operating safety factor of 3:1 or less. For static operating conditions, the Eaton ratings above can be safely increased by 25-30%. For example, a 3000 psi dynamic rated hose might be used in a 4000 psi static pressure application. Typical examples of static applications are water blast and hydraulic jacking.

Materials

The above tables represent performance using common low carbon steel material. Other materials and their characteristics influence these ratings. Medium carbon steels or heat treated materials can support higher working pressures. Conversely non-ferrous materials such as aluminum or brass will have reduced capability – as much as 50%, or less, pressure handling capability. It is important to consider material properties in designing a system to ensure pressure rating compatibility of all materials.

Design & application

Eaton's Fluid Conveyance engineering and support teams have many decades of experience in designing, manufacturing and servicing hydraulic and other fluid conveyance systems globally. Eaton's product line is designed as a comprehensive collection of hose, fittings, connectors, couplings and accessories that allow a system designer to select components to complete a fluid power system or a service technician to replace a component with confidence. The individual product specifications, the above pressure ratings and other technical information are intended as supporting guidelines for system design and service needs and are not to be construed as a guarantee of performance of the system or of individual Eaton components. Eaton provides comprehensive technical support so please call with questions about pressure needs not covered by these charts or for specific application support.

Fluid compatibility

This chart indicates the suitability of various elastomers and metals for use with fluids to be conveyed. It is intended as a guide only and is not a guarantee. Final selection of the proper hose style, seal, or material of metal components is further dependent on many factors including pressure, fluid and ambient temperature, concentration, duration of exposure, etc.

How to use the chart

1. The chart has separate sections for rating elastomers for use as hose inner tubes and as seals. Ratings for a given elastomer may not always be the same in both sections.
2. Both the elastomer and the metal must be considered when determining suitability of a combination for a hose assembly, adapter with o-ring, swivel joint or coupling.
3. Locate the fluid to be conveyed and determine the suitability of the elastomeric and metal components according to the resistance ratings shown for each.
4. Specific hose part numbers can be found under the inner tube material groupings in the Hose Tube Identification Chart.
5. Dimensional and operating specifications for each hose can be found on the catalog pages shown with each hose part number.
6. Information on o-rings and seal options for swivel joints and couplings, and how to specify them, are shown in the respective sections of this catalog.
7. For further details on the products shown in this catalog, and their applications, contact:

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Eden Prairie, MN 55344
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Resistance key rating

E = Excellent – Fluid has little or no effect.

G = Good – Fluid has minor to moderate effect.

C = Conditional – Service conditions should be described to Eaton Aeroquip for determination of suitability for application.

U = Unsatisfactory

The differences between ratings "E" and "G" are relative. Both indicate satisfactory service. Where there is a choice, the materials rated "**E**" may be expected to give better or longer service than those rated "**G**"

NOTE: Special precautions are necessary in gaseous applications due to the potential volume of gaseous fluid in the system. Unless the cover is perforated, hose styles with rubber or thermoplastic covers are not suitable for gases above 250 psi. Hose styles with perforated covers are so noted in their construction descriptions.

⚠ **WARNING**: Compatibility of hose fittings with conveyed fluid is an essential factor in avoiding chemical reactions that may result in release of fluids or failure of the connection with the potential of causing severe personal injury or property damage.

Hose tube identification chart

1. Synthetic rubber

1503	(p.C-9)	EC502	(p.B-33)	FC579	(p.B-34)	FC849B	(p.B-25)
2556	(p.C-5)	EC600	(p.B-20)	FC619	(p.B-42)	FC500	(p.B-17)
2565	(p.C-5)	EC850	(p.B-21)	FC639	(p.B-22)	GH120	(p.B-13)
2580	(p.C-8)	EC910	(p.B-41)	FC606	(p.B-38)	GH466	(p.B-39)
2583	(p.C-7)	EC810	(p.B-19)	FC647	(p.C-4)	GH493	(p.B-14)
2651	(p.C-10)	FC254	(p.B-36)	FC735	(p.B-11)	GH506	(p.B-37)
2681	(p.B-29)	FC273B	(p.B-18)	FC736	(p.B-15)	GH663	(p.B-23)
2781	(p.B-30)	FC310	(p.B-26)	FC839B	(p.B-8)	GH681	(p.B-7)
EC230	(p.B-35)	FC466	(p.C-7)	FC849	(p.B-24)	GH781	(p.B-10)
						GH793	(p.B-28)

2. PTFE

2807	(p.G-8)	S-TW	(p.G-5)	FC740	(p.G-10)	S-Series	(p.G-3)
SC-Series	(p.G-4)	Hi-PSI	(p.G-7)	8000	(p.G-9)	8500	(p.G-9)

3. Synflex thermoplastic elastomer

3E80	(p.B-48)	3VE0	(p.B-51)	30CT	(p.B-49)	3130	(p.B-44)
3R80	(p.B-47)	3V10	(p.B-50)	37AL	(p.B-46)	3740	(p.B-45)

4. AQP

2661	(p.B-43)	FC300	(p.F-22)	FC498	(p.C-6)	FC650	(p.F-23)
EC525	(p.B-16)	FC332	(p.C-4)	FC510	(p.B-27)	FC699	(p.F-23)
FC234	(p.F-24)	FC350	(p.F-21)	FC598	(p.C-6)	GH194	(p.B-9)
		FC355	(p.F-20)	FC598	(p.C-6)	GH195	(p.B-12)

5. Special application hose (not included in fluid chart)

Fuel	FC650	(p. G-5)	GH100	(p.F-19)	GH101	(p.F-19)	35FH (p.F-13)
LPG	FC321	(p. F-25)	35NG	(p.F-27)	NG-TW	(p.F-28)	CR170 (p.F-26)
Railroad air brake	1531	(p.F-15)					
Silicone	EH225	(p.F-16)	EH226	(p. F-17)	EH227	(p.F-18)	EC038 (p.F-14)
Truck air brake	2554	(p.F-15)	2570	(p. F-14)	FC350	(p.F-21)	
A/C	GH001	(p.E-3)	GH134	(p.E-4)	FC802	(p.E-4)	FC800 (p.E-5)
	FC555	(p.E-6)					

6. EPDM rubber

FC611	(p.B-31)	FC636	(p.B-40)	FC693	(p.B-32)		

Seal elastomer data

Seal elastomer	Application specification	Max. operating temperature range
Buna-N†	none	–40°C to +121°C [–40°F to +250°F]
Neoprene	none	–54°C to +100°C [–65°F to +212°F]
EPR (Ethylene Propylene Rubber)/EPDM	none	–54°C to +149°C [–65°F to +300°F]
Viton*	MIL-R-25897	–29°C to +204°C [–15°F to +400°F]

†Buna-N temperature range -65°F to +225°F. Also per MIL-R-6855.

*Viton is a trademark of E.I. DuPont.

Hose selection

Fluid compatibility

This chart is intended for reference use only

The information in this chart pertains strictly to material compatibility and is not intended to be used as an application guide. For information on specific applications not included in this catalog, please contact Eaton Aeroquip.

*Viton is a E.I. DuPont trademark.

Note 1 - Rubber-covered hose must be perforated to allow gas to escape.

Note 2 - Due to the widely different additives in these fluids, testing should be done on the actual fluid being considered.

E=Excellent
G=Good
C=Conditional
U=Unsatisfactory

Fluid	Hose: Synthetic rubber 1	PTFE 2	Thermoplastic elastomer 3	AQP 4	Special application hose 5	EPDM 6	Seals: Buna-N	Neoprene	EPR	Viton*	Urethane	Hytrel	Metal: Steel	Brass	Stainless steel	Aluminum	Monel
Acetaldehyde	U	E	C	U	-	G	U	C	C	U	U	G	G	E	E	E	E
Acetic acid, 10%	U	E	C	C	-	E	U	U	E	G	U	C	U	U	C	C	U
Acetic acid, glacial	U	E	C	C	-	E	U	U	C	U	U	C	U	U	C	C	C
Acetone	U	E	G	U	-	E	U	U	G	U	U	G	E	E	E	E	E
Acetophenone	U	E	-	U	-	E	U	U	E	U	U	-	E	E	E	C	E
Acetyl acetone	U	E	U	U	-	E	U	U	G	U	U	G	U	C	C	C	C
Acetyl chloride	U	E	U	U	-	U	U	U	U	E	U	U	C	C	C	U	E
Acetylene[1]	G	E	G	G	-	E	U	U	G	E	G	G	E	E	E	E	E
Air, hot (up to +160°F)1	E	E	E	E	-	E	E	E	E	E	E	E	E	E	E	E	E
Air, hot (161°F – 200°F)[1]	C	E	U	E	-	E	G	G	E	E	G	G	E	E	E	E	E
Air, hot (201°F – 300°F)[1]	U	E	U	C	-	G	U	U	G	E	U	U	E	E	E	E	E
Air wet, below 160°F[1]	E	E	C	E	-	E	E	E	E	E	G	C	U	G	E	E	E
Aluminum chloride, 10% aq	E	E	E	E	-	E	E	E	E	E	G	E	U	U	U	U	U
Aluminum fluoride, 10% aq	E	E	E	U	-	E	E	E	E	E	G	E	U	U	U	E	C
Aluminum nitrate, 10% aq	E	E	E	C	-	E	E	E	E	E	G	E	U	U	C	C	C
Aluminum sulfate, 10% aq	E	E	G	E	-	E	E	E	E	E	-	G	U	C	E	C	C
Alums, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	U	C	E	C	C
Ammonia, anhydrous[1]	C	U	U	C	-	E	E	E	E	U	-	-	E	U	E	E	E
Ammonia, aqueous	G	G	U	C	-	E	E	E	E	U	-	-	E	U	E	E	E
Ammonium carbonate, 10% aq	U	E	C	U	-	E	U	E	E	U	-	C	C	U	C	C	C
Ammonium chloride, 10% aq	E	E	C	U	-	E	E	E	E	U	-	-	U	U	C	U	C
Ammonium hydroxide, 10% aq	U	E	U	U	-	E	C	C	E	C	U	U	G	U	C	C	U
Ammonium nitrate, 10% aq	E	E	C	U	-	E	E	G	E	U	G	C	G	U	G	G	U
Ammonium phosphate, 10% aq	E	E	C	U	-	E	E	E	E	-	G	C	U	C	G	U	G
Ammonium sulfate/sulfide, 10% aq	E	E	C	U	-	E	E	E	E	U	G	C	U	U	G	U	G
Amyl acetate	U	E	U	U	-	E	U	U	G	U	U	U	E	E	E	E	E
Amyl alcohol	G	E	E	C	-	E	G	C	E	G	C	E	G	G	E	U	G
Aniline, aniline oil	U	E	U	U	-	E	U	U	G	U	U	U	E	U	E	G	G
Aniline dyes	U	E	U	U	-	E	U	G	G	G	U	U	U	C	G	C	G
Asphalt, < 200°F	C	E	G	G	-	U	G	C	U	E	G	G	E	G	E	C	E
IRM 901	E	E	E	E	-	U	E	E	C	E	E	E	E	E	E	E	E
ASTM #2	E	E	E	E	-	U	E	G	U	E	G	E	E	E	E	E	E
IRM 903	E	E	E	E	-	U	E	G	U	E	G	E	E	E	E	E	E
Automatic trans. fluid [2]	G	E	G	G	-	U	E	G	U	E	C	G	E	E	E	E	E
Barium chloride, 10% aq	E	E	C	C	-	E	E	E	E	E	G	C	U	G	G	G	G
Barium hydroxide, 105 aq	E	E	G	C	-	E	E	E	E	E	E	G	G	U	G	U	G
Barium sulfide, 10% aq	E	E	C	C	-	E	E	E	E	E	G	C	C	U	G	U	U
Benzene, benzol	U	E	U	U	-	U	U	U	U	E	U	C	G	E	E	G	E
Benzoic acid	U	E	C	U	-	U	U	U	E	E	C	C	U	G	G	G	G
Benzyl alcohol	U	E	C	U	-	E	U	G	G	E	C	C	E	G	E	G	G
Biodiesel (<180˚F)	G	E	G	C	-	U											
Biodiesel (>180˚F)	C	E	U	U	-	U											
Black sulfate liquor	G	E	C	C	-	E	C	C	C	E	U	C	E	C	E	U	U
Blast furnace gas	C	U	C	G	-	U	U	U	U	E	U	C	E	C	E	U	U
Borax, 10% aq	E	E	G	C	-	E	G	G	E	E	G	E	E	E	E	G	-
Boric acid, 10% aq	E	E	C	E	-	E	G	G	G	E	G	G	U	G	C	C	C
Brine	G	E	C	C	-	C	E	G	E	E	G	C	U	G	G	U	E
Bromine, dry	U	E	U	U	-	U	U	U	U	E	U	U	U	C	U	C	C
Butane[1]	LPG approved hose only				-	E	C	U	E	-	-	E	E	E	E	E	
Butyl acetate	U	E	U	U	-	E	U	U	G	U	U	C	E	E	E	E	E
Butyl alcohol	E	E	G	G	-	C	E	E	G	E	G	G	G	G	G	G	G

Resistance key rating

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G = Good – Fluid has minor to moderate effect.

C = Conditional – Service conditions should be described to Eaton Aeroquip for determination of suitability for application.

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Note 1 - Rubber-covered hose must be perforated to allow gas to escape.
Note 2 - Due to the widely different additives in these fluids, testing should be done on the actual fluid being considered.

E=Excellent G=Good C=Conditional U=Unsatisfactory	Hose						Seals						Metal				
	Synthetic rubber	PTFE	Thermoplastic elastomer	AQP	Special application hose	EPDM	Buna-N	Neoprene	EPR	Viton*	Urethane	Hytrel	Steel	Brass	Stainless steel	Aluminum	Monel
	1	2	3	4	5	6											
Fluid																	
Butyl cellosolve	U	E	U	U	-	E	U	U	G	U	U	C	E	E	E	E	E
Butylene (butene)[1]	C	E	-	C	-	U	C	U	U	E	U	-	E	E	E	E	E
Butyl stearate	U	E	-	U	-	U	G	U	U	E	-	-	G	G	G	G	G
Butyraldehyde	U	E	-	U	-	E	U	U	G	U	U	-	E	E	E	E	G
Calcium acetate, 10% aq	G	E	C	C	-	E	G	G	E	U	U	C	G	G	G	C	G
Calcium bisulfate, 10% aq	U	E	C	G	-	U	E	E	U	E	G	G	U	C	C	U	U
Calcium chloride, 10% aq	E	E	E	C	-	E	E	E	E	E	E	E	G	G	G	C	G
Calcium hydroxide, 10% aq	E	E	C	C	-	E	E	E	E	E	U	C	G	G	G	U	G
Calcium hydroxide, 10% aq	C	E	C	U	-	E	U	U	E	E	U	C	U	G	C	U	U
Calcium nitrate, 10% aq	E	E	E	G	-	E	E	E	E	E	E	E	G	G	G	G	G
Carbitol	G	E	G	C	-	G	G	G	G	G	U	G	E	E	E	E	E
Carbolic acid (phenol)	U	E	U	U	-	C	U	U	G	E	U	U	U	E	E	-	-
Carbonic acid	C	E	C	U	-	E	G	E	E	E	C	C	U	C	E	G	E
Carbon dioxide, dry gas[1]	E	E	E	E	-	E	G	G	E	E	G	E	E	E	E	E	E
Carbon disulfide	U	E	U	U	-	U	U	U	U	E	C	C	G	G	G	E	G
Carbon monoxide[1]	E	E	E	E	-	E	G	G	E	E	G	E	E	E	E	E	E
Carbon tetrachloride	U	E	U	U	-	U	U	U	U	E	U	U	U	G	G	U	E
Castor oil	E	E	G	E	-	G	E	E	G	E	G	G	E	E	E	E	E
Cellosolve acetate	U	E	U	U	-	E	U	U	G	U	U	U	U	U	E	G	E
China wood oil (tung Oil)	E	E	C	C	-	U	G	G	U	E	U	C	E	G	E	E	E
Chlorine1	U	G	U	U	-	U	U	U	U	G	U	U	C	C	C	C	C
Chloroacetic acid	U	E	U	U	-	E	U	U	G	U	U	U	U	U	U	U	G
Chloroacetone	U	E	U	U	-	E	U	U	E	U	U	U	G	G	G	U	G
Chlorobenzene	U	E	U	U	-	U	U	U	U	G	U	U	G	G	G	G	G
Chloroform	U	E	U	U	-	U	U	U	U	E	U	U	G	G	G	G	G
O-Chlorophenol	U	E	U	U	-	U	U	U	U	E	U	U	G	G	G	U	G
Chlosulfonic acid	U	U	U	U	-	U	U	U	U	U	U	U	G	U	G	G	C
Chrome plating solution	U	E	-	U	-	U	U	U	G	E	U	-	C	U	U	U	U
Chromic acid	U	E	-	U	-	C	U	U	C	E	U	-	C	U	U	U	U
Citric acid	G	E	C	G	-	E	E	E	E	E	E	C	C	C	C	C	C
Coke oven gas	U	E	-	U	-	U	U	U	U	E	U	-	E	C	E	U	U
Copper chloride, 10% aq	E	E	E	G	-	E	E	E	E	E	G	E	U	U	U	U	U
Copper cyanide, 10% aq	E	E	-	G	-	E	E	E	E	E	E	-	E	U	G	U	G
Copper sulfate, 10% aq	E	E	G	G	-	E	E	E	E	E	G	G	U	C	G	U	G
Cotton seed Oil	E	E	E	G	-	C	E	G	C	E	E	E	E	E	E	E	E
Creosote (coal tar)	G	E	U	G	-	U	G	C	U	E	U	U	E	C	E	E	E
Crude oil	G	E	C	E	-	U	E	G	U	E	G	C	G	U	G	U	U
Cyclohexanol	C	E	C	G	-	U	E	G	U	E	C	C	E	E	E	C	E
Cyclohexanone	U	E	C	U	-	G	U	U	G	U	G	G	E	E	E	C	E
Detergent/ Water solution	E	E	C	G	-	E	E	E	E	E	C	C	G	E	E	E	E
Diacetone alchohol (acetol)	U	E	U	U	-	E	U	U	E	U	C	C	E	E	E	E	E
Dibenzyl ether	U	E	-	U	-	G	U	U	G	U	-	-	G	G	G	G	G
Diesel oil [2]	G	E	C	G	-	U	E	C	U	E	C	C	E	E	E	E	E
Diethylamine	C	E	-	C	-	C	G	G	G	U	-	-	E	U	E	-	E
Dioctyl phthalate (DOP)	U	E	C	C	-	G	U	U	G	G	C	C	E	E	E	E	E
Dowtherm A&E	U	E	-	U	-	U	U	U	U	E	-	-	G	U	E	E	E
Ethyl alcohol (Ethanol)	E	E	C	G	-	E	E	E	E	E	C	C	E	E	E	G	E
Ethyl acetate	U	E	C	U	-	G	U	U	G	U	C	C	E	E	E	E	E
Ethyl benzene	U	E	-	U	-	U	U	U	U	E	U	-	E	G	G	G	E
Ethyl cellulose	G	E	U	U	-	G	G	G	G	U	C	C	E	G	G	G	G
Ethyl chloride	C	E	U	U	-	U	U	U	U	E	U	U	E	E	E	G	G
Ethylene dichloride	U	E	U	U	-	U	U	U	U	G	U	U	G	C	G	G	G
Ethylene glycol	E	E	C	G	-	E	E	E	E	E	C	C	U	G	E	E	E

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Hose selection

Fluid compatibility

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*Viton is a E.I. DuPont trademark.

Note 1 - Rubber-covered hose must be perforated to allow gas to escape.

Note 2 - Due to the widely different additives in these fluids, testing should be done on the actual fluid being considered.

E=Excellent
G=Good
C=Conditional
U=Unsatisfactory

Fluid	Hose: Synthetic rubber 1	PTFE 2	Thermoplastic elastomer 3	AQP 4	Special application hose 5	EPDM 6	Seals: Buna-N	Neoprene	EPR	Viton*	Urethane	Hytrel	Metal: Steel	Brass	Stainless steel	Aluminum	Monel
Ferric chloride, 10% aq	E	E	-	G	-	E	E	G	E	E	-	-	U	U	U	U	U
Ferric nitrate, 10% aq	E	E	C	E	-	E	E	E	E	E	C	C	U	U	G	U	U
Ferric sulfate, 10% aq	E	E	C	E	-	E	G	G	G	E	C	C	U	U	E	U	U
Formaldehyde	U	E	C	U	-	E	C	C	G	G	C	C	E	E	E	G	G
Formic acid	G	E	U	C	-	E	C	G	E	U	U	U	U	C	C	C	C
Fuel oil	E	E	G	E	-	U	E	G	U	E	G	G	E	E	E	E	E
Furfural	U	E	-	U	-	G	C	C	G	U	U	-	G	G	G	G	G
Gallic acid, solution	G	E	-	C	-	G	G	G	G	E	U	-	U	-	G	C	G
Gasoline[2]	G	E	E	G	-	U	E	C	U	E	E	E	E	E	E	E	E
Gasohol[2]	G	E	G	C	-	U	G	G	U	E	E	E	E	E	E	G	E
Glycerine/ Glycerol	E	E	E	E	-	E	E	E	E	E	G	E	E	G	E	E	E
Green sulfate liquor	G	E	-	U	-	E	G	G	E	E	-	-	U	U	E	U	U
Helium[1]	E	G	C	E	-	E	E	E	E	E	E	E	E	E	E	E	E
Heptane	E	E	E	C	-	U	E	G	U	E	G	G	E	E	E	E	E
Hexaldehyde	U	E	-	U	-	E	U	G	G	U	U	-	G	G	E	E	G
Hexane	E	E	E	E	-	U	E	G	U	E	G	G	E	E	E	E	E
Hydraulic oils[2]																	
Ester blend	C	E	C	G	-	C	E	U	U	E	U	E	E	E	E	E	E
Phos. Ester/ petroleum blend	U	E	C	U	-	U	U	U	U	C	U	G	E	E	E	E	E
Silicone oils	E	E	E	E	-	E	E	E	E	E	E	E	E	E	E	E	E
Straight petroleum base	E	E	E	E	-	U	E	G	U	E	E	E	E	E	E	E	E
Straight phosphate ester	U	E	C	U	-	E	U	U	G	C	U	G	E	E	E	E	E
Water glycol	E	E	C	G	-	E	E	E	E	E	C	C	E	E	E	G	E
Water petroleum emulsion	E	E	C	G	-	U	E	G	U	E	C	C	C	E	E	G	E

Fluid	Hose: Synthetic rubber 1	PTFE 2	Thermoplastic elastomer 3	AQP 4	Special application hose 5	EPDM 6	Seals: Buna-N	Neoprene	EPR	Viton*	Urethane	Hytrel	Metal: Steel	Brass	Stainless steel	Aluminum	Monel
Hydrobromic acid	U	E	U	E	-	G	U	U	E	E	U	U	E	U	E	E	U
Hydrochloric acid, cold	U	E	U	U	-	G	U	U	G	E	U	U	U	U	U	U	U
Hydrocyanic acid	C	E	-	U	-	E	C	C	E	E	-	-	E	E	G	E	G
Hydrofluoric acid	U	E	U	U	-	U	U	U	C	U	U	U	U	U	U	U	C
Hydrofluorosilic acid	E	E	-	G	-	G	G	G	E	E	-	-	U	U	U	U	U
Hydrogen[1]	G	C	G	G	-	E	E	E	E	E	E	E	E	E	E	E	E
Hydrogen peroxide	C	E	G	C	-	G	G	G	G	E	G	G	U	U	G	E	U
Hydrogen sulfide, dry	C	C	C	U	-	E	U	G	E	U	-	G	E	G	G	G	G
Isocyanate	U	E	U	U	-	U	U	U	G	E	U	U	G	-	G	-	-
Iso octane	G	E	E	G	-	U	E	G	U	E	G	E	E	E	E	E	E
Isopropyl acetate	U	E	C	U	-	C	U	U	G	U	U	C	E	-	E	E	E
Isopropyl alcohol	G	E	C	G	-	E	G	G	E	E	U	C	E	E	E	G	E
Isopropyl ether	G	E	-	C	-	U	G	U	U	U	C	-	G	G	G	-	-
JP-4, JP-5	E	E	G	E	-	U	E	U	U	E	U	G	E	E	E	E	E
Kerosene	G	E	G	E	-	U	E	U	U	E	U	G	E	E	E	E	E
Lacquer/ lacquer solvents	U	E	U	U	-	E	U	U	U	U	U	G	U	E	E	E	E
Lime sulfur	U	E	C	U	-	E	U	E	E	E	C	C	G	U	G	-	U
Linseed oil	E	E	G	G	-	U	E	G	U	E	G	G	E	E	E	E	E
LPG[1]	LPG approved hose only						E	G	U	E	-	-	E	E	E	E	E
Lubricating oils[2]	See hydraulic oils						See hydraulic oils						See hydraulic oils				
Magnesium chloride, 10%aq	E	E	C	E	-	E	E	E	E	E	C	C	E	C	C	G	G
Magnesium hydroxide, 10% aq	G	E	C	G	-	E	G	G	E	E	C	C	E	G	E	G	G
Magnesium sulfate, 10% aq	E	E	C	E	-	E	E	E	E	E	C	C	E	E	E	E	E
Maleic acid	U	E	C	C	-	G	U	U	U	E	C	C	E	G	G	G	G
Maleic anhydride	U	E	C	U	-	C	U	U	U	E	C	C	G	U	E	G	E
Malic acid	G	E	-	G	-	U	G	G	U	G	-	-	U	-	E	G	E
Mercuric chloride	G	E	E	G	-	G	E	E	E	E	E	E	U	U	U	U	U
Mercury	E	E	E	E	-	E	E	E	E	E	E	E	E	U	E	U	G
Methanol	E	E	C	E	-	E	G	G	E	U	C	C	G	G	E	C	E

Resistance key rating

E = Excellent – Fluid has little or no effect.

G = Good – Fluid has minor to moderate effect.

C = Conditional – Service conditions should be described to Eaton Aeroquip for determination of suitability for application.

U = Unsatisfactory

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Note 1 - Rubber-covered hose must be perforated to allow gas to escape.

Note 2 - Due to the widely different additives in these fluids, testing should be done on the actual fluid being considered.

E=Excellent G=Good C=Conditional U=Unsatisfactory	Synthetic rubber	PTFE	Thermoplastic elastomer	AQP	Special application hose	EPDM	Buna-N	Neoprene	EPR	Viton*	Urethane	Hytrel	Steel	Brass	Stainless steel	Aluminum	Monel
	1	2	3	4	5	6											
Fluid	**Hose**						**Seals**						**Metal**				
Methyl bromide	C	E	U	U	-	U	G	U	U	E	U	U	E	E	G	U	E
Methyl chloride	U	E	U	U	-	U	U	U	U	E	U	U	E	E	E	U	G
Methyl butyl ketone	U	E	U	U	_	E	U	U	E	U	C	C	E	E	E	-	E
Methyl ethyl ketone	U	E	U	U	_	E	U	U	E	U	U	G	G	G	G	G	G
Methylene chloride	U	E	U	U	_	U	U	U	U	G	U	U	G	G	G	G	G
Methyl isobutyl ketone	U	E	U	U	_	E	U	U	U	U	U	U	G	G	G	G	G
Methyl isopropyl ketone	U	E	U	C	-	E	U	U	U	U	U	U	G	G	G	G	G
Methyl salicylate	U	E	-	U	-	C	U	U	C	U	-	-	E	G	G	E	G
MIL-L-2104	E	E	E	E	-	U	E	G	U	E	E	E	E	E	E	-	E
MIL-H-5606	E	E	E	E	-	U	E	G	U	E	E	E	E	E	E	E	E
MIL-H-6083	E	E	E	E	-	U	E	E	U	E	E	E	E	E	E	-	E
MIL-L-7808	G	E	G	G	-	U	G	U	U	E	G	G	G	G	E	-	-
MIL-L-23699	E	E	-	G	-	U	G	U	U	E	-	-	E	E	E	E	E
MIL-H-46170	G	E	-	G	-	C	E	G	U	E	-	-	E	E	E	-	E
MIL-H-83282	G	E	-	G	-	U	E	U	U	E	-	-	E	E	E	-	E
Mineral oils	E	E	G	E	-	U	E	G	U	E	G	G	E	E	E	E	E
Naphtha	C	E	G	E	-	U	C	U	U	E	C	G	-	-	-	-	-
Naphthalene	U	E	U	U	-	U	U	U	U	E	C	G	E	G	E	G	G
Naphthenic acid	U	E	-	U	-	U	C	U	U	E	-	-	-	G	E	G	G
Natural gas[1]	LPG approved hose only						E	E	U	E	-	-	G	G	G	G	G
Nickel acetate, 10% aq	G	C	U	G	-	E	C	C	E	G	U	U	G	C	E	G	E
Nickel chloride, 10% aq	E	E	U	E	-	E	E	G	E	E	U	U	U	U	G	U	G
Nickel sulfate, 10% aq	E	E	U	E	-	E	E	E	E	E	U	U	U	G	G	U	G
Nitric acid, to 10%	U	E	U	U	-	G	U	U	U	E	U	C	U	U	E	U	U
Nitric acid, over 10%	U	C	U	U	-	U	U	U	U	G	U	U	U	U	E	C	U
Nitrobenzene	U	E	U	U	-	E	U	U	U	G	U	U	E	G	E	E	E

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	1	2	3	4	5	6											
Fluid	**Hose**						**Seals**						**Metal**				
Nitrogen[1]	E	E	E	E	-	E	E	E	E	E	E	E	E	E	E	E	E
Octyl alcohol	C	E	E	U	-	U	E	E	E	E	E	E	E	E	E	E	E
Oleic acid	G	E	G	U	-	U	U	U	C	G	G	E	C	E	G	C	G
Ortho-dichlorobenzene	U	E	-	U	-	U	U	U	U	E	-	-	G	G	G	G	G
Oxalic acid, 10% aq	C	E	C	C	-	E	G	G	E	E	C	C	U	C	C	C	C
Oxygen[1]	U	U	U	U	-	E	-	-	-	-	-	-	G	G	G	G	G
Palmitic acid	E	E	E	E	-	G	E	G	G	E	-	E	G	-	E	G	G
Para-dichlorobenzene	U	E	-	U	-	U	U	U	U	E	-	-	G	G	G	G	G
Pentane[1]	Lpg approved hose only						E	E	U	E	U	G	G	G	G	E	G
Perchloric acid	U	E	U	U	-	G	E	G	G	E	U	U	U	U	U	U	U
Per-chloroethylene	U	E	U	U	-	U	U	U	U	E	U	U	C	G	G	G	E
Petroleum base oils	G	E	E	E	-	U	E	G	U	E	E	E	E	E	E	E	E
Phenol (carbolic acid)	U	E	U	U	-	U	U	U	G	E	U	U	U	E	E	E	G
Phosphate ester[2]	U	E	C	U	-	E	U	U	G	C	U	G	E	E	E	E	E
Phosphoric acid 20%	U	E	U	U	-	E	U	U	G	E	U	U	U	E	U	C	E
Phosphorous trichloride	U	E	U	U	-	E	U	U	E	E	U	U	C	U	C	E	E
Potassium Acetate, 10% aq	G	E	-	G	-	E	G	G	E	U	-	-	C	G	C	U	G
Potassium chloride, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	E	C	E	U	G
Potassium cyanide, 10% aq	E	E	E	G	-	E	E	E	E	E	E	E	C	U	G	U	C
Potassium dichromate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	C	C	C	C	C
Potassium hydroxide, to 10%	G	E	C	C	-	E	G	G	E	G	C	C	G	G	G	U	E
Potassium hydroxide, over 10%	C	E	U	C	-	E	C	C	E	U	U	U	G	G	G	U	E
Potassium nitrate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	G	G	E	G	-
Potassium sulfate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	-	-	-	-	-
Propane[1] (liquified)	LPG approved hose only						C	-	-	-	-	-	E	E	E	E	E

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Hose selection

Fluid compatibility

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Fluid	Hose: Synthetic rubber 1	PTFE 2	Thermoplastic elastomer 3	AQP 4	Special application hose 5	EPDM 6	Seals: Buna-N	Neoprene	EPR	Viton*	Urethane	Hytrel	Metal: Steel	Brass	Stainless steel	Aluminum	Monel
Propyl acetate	U	E	-	U	-	G	U	U	G	U	-	-	E	-	E	E	E
Propyl alcohol	E	E	U	E	-	E	E	E	E	E	U	U	E	E	E	E	E
Propylene[1]	U	E	-	U	-	U	U	U	U	E	-	-	E	E	E	E	E
Refrigerant R-121	E	-	G	C	-	C	G	E	C	E	E	E	E	E	E	E	E
Refrigerant R-131	E	-	G	C	-	G	G	E	C	E	E	E	E	E	E	E	E
Refrigerant R-221	U	C	U	U	-	E	U	E	C	U	U	U	E	E	E	E	E
Refrigerant R-134a1	C	C	U	U	-	E	E	C	U	U	U	E	E	E	E	E	E
Sewage	G	E	E	G	-	E	E	E	E	E	U	E	G	G	G	G	G
Silicone oils	G	E	E	G	-	E	E	E	E	E	E	E	E	E	E	E	E
Soap (water solutions)	E	E	C	E	-	E	E	E	E	E	C	C	E	E	E	U	E
Sodium acetate, 10% aq	G	U	-	G	-	E	G	G	E	U	-	-	E	E	G	E	E
Sodium Bicarbonate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	G	G	E	G	E
Sodium borate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	E	E	E	G	-
Sodium carbonate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	E	G	E	U	E
Sodium chloride, 10% aq	E	E	E	G	-	E	E	E	E	E	E	E	U	C	C	C	E
Sodium cyanide, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	E	-	C	U	U
Sodium hydroxide, to 10%	C	E	G	C	-	E	U	G	E	E	G	G	C	G	C	U	C
Sodium hydroxide, over 10%	U	E	C	U	-	E	U	U	G	E	C	C	C	C	C	U	C
Sodium hypochlorite, 10% aq	C	E	C	G	-	G	C	C	E	C	C	C	U	U	U	U	C
Sodium metaphosphate, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	E	G	G	U	G

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Sodium nitrate, 10% aq	G	E	E	G	_	E	G	G	E	-	E	E	E	C	E	E	E
Sodium perborate, 10% aq	G	E	-	G	-	E	G	G	E	E	-	-	C	U	C	U	C
Sodium peroxide, 10% aq	G	E	-	G	-	G	G	G	E	E	U	-	U	U	C	C	C
Sodium phosphates, 10% aq	E	E	E	C	-	E	E	E	E	E	E	E	U	E	G	U	E
Sodium silicate, 10% aq	E	E	E	G	-	E	E	E	E	E	E	E	E	E	E	E	E
Sodium sulfate, 10% aq	E	E	E	G	-	E	E	E	E	E	E	E	C	G	G	G	G
Sodium sulfide, 10% aq	E	E	E	G	-	E	E	E	E	E	E	E	C	U	C	U	G
Sodium thiosulfate, 10% aq	G	E	E	G	-	E	G	E	E	E	E	E	U	U	C	G	E
Soy bean oil	E	E	G	C	-	U	E	G	U	E	G	G	E	E	E	E	E
Stannic chloride	G	E	C	G	-	E	E	G	E	E	C	C	U	U	U	U	U
Steam[1] (up to 388°F)	U	E	U	U	-	G	U	U	C	C	U	U	E	E	E	G	E
Stearic acid	G	E	G	G	-	G	G	G	G	E	G	G	C	C	E	C	E
Stoddard solvent	G	E	U	C	-	U	E	G	U	E	U	U	E	E	E	E	E
Styrene	U	E	U	U	-	U	U	U	U	G	U	U	E	E	E	E	E
Sulfur, slurry	C	E	G	E	-	E	U	E	E	E	G	G	E	U	G	E	E
Sulfur chloride, Wet	U	E	-	U	-	U	U	U	U	E	-	-	G	-	G	G	U
Sulfur dioxide, dry[1]	U	E	U	U	-	E	U	U	G	E	U	U	E	G	G	E	G
Sulfuric acid, to 10%	U	E	U	U	-	E	U	G	U	E	C	C	U	G	C	-	E
Sulfuric acid, over 10%	U	E	U	U	-	U	U	U	U	G	U	U	C	C	C	U	C
Sulfurous acid	U	E	U	G	-	G	C	C	U	G	U	U	U	C	C	C	U
Tannic acid	G	E	G	G	-	E	G	E	E	E	G	G	E	E	E	C	E
Tar (Bituminous)	G	E	G	G	-	U	G	U	U	E	G	G	E	G	E	E	E
Tartaric acid	E	E	G	E	-	G	E	G	G	E	G	G	U	C	C	E	E
Tertiary butyl alcohol	G	E	G	E	-	G	G	G	G	E	G	G	G	G	G	G	G
Titanium tetrachloride	U	E	-	U	-	U	C	U	U	E	-	-	E	U	G	U	
Toluene (toluol)	U	E	U	U	-	U	U	U	U	E	U	U	E	E	E	E	E

Resistance key rating

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G = Good – Fluid has minor to moderate effect.
C = Conditional – Service conditions should be described to Eaton Aeroquip for determination of suitability for application.
U = Unsatisfactory

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Trichlorethylene	U	E	U	U	-	U	U	U	U	E	U	U	E	G	E	E	E
Tricresyl Phosphate	U	E	U	U	-	E	U	U	E	G	U	U	E	-	C	-	G
Triethanolamine	G	E	U	G	-	E	E	U	E	U	U	U	E	U	E	E	E
Tung Oil	E	E	C	C	-	U	G	G	U	E	U	C	E	G	E	E	E
Turpentine	E	E	G	G	-	U	G	U	U	E	G	G	G	G	G	G	G
Varnish	C	E	G	G	-	U	G	U	U	E	G	G	E	G	E	E	E
Vinyl Chloride	U	E	U	U	-	U	U	U	U	E	U	U	E	U	C	E	E
Water (to +150°F)	E	E	E	G	-	E	E	E	E	E	E	E	C	G	E	G	E
Water (+151°F to +200°F)	C	E	U	C	-	E	E	E	E	E	U	U	C	G	E	G	E
Water (+201°F to +350°F)	U	E	U	U	-	E	U	U	G	G	U	U	C	G	E	G	E
Water Glycol	E	E	C	E	-	E	E	E	E	E	C	C	E	E	E	G	E
Water Petroleum Emulsion[2]	E	E	C	C	-	U	E	G	U	E	C	C	C	E	E	G	E
Xylene	U	E	C	U	-	U	U	U	U	E	U	C	E	E	E	E	E
Zinc Chloride, 10% aq	E	E	E	E	-	E	E	E	E	E	E	E	E	U	U	C	G
Zinc Sulfate, 10% aq	E	E	-	E	-	E	E	E	E	E	-	-	U	C	G	C	G

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E = Excellent – Fluid has little or no effect.

G = Good – Fluid has minor to moderate effect.

C = Conditional – Service conditions should be described to Eaton Aeroquip for determination of suitability for application.

U = Unsatisfactory

Hydraulic fluids & lubricating oils

The following is a representative list of fluids and manufacturers. The fluids are grouped under generic "family" heads and arranged alphabetically. For each generic "family" listing we have included maximum fluid temperature recommendations for the six hose classifications on page A-15 (1 through 6). Two maximum fluid temperature ratings are listed under designations of "H" and "LP". The "H" designation is for hydraulic service up to the maximum rated operating pressure of any particular hose in the classification. The "LP" designation is for low-pressure service such as lubricating oil systems or low-pressure hydraulic return lines. The letter "U" in the box indicates unsatisfactory resistance to the fluid type. Fluid temperature ratings are predicated on maximum allowable ambient temperatures as follows:

Classifications 1 and 3

(Synthetic rubber and thermoplastic elastomer)

"H" fluid temp. ratings: +140°F ambient

"LP" fluid temp. ratings: +180°F ambient

Classification 2 (PTFE)

"H" fluid temp. ratings: +400°F ambient

"LP" fluid temp ratings: +400°F ambient

Classification 4 (AQP)

"H" fluid temp. ratings: +160°F ambient

"LP" fluid temp. ratings: +250°F ambient

(If "H" fluid temperature is +225°F or less, allowable ambient temperature may be increased to +200°F)

Ambient temperatures in excess of those recommended, in conjunction with maximum fluid temperatures, can materially shorten the service life of the hose.

Caution: The fluid manufacturer's recommended maximum operating temperature for any specific name brand fluid should be scrupulously observed by the user. These recommended temperatures can vary widely between name brands of different fluid compositions, even though they fall into the same generic "family" of fluids. Exceeding the manufacturer's recommended maximum temperature can result in fluid breakdown, producing by-products that are harmful to elastomeric products, as well as other materials in the system. If a manufacturer's recommended maximum temperature for his specific fluid is lower than that for the hose rating, it should take precedence over the hose rating for service usage.

This chart is intended for reference use only.

The information in this chart pertains strictly to material compatibility and is not intended to be used as an application guide. For information on specific applications not included in this catalog, please contact Eaton Aeroquip.

*Viton is a E.I. DuPont trademark.

Note 1 - Rubber-covered hose must be perforated to allow gas to escape.

Note 2 - Due to the widely different additives in these fluids, testing should be done on the actual fluid being considered.

Hose selection

Fluid compatibility

Straight petroleum-base

Maximum fluid temperature recommendation.
See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4
H	+200˚F	+400˚F	+200˚F	+300˚F
LP	+200˚F	+450˚F	+200˚F	+300˚F

Fluid name

Aircraft hydraulic oil AA
Ambrex oils
Arco A.T.F. Dexron
Arco A.T.F. dDexron IV
Arco A.T.F. Ype F
Arco fleet motor
Arco H.T.F. C-2 fluid
Arco H.T.C. 100 fluid
Arco 303 fluid
ATF special
Automatic transmission fluid (Dexron)

Carnea oils
Citgo amplex
Citgo ATF, type F
Citgo ATF, Dexron
Citgo extra duty circulating oils mineral oil (Heavy duty) (R & O)
Citgo motor oils
Citgo pacemaker series mineral oil (R & O)
Citgo pacemaker t series mineral oil (R & O)
Citgo pacemaker XD series mineral oil (Heavy duty) (R & O)
Citgo sentry
Citgo tractor hydraulic fluid
Conoco 303 fluid
Custom motor oil

Dectol R & O oils
Delo 400 motor oils
Delvac oils
Delvac SHC
Delvac special 10W-30
Donax T oils
DTE oils
Duro
Duro AW

EP hydraulic oils
EP industrial oils
EP machine oils
Energol HL68
Energol HLP C68
Etna oils
Exxon ATF

Factovis 52 – Conventional R & O hydraulic fluid

Gulf harmony AW
Gulf security AW
Glide

Hulburt 27 series
Hydraulic series
Hydraulic oils
Hydroil series

Industron 53 – anti wear hydraulic fluid

Lubrite motor 20W-40

Mobil AFT 210
Mobil AFT 220
Mobilfluid 62
Mobilfluid 423
Mobil hydraulic oils
Mobiloil special
Mobiloil super 10W-40

NUTO oils

OC turbine oils

Peaco oils
Pennbell oils
Power-tran fluid

Quadroil series

Rando oils
Rando oils HD
Redind oils
Regal oils R & O
Rimula oils
Rotella oils
Rotella T oils
RPM Delo 200 motor oils
RPM Delo 300 motor oils
RPM Delo special motor oils
Rubilene

Shell brand
Special motor oils
Sun R & O oils
Suntac HP oils
Suntac WR oils
Sunvis 700 oils
Sunvis 800 oils
Sunvis 900 oils
Super hydraulic oils
Supreme motor oils

Tellus oils
Teresstic oils
Torque fluids
Torque fluid 47
Torque fluid 56
Tractor hydraulic fluid

Union ATF Dexron
Union ATF type F
Union C-2 fluid
Union C-P oil
Union custom motor oil
Union gas engine oil
Union Guardol motor oil
Union heavy duty motor oil
Union hydraulic oil AW
Union hydraulic tractor fluid
Union premium motor oil
Union S-1 motor oil
Union special motor oil
Union super motor oil
Union torque correction fluid
Union turbine oil
Union turbine Oil XD
Union Unax
Union Unax AW
Union Unax R & O
Union Unax RX
Union Unitec motor oil
Univis J13
Univis J26
Univis P32

Vactra oils
Vitrea oils

Way lubricants

XD-3 motor oils

Water and petroleum oil emulsion (fr)

Maximum fluid temperature recommendation.
See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4
H	+200˚F	+250˚F	+150˚F	+200˚F
LP	+200˚F	+250˚F	+150˚F	+200˚F

Fluid name

Aqualube
Astrol #587

Chevron FR Fluid D
Chrysler L-705
Citgo pacemaker invert FR fluid
Conoco FR hydraulic fluid

Dasco IFR
Duro FR-HD

Fire resistant hydrafluid
Fire resistant hydraulic
Fluid B
FR 3110 hydraulic fluid (invert)
Fyre-safe W/O

Gulf R & D FR fluid

Houghto-safe 5046
Houghto-safe 5046W
Hulsafe 500
Hy-chock oil
Hydrasol A

Ironsides #814-A
Irus fluid 905

Kutwell 40

Masol fire resistant fluid
Meltran FR 900
Mine guard
Mobilmet S122

Penn drake hydraqua fluid
Permamul FR
Puro FR fluid
Pyrogard C
Pyrogard D

Quintolubric 957 series
Quintolubric 958 series

Regent hydrolube #670

Safoil hydraulic fluid anti-wear
Sinclair Duro FR-HD
Solvac 1535G
Staysol FR
Sunsafe F

Union FR fluid
Union soluble oil HD

Veedol auburn FRH
Veedol auburn FRH Concentrate

Water and glycol solution

Maximum fluid temperature recommendation.
See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4
H	+200˚F	+250˚F	+150˚F	C
LP	+200˚F	+250˚F	+150˚F	C

Fluid name

Chem-trend HF-18
Chem-trend HF-20
Chevron glycol FR fluids
Citgo glycol FR fluids
Citgo glycol FR-20 XD
Citgo pacemaker

Dasco FR 150
Dasco FR 200
Dasco FR 200 B
Dasco FR 310

Fyrguard 150
Fyrguard 200
Fyre-Safe 225

Gulf FR fluid G-200
Gulf FR fluid – G series

Houghto-safe 271
Houghto-safe 416
Houghto-safe 520
Houghto-safe 525
Houghto-safe 616
Houghto-safe 620
Houghto-Safe 625
Houghto-safe 640
Hydra safe 620
Hydra safe 625
Hydraulic safety fluid 200
Hydraulic safety fluid 300
Hyspin AF-1
Hyspin AF-2
Hyspin AF-3

Maxmul
Maxmul FR
Melsyn 200
Melsyn glycol FR

Nyvac FR fluid
Nyvac FR 200 fluid
Nyvac 20 (WG)
Nyvac 30 (WG)

Park water glycol hydraulic fluid
Pennzoil fluid FR 2X

Quintolubric 700 series

Santosafe W/G 15
Santosafe W/G 20
Santosafe W/G 30
Standard glycol FR #15
Standard glycol FR #20
Standard glycol FR #25

Ucon hydrolube 150 CP
Ucon hydrolube 200 CP
Ucon hydrolube 275 CP
Ucon hydrolube 300 CP
Ucon hydrolube 550 CP
Ucon hydrolube 900 CP
Ucon hydrolube 150 DB
Ucon hydrolube 275 DB
Ucon hydrolube 150 LT
Ucon hydrolube 200 LT
Ucon hydrolube 275 LT
Ucon hydrolube 300 LT
Ucon M-1
Ucon hydrolube 200 NM
Ucon hydrolube 300 NM

Hose selection

Fluid compatibility

Straight phosphate-ester (fr)

Maximum fluid temperature recommendation.

See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4	6
H	U	+400˚F	+200˚F	U	200
LP	U	+400˚F	+200˚F	U	200

Fluid name

FR Fluids
Fyrquel 90
Fyrquel 150
Fyrquel 220
Fyrquel 300
Fyrquel 550
Fyrquel 1000
Fyrquel 150 R & O
Fyrquel 220 R & O
Fyrquel 550 R & O

Gulf FR Fluid P-37
Gulf FR Fluid P-40
Gulf FR Fluid P-43
Gulf FR Fluid P-45
Gulf FR Fluid P-47

Houghto-Safe 1010
Houghto-Safe 1055
Houghto-Safe 1115
Houghto-Safe 1120
Houghto-Safe 1130

Pyrogard 51
Pyrogard 53
Pyrogard 55

Safetytex 215
Skydraul 500A
Skydraul 7000

Univis P12

Ester blend turbine oils

Maximum fluid temperature recommendation.

See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4
H	-	-	-	-
LP	+250˚F	+450˚F	+200˚F	+300˚F

Fluid name

Stauffer Jet I
Stauffer Jet II

Silicone oils

Maximum fluid temperature recommendation.

See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4
H	+200˚F	+400˚F	+200˚F	+300˚F
LP	+250˚F	+400˚F	+200˚F	+300˚F

Fluid name

Dow Corning 200 Fluid (100CS)
Dow Corning QF1-2023

Dow Corning 4-3600
Dow Corning 3-3672

Polyol-ester

Maximum fluid temperature recommendation.

See caution on page A-15 for maximum fluid temperatures and limiting ambient temperatures.

Hose classifications (see page. A-15)

	1	2	3	4
H	+150˚F	+400˚F	-	+150˚F
LP	+200˚F	+400˚F	-	+250˚F

Fluid name

Quintolubric 822 Series

Lubricant compatibility chart

	Hose style				
Lubricant	**FC802**	**FC800**	**FC555**	**GH134**	**GH001**
Mineral oil	Y	Y	Y	Y	Y
PAG	Y	Y	Y	Y	Y
Ester oil	Y	Y	Y	Y	Y
Alkylbenzene	Y	Y	Y	C*	C*

* Contact your Eaton or Eaton Tech Support for additional information.
Y = Compatible N = Non-compatible C=Conditional

A

Flow capacities of hose assemblies at suggested flow velocities

The chart below is designed and provided as an aid in the determination of the correct hose size.

Example: At 13 U.S. gallons per minute, what is proper hose size within the suggested velocity range for pressure lines?

Solution: Locate 13 U.S. gallons per minute in the left hand column and 10 feet per second in the right hand column (the center of the suggested velocity range for pressure lines). Lay a straightedge across the two points. The inside diameter is shown in the center column nearest the straight edge.

For suction hose, follow the same procedure except use suggested velocity range for pump inlet lines in the right hand column.

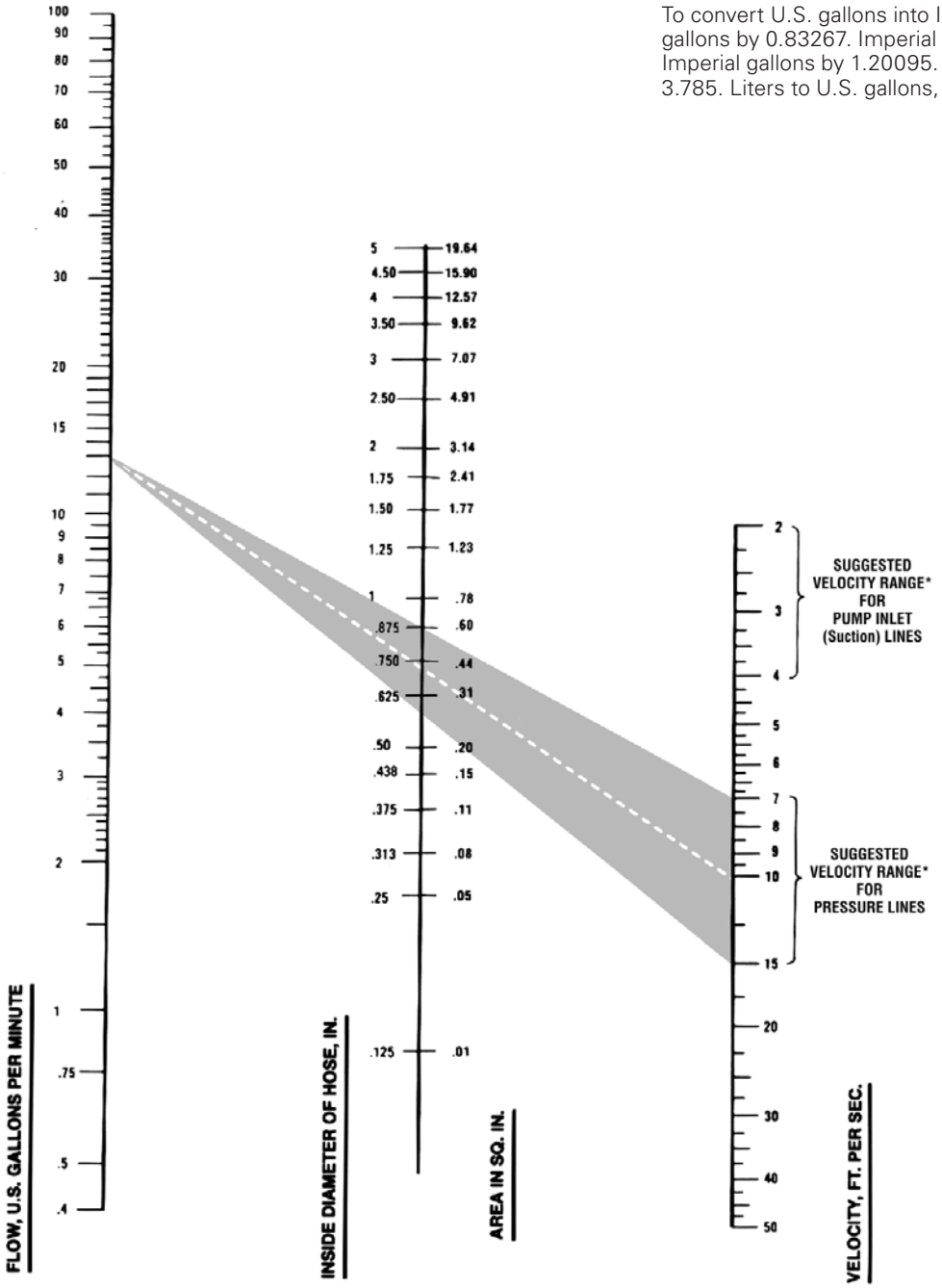
Based on formula

$$\text{Area (sq. in.)} = \frac{\text{G.P.M. x 0.3208}}{\text{Velocity (FT./SEC.)}}$$

* Suggestions are for oils having a maximum viscosity of 315 S.S.U. at +100°F (+38°C) and operating at temperatures between +65°F and +155°F (+54°C to +69°C). Under certain conditions, velocities in pressure lines can be increased up to 25 feet per second. Contact Aeroquip® with specific information on your application.

Conversions

To convert U.S. gallons into Imperial gallons multiply U.S. gallons by 0.83267. Imperial gallons into U.S. gallons multiply Imperial gallons by 1.20095. U.S. gallons to liters multiply by 3.785. Liters to U.S. gallons, multiply by 0.2642.



A

Flow capacities pressure drop

Pressure drop in psi (pounds per square inch)/gpm (gallons per minute) for 10 feet of hose (smooth bore) without fittings.

Fluid specification:

Specific gravity = 0.85;
Viscosity = v =
20 centistokes (C.S.),
(20 C.S. = 97 S.S.U.).

Hose pressure drop

Hose dash size	-04		-05		-06		-08		-10		-12		-16		-20		-24		-32		-40	-48
Hose I.D. (inches)	0.19	0.25	0.25	0.31	0.31	0.38	0.41	0.50	0.50	0.63	0.63	0.75	0.88	1.00	1.13	1.25	1.38	1.50	1.81	2.00	2.38	3.00
U.S. gallons per minute																						
0.25	10	3.1	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.50	19	6	6	2.7	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	40	12	12	5.5	5.5	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	95	24	24	10	10	4.8	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	185	46	46	17	17	7	5	2.2	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	78	78	29	29	12	8	3	3	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-
5	-	120	120	44	44	18	12	4.5	4.5	1.6	1.6	0.72	-	-	-	-	-	-	-	-	-	-
8	-	-	-	95	95	39	26	10	10	3.6	3.6	1.4	0.60	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	59	40	15	15	5.7	5.7	2	1	0.55	-	-	-	-	-	-	-	-
12	-	-	-	-	-	80	52	20	20	7.2	7.2	2.6	1.5	0.75	0.43	-	-	-	-	-	-	-
15	-	-	-	-	-	-	75	30	30	10	10	4.2	2.2	1.2	0.67	0.38	-	-	-	-	-	-
18	-	-	-	-	-	-	107	40	40	15	15	6.3	3	1.5	0.70	0.55	0.35	-	-	-	-	-
20	-	-	-	-	-	-	-	49	49	19	19	8	3.4	2	1.1	0.65	0.43	0.27	-	-	-	-
25	-	-	-	-	-	-	-	72	72	26	26	11	5.5	3	1.6	1	0.64	0.40	0.17	-	-	-
30	-	-	-	-	-	-	-	-	-	34	34	14	7	3.6	2.2	1.3	0.80	0.52	0.22	0.14	-	-
35	-	-	-	-	-	-	-	-	-	47	47	19	9.5	5	2.8	1.7	1.1	0.70	0.27	0.18	-	-
40	-	-	-	-	-	-	-	-	-	-	-	25	12	6.5	3.4	2.2	1.4	0.90	0.38	0.24	-	-
50	-	-	-	-	-	-	-	-	-	-	-	36	17	9	5.3	3.3	2	1.3	0.54	0.35	0.15	-
60	-	-	-	-	-	-	-	-	-	-	-	50	23	12	7.5	4.4	2.8	1.8	0.75	0.45	0.20	-
70	-	-	-	-	-	-	-	-	-	-	-	-	31	17	9.3	6	3.8	2.4	1	0.65	0.30	-
80	-	-	-	-	-	-	-	-	-	-	-	-	38	21	12	7.1	4.6	3	1.2	0.76	0.34	0.11
90	-	-	-	-	-	-	-	-	-	-	-	-	49	27	15	9	5.9	3.8	1.5	1	0.45	0.13
100	-	-	-	-	-	-	-	-	-	-	-	-	-	33	19	12	7	4.7	1.9	1.3	0.55	0.18
150	-	-	-	-	-	-	-	-	-	-	-	-	-	60	36	22	13	8.5	3.4	2.2	1	0.33
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	23	15	6	3.9	1.7	0.55
250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	33	22	8.5	5.3	2.5	0.75
300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45	29	12	7.5	4	1.1
400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	21	14	6.5	2.2
500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	20	10	3
800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	5
1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10

* Pressure drop values listed are typical of many petroleum based hydraulic oils at approximately +100°F (+38°C). Differences in fluids, fluid temperature and viscosity can increase or decrease actual pressure drop compared to the values listed.

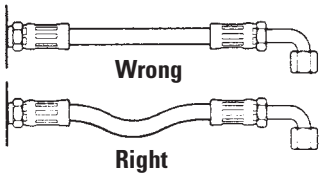
To convert

To convert U.S. gallons into Imperial gallons multiply U.S. gallons by 0.83267. Imperial gallons into U.S. gallons multiply Imperial gallons by 1.20095. U.S. gallons to litres multiply by 3.785. Litres to U.S. gallons, multiply by 0.2642.

Hose routing and installation

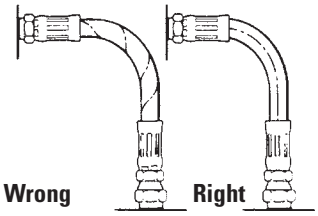
1. Provide for length change.

In straight hose installations, allow enough slack in the hose line to provide for changes in length that will occur when pressure is applied. This change in length can be from +2% to -4%.



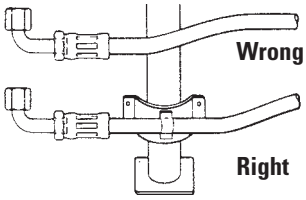
2. Avoid twisting and orient properly.

Do not twist hose during installation. This can be determined by the printed layline on the hose. Pressure applied to a twisted hose can cause hose failure or loosening of connections.



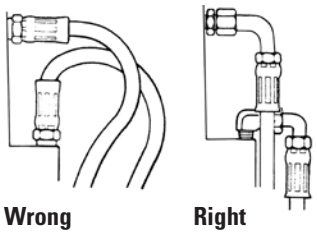
3. Protect from hazardous environment.

Keep hose away from hot parts. High ambient temperature will shorten hose life. If you can not route it away from the heat source, insulate it. (See Spring Guards page K-2)



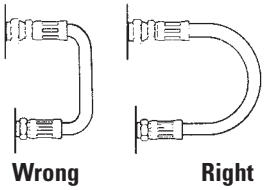
4. Avoid mechanical strain.

Use elbows and adapters in the installation to relieve strain on the assembly and to provide easier and neater installations that are accessible for inspection and maintenance.



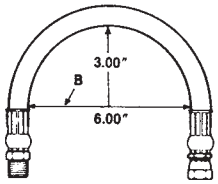
5. Use proper bend radius.

Keep the bend radius of the hose as large as possible to avoid collapsing of the hose and restriction of flow. Follow catalog specs on minimum bend radii.



6. Use proper bend radius (cont'd).

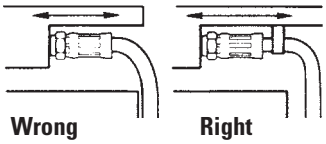
Minimum bend radius is measured on the inside bend of the hose. To determine minimum bend, divide the total distance between ends (B length) by 2. For example, B=6, minimum bend radius=3.



7. Secure for protection.

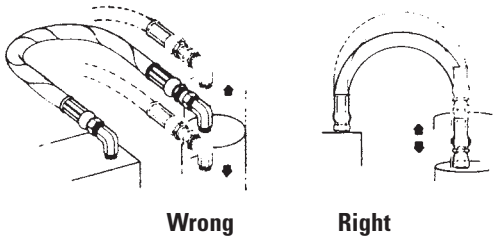
Install hose runs to avoid rubbing or abrasion. Use Areoquip Hose Clamps to support long runs of hose or to keep hose away from moving parts. It is important that the clamps not allow the hose to move. This movement will cause abrasion and premature hose failure.

See Hose Clamps page K-5.



8. Avoid improper hose movement.

Make sure relative motion of the machine components produces bending rather than twisting of the hose. Hose should be routed so that the flex is in the same plane as the equipment movement.



⚠ Refer to safety information regarding hose installation on pages A-2 and A-3.

A

Analyzing failures

Everyone in maintenance encounters hose failures. Normally, there is no problem. The hose is replaced and the equipment goes back in operation. Occasionally the failures come too frequently – the same equipment with the same problems keep popping up. At this point the task is to determine and correct the cause of these repeated failures.

Improper application

Beginning with the most obvious, the most common cause of hose failures – Improper application – compare the hose specifications with the requirements of the application.

Pay particular attention to the following areas:

- The maximum operating pressure of the hose.
- The recommended temperature range of the hose.
- Whether the hose is rated for vacuum service.
- The fluid compatibility of the hose.

Check all of these areas against the requirements of the application. If they don't match up, you need to select another hose. It's a good idea at this point to call on your local hose distributor for assistance in selecting the proper hose. Eaton's distributors, for example, are well equipped to perform this service for you.

Distributor personnel attend special training courses in hydraulics and hose application conducted by the company. Or, if your problem is particularly difficult, the distributor can call on the services of Eaton's field engineering staff. The company will send in a hose and hydraulic specialist to study the problem and come up with a solution.

Improper assembly and installation

The second major cause of premature hose failure is improper assembly and installation procedures. This can involve anything from using the wrong fitting on a hose, to poor routing of the hose.

Eaton provides excellent training material that you can use to combat this problem. A little time spent in training your maintenance people could pay big dividends in reduced downtime.

You can make use of the material available from Eaton to improve your hose assembly and installation techniques.

This material is available free from
Eaton Corporation
14615 Lone oak road,
Eden prairie, MN 55344
USA, 952/937-9800.

External damage

External damage can range from abrasion and corrosion, to hose that is crushed by a lift truck. These are problems that can normally be solved simply once the cause is identified. The hose can be re-routed or clamped, or a fire sleeve or abrasion guard can be used.

In the case of corrosion, the answer may be as simple as changing to a hose with a more corrosion resistant cover or re-routing the hose to avoid the corrosive element.

Faulty equipment

Too frequent or premature hose failure can be the symptom of a malfunction in your equipment. This is a factor that should be considered since prompt corrective action can sometimes avoid serious and costly equipment breakdown. Reprints of an article on "Troubleshooting hydraulic systems," which tells you how to spot problems in a hydraulic system are available from Eaton.

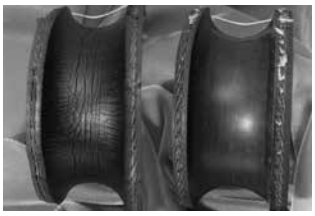
Faulty hose

Occasionally a failure problem will lie in the hose itself. The most likely cause of a faulty rubber hose is old age. Check the lay line on the hose to determine the date of manufacture. (2Q99 means second quarter 1999.) The hose may have exceeded its recommended shelf life. If you suspect that the problem lies in the manufacture of the hose (and don't jump to this conclusion until you have exhausted the other possibilities) contact your distributor. Given effective quality control methods, the odds of a faulty batch of hose being released for sale are extremely small. So make sure that you haven't overlooked some other problem area.

Analyzing failures

A physical examination of the failed hose can often offer a clue to the cause of the failure. Following are 22 symptoms to look for along with the conditions that could cause them:

1. Symptom: The hose tube is very hard and has cracked.



Cause: Heat has a tendency to leach the plasticizers out of the tube. This is a material that gives the hose its flexibility or plasticity.

Aerated oil causes oxidation to occur in the tube. This reaction of oxygen on a rubber product will cause it to harden. Any combination of oxygen and heat will greatly accelerate the hardening of the hose tube. Cavitation occurring inside the tube would have the same effect.

2. Symptom: The hose is cracked both externally and internally but the elastomeric materials are soft and flexible at room temperature.

Cause: The probable reason is intense cold ambient conditions while the hose was flexed. Most standard hoses are rated to –40°F (–40°C). Some AQP hoses are rated at –55°F (–49°C). Military specified hoses are generally rated to –65°F (–54°C). PTFE hose is rated to –100°F (–73°C). Some Everflex Polyon thermoplastic hoses are rated at –65°F (–54°C).

3. Symptom: The hose has burst and examination of the wire reinforcement after stripping back the cover reveals random broken wires the entire length of the hose.

Cause: This would indicate a high frequency pressure impulse condition. SAE impulse test requirements for a double wire braid reinforcement are 200,000 cycles at 133% of recommended working pressure. The SAE impulse test requirements for a four spiral wrapped reinforcement (100R12) are 500,000 cycles at 133% maximum operating and at +250°F (121°C). If the extrapolated impulses in a system amount to over a million in a relatively short time a spiral reinforced hose would be the better choice.

Analyzing failures

4. Symptom: The hose has burst, but there is no indication of multiple broken wires the entire length of the hose. The hose may have burst in more than one place.

Cause: This would indicate that the pressure has exceeded the minimum burst strength of the hose. Either a stronger hose is needed or the hydraulic circuit has a malfunction which is causing unusually high pressure conditions.

5. Symptom: Hose has burst. An examination indicates the wire braid is rusted and the cover has been cut, abraded or deteriorated badly.

Cause: The primary function of the cover is to protect the reinforcement. Elements that may destroy or remove the hose covers are:

1. Abrasion
2. Cutting
3. Battery acid
4. Steam cleaners
5. Chemical cleaning solutions
6. Muriatic acid (for cement clean-up)
7. Salt water
8. Heat
9. Extreme cold

Once the cover protection is gone the wire reinforcement is susceptible to attack from moisture or other corrosive matter.

6. Symptom: Hose has burst on the outside bend and appears to be elliptical in the bent section. In the case of a pump supply line, the pump is noisy and very hot. The exhaust line on the pump is hard and brittle.

Cause: Violation of the minimum bend radius is most likely the problem in both cases. Check the minimum bend radius and make sure that the application is within specifications. In the case of the pump supply line partial collapse of the hose is causing the pump to cavitate creating both noise and heat. This is a most serious situation and will result in catastrophic pump failure if not corrected.

7. Symptom: Hose appears to be flattened out in one or two areas and appears to be kinked. It has burst in this area and also appears to be twisted.

Cause: Torquing of a hydraulic control hose will tear loose the reinforcement layers and allow the hose to burst through the enlarged gaps between the braided plaits of wire strands. Use swivel fittings or joints to be sure there is no twisting force on a hydraulic hose.

8. Symptom: Hose type has broken loose from the reinforcement and piled up the end of the hose. In some cases it may protrude from the end of the hose fitting.

Cause: The probable cause is high vacuum or the wrong hose for vacuum service. No vacuum is recommended for double wire braid, 4 and 6 spiral wire hose unless some sort of internal coil support is used. Even though a hose is rated for vacuum service, if it is kinked, flattened out or bent too sharply this type of failure may occur.

9. Symptom: Hose has burst about six to eight inches away from the end fitting. The wire braid is rusted. There are no cuts or abrasions of the outer cover.

Cause: Improper assembly of the hose end fitting allowing moisture to enter around the edge of the fitting socket. The moisture will wick through the reinforcement. The heat generated by the system will drive it out around the fitting area but six to eight inches away it will be entrapped between the inner line and outer cover causing corrosion of the wire reinforcement.

10. Symptom: There are blisters in the cover of the hose. If one pricks the blisters, oil will be found in them.

Cause: A minute pin hole in the hose tube is allowing the high pressure oil to seep between it and the cover. Eventually it will form a blister wherever the cover adhesion is weakest. In the case of a screw together reusable fitting insufficient lubrication of the hose and fitting can cause this condition because the dry tube will adhere to the rotating nipple and tear enough to allow seepage. Faulty hose can also cause this condition.

11. Symptom: Blistering of the hose cover where a gaseous fluid is being used.

Cause: The high pressure gas is effusing through the hose tube, gathering under the cover and eventually forming a blister wherever the adhesion is weakest. Specially constructed hoses are available for high pressure gaseous applications. Your supplier can advise you on the proper hose to use in these cases.

12. Symptom: Fitting blew off of the end of the hose.

Cause: It may be that the wrong fitting has been put on the hose. Recheck manufacturer's specifications and part numbers. In the case of a crimped fitting the wrong machine setting may have been used resulting in over or under crimping. The socket of a screw together fitting for multiple wire braided hose may be worn beyond its tolerance. The swaging dies in a swaged hose assembly may be worn beyond the manufacturer's tolerances. The fitting may have been applied improperly to the hose. Check manufacturer's instructions. The hose may have been installed without leaving enough slack to compensate for the possible 4% shortening that may occur when the hose is pressurized. This will impose a great force on the fitting. The hose itself may be out of tolerance.

13. Symptom: The tube of the hose is badly deteriorated with evidences of extreme swelling. In some cases the hose tube may be partially "washed out."

Cause: Indications are that the hose tube is not compatible with the agent being carried. Even though the agent is normally compatible, the addition of heat can be the catalyst that can cause inner liner deterioration. Consult your hose supplier for a compatibility list or present him with a sample of the fluid being conducted by the hose for analysis. Make sure that the operating temperatures both internal and external do not exceed recommendations.

Analyzing failures

14. Symptom: Hose has burst. The hose cover is badly deteriorated and the surface of the rubber is crazed.

Cause: This could be simply old age. The crazed appearance is the effect of weathering and ozone over a period of time. Try to determine the age of the hose. Some manufacturers print or emboss the cure date on the outside of the hose. As an example, Aeroquip hose would show "4Q01" which would mean that the hose was manufactured during the fourth quarter (October, November or December) of 2001.

15. Symptom: Hose is leaking at the fitting because of a crack in the metal tube adjacent to the braze on a split flange head.

Cause: Because the crack is adjacent to the braze and not in the braze this is a stress failure brought on by a hose that is trying to shorten under pressure and has insufficient slack in it to do so. We have cured dozens of these problems by lengthening the hose assembly or changing the routing to relieve the forces on the fitting.

16. Symptom: A spiral reinforced hose has burst and literally split open with the wire exploded out and badly entangled.

Cause: The hose is too short to accommodate the change in length occurring while it is pressured.

17. Symptom: Hose is badly flattened out in the burst area. The tube is very hard down stream of the burst but appears normal up stream of the burst.

Cause: The hose has been kinked either by bending it too sharply or by squashing it in some way so that a major restriction was created. As the velocity of the fluid increases through the restriction the pressure decreases to the vaporization point of the fluid being conveyed. This is commonly called cavitation, and causes heat and rapid oxidation to take place which hardens the tube of the hose down stream of the restriction.

18. Symptom: Hose has not burst but it is leaking profusely. A bisection of the hose reveals that the tube has been gouged through to the wire braid for a distance of approximately two inches.

Cause: This failure would indicate that erosion of the hose tube has taken place. A high velocity needle like fluid stream being emitted from an orifice and impinging at a single point on the hose tube will hydraulically remove a section of it. Be sure that the hose is not bent close to a port that is orificed. In some cases where high velocities are encountered particles in the fluid can cause considerable erosion in bent sections of the hose assembly.

19. Symptom: The hose fitting has been pulled out of the hose. The hose has been considerably stretched out in length. This may not be a high pressure application.

Cause: Insufficient support of the hose. It is very necessary to support very long lengths of hose, especially if they are vertical. The weight of the hose along with the weight of the fluid inside the hose in these cases is being imposed on the hose fitting. This force can be transmitted to a wire rope or chain by clamping the hose to it much like the utilities support bundles of wire from pole to pole. Be sure to leave sufficient slack in the hose between clamps to make up for the possible 4% shortening that could take place when the hose is pressurized.

20. Symptom: The hose has not burst but it is leaking profusely. An examination of the bisected hose reveals that the tube has burst inwardly.

Cause: This type of failure is commonly referred to as hose tube blow down. It is usually associated with very low viscosity fluids such as air, nitrogen, freon and other gases. What happens is that under high pressure conditions the gases will effuse into the pores of the hose tube charging them up like miniature accumulators. If the pressure is very suddenly reduced to zero the entrapped gases literally explode out of the tube often tearing holes in it. In some hose constructions a second hose tube made from a plastic such as nylon, is inserted into the hose.

A small leak will allow the gaseous fluid to seep between the two inner liners and when pressure is reduced to zero the innermost liner will collapse because the entrapped pressure around its inner diameter.

21. Symptom: PTFE hose assembly has collapsed internally in one or more places.

Cause: One of the most common causes for this is improper handling of the PTFE assembly. PTFE is a thermoplastic material which is not rubber-like. When bent sharply it simply collapses. This type of collapse is localized in on area and is radical. When the PTFE tube is folded longitudinally in one or more places this could be the result of heat (which softens the hose) along with vacuum conditions inside of it. Because of the additional tension of the wire braid, reinforcement inherent with this type of hose, there is always a radial tension on the tube trying to push it in. Rapid cycling from a very hot agent in the hose to a very cold agent in the hose can produce the same type of failure. Eaton Aeroquip offers an internal support coil that will eliminate this problem.

22. Symptom: A PTFE hose assembly has developed a pin hole leak or several pin hole leaks.

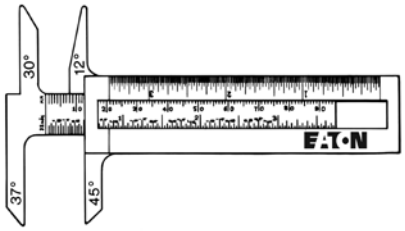
Cause: This situation occurs when a petroleum based fluid, with low viscosity, is flowing at high velocity. This condition can generate high voltage use to static electricity. The high voltage is seeking a ground connection and the only ground connection available is the braided stainless steel reinforcement. This causes an electric arc, which penetrates through the PTFE tube as it travels to the reinforcement. Specially constructed PTFE tubes are available that have enough carbon black in them so as to be conductive. They will "drain off" the static electricity and preclude this problem.

Fluid connectors identification

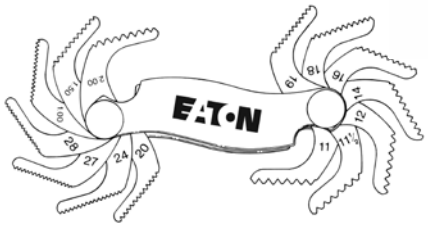
Measuring Tools: A seat angle gauge, thread pitch gauge and an I.D./O.D. caliper are necessary to make accurate measurements of commonly used connectors. Eaton offers a unique new caliper than offers the capabilities of both a caliper and a seat angle gauge in one unit.

FT1341

Identification Tool Kit

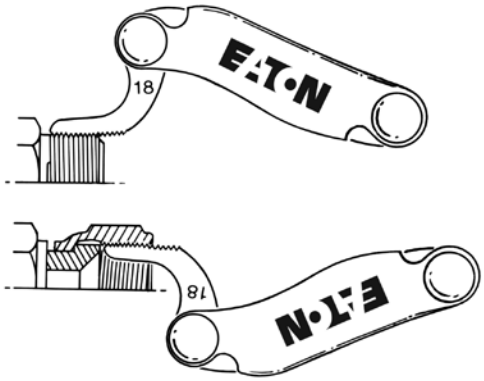


I.D./O.D. Angle gauge caliper

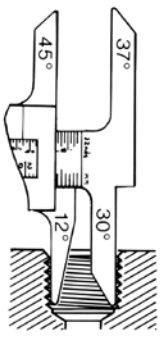


Thread pitch gauge

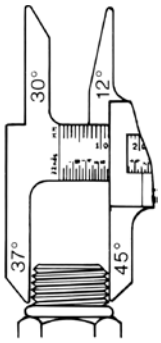
How to measure threads



Use a thread pitch gauge to determine the number of threads per inch or the distance between threads in metric connections. Place the gauge on the threads until the fit is snug. Match the measurement to the charts.



I.D.

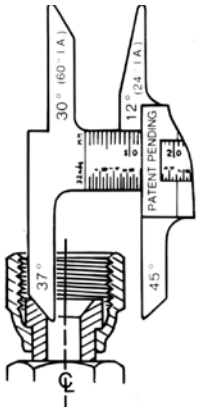


O.D.

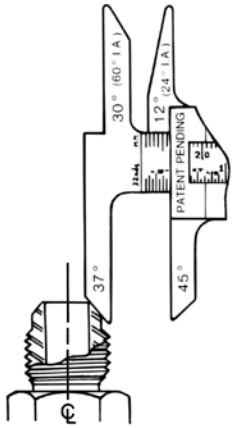
Measure the thread diameter with an I.D./O.D. caliper as shown. Match the measurements to the charts.

How to measure sealing surface angles

Female connections are usually measured by inserting the gauge into the connection and placing it on the sealing surface. If the centerlines of the connection and gauge are parallel, the correct angle has been determined.



Male flare type connectors are usually measured by placing the gauge on the sealing surface. If the centerlines of the connection and gauge are parallel, the correct angle has been determined.

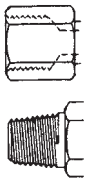
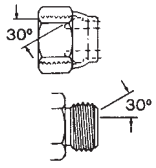
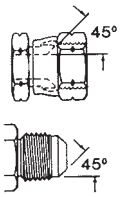
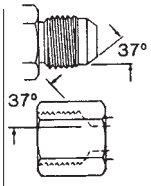
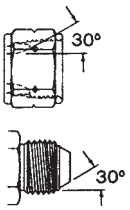
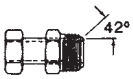
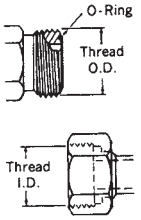


Fluid connectors

Thread size chart

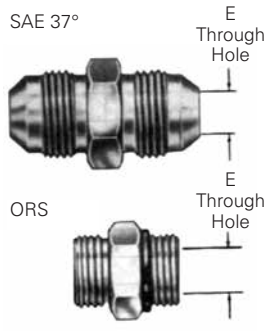
Thread size chart

The following chart is intended as a quick reference guide for thread size by dash size.

Dash size	 N.P.T.F.	 N.P.S.M. approx. dia.	 SAE 45° auto. refrig.	 SAE 37° (J.I.C.) hydraulic	 SAE O-Ring boss	 P.T.T. 30° automotive	 SAE invert. flare	 ORS
–02	1/8–27	1/8–27	5/16–24	5/16–24	5/16–24	-	5/16–24	-
–03	-	-	3/8–24	3/8–24	3/8–24	-	3/8–24	-
–04	1/4–18	1/4–18	7/16–20	7/16–20	7/16–20	-	7/16–24	9/16–18
–05	-	-	1/2–20	1/2–20	1/2–20	-	1/2–20	-
–06	3/8–18	3/8–18	5/8–18	9/16–18	9/16–18	-	5/8–18	11/16–16
–07	-	-	11/16–24	-	-	-	11/16–18	-
–08	1/2–14	1/2–14	3/4–16	3/4–16	3/4–16	-	3/4–18	1 3/16–16
–10	-	-	7/8–14	7/8–14	7/8–14	-	7/8–18	1–14
–12	3/4–14	3/4–14	1 1/16–14	1 1/16–12	1 1/16–12	-	1 1/16–16	13/16–12
–14	-	-	-	1 3/16–12	1 3/16–12	-	-	-
–16	1–11 1/2	1–11 1/2	-	1 5/16–12	1 5/16–12	1 5/16–14	-	1 7/16–12
–20	1 1/4–11 1/2	1 1/4–11 1/2	-	1 5/8–12	1 5/8–12	1 5/8–14	-	1 11/16–12
–24	1 1/2–11 1/2	1 1/2–11 1/2	-	1 7/8–12	1 7/8–12	1 7/8–14	-	2–12
–32	2–11 1/2	2–11 1/2	-	2 1/2–12	2 1/2–12	2 1/2–12	-	-
–40	2 1/2–8	2 1/2–8	-	3–12	3–12	-	-	-
–48	3–8	3–8	-	3 1/2–12	3 1/2–12	-	-	-

Through hole dimensions

All dimensions are nominal. In jump size bodies, the minimum through hole dimensions will correspond to the smallest dash size.



Dash size	E through hole			
	SAE 37°		ORS	
	mm	in	mm	in
–03	3,0	0.12	-	-
–04	4,3	0.17	4,3	0.17
–05	5,8	0.23	-	-
–06	7,6	0.30	6,6	0.26
–08	9,9	0.39	9,7	0.38
–10	12,2	0.48	12,2	0.48
–12	15,5	0.61	15,5	0.61
–16	21,3	0.84	20,6	0.81
–20	25,8	1.08	26,7	1.05
–24	33,3	1.31	33,3	1.31
–32	45,2	1.78	-	-

Proper tube installation

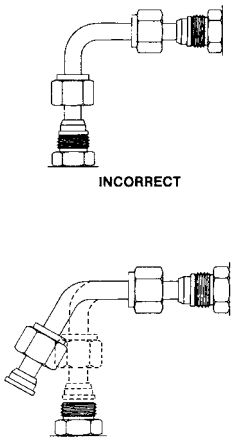


Figure 1

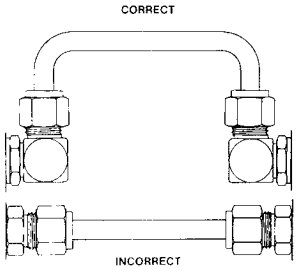


Figure 2

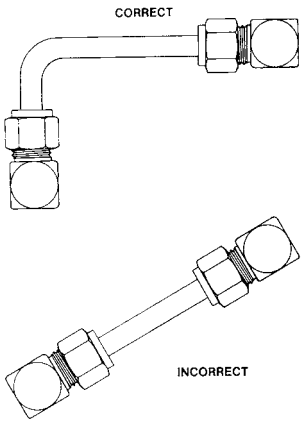


Figure 3

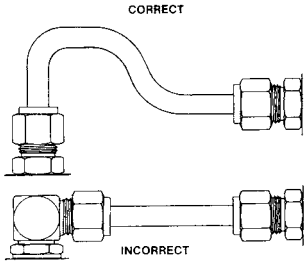


Figure 4

When compared to rigid pipe, hydraulic tubing offers the following advantages:

1. Size for size, tubing is lighter in weight, easier to handle and can be bent more easily than iron pipe.
2. Bent tubing reduces pressure drop and turbulence in the system because it eliminates sudden change in the direction of the fluid flow.
3. Hydraulic tubing reduces the number of connections required, thus reducing material and labor costs.
4. Fewer joints means lower costs and fewer points of potential leakage.
5. The use of tube fittings makes every joint a union which permits easier, faster maintenance and repair work.
6. The ORS-TF Tube Fitting eliminates the need for threading, brazing or welding.

Tube bending

To reduce the number of fittings in a tube assembly, bend the tubing whenever possible.

Steel tubing can be bent in many sizes by using a hand bender designed for steel tubing. For production quantities, or for larger sizes, a power bending tool is generally used.

Contact Eaton for additional tube bending information.

Tube routing and installation

Tubing manufacturers will advise the correct radii for various types and wall thicknesses of tubing. Kinks, flattened bends, wrinkles and tube breakage can be avoided by the use of proper tube bending equipment.

Avoid straight line connections whenever possible, especially in short runs.

Fluid conveying systems (see figures 2, 3 and 4) should be designed to follow the contour of the equipment. They are easier to install and present a neater appearance. Long runs should be supported by brackets or clamps. All heavy systems components should be bolted or clamped to eliminate tubing fatigue.

Inspect the tubing to see that it conforms to the required specifications before installation.

Tubes should align with the center line of the fittings, without distortion or tension. Tubing should not be sprung into position (see figure 1) to be assembled to the fitting. If this occurs the tubing has not been properly fabricated, and when installed and connected, places the tubing under stress.

Hydraulic tubing–Maximum operating pressures

SAEJ356, J524, J525, J526, J527

Tube O.D.	Dash size	Tubing wall thickness (in inches)											
-	-	0.028		0.035		0.049		0.065		0.083		0.095	
-	-	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**
0.19	-03	297,0	4250	375,0	5450	-	-	-	-	-	-	-	-
0.25	-04	213,0	3100	272,0	3950	396,0	5750	420,0	6000	-	-	-	-
0.31	-05	169,0	2450	213,0	3100	315,0	4500	420,0	6000	-	-	-	-
0.38	-06	140,0	2000	175,0	2550	251,0	3650	350,0	5000	420,0	6000	420,0	6000
0.50	-08	-	-	127,0	1850	186,0	2700	251,0	3650	335,0	4800	388,0	5550
0.62	-10	-	-	105,0	1500	145,0	2100	196,0	2850	258,0	3750	299,0	4350
0.75	-12	-	-	84,0	1200	122,0	1750	162,0	2350	210,0	3050	248,0	3550
1.00	-16	-	-	62,0	900	89,0	1300	122,0	1750	157,0	2250	182,0	2600
1.25	-20	-	-	-	-	70,0	1000	93,0	1350	122,0	1750	143,0	2050
1.50	-24	-	-	-	-	-	-	79,0	1150	100,0	1450	119,0	1700
2.00	-32	-	-	-	-	-	-	58,0	850	77,0	1100	87,0	1250

Tube O.D.	Dash size	Tubing wall thickness (in inches)											
-	-	0.109		0.120		0.134		0.148		0.156		0.188	
-	-	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**	**bar**	**psi**
0.19	-03	-	-	-	-	-	-	-	-	-	-	-	-
0.25	-04	-	-	-	-	-	-	-	-	-	-	-	-
0.31	-05	-	-	-	-	-	-	-	-	-	-	-	-
0.38	-06	-	-	-	-	-	-	-	-	-	-	-	-
0.50	-08	420,0	6000	420,0	6000	-	-	-	-	-	-	-	-
0.62	-10	353,0	5050	392,0	5600	-	-	-	-	-	-	-	-
0.75	-12	286,0	4150	322,0	4600	-	-	-	-	-	-	-	-
1.00	-16	210,0	3000	231,0	3350	262,0	3800	294,0	4200	-	-	-	-
1.25	-20	162,0	2350	182,0	2650	189,0	2700	203,0	2950	217,0	3100	259,0	3750
1.50	-24	134,0	1950	148,0	2150	171,0	2450	171,0	2450	182,0	2600	220,0	3150
2.00	-32	100,0	1450	112,0	1600	126,0	1800	140,0	2000	147,0	2100	178,0	2550

Maximum operating pressure ratings at specified wall thickness are based upon recommended tubing ratings per SAEJ1065 as well as limited laboratory test data. Operating pressures are based upon a 4:1 safety factor relative to tube burst data. Eaton recommends a maximum operating pressure of the joint which is the lesser of the tubing rating or the mating connector rating.

Recommended wall thickness for tube fitting applications

Tube	Dash	Versil-Flare SAE 37° flare	Versil-Flare SAE 37° flareless	ORS-BR SAE O-Ring face seal	ORS-TF SAE O-ring face seal
0.19	-03	0.028 - 0.035	0.028 - 0.035	-	-
0.25	-04	0.028 - 0.065	0.028 - 0.065	0.028 - 0.065	0.028 - 0.065
0.31	-05	0.028 - 0.065	0.028 - 0.065	-	-
0.38	-06	0.028 - 0.065	0.028 - 0.095	0.035 - 0.083	0.028 - 0.065
0.50	-08	0.035 - 0.083	0.035 - 0.120	0.035 - 0.109	0.035 - 0.120
0.62	-10	0.035 - 0.095	0.035 - 0.120	0.035 - 0.120	0.035 - 0.095
0.75	-12	0.035 - 0.109	0.035 - 0.120	0.035 - 0.120	0.049 - 0.120
1.00	-16	0.035 - 0.120	0.035 - 0.134	0.049 - 0.148	0.049 - 0.134
1.25	-20	0.049 - 0.120	0.049 - 0.188	0.049 - 0.188	0.049 - 0.156
1.50	-24	0.065 - 0.120	0.065 - 0.188	0.065 - 0.188	0.065 - 0.188
2.00	-32	0.065 - 0.134	0.065 - 0.188	-	-

Recommended hydraulic tubing material specifications

Hydraulic tubing SAE specifications

Versil-Flare SAE 37° flare	Versil-Flare SAE 37° flareless	ORS-BR SAE O-ring face seal	ORS-TF SAE O-ring face seal
SAEJ524	SAEJ356	SAEJ356	SAEJ356
SAEJ525	SAEJ524	SAEJ524	SAEJ524
-	SAEJ525	SAEJ525	SAEJ525
-	SAEJ527	SAEJ526	SAEJ526

Hydraulic tubing material description

SAEJ356 electric resistance welded flash controlled low carbon steel, SAEJ524 seamless annealed low carbon steel, SAEJ525 electric resistance welded cold worked annealed, SAEJ526 single wall welded low carbon steel (automotive), SAEJ527 brazed double wall low carbon steel (automotive). The maximum hardness of the above tubing should not exceed Rockwell B65.

Fluid connectors

Non-threaded connections, American connections

How to measure non-threaded connections

Four bolt flange

First measure the port hole diameter using the caliper. Next, measure the longest bolt hole spacing from center-to-center or measure the flange head diameter.

Staplok

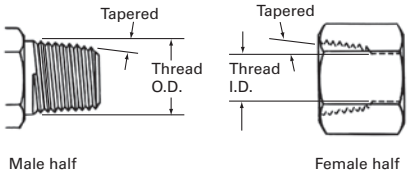
Measure the male diameter with the O.D. portion of the caliper. Measure the female half by inserting the I.D. portion of the caliper into the through hole.

Dash numbers

Most fluid piping system sizes in the United States are measured by dash numbers. These are universally used abbreviations for the size of the component expressed as the numerator of the fraction with the denominator always being 16. For example, a –04 port is 4/16 or 1/4-inch. Dash numbers are usually nominal (in name only) and are abbreviations that make ordering of components easier.

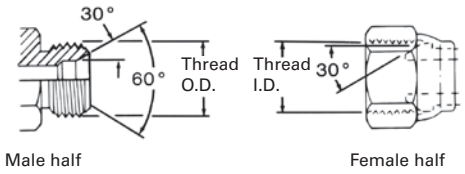
American connections

NPTF (National pipe tapered fuel)



This connection is still widely used in fluid power systems, even though it is not recommended by the National Fluid Power Association (NFPA) for use in hydraulic applications. The thread is tapered and the seal takes place by deformation of the threads.

NPSM (National pipe straight mechanical)



This connection is sometimes used in fluid power systems. The female half has a straight thread and an inverted 30° seat. The male half of the connection has a straight thread and a 30° internal chamfer. The seal takes place by compression of the 30° seat on the chamfer. The threads hold the connection mechanically.

Note: A properly chamfered NPTF male will also seal with the NPSM female.

NPTF threads

Measure thread diameter and subtract 1/4-inch to find the nominal pipe size.

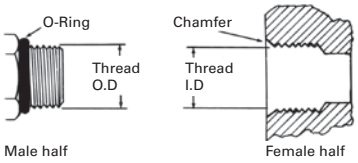
Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fract.	Dec.	Frac.	Dec.
1/8	02	1/8-27	13/32	0.41	3/8	0.38
1/4	04	1/4-18	17/32	0.54	1/2	0.49
3/8	06	3/8-18	11/16	0.68	5/8	0.63
1/2	08	1/2-14	27/32	0.84	25/32	0.77
3/4	12	3/4-14	1 1/16	1.05	1	0.98
1	16	1-11 1/2	1 5/16	1.32	1 1/4	1.24
1 1/4	20	1 1/4-11 1/2	1 21/32	1.66	1 19/32	0.58
1 1/2	24	1 1/2-11 1/2	1 29/32	1.90	1 13/16	1.82
2	32	2-11 1/2	2 3/8	2.38	2 5/16	2.30

NPSM threads

Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fract.	Dec.	Fract.	Dec.
1/8	02	1/8-27	13/32	0.41	3/8	0.38
1/4	04	1/4-18	17/32	0.54	1/2	0.49
3/8	06	3/8-18	11/16	0.68	5/8	0.63
1/2	08	1/2-14	27/32	0.84	25/32	0.77
3/4	12	3/4-14	1 1/16	1.05	1	0.98
1	16	1-11 1/2	1 5/16	1.32	1 1/4	1.24
1 1/4	20	1 1/4-11 1/2	1 21/32	1.66	1 19/32	0.58
1 1/2	24	1 1/2-11 1/2	129/32	1.90	1 13/16	1.82
2	32	2-11 1/2	2 3/8	2.38	2 5/16	2.30

American connections

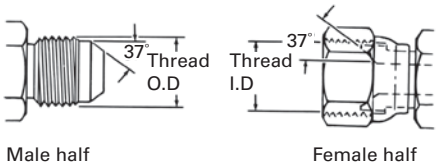
SAE J1926 straight thread O-Ring boss (ORB)



This port connection is recommended by the NFPA for optimum leakage control in medium and high pressure hydraulic systems. The male connector has a straight thread and an O-Ring. The female port has a straight thread, a machined surface (minimum spotface) and a chamfer to accept the O-Ring. The seal takes place by compressing the O-Ring into the chamfer. The threads hold the connection mechanically.

Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fract.	Dec.	Fract.	Dec.
1/8	02	5/16-24	5/16	0.31	9/32	0.27
3/16	03	3/8-24	3/8	0.38	11/32	0.34
1/4	04	7/16-20	7/16	0.44	13/32	0.39
5/16	05	1/2-20	1/2	0.50	15/32	0.45
3/8	06	9/16-18	9/16	0.56	17/32	0.51
1/2	08	3/4-16	3/4	0.75	3/4	0.69
5/8	10	7/8-14	7/8	0.88	13/16	0.81
3/4	12	1 1/16-12	1 1/16	1.06	1	0.98
7/8	14	1 3/16-12	1 3/16	1.19	1 1/8	1.13
1	16	1 5/16-12	1 5/16	1.31	1 1/4	1.23
1 1/4	20	1 5/8-12	1 5/8	1.63	1 9/16	1.54
1 1/2	24	1 7/8-12	1 7/8	1.88	1 13/16	1.79
2	32	2 1/2-12	2 1/2	2.50	2 7/16	2.42

SAE J514 37° hydraulic

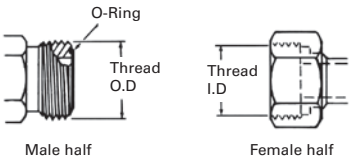


This connection is very common in fluid power systems. Both the male and female halves of the connections have 37° seats. The seal takes place by establishing a line contact between the male flare and the female cone seat. The threads hold the connection mechanically.

Caution: In the –02, –03, –04, –05, –08 and –10 sizes, the threads of the SAE 45° flare and the SAE 37° flare are the same. However, the sealing surface angles are not the same.

Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fract.	Dec.	Fract.	Dec.
1/8	02	5/16-24	5/16	0.31	9/32	0.27
3/16	03	3/8-24	3/8	0.38	11/32	0.34
1/4	04	7/16-20	7/16	0.44	13/32	0.39
5/16	05	1/2-20	1/2	0.50	15/32	0.45
3/8	06	9/16-18	9/16	0.56	17/32	0.51
1/2	08	3/4-16	3/4	0.75	3/4	0.69
5/8	10	7/8-14	7/8	0.88	13/16	0.81
3/4	12	1 1/16-12	1 1/16	1.06	1	0.98
7/8	14	1 3/16-12	1 3/16	1.19	1 1/8	1.13
1	16	1 5/16-12	1 5/16	1.31	1 1/4	1.23
1 1/4	20	1 5/8-12	1 5/8	1.63	1 9/16	1.54
1 1/2	24	1 7/8-12	1 7/8	1.88	1 13/16	1.79
2	32	2 1/2-12	2 1/2	2.50	2 7/16	2.42

ORS SAE J1453 O-Ring face seal

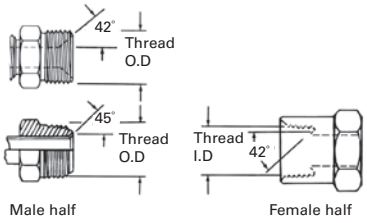


This connection offers the very best leakage control available today. The male connector has a straight thread and an O-Ring in the face. The female has a straight thread and a machined flat face. The seal takes place by compressing the O-Ring onto the flat face of the female, similar to the split flange type fitting. The threads hold the connection mechanically.

Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fraction	Decimal	Fraction	Decimal
1/4	04	9/16-18	9/16	0.56	17/32	0.51
3/8	06	11/16-16	11/16	0.69	5/8	0.63
1/2	08	13/16-16	13/16	0.82	3/4	0.75
5/8	10	1-14	1	1.00	15/16	0.93
3/4	12	1 3/16-12	1 3/16	1.19	1 1/8	1.11
1	16	1 7/16-12	1 7/16	1.44	1 3/8	1.36
1 1/4	20	1 11/16-12	1 11/16	1.69	1 5/8	1.61
1 1/2	24	2-12	2	2.00	1 15/16	1.92

American connections

SAE J512 inverted

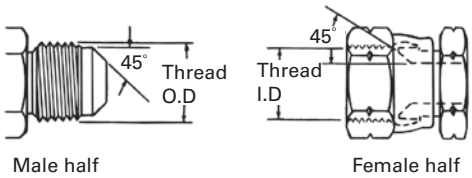


This connection is frequently used in automotive systems. The male connector can either be a 45° flare in the tube fitting form or a 42° seat in the machined adapter form.

The female has a straight thread with a 42° inverted flare. The seal takes place on the flared surfaces. The threads hold the connection mechanically.

Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fract.	Dec.	Fract.	Dec.
1/8	02	5/16-24	5/16	0.32	9/32	0.28
3/16	03	3/8-24	3/8	0.38	11/32	0.34
1/4	04	7/16-24	7/16	0.44	13/32	0.40
5/16	05	1/2-20	1/2	0.50	15/32	0.45
3/8	06	5/8-18	5/8	0.63	9/16	0.57
7/16	07	11/16-18	11/16	0.69	5/8	0.63
1/2	08	3/4-18	3/4	0.75	23/32	0.70
5/8	10	7/8-18	7/8	0.88	13/16	0.82
3/4	12	1 1/16-16	1 1/16	1.06	1	1.00

SAE J512 45°



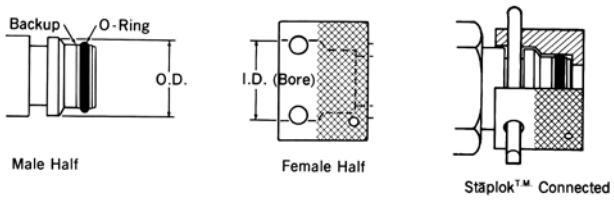
This connection is commonly used in refrigeration, automotive and truck piping systems. The connector is frequently made of brass. Both the male and female connectors have 45° seats. The seal takes place between the male flare the female cone seat.

The threads hold the connection mechanically.

Caution: In the –02, –03, –04, –05, –08 and –10 sizes, the threads of the SAE 45° flare and the SAE 37° flare are the same. However, the sealing surface angles are not the same.

Inch size	Dash size	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fract.	Dec.	Fract.	Dec.
1/8	02	5/16-24	5/16	0.31	9/32	0.27
3/16	03	3/8-24	3/8	0.38	11/32	0.34
1/4	04	7/16-20	7/16	0.44	13/32	0.39
5/16	05	1/2-20	1/2	0.50	15/32	0.45
3/8	06	5/8-18	5/8	0.63	9/16	0.57
1/2	08	3/4-16	3/4	0.75	11/16	0.69
5/8	10	7/8-14	7/8	0.88	13/16	0.81
3/4	12	1 1/16-14	1 1/16	1.06	1	0.99
7/8	14	1 1/4-12	1 1/4	1.25	1 5/32	1.16
1	16	1 3/8-12	1 3/8	1.38	1 9/32	1.29

Staplok (SAE J1467)



This is a radial O-Ring seal connection developed in Germany and commonly used for hydraulic application in underground mines. The male contains an exterior O-Ring and backup ring, plus a groove to accept the "staple". The female has a smooth bore with two holes for the stable. A "U" shaped retaining clip or staple is inserted through the two holes, passing through the groove in the male to lock the connection together. The seal takes place by contact between the O-Ring in the male and the smooth bore of the female.

Inch size	Dash size.	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
			Fraction	Decimal	Fraction	Decimal
1/4	04	-	9/32	0.586	1 9/32	0.597
3/8	06	-	25/32	0.783	51/64	0.794
1/2	08	-	15/16	0.940	61/64	0.951
3/4	12	-	1 9/64	1.137	1 9/64	1.148
1	16	-	1 17/32	1.529	1 35/64	1.540
1 1/4	20	-	1 13/16	1.806	1 13/16	1.817
1 1/2	24	-	2 5/32	2.163	2 11/64	2.174
2	32	-	2 33/64	2.517	2 17/32	2.528

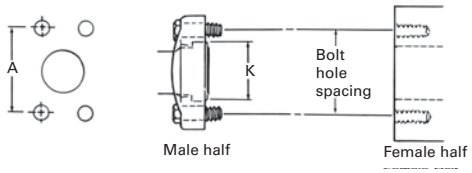
American connections

How to measure

Four Bolt Flange—First measure the port hole diameter using the caliper.

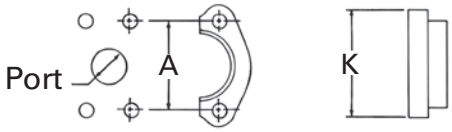
Next, measure the longest bolt hole spacing from center-to-center (Dimension "A") or measure the flanged head diameter.

SAE J518 4-Bolt Flange*



This connection is commonly used in fluid power systems. There are two pressure ratings. Code 61 is referred to as the "standard" series and Code 62 is the "6000 psi" series. The design concept for both series is the same, but the bolt hole spacing and flanged head diameters are larger for the higher pressure, Code 62 connection. The female (port) is an unthreaded hole with four bolt holes in a rectangular pattern around the port. The male consists of a flanged head, grooved for an O-Ring, and either a captive flange or split flange halves with bolt holes to match the port. The seal takes place on the O-Ring, which is compressed between the flanged head and the flat surface surrounding the port. The threaded bolts hold the connection together.

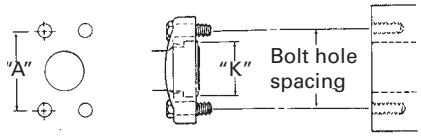
Note: * SAE J518, JIS B 8363, ISO/ DIS 6162 and DIN 20066 are interchangeable, except for bolt sizes.



Inch Size (dash size)	Port hole I.D. inch fract. deci.)	Bolt dimension inch		Bolt hole spacing "A" inch (dec)		Flanged head dia. "K" inch (dec)	
		Cd. 61	Cd. 62	Cd. 61	Cd. 62	Cd. 61	Cd. 62
1/2 (08)	1/2 (0.50)	5/16-18x1 1/4	5/16-18x1 1/4	1 1/2 (1.50)	1 19/32 (1.59)	1 3/16 (1.19)	1 1/4 (1.25)
3/4 (12)	3/4 (0.75)	3/8-16x1 1/4	3/8-16x1 1/2	1 7/8 (1.88)	2.00 (2.00)	1 1/2 (1.50)	1 5/8 (1.63)
1 (16)	1.00 (1.00)	3/8-16x1 1/4	7/16-14x1 3/4	2 1/16 (2.06)	2 1/4 (2.25)	1 3/4 (1.75)	1 7/8 (1.88)
1 1/4 (20)	1 1/4 (1.25)	7/16-14x1 1/2	1/2-13x1 3/4	2 5/16 (2.31)	2 5/8 (2.63)	2.00 (2.00)	2 1/8 (2.13)
1 1/2 (24)	1 1/2 (1.50)	1/2-13x1 1/2	5/8-11x2 1/4	2 3/4 (2.75)	3 1/8 (3.12)	2 3/8 (2.38)	2 1/2 (2.50)
2 (32)	2.00 (2.00)	1/2-13x1 1/2	3/4-10x2 3/4	3 1/16 (3.06)	3 13/16 (3.81)	2 13/16 (2.81)	3 1/8 (3.12)

ISO connections

ISO/DIS 6162 4-bolt flange*



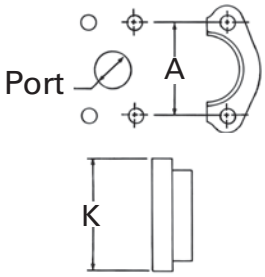
This connection is commonly used in fluid power systems. There are two pressure ratings. PN 35/350 bar (Code 61) is the "standard" series and PN 415 bar (Code 62) is the high pressure series. The design concept for both series is the same, but the bolt hole spacing and flanged head diameters are larger for the higher pressure, PN 415 bar connection. Both metric and inches bolts are used. The port will have an "M" stamped on it if metric bolts are required.

The female (port) is an unthreaded hole with four bolt holes in a rectangular pattern around the port. The male consists of a flanged head, grooved for an O-Ring, and either a captive flange or split flange halves with bolt holes to match the port. The seal takes place on the O-Ring, which is compressed between the flanged head and the flat surface surrounding the port. The threaded bolts hold the connection together.

* ISO/DIS 6162, DIN 20066, JIS B 8363 and SAE J518 are interchangeable, except for bolt sizes.

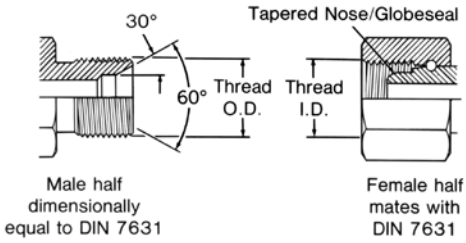
Size	Port hole	Bolt dimensions spacing		Bolt hole"A"	
		ISO 6162-1 Bar (Cd.61)	ISO 6162-2 Bar (Cd.62)	ISO 6162-1 Bar (Cd.61)	ISO 6162-2 Bar (Cd.62)
mm in (dash)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
13(1/2) (08)	12,7 (.50)	M8 x 1.25x 30 (5/16–18 x 1 1/4)	M8 x 1.25 x 30 (5/16–18 x 1 1/4)	38.1 (1.50)	40.5 (1.57)
19(3/4) (12)	19,1 (.75)	M10 x 1.5 x 35 (3/8–16 x 1 1/4)	M10 x 1.5 x 40 (3/8–16 x 1 1/2)	47.6 (1.88)	50.8 (2.00)
25(1) (16)	25,4 (1.00)	M10 x 1.5 x 35 (3/8–16 x 1 1/4)	M12 x 1.75 x 45 (7/16–14 x 1 3/4)	52.4 (2.06)	57.2 (2.25)
32(1 1/4) (20)	31,8 (1.25)	M10 x 1.5 x 40 (7/16–14 x 1 1/2)	M14 x 2 x 50 (1/2–13 x 1 3/4)	58.7 (2.31)	66.7 (2.63)
38 (1 1/2) (24)	38,1 (1.50)	M12 x 1.75 x 40 (1/2–13 x 1 1/2)	M16 x 2 x 55 (5/8–11 x 2 1/4)	69.9 (2.75)	79.4 (3.13)
51(2) (32)	50,8 (2.00)	M12 x 1.75 x 40 (1/2–13 x 1 1/2)	M20 x 2.5 x 70 (3/4–10 x 2 3/4)	77.8 (3.06)	96.8 (3.81)

Inch size	Flanged head dia. "K"			
	ISO 6162-1 Bar (Cd.61)		ISO 6162-2 Bar (Cd.62)	
	mm	in	mm	in
1/2	30.18	1.19	31.75	1.25
3/4	38.10	1.50	41.28	1.63
1	44.45	1.75	47.63	1.88
1 1/4	50.80	2.00	53.98	2.13
1 1/2	60.33	2.38	63.50	2.50
2	71.42	2.81	79.38	3.13



German connections

DIN 7631 series

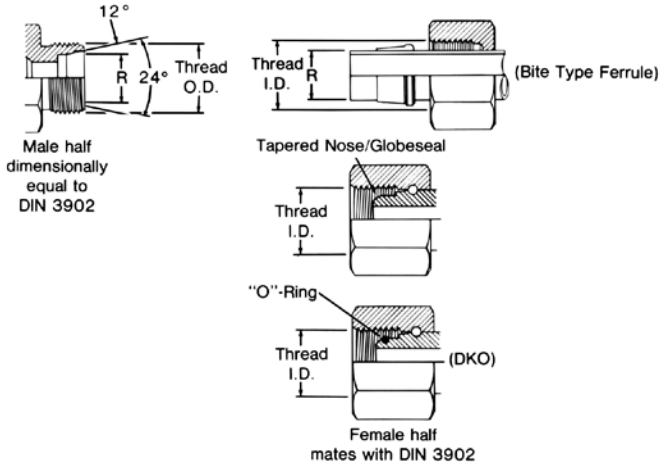


This connection is frequently used in hydraulic systems. The male has a straight metric thread and a 60° (included angle) recessed cone. The female has a straight thread and a tapered Nose/Globeseal seat. The seal takes place by contact between the cone of the male and the nose of the tapered Nose/Globeseal flareless swivel.

The threads hold the connection mechanically.

Use with pipe/tube O.D.		Metric thread size	Male thread O.D.		Female thread I.D.	
mm	in		mm	in	mm	in
6	0.24	M12 x 1.5	12	0.47	10,5	0.41
8	0.32	M14 x 1.5	14	0.55	12,5	0.49
10	0.39	M16 x 1.5	16	0.63	14,5	0.57
12	0.47	M18 x 1.5	18	0.71	16,5	0.65
15	0.59	M22 x 1.5	22	0.87	20,5	0.81
18	0.71	M26 x 1.5	26	1.02	24,5	0.96
22	0.87	M30 x 1.5	30	1.18	28,5	1.12
28	1.10	M38 x 1.5	38	1.50	36,5	1.44
35	1.38	M45 x 1.5	45	1.77	43,5	1.71
42	1.65	M52 x 1.5	52	2.04	50,5	1.99

DIN 3902 series



This connection style consists of a common male and three different female halves. The male has a straight metric thread, a 24° included angle and a recessed counterbore that matches the tube O.D. used with it. The female may be a tube, nut and ferrule, a tapered nose/Globeseal flareless swivel or a tapered Nose/Globeseal flareless swivel with an O-Ring in the Nose (DKO type).

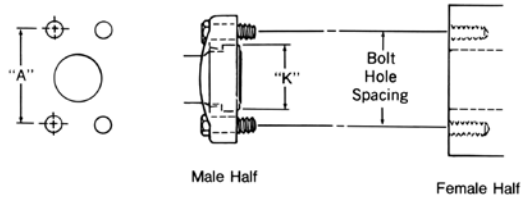
Tube O.D. "R" Dim. l.Rh.*		Tube O.D. "R" Dim. s.Rh.†		Metric thread Size	Male thread O.D.		Female thread I.D.	
mm	in.	mm	in		mm	in	mm	in
6	0.24	-	-	M12 x 1.5	12	0.47	10.5	0.41
8	0.32	6	0.24	M14 x 1.5	14	0.55	12.5	0.49
10	0.39	8	0.32	M16 x 1.5	16	0.63	14.5	0.57
12	0.47	10	0.39	M18 x 1.5	18	0.71	16.5	0.65
-	-	12	0.47	M20 x 1.5	20	0.78	18.5	0.73
15	0.59	14	0.55	M22 x 1.5	22	0.87	20.5	0.81
-	-	16	0.63	M24 x 1.5	24	0.94	22.5	0.89
18	0.71	-	-	M26 x 1.5	26	1.02	24.5	0.96
22	0.87	20	0.78	M30 x 2.0	30	1.18	28	1.11
28	1.10	25	0.98	M36 x 2.0	36	1.41	34	1.34
-	-	30	1.18	M42 x 2.0	42	1.65	40	1.57
35	1.38	-	-	M45 x 2.0	45	1.77	43	1.70
42	1.65	38	1.50	M52 x 2.0	52	2.04	50	1.97

*l.Rh. is a light duty system.

†s.Rh. is a heavy duty system.

German connections

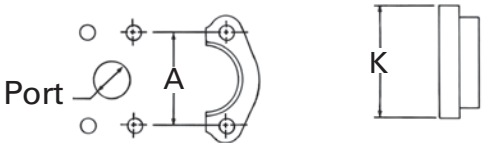
DIN 20066 4-bolt flange*



This connection is commonly used in fluid power systems. There are two pressure ratings. Form R (Code 61) is referred to as the "standard duty" series and Form S (Code 62) is the "heavy duty" series. The design concept for both series is the same, but the bolt hole spacing and flanged head diameters are larger for the higher pressure, Form S connection. Both metric and inch bolts are used. The female (port) is an unthreaded hole with four bolt holes in a rectangular pattern around the port. The male consists of a flanged head, grooved for an O-Ring, and either a captive flange or split flange halves with bolt holes to match the port. The seal takes place on the O-Ring, which is compressed between the flanged head and the flat surface surrounding the port. The threaded bolts hold the connection together.

Note: *DIN 20066, IS/DIS 6166, JIS B 8363 and SAE J518 are interchangeable, except for bolt sizes.

Size mm (inch) (dash)	Port hole	Bolt dimensions		Bolt hole spacing	
		Form R. (Cd. 61)	Form S (Cd. 62)	Form R (Cd. 61)	Form S (Cd. 62)
	mm (in)	-	-	mm (in)	mm (in)
12 (1/2) (08)	12,7 (0.50)	M8 x 1.25x 30 5/16–18 x 1 1/4	M8 x 1.25 x 30 5/16–18 x 1 1/4	38.10 (1.50)	40.49 (1.57)
20 (3/4) (12)	19,1 (0.75)	M10 x 1.5 x 30 3/8–16 x 1 1/4	M10 x 1.5 x 40 3/8–16 x 1 1/2	47.63 (1.88)	50.80 (2.00)
25 (1) (16)	25,4 (1.00)	M10 x 1.5 x 35 3/8–16 x 1 1/4	M12 x 1.75 x 45 7/16–14 x 1 3/4	52.37 (2.06)	57.15 (2.25)
32 (1-1/4) (20)	31,7 (1.25)	M10 x 1.75 x 40 7/16–14 x 1 1/2	M14 x 2 x 45 1/2–13 x 1 3/4	58.72 (2.31)	66.68 (2.63)
40 (1-1/2) (24)	38,0 (1.50)	M12 x 1.75 x 40 1/2–13 x 1 1/2	M16 x 2 x 55 5/8–11 x 2 1/4	69.85 (2.75)	79.38 (3.13)
50 (2) (32)	50,8 (2.00)	M12 x 1.75 x 40 1/2–13 x 1 1/2	M20 x 2.5 x 70 3/4–10 x 2 3/4	77.77 (3.06)	96.82 (3.81)



Inch size	Flanged head dia. "K"			
	Form R (Cd. 61)		Form S (Cd. 62)	
	mm	in	mm	in
1/2	30.18	1.19	31.75	1.25
3/4	38.10	1.50	41.28	1.63
1	44.45	1.75	47.63	1.88
1 1/4	50.80	2.00	53.98	2.13
1 1/2	60.33	2.38	63.50	2.50
2	71.42	2.81	79.38	3.13

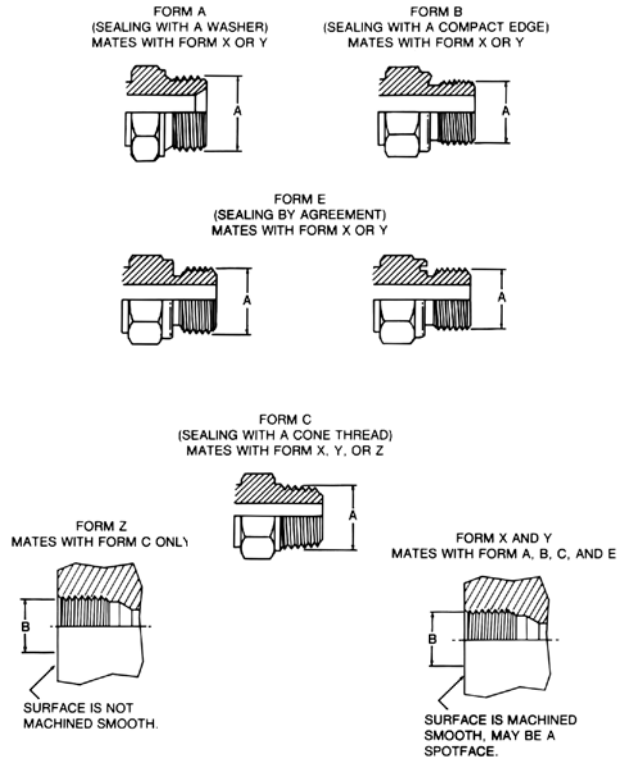
German connections

DIN 3852 Male connectors and female ports

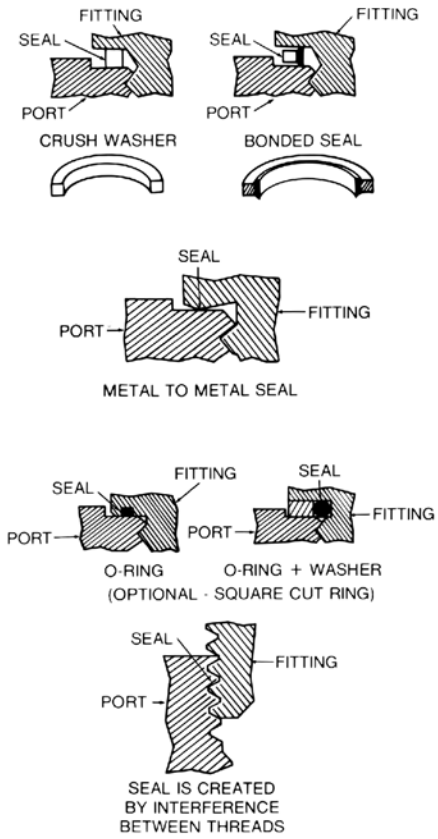
DIN 3852 metric threads

Metric thread	Male thread O.D. "A"		Female thread I.D. "B"	
	mm	(in)	mm	(in)
M12 x 1.5	12	0.47	10,5	0.41
M14 x 1.5	14	0.55	12,5	0.49
M16 x 1.5	16	0.63	14,5	0.57
M18 x 1.5	18	0.71	16,5	0.65
M20 x 1.5	20	0.78	18,5	0.73
M22 x 1.5	22	0.87	20,5	0.81
M24 x 1.5	24	0.94	22,5	0.89
M26 x 1.5	26	1.02	24,5	0.96
M27 x 2	27	1.06	25	0.98
M30 x 1.5	30	1.18	28,5	1.12
M30 x 2	30	1.18	28	1.10
M33 x 2	33	1.30	31	1.22
M36 x 1.5	36	1.41	34,5	1.36
M36 x 2	36	1.41	34	1.33
M38 x 1.5	38	1.49	36,5	1.43
M38 x 2	38	1.49	36	1.41
M42 x 1.5	42	1.65	40,5	1.60
M42 x 2	42	1.65	40	1.57
M45 x 1.5	45	1.77	43,5	1.71
M45 x 2	45	1.77	43	1.69
M48 x 1.5	48	1.89	46,5	1.83
M48 x 2	48	1.89	46	1.81
M52 x 1.5	52	2.04	50,5	1.89
M52 x 2	52	2.04	50	1.97

For DIN 3852 Whitworth pipe thread dimensions, see BSPT/BSPP dimensions. They are the same.

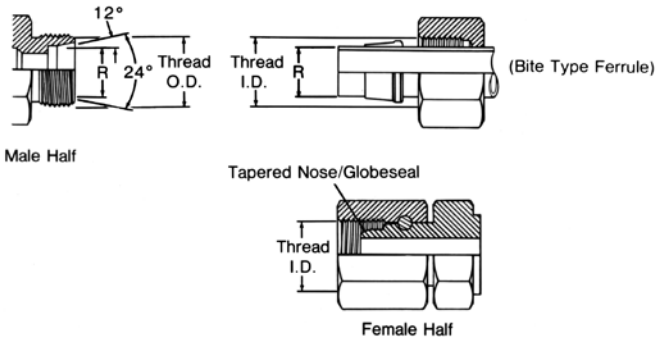


How the seal works



French connections

Millimetrique and GAZ series



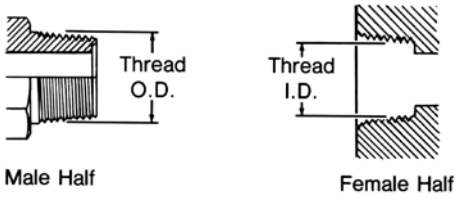
This connection consists of a common male and two different females. The millimetric series is used with whole number metric O.D. tubing and the GAZ Series is used with fractional number metric O.D. pipe size tubing.

Millimetric and GAZ threads

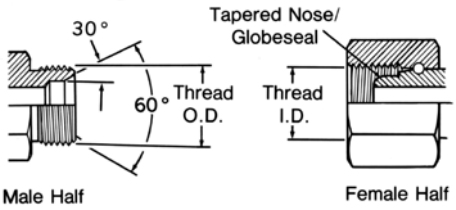
Tubing O.D. "R" dim.		"Gaz" pipe O.D. R" dim.		Metric thread	Male Thread O.D. "A"		Female Thread I.D. "B"	
mm	in	mm	in		mm	(in)	mm	(in)
6	0.24	-	-	M12 x 1.5	12	0.47	11	0.43
8	0.32	-	-	M14 x 1.5	14	0.55	12.5	0.49
10	0.39	-	-	M16 x 1.5	16	0.63	14.5	0.57
12	0.47	-	-	M18 x 1.5	18	0.71	16.5	0.65
14	0.55	13.25	0.52	M20 x 1.5	20	0.78	18.5	0.73
15	0.59	-	-	M22 x 1.5	22	0.87	20.5	0.81
16	0.63	16.75	0.66	M24 x 1.5	24	0.94	22.5	0.89
18	0.71	-	-	M27 x 1.5	27	1.06	25.5	1.00
22	0.87	21.25	0.83	M30 x 1.5	30	1.18	28.5	1.12
25	0.98	-	-	M33 x 1.5	33	1.30	31.5	1.24
28	1.10	26.75	1.05	M36 x 1.5	36	1.41	34.5	1.36
30	1.18	-	-	M39 x 1.5	39	1.54	37.5	1.48
32	1.25	-	-	M42 x 1.5	42	1.65	40.5	1.60
35	1.38	33.50	1.32	M45 x 1.5	45	1.77	43.5	1.71
38	1.50	-	-	M48 x 1.5	48	1.89	46.5	1.83
40	1.57	42.25	1.66	M52 x 1.5	52	2.04	50.5	1.99
45	1.77	-	-	M54 x 2.0	54	2.12	52	2.05
-	-	48.25	1.90	M58 x 2.0	58	2.28	55	2.16

British connections

British standard pipe(BSP)



This BSPT (tapered) connection is similar to the NPT, except that the thread pitches are different in most sizes, and the thread form and O.D.s are close but not the same. Sealing is accomplished by thread distortion. A thread sealant is recommended.



The BSP (parallel) male is similar to the NPSM male except the thread pitches are different in most sizes.

The female swivel BSPP has a tapered nose/Globeseal flareless swivel which seals on the cone seat of the male.

BSPT/BSPP threads

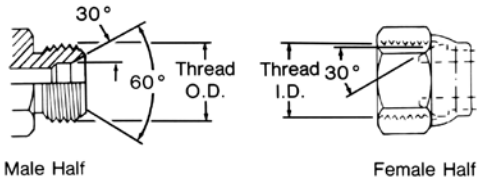
Inch size	Dash size	Nominal thread size	Male thread O.D. inch		Female thread I.D. inch	
mm	mm		fraction	decimal	fraction	decimal
1/8	02	1/8–28	3/8	0.38	11/32	0.35
1/4	04	1/4–19	33/64	0.52	15/32	0.47
3/8	06	3/8–19	21/32	0.65	19/32	0.60
1/2	08	1/2–14	13/16	0.82	3/4	0.75
5/8	10	5/8–14	7/8	0.88	13/16	0.80
3/4	12	3/4–14	1 1/32	1.04	31/32	0.97
1	16	1–11	1 5/16	1.30	1 7/32	1.22
1 1/4	20	1 1/4–11	1 21/32	1.65	1 9/16	1.56
1 1/2	24	1 1/2–11	1 7/8	1.88	1 25/32	1.79
2	32	2–11	2 11/32	2.35	2 1/4	2.26

*Frequently, the thread size is expressed as a fractional dimension preceded by the letter "G" or the letter "R". The "G" represents a parallel thread and the "R" indicates a tapered thread. For example, BSPP 3/8–19 may be expressed as G 3/8, and BSPT 3/8–19 may be expressed as R3/8.

Japanese connections

JIS 30° male inverted seat, parallel pipe threads

(Threads per JIS B 0202)

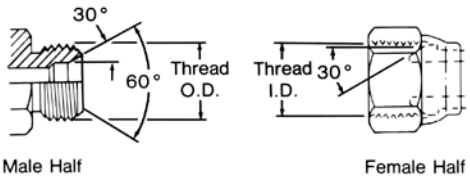


The JIS parallel is similar to the BSPP connection. The JIS parallel thread and the BSPP connection are interchangeable.

Inch size	Dash size	Nominal thread size (similar to bspp)	Male thread O.D.		Female thread O.D.	
mm	mm		fract.	dec.	fract.	dec.
1/4	6 (04)	1/4–19	33/64	13.2	15/32	11.9
3/8	9 (06)	3/8–19	21/32	16.7	19/32	15.3
1/2	12 (08)	1/2–14	13/16	21.0	3/4	19.2
3/4	19 (12)	3/4–14	1 1/32	26.4	31/32	24.6
1	25 (16)	1–11	1 5/16	33.3	1 7/32	30.9
1 1/4	32 (20)	1 1/4–11	1 21/32	41.9	1 9/16	39.6
1 1/2	38 (24)	1 1/2–11	1 7/8	47.8	1 25/32	45.5
2	50 (32)	2–11	2 11/32	59.7	2 1/4	57.4

JIS 30° male inverted seat, parallel pipe threads

(Threads per JIS B 0207)

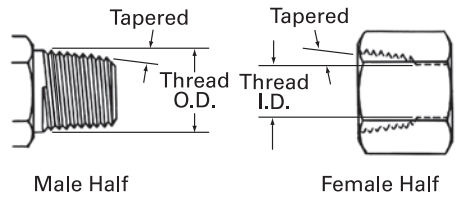


The JIS parallel (metric) is the same as the JIS parallel (PF), except for the thread difference.

Inch size	Dash size equi-valent	Thread size	Male thread O.D.		Female thread O.D.	
mm	mm		fract.	dec.	fract.	dec.
6	04	M14 x 1.5	14	0.55	12.5	0.49
9	06	M18 x 1.5	18	0.71	16.5	0.65
12	08	M22 x 1.5	22	0.87	20.5	0.81
19	12	M30 x 1.5	30	1.18	28.5	1.12
25	16	M33 x 1.5	33	1.30	31.5	1.24
32	20	M42 x 1.5	42	1.65	40.5	1.60

JIS Tapered pipe (PT)

(Threads per JIS B 0203)

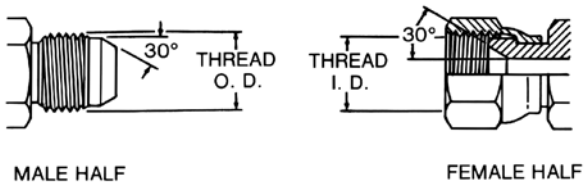


The JIS tapered thread is similar to the BSPT connection in design, appearance and dimensions. The JIS tapered thread and the BSPT connection are interchangeable.

Inch size	Dash size	Nominal thread size (similar to bspp)	Male thread O.D. inch		Female thread I.D. inch	
mm	mm	-	fract.	dec.	fract.	dec.
1/4	6 (04)	1/4–19	33/64	13.2	15/32	11.9
3/8	9 (06)	3/8–19	21/32	16.7	19/32	15.3
1/2	12 (08)	1/2–14	13/16	21.0	3/4	19.2
3/4	19 (12)	3/4–14	1 1/32	26.4	31/32	24.6
1	25 (16)	1–11	1 5/16	33.3	1 7/32	30.9
1 1/4	32 (20)	1 1/4–11	1 21/32	41.9	1 9/16	39.6
1 1/2	38 (24)	1 1/2–11	1 7/8	47.8	1 25/32	45.5
2	50 (32)	2–11	2 11/32	59.7	2 1/4	57.4

JIS 30° female (cone) seat, parallel pipe threads (PT)

(Threads per JIS B 0202)

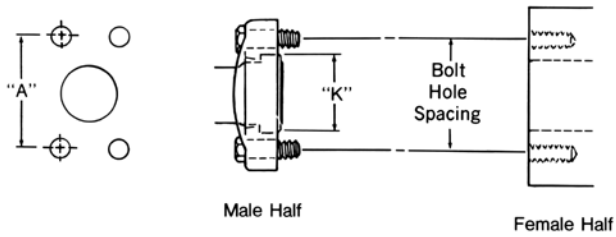


The Japanese JIS 30° flare is similar to the American SAE 37° flare connection in application as well as sealing principles. However, the flare angle and dimensions are different. The threads are similar to BSPP.

Inch size	Dash size	Nominal thread size (similar to bspp)	Male thread O.D. inch		Female thread O.D. inch	
mm	mm	-	fract.	dec.	fract.	dec.
1/4	6 (04)	1/4–19	33/64	13.2	15/32	11.9
3/8	9 (06)	3/8–19	21/32	16.7	19/32	15.3
1/2	12 (08)	1/2–14	13/16	21.0	3/4	19.2
3/4	19 (12)	3/4–14	1 1/32	26.4	31/32	24.6
1	25 (16)	1–11	1 5/16	33.3	1 7/32	30.9
1 1/4	32 (20)	1 1/4–11	1 21/32	41.9	1 9/16	39.6
1 1/2	38 (24)	1 1/2–11	1 7/8	47.8	1 25/32	45.5
2	50 (32)	2–11	2 11/32	59.7	2 1/4	57.4

Japanese connections

JIS B 8363 4-bolt flange*

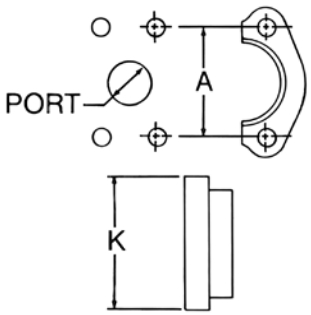


This connection is commonly used in fluid power systems. There are two pressure ratings. Type I (Code 61) is referred to as the "standard" series and Type II (Code 62)is the "6000 psi" series. The design concept for both series is the same, but the bolt hole spacing and flanged head diameters are larger for the higher pressure, Type II connection. Both metric and inch bolts are used. The female (port) is an unthreaded hole with four bolt holes in a rectangular pattern around the port. The male consists of a flanged head, grooved for an O-Ring, and either a captive flange or split flange halves with bolt holes to match the port. The seal takes place on the O-Ring, which is compressed between the flanged head and the flat surface surrounding the port. The threaded bolts hold the connection together.

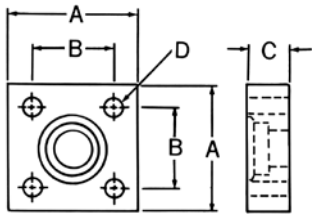
Note: *JIS B 8363, ISO/DIS 6162, DIN 20066, and SAE J518 are interchangeable, except for bolt sizes.

Size mm inch (dash)	Port hole mm (inch)	Bolt dimensions mm & inch		Bolt hole spacing "A" mm (inch)	
		Type I (Cd.61)	Type II (Cd. 62)	Type I (Cd. 61)	Type II (Cd. 62)
mm in (dash)	mm (in)	mm (in)	mm (in)	mm(in)	mm (in)
12(1/2) (08)	12,7 (0.50)	M8 x 1.25 x 30 (5/16–18 x 1 1/4)	M8 x 1.25 x 30 (5/16–18 x 1 1/4)	38.1 (1.50)	40.49 (1.57)
19(3/4) (12)	19,1 (0.75)	M10 x 1.5 x 30 (3/8–16 x 1 1/4)	M10 x 1.5 x 40 (3/8–16 x 1 1/2)	47.63 (1.88)	50.80 (2.00)
25(1) (16)	25,4 (1.00)	M10 x 1.5 x 30 (3/8–16 x 1 1/4)	M12 x 1.75 x 45 (7/16–14 x 1 3/4)	52.37 (2.06)	57.15 (2.25)
32 (1 1/4) (20)	31,7 (1.25)	M10 x 1.5 x 40 (7/16–14 x 1 1/2)	M14 x 2 x 45 (1/2–13 x 1 3/4)	58.72 (2.31)	66.68 (2.63)
38 (1 1/2) (24)	38,0 (1.50)	M12 x 1.75 x 40 (1/2–13 x 1 1/2)	M16 x 2 x 55 (5/8–11 x 2 1/4)	69.85 (2.75)	79.38 (3.13)
50(2) [32]	50,8 (2.00)	M12 x 1.75 x 40 (1/2–13 x 1 1/2)	M20 x 2.5 x 70 (3/4–10 x 2 3/4)	77.77 (3.06)	96.82 (3.81)

Inch size	Flanged head dia. "K"			
	Type I bar (Cd.61)		Type II bar (Cd. 62)	
	mm	in	mm	in
1/2	30, 18	1.19	31, 75	1.25
3/4	38, 10	1.50	41, 28	1.63
1	44, 45	1.75	47, 63	1.88
1 1/4	50, 80	2.00	53, 98	2.13
1 1/2	60, 33	2.38	63, 50	2.50
2	71, 42	2.81	79, 38	3.13



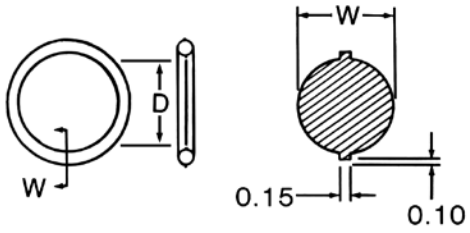
JIS 210 Kgf/cm2 4-bolt square flange



The JIS 4-bolt square flange connection is similar in concept to the SAE 4-bolt flange connection, except that the JIS bolt pattern is square and the flange itself is different.

Size mm	Appx. inch size	Bolt size mm (bolt length for long (design)	Dim. "A" mm (inch)	Dim. "B" mm (inch)	Dim. "C" mm (inch)	Bolt hole dia "D" mm (inch)
12	1/2	M10 x 1.5 x 55 (80)	63 (2.48)	40 (1.57)	22 (0.87)	11 (0.43)
19	3/4	M10 x 1.5 x 55 (80)	68 (2.67)	45 (1.77)	22 (0.87)	11 (0.43)
25	1	M12 x 1.75 x 70 (100)	80 (3.15)	53 (2.09)	28 (1.10)	13 (0.51)
32	1 1/4	M12 x 1.75 x 70 (100)	90 (3.54)	63 (2.48)	28 (1.10)	13 (0.51)
38	1 1/2	M16 x 2.0 x 90 (130)	100 (3.94)	70 (2.76)	36 (1.42)	18 (0.71)
50	2	M16 x 2.0 x 90 (130)	112 (4.41)	80 (3.15)	36 (1.42)	18 (0.71)

JIS 210 Kgf/cm2 O-Ring



Nominal size mm	Dim."D"mm	Dim."W"mm
12	24.4 ± 0.15	3.1 ± 0.1
19	29.4 ± 0.15	3.1 ± 0.1
25	34.4 ± 0.15	3.1 ± 0.1
32	39.4 ± 0.15	3.1 ± 0.1
38	49.4 ± 0.15	3.1 ± 0.1
50	59.4 ± 0.15	3.1 ± 0.1

Fluid connector

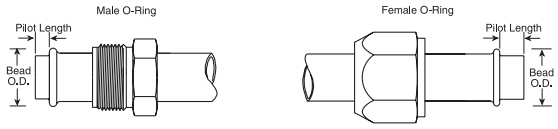
O-Ring pilot thread sizes

O-Ring pilot thread sizes

This connection is common to air conditioning systems, both in vehicle and commercial applications. Both the male and female halves of the connections have a pilot, either long or short. The seal takes place by compressing an O-ring adjacent to the bead of the tube. The threads hold the connection together mechanically.

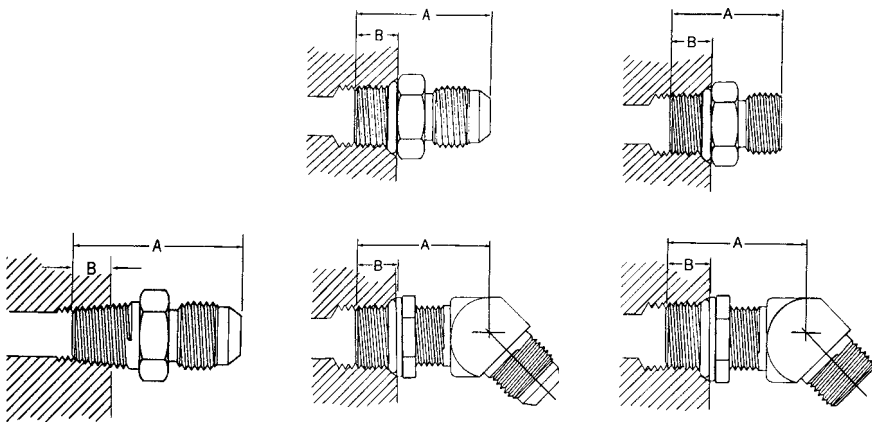
		Male thread			Female thread		
Inch size	**Dash size**	**O.D. (inch) nominal thread**	**O.D. (inch) fraction**	**O.D. (inch) decimal**	**I.D. (inch) nominal thread**	**I.D. (inch) fraction**	**I.D. (inch) decimal**
3/8	06	5/8 - 18	5/8	0.62	5/8 - 18	9/16	0.57
1/2	08	3/4 - 18	3/4	0.75	3/4 - 16	11/16	0.69
5/8	10	7/8 - 18	7/8	0.87	7/8 - 14	13/16	0.81
3/4	12	1 1/16 -16	1 1/16	1.06	1 1/16 - 14	1	0.99

		Long pilot		Short pilot	
Inch size	**Nominal tube size**	**Bead O.D.(inch)**	**Pilot length**	**Bead O.D. (inch)**	**Pilot length**
3/8	06	0.52	0.28	0.52	0.19
1/2	08	0.64	0.39	0.64	0.19
5/8	10	0.77	0.39	0.77	0.19
3/4	12	0.91	0.39	0.91	0.19



Thread engagement

Dimensions may vary due to tolerance conditions. Listed below are the thread engagement dimensions (B) which must be taken into consideration when making connection with ports or appropriate female adapters. The "B" dimension must be subtracted from the overall length (A) to insure proper connection.



Dash size	Male pipe		SAE O-ring boss SAE J1926 with 37° flare J514		SAE O-ring boss SAE J1926 with ORS J1453	
mm	Straight and angled dimension "B"		Straight and adjustable dimension "B"		Straight and adjustable dimension "B"	
	mm	in	mm	in	mm	in
–02	6,4	0.25	–	–	–	–
–04	9,7	0.38	9,1	0.36	10,9	0.43
–05	–	–	9,1	0.36	10,9	0.43
–06	9,7	0.38	9,1	0.39	11,9	0.47
–08	12,7	0.50	10,9	0.43	14,0	0.55
–10	–	–	12,7	0.50	16,0	0.63
–12	15,7	0.62	15,0	0.59	18,5	0.73
–14	–	–	15,0	0.59	–	–
–16	17,5	0.69	15,0	0.59	18,5	0.73
–20	17,5	0.69	15,0	0.59	18,5	0.73
–24	17,5	0.69	15,0	0.59	18,5	0.73
–32	19,1	0.75	15,0	0.59	–	–

Allowable bulkhead thickness:

For ORS

Dash size	Hole diameter	ORS bulkhead thickness			
		Min		Max	
	in	mm	in	mm	in
–04	0.575 +.015/–.000	5,1	0.20	12,7	0.50
–06	0.700 +.015/–.000	5,1	0.20	15,0	0.59
–08	0.825 +.015/–.000	5,6	0.22	15,0	0.59
–10	1.015 +.015/–.000	5,8	0.23	15,0	0.59
–12	1.200 +.015/–.000	6,4	0.25	15,0	0.59
–16	1.450 +.015/–.000	6,4	0.25	15,2	0.60
–20	1.715 +.015/–.000	6,4	0.25	15,2	0.60
–24	2.030 +.015/–.000	6,4	0.25	15,2	0.60

For 37° Flare

Dash size	Hole diameter	37° bulkhead thickness straights				37° bulkhead thickness shapes			
		Min		Max		Min		Max	
	in	mm	in	mm	in	mm	in	mm	in
–03	0.391 +.016/–.000	1,3	0.05	10,4	0.41	3,3	0.13	6,4	0.25
–04	0.453 +.016/–.000	1,3	0.05	10,4	0.41	3,3	0.13	7,1	0.28
–05	0.516 +.016/–.000	1,3	0.05	10,4	0.41	3,3	0.13	7,1	0.28
–06	0.578 +.016/–.000	1,3	0.05	11,2	0.44	3,3	0.13	7,6	0.30
–08	0.766 +.016/–.000	1,3	0.05	11,2	0.44	4,1	0.16	8,6	0.34
–10	0.891 +.016/–.000	1,3	0.05	11,9	0.47	4,1	0.16	9,1	0.36
–12	1.076 +.016/–.000	1,3	0.05	11,9	0.47	4,1	0.16	9,7	0.38
–16	1.328 +.016/–.000	1,3	0.05	11,9	0.47	4,1	0.16	9,7	0.38
–20	1.656 +.031/–.000	1,3	0.05	11,9	0.47	4,1	0.16	9,7	0.38
–24	1.906 +.031/–.000	1,3	0.05	11,9	0.47	4,1	0.16	9,7	0.38

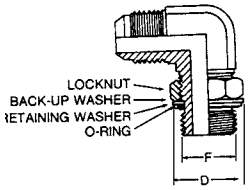
Fluid connectors

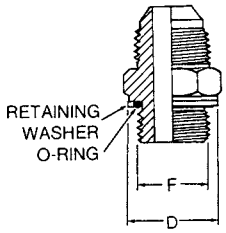
Metric thread dimensions, Conversion adapters

Metric thread dimensions

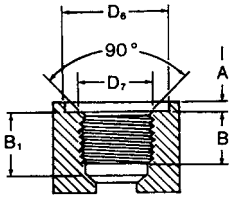
Conversion adapters

Sealing is achieved by means of an O-Ring, retaining washer and a properly machined port. The O-Ring is "captured" by the I.D. of the retaining washer. The port may be of the spot faced or a flat machined surface as long as the D6 dimension is met. Assembly instructions for adjustable type adapters are found at Lifesaver Fittings E-SROV-TS008-E.





DIN 3852 large spot face



Equivalent to DIN 3852 form x

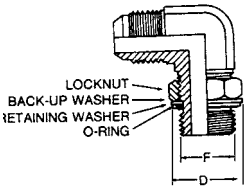
Thread size	M 10 x 1	M 12 x 1.5	M 14 x 1.5	M 16 x 1.5	M 18 x 1.5	M 20 x 1.5	M 22 x 1.5	M 26 x 1.5	M 27 x 2	M 33 x 2	M 42 x 2	M 48 x 2
F Thread Dia.	10.0	12.0	14.0	16.0	18.0	20.0	22.0	26.0	27.0	33.0	42.0	48.0
A max	1.0	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5	2.5	2.5	2.5
B min (full thread)	12.0	12.0	12.0	12.0	12.0	14.0	14.0	16.0	16.0	18.0	20.0	22.0
B1 min	13.5	18.5	18.5	18.5	18.5	20.5	20.5	22.5	24.0	26.0	28.0	30.0
D max	15.7	18.7	19.7	23.2	26.2	28.2	30.2	35.2	36.2	43.2	52.7	58.7
D6 min	16.2	19.2	20.2	23.7	26.9	28.9	30.7	35.7	36.7	44.4	53.4	59.9
D7 max	10.2	12.2	14.2	16.2	18.2	20.2	22.2	26.2	27.2	33.3	42.3	48.3

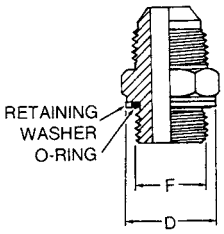
BSPP (parallel) threads

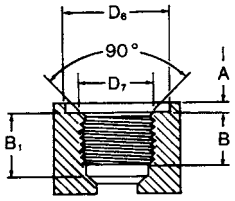
Sealing is achieved by means of an O-Ring, retaining washer and a properly machined port.

The O-Ring is "captured" by the I.D. of the retaining washer. The compression is controlled by the thickness of the retaining washer.

The port may be of the spot faced or a flat machined surface as long as the D6 dimension is met.



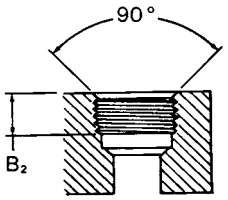




Thread size	G 1/8"-28		G 1/4"-19		G 3/8"-19		G 1/2"-14		G 3/4"-14		G 1"-11		G 11/4"-11		G 11/2"-11	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
F Thread Dia.	9,7	0.38	13,2	0.50	16,7	0.66	20,9	0.83	26,4	1.04	33,3	1.31	41,9	1.65	47,8	1.88
A max	1,0	0.04	2,0	0.08	2,05	0.10	2,5	0.10	2,5	0.10	2,5	0.10	2,5	0.10	2,5	0.10
B1 min (full thread)	8,0	0.31	12,0	0.47	12,0	0.47	14,0	0.63	16,0	0.63	18,0	0.71	20,0	0.79	22,0	0.87
B1 min	13,0	0.51	18,5	0.73	18,5	0.73	22,0	0.94	24,0	0.94	27,0	1.06	29,0	1.14	31,0	1.22
D max	15,7	0.62	19,7	0.78	24,0	0.94	28,7	1.38	35,2	1.38	43,2	1.70	52,7	2.07	58,7	2.31
D6 min	16,2	0.64	20,2	0.81	24,9	0.98	29,4	1.43	36,4	1.43	44,4	1.75	53,4	2.10	59,9	2.36
D7 max	10,0	0.39	13,4	0.53	16,9	0.67	21,2	1.05	26,7	1.05	33,6	1.32	42,3	1.67	48,2	1.90

BSPT (tapered) threads port sealing

Sealing is achieved by means of metal to metal deformation of the adapter and port threads.



Thread size 11	R 1/8"-28		R 1/4"-19		R 3/8"-19		R 1/2"-14		R 3/4"-14		R 1"-11		R 11/4"-11		R 1 1/2"-	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
B2 min (full thread)	5,5	0.22	8,5	0.33	8,5	0.33	10,5	0.41	13,0	0.51	14,5	0.57	17,0	0.67	17,0	0.67

Conversion table: Inch/Millimeter

Multiply inch x 25.4 =mm

Inches		Millimeters
Fract.	Dec.	Dec.
1/64	0.016	0.397
1/32	0.031	0.794
3/64	0.047	1.191
1/16	0.063	1.588
5/64	0.078	1.984
3/32	0.094	2.381
7/64	0.109	2.778
1/8	0.125	3.175
9/64	0.141	3.572
5/32	0.156	3.969
11/64	0.172	4.366
3/16	0.188	4.763
13/64	0.203	5.159
7/32	0.219	5.556
15/64	0.234	5.953
1/4	0.250	6.350

Inches		Millimeters
Fract.	Dec.	Dec.
17/64	0.266	6.747
9/32	0.281	7.144
19/64	0.297	7.541
5/16	0.313	7.938
21/64	0.328	8.334
11/32	0.344	8.731
23/64	0.359	9.128
3/8	0.375	9.525
25/64	0.391	9.922
13/32	0.406	10.319
27/64	0.422	10.716
7/16	0.438	11.113
29/64	0.453	11.509
15/32	0.469	11.906
31/64	0.484	12.303
1/2	0.500	12.700

Inches		Millimeters
Fract.	Dec.	Dec.
33/64	0.516	13.097
17/32	0.531	13.494
35/64	0.547	13.891
9/16	0.563	14.288
37/64	0.578	14.684
19/32	0.594	15.081
39/64	0.609	15.478
5/8	0.625	15.875
41/64	0.641	16.272
21/32	0.656	16.669
43/64	0.672	17.066
11/16	0.688	17.463
45/64	0.703	17.859
23/32	0.719	18.256
47/64	0.734	18.653
3/4	0.750	19.050

Inches		Millimeters
Fract.	Dec.	Dec.
49/64	0.766	19.447
25/32	0.781	19.844
51/64	0.797	20.241
13/16	0.813	20.638
53/64	0.828	21.034
27/32	0.844	21.431
55/64	0.859	21.828
7/8	0.875	22.225
57/64	0.891	22.622
29/32	0.906	23.019
59/64	0.922	23.416
15/16	0.938	23.813
61/64	0.953	24.209
31/32	0.969	24.606
63/64	0.984	25.003
1	1.000	25.400

Conversion table: Pressure

(Per SAE J517 Section A)

Mpa	Bar	PSI
0.25	2.5	35
0.3	3	45
0.35	3.5	50
0.4	4	56
0.4	4	62
0.5	5	70
0.6	6	90
0.7	7	100
0.8	8	112
0.85	8.5	125
1	10	140
1.05	10.5	150
1.25	12.5	180
1.4	14	200
1.6	16	225
1.7	17	250
2.1	21	300
2.4	24	350
2.6	26	375
2.8	28	400
3.5	35	500
3.9	39	565

Mpa	Bar	PSI
4.2	42	600
4.3	43	625
4.9	49	700
5	50	725
5.2	52	750
5.6	56	800
6.1	61	875
7	70	1000
7.8	78	1125
8.4	84	1200
8.7	87	1250
9.8	98	1400
10	100	1450
10.5	105	1500
11.2	112	1600
11.3	113	1625
12.2	122	1750
14	140	2000
15.7	157	2250
16.8	168	2400
17.5	175	2500
19.2	192	2750

Mpa	Bar	PSI
20	200	2900
21	210	3000
22.4	224	3200
22.7	227	3250
24.5	245	3500
28	280	4000
29.7	297	4250
31.5	315	4500
33.5	335	4800
35	350	5000
38.5	385	5500
40	400	5800
42	420	6000
43.5	435	6250
45.5	455	6500
49	490	7000
52.5	525	7500
56	560	8000
59.5	595	8500
61	610	8750
63	630	9000
70	700	10000

Mpa	Bar	PSI
77	770	11000
78	780	11250
80	800	11600
84	840	12000
87	870	12500
98	980	14000
112	1120	16000
119	1190	17000
122	1220	17500
140	1400	20000
157	1570	22500
160	1600	23200
168	1680	24000
175	1750	25000
210	2100	30000
245	2450	35000
280	2800	40000
315	3150	45000
350	3500	50000

A new method for calculating the equivalent metric conversion to Mpa from psi was utilized. This method provides an extremely easy and consistent method of conversion to arrive at a rounded metric units using 7 Mpa for each 1000 psi. The resulting Mpa pressure in never more than 1.7% higher that the mathematically correct Mpa unit when the pressure in higher than 250 psi. All operating pressures of SAE J517 hoses are above 250 psi except for most of 100R4 and the 76mm (-48) and larger sizes of 100R5. Therefore all files of previous test results should not be compromised

Assembly instructions

Assembly torque

Recommended parallel connection assembly torque

Eaton recommends that a torque wrench be used to assure proper fitting assembly of these connections.

The values listed are for steel connections. Contact Eaton for torque values for other materials.

Straight thread O-Ring boss low pressure with 37° (SAEJ514)

Dash size	Thread size (inches)	Jam nut or straight fitting torque lb.-ft.	Jam nut or straight fitting torque newton meters
–03	3/8-24	8-9	12-13
–04	7/16-20	13-15	18-20
–05	1/2-20	14-15	19-21
–06	9/16-18	23-24	32-33
–08	3/4-16	40-43	55-57
–10	7/8-14	43-48	59-64
–12	1 1/16-12	68-75	93-101
–14	1 3/16-12	83-90	113-122
–16	1 5/16-12	112-123	152-166
–20	1 5/8-12	146-161	198-218
–24	1 7/8-12	154-170	209-230
–32	2 1/2-12	218-240	296-325

Straight thread O-Ring boss high pressure with ORS (J1453)

Dash size	Thread size (inches)	Jam nut or straight fitting torque lb.-ft.	Jam nut or straight fitting torque newton meters
–03	3/8-24	8-10	11-13
–04	7/16-20	14-16	20-22
–05	1/2-20	18-20	24-27
–06	9/16-18	24-26	33-35
–08	3/4-16	50-60	68-78
–10	7/8-14	72-80	98-110
–12	1 1/16-12	125-135	170-183
–14	1 3/16-12	160-180	215-245
–16	1 5/16-12	200-220	270-300
–20	1 5/8-12	210-280	285-380
–24	1 7/8-12	270-360	370-490

ORS

Dash size	Thread size (inches)	Swivel nut torque lb.-ft.	Swivel nut torque newton meters
–04	9/16-18	10-12	14-16
–06	11/16-16	18-20	24-27
–08	13/16-16	32-35	43-47
–10	1-14	46-50	62-68
–12	1 3/16-12	65-70	88-95
–16	1 7/16-12	92-100	125-136
–20	1 11/16-12	125-140	170-190
–24	2-12	150-165	204-224

SAE 37° (JIC)

Dash size	Thread size (inches)	Swivel nut torque lb.-ft.	Swivel nut torque newton meters
–04	7/16-20	11-12	15-16
–05	1/2-20	15-16	20-22
–06	9/16-18	18-20	24-28
–08	3/4-16	38-42	52-58
–10	7/8-14	57-62	77-85
–12	1 1/16-12	79-87	108-119
–16	1 5/16-12	108-113	148-154
–20	1 5/8-12	127-133	173-182
–24	1 7/8-12	158-167	216-227
–32	2 1/2-12	245-258	334-352

Metric

Thread size	Straight adapter or locknut torque	
mm	lb.-ft.	Newton meters
M10 x 1	13-15	18-20
M12 x 1.5	15-19	20-25
M14 x 1.5	19-23	25-30
M16 x 1.5	33-40	45-55
M18 x 1.5	37-44	50-60
M20 x 1.5	52-66	70-90
M22 x 1.5	55-70	75-95
M26 x 1.5	81-96	110-130
M27 x 2	96-111	130-150
M33 x 2	162-184	220-250
M42 x 2	170-192	230-260
M48 x 2	258-347	350-470

BSPP

Nominal thread size	Straight adapter or locknut torque	
inches**	lb.-ft.	Newton meters
G 1/8-28	13-15	18-20
G 1/4-19	19-23	25-30
G 3/8-19	33-40	45-55
G 1/2-14	55-70	75-95
G 3/4-14	103-118	140-160
G 1-11	162-184	220-250
G 1 1/4-11	170-192	230-260
G 1 1/2-11	258-347	350-470

**"G" denotes parallel threads, other than ISO 6149. (Port connection only)

Assembly instruction tips

Terms

- Skive—Removal of the cover material exposing the reinforcement prior to fitting assembly.
- Dash Size—The hose or fitting size expressed in 1/16 of an inch.The numerator of a fraction whose denominator is 16. Example: –8 or –08 is 8/16" = 1/2".
- Nipple—The part of a hose fitting that goes into the hose tube.
- Socket—The part of a hose fitting that goes over the hose cover or reinforcement.
- Mandrel—A round, properly sized, steel bar used for support during assembly of the fitting or skiving the hose cover.
- Annular Rings—A series of concentric rings inside the socket.

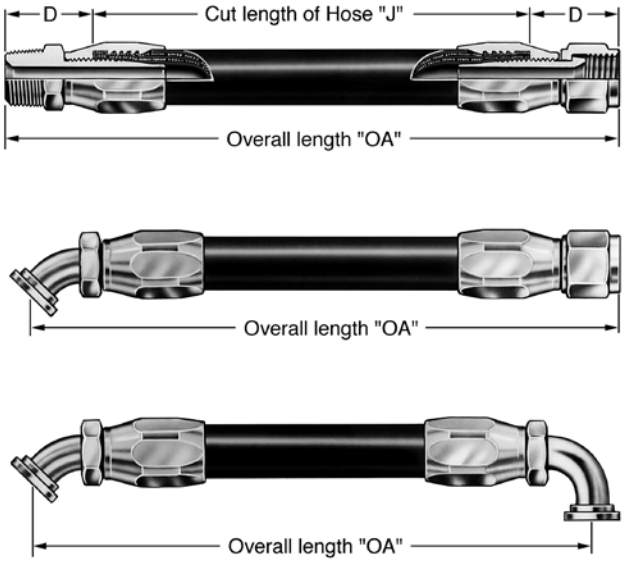
Reusable fitting tips to remember for easy assembly

- Part numbers and dash sizes are indicated on fitting sockets.
- It is essential the fitting be mated with a compatible hose style with the same dash size.
- Reusable fittings that have a notch in the socket serve as a reference for the cover skiving length.
- Familiarize yourself with the assembly instructions before you start to make an assembly.
- For hoses that require skiving, be sure to skive the hose to the proper length and down to the wire reinforcement.
- Use Aeroquip 222070 hose assembly lube liberally on both the inside of the hose and on the fitting nipple. (Check for compatibility.)
- Always cut hose square by using a sharp instrument (hacksaw or cutoff wheel).
- For volume production of hose assemblies, use Eaton Assembly Equipment.

Cutting the hose

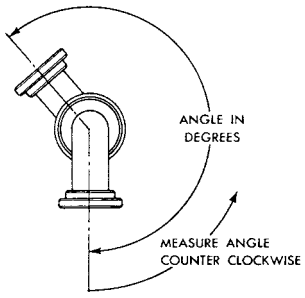
1. To determine the "J" length (cut length of hose) from "OA" (overall length) deduct "D" dimensions of both end fittings. Consult fitting information pages for "D" dimensions. For hose assemblies with SOCKETLESS® fittings, add 1/2" to "J" length.

   Tip: If the old Aeroquip® assembly was the right length, simply remove the hose fittings and measure the hose.
2. Cut the hose square. Use a cut-off wheel or fine-tooth hacksaw.
3. Clean the hose bore.



Phase angle (offset)

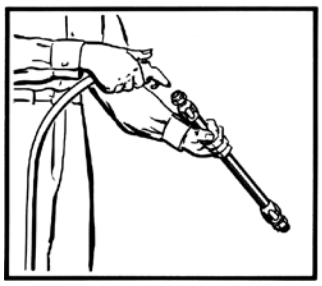
When making double elbow assemblies, the following steps should be followed to obtain the desired angle between elbows. Tighten both elbows to maximum allowable gap between socket and nipple hex. Start to position for relative angle between elbows. Finish assembly by adjusting both elbows. Backing off to get desired angle should be avoided.



Assembly instructions

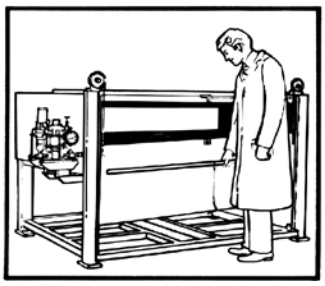
Maintenance

Cleaning, inspection, testing and storage

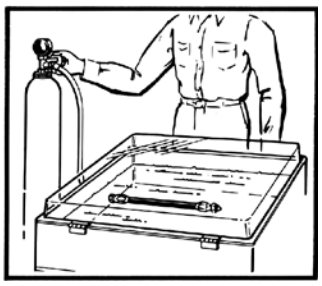


Clean

Inspect



Proof test - hydrostatic



Proof test - pneumatic

Maintenance

Hose assemblies in operation should be inspected frequently for leakage, kinking, abrasion, corrosion or any other signs of wear or damage. Worn or damaged hose assemblies should be replaced immediately.

Clean

At minimum a hose assembly should be blown out with clean compressed air. Eaton recommends using the **Jetcleaner Hose Cleaning System** (FT1355).

Assemblies may be rinsed out with mineral spirits if the tube stock is compatible with oil, otherwise hot water at +150°F max. may be used. Consult Eaton for special cleaning equipment.

Inspect

Examine hose assembly internally for cut or bulged tube, obstructions, and cleanliness. For segment style fittings, be sure that the hose butts up against the nipple shoulder; band and retaining ring are properly set and tight, and segments are properly spaced. Check for proper gap between nut and socket or hex and socket. Nuts should swivel freely. Cap the ends of the hose with plastic covers to keep clean.

Proof test – hydrostatic

The hose assembly should be hydrostatically tested at twice the recommended working pressure of the hose.

Test pressure should be held for not more than one minute and not less than 30 seconds. When test pressure is reached, visually inspect hose assembly for: a) Any leaks or signs of weakness. b) Any movement of the hose fitting in relation to the hose. Any of these defects are cause for rejection.

(See Assembly Equipment Section for Eaton Proof Test Stands.)

Proof test – pneumatic

Hose assemblies intended for gas or air service should be tested with air or nitrogen at 100 psi with the assembly immersed in water. Random bubbles may appear over the hose and fitting area when assembly is first pressurized. This should not be construed as a defect. However, if the bubbles persist in forming at a steady rate at any particular point on the hose, the assembly should be rejected.

Caution: Testing should be conducted in approved test stands with adequate guards to protect the operator.

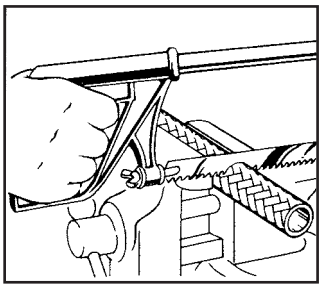
Storage and handling

Hose should be stored in a dark, dry atmosphere away from electrical equipment, and the temperature should not exceed +90°F. Storage in the original shipping container is preferred.

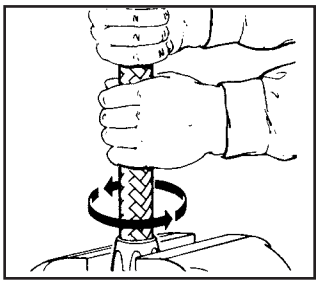
Hose and reusable fittings

Standard (mandrelless) reusable fittings with single wire braid, multiple textile braid, hydraulic and LPG hose.

FC234, FC300, FC321, FC350, FC355, 1503, 2580, 2651
(for fittings requiring mandrel, see page A-58)



Step 1
Cut hose square with finetooth hacksaw or cut-off wheel.



Step 2
Put socket in vise.

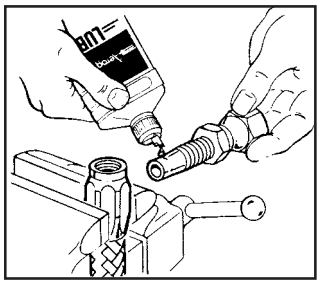
Screw hose counterclockwise into socket until it bottoms.

Back off 1/4 turn.

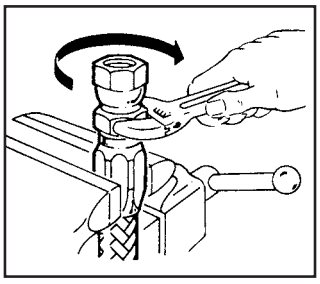
When assembling long lengths of hose, it may be preferred to put hose in vise just tight enough to prevent from turning, and screw socket into the hose counterclockwise until it bottoms.

Back off 1/4 turn.

Back off FC300, FC350 and FC355 1/4 to 1/2 turn.



Step 3
Lubricate nipple and threads LIBERALLY. Use heavy oil or Aeroquip® 222070 hose assembly lube.

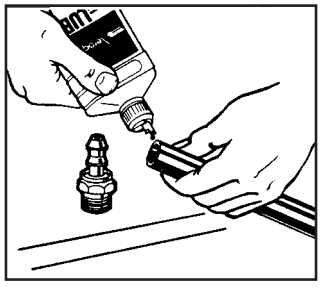


Step 4
Screw nipple clockwise into socket and hose. Leave 1/32" to 1/16" clearance between nipple hex and socket.

Recommendations for cleaning, inspection and testing are summarized on page A-52. Disassemble in reverse order.

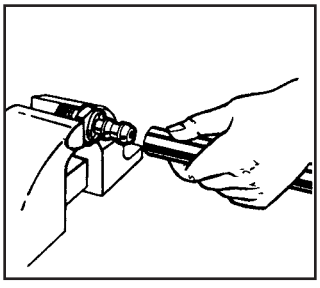
SOCKETLESS® fittings with textile braid low pressure hose

FC332, FC647, 2556, 2565, 2575



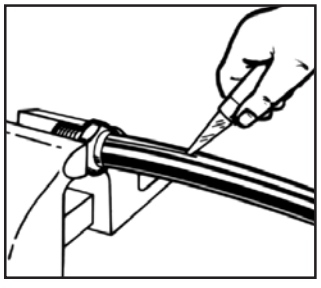
Step 1 to Assemble

Cut hose to required length with a sharp knife. Oil inside of hose and outside of nipple liberally.



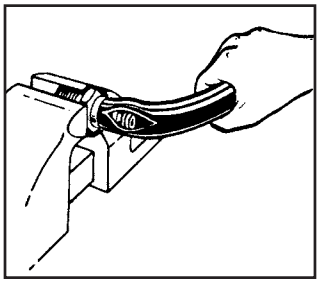
Step 2

Push hose on fitting until hose end bottoms underneath protective cap as shown. For quantity production use a SOCKETLESS Fitting assembly machine. Recommendations for cleaning, inspection and testing are summarized on page A-52.



Step 1 to disassemble

Slit hose lengthwise from protective cap to end of nipple.



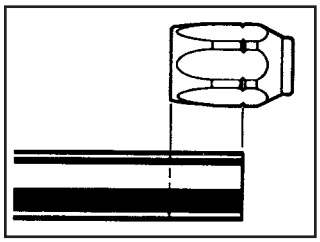
Step 2

Bend hose, then snap hose off with a quick tug.

Hose and reusable fittings

Standard reusable fittings with Hi-Pac and two wire braid hose

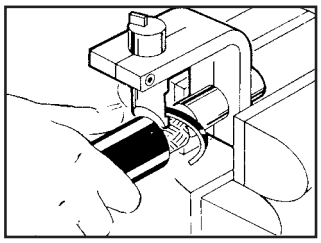
FC310, FC510, 2781



Step 1

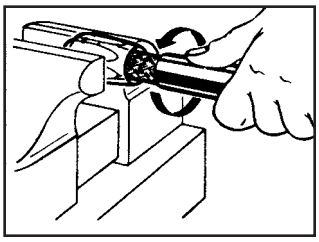
Cut hose to length required using a fine-tooth hacksaw or cut-off wheel. Clean hose bore.

Hose must be stripped of its rubber cover before inserting in socket. Locate skiving point by putting hose end next to socket as shown. Measure from hose end of socket to notch on socket.



Skive Tool

Use the correct size FT1229 hose cover skiving tool. Mount the tool in a vise. Push the hose over the mandrel. Rotate the hose clockwise until it bottoms or secure hose in a vise and attach FT1279 auger to the skive tool. Insert mandrel into the hose and rotate clockwise until it bottoms.



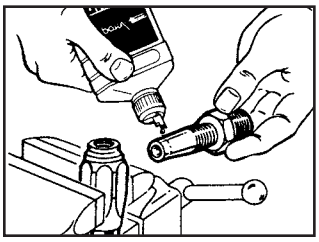
Step 2

Put socket in vise.

Screw hose into socket counterclockwise until it bottoms.

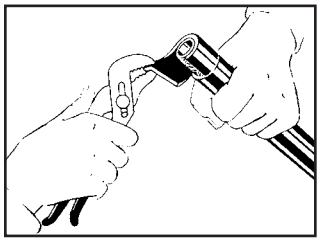
When assembling long lengths of hose, it may be preferred to put hose in vise just tight enough to prevent from turning, and screw socket onto the hose counterclockwise until it bottoms.

Note: Sockets for hose fittings in the –16, –24 and –32 sizes are furnished with internal annular grooves in place of helical grooves (all FC310 and FC510 hose sockets are annular grooved). Install socket by pushing hose into socket with a back and forth rocking and twisting motion until hose bottoms on shoulder of socket.



Step 3

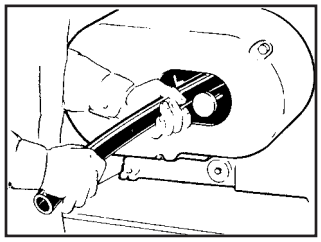
Lubricate nipple threads and inside of hose liberally. Use heavy oil or Eaton 222070 hose assembly lube.



Step 1A

Skive Hose

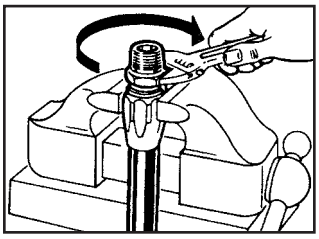
By Hand: Cut rubber cover around down to wire reinforcement. Slit lengthwise. Raise flap and pull off with pliers. Clean excess rubber off wire reinforcement with wire brush or soft wire wheel. Do not fray or flare wire reinforcement when brushing.



Machine

Use the S1102 cut-off and skiving machine. Consult the owners manual. Select the correct mandrel. Turn on the machine. Put the hose over the mandrel and rotate.

Note: When skiving, remove the rubber cover until the wire reinforcement is exposed around the circumference of the hose.



Step 4

Screw nipple clockwise into socket and hose.

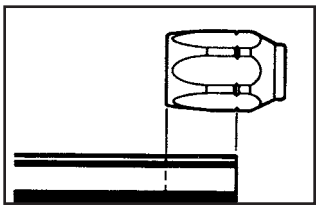
Leave 1/32" to 1/16" clearance between nipple hex and socket.

Recommendations for cleaning, inspection and testing are summarized on page A-52. Disassemble in reverse order.

Hose and reusable fittings

Standard reusable fittings with four spiral wire hose

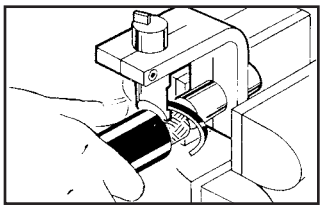
GH493, FC736



Step 1

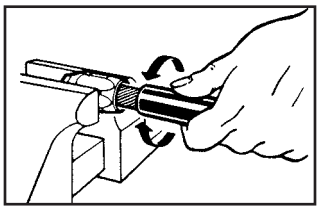
Cut hose to length required using a fine-tooth hacksaw or cut-off wheel. Clean hose bore.

Hose must be stripped of its rubber cover before inserting into socket. Locate skiving point by putting hose end next to socket as shown. Measure from hose end of socket to notch on socket.



Skive Tool

Use the correct size Eaton FT1229 hose cover skiving tool. Mount the tool in a vise. Push the hose over the mandrel. Rotate the hose clockwise until it bottoms or secure hose in a vise and attach FT1279 auger to the skive tool. Insert mandrel into the hose and rotate clockwise until it bottoms.

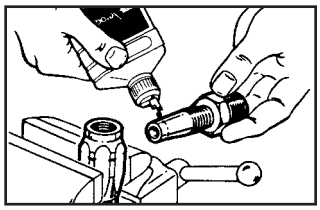


Step 2

Sockets for hose fittings are furnished with internal annular grooved design. Install socket by pushing hose into socket with a back and forth rocking and clockwise twisting motion until hose bottoms on shoulder of socket.

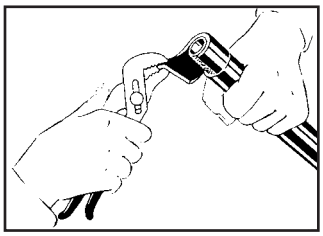
An alternate method is to insert the hose in a vise. Install socket by pushing onto the hose with a back and forth rocking and clockwise twisting motion until the hose bottoms on the shoulder of socket.

A rawhide hammer or similar tool may be used to tap the socket onto the hose but avoid damage to internal socket threads. Be sure not to damage hose cover or wire reinforcement.



Step 3

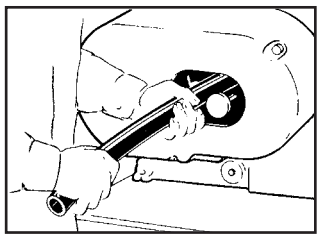
Liberally lubricate nipple threads and inside of hose. Use heavy weight oil or Aeroquip® 222070 hose assembly lube.



Step 1A

Skive hose by hand

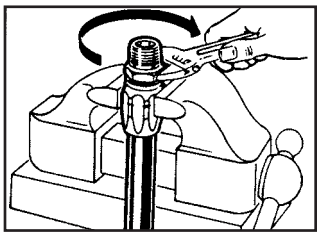
Cut rubber cover around down to wire reinforcement with a knife. Slit lengthwise. Raise flap and pull off with pliers. Clean excess rubber off wire reinforcement with wire brush or soft wire wheel. Do not fray or flare wire reinforcement when brushing.



Machine

Use the Eaton S1102 cut-off and skiving machine. Consult the owners manual. Select the correct mandrel. Turn on the machine. Put the hose over the mandrel and rotate counterclockwise.

Note: when skiving, remove the rubber cover until the wire reinforcement is exposed around the circumference of the hose.



Step 4

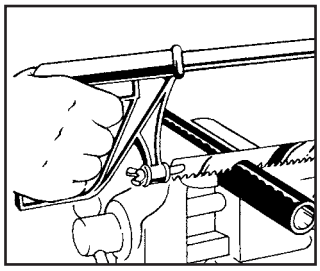
Screw nipple clockwise into socket and hose. Leave a 1/32" to 1/16" clearance between nipple hex and socket.

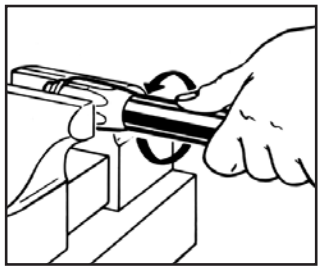
Recommendations for cleaning, inspection and testing are summarized on page A-52. Disassemble in reverse order.

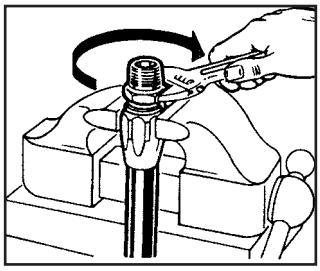
Hose and reusable fittings

Thru-the-cover style reusable fittings with hose

GH663, GH793







Step 1
Cut hose to length required using a fine tooth hacksaw or cut-off machine. Clean hose bore.

Step 2
Liberally lubricate hose cover with Aeroquip® 222070 hose assembly lube.

Place socket in vise and turn hose into socket counterclockwise until it bottoms.

When assembling long lengths of hose, it may be preferred to put hose in vise just tight enough to prevent from turning, and screw socket onto the hose counterclockwise until it bottoms.

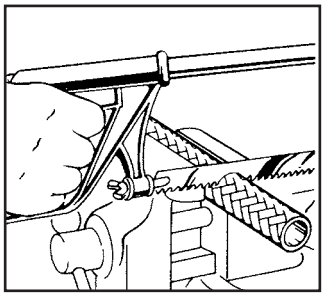
Step 3
Liberally lubricate nipple threads and inside of hose. Use heavy weight oil or Aeroquip® 222070 hose assembly lube.

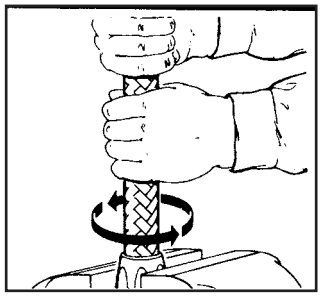
Step 4
Screw nipple clockwise into socket and hose. Leave 1/32" to 1/16" clearance between nipple hex and socket.

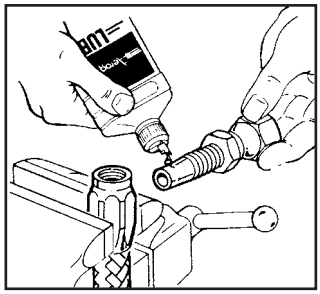
Recommendations for cleaning, inspection and testing are summarized on page A-52. Disassemble in reverse order.

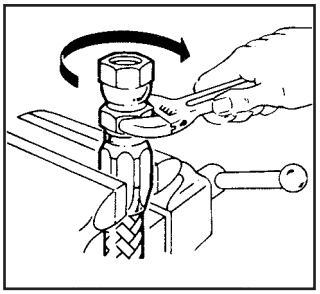
Standard (mandrelless) reusable fittings with engine, air brake and railroad air brake hose

1531, 1531A, 2550, 2554, 2570 (for fittings requiring mandrel, see page A-58)









Step 1
Cut hose square to length required with fine-tooth hacksaw or cut-off wheel. Clean hose bore.

Step 2
Put socket in vise. Screw hose counterclockwise into socket until hose bottoms. Back off 1/4 turn.

When assembling long lengths of hose, it may be preferred to put hose in vise just tight enough to prevent from turning, and screw socket into the hose counterclockwise until it bottoms. Back off 1/4 turn.

Note: For 2550, 2554 and 2570 hose: Sockets for these hose fittings are furnished with internal annular grooved design. Install socket by pushing hose into socket with a back and forth rocking and twisting motion until hose bottoms on shoulder of socket. Back off 1/4 turn.

Step 3
Lubricate nipple threads and inside of hose liberally with Aeroquip® 222070 hose assembly lube or heavy weight oil.

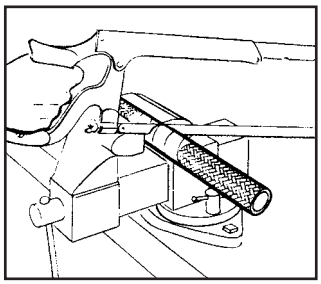
Step 4
Screw nipple clockwise into socket and hose. Leave a 1/32" to 1/16" clearance between nipple hex and socket.

Recommendations for cleaning, inspection and testing are summarized on page A-52. Disassemble in reverse order.

Hose and reusable fittings

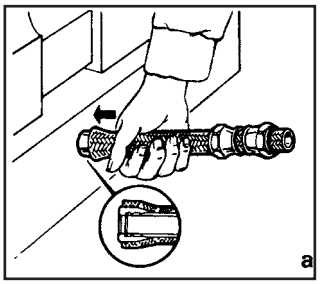
"Super Gem"® fittings with PTFE hose

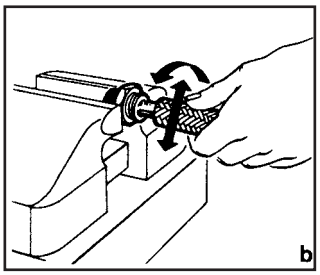
FC465, 2807, 2808



Step 1

Wrap hose with masking tape at cut-off point and cut square to length through taped area using a cut-off machine or fine-tooth hacksaw. Remove tape and trim any loose wires flush with tube stock. Any burrs on the bore of the tube stock should be removed with a knife. Clean the hose bore. Sometimes wire braid will tend to "neck down" on one end and flare out, on the opposite end. This is a characteristic of wire braid hose and can be used to an advantage in the assembly of the "super gem" sockets. Slip two sockets back to back over the "necked down" end of the hose.

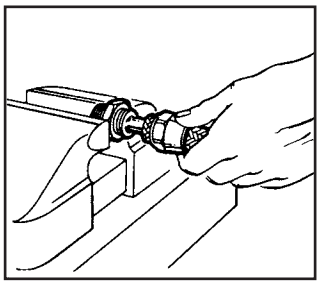




Step 2

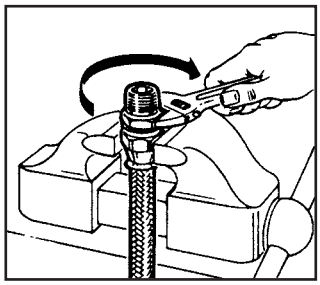
a. Push the sleeve over the end of the tube and under the wire braid by hand. Complete positioning of the sleeve by pushing the hose end against a flat surface. Visually inspect to see that tube stock butts against the inside shoulder of the sleeve.

b. Set the sleeve barbs into the PTFE tube by using assembly tool FT1038A or working the hose bore over the nipple into the end of the sleeve and tube. Assembly kit FT1081 is also available.



Step 3

Lubricate nipple and socket threads. For stainless steel fittings, use a molydisulfide base lubricant (e.g., Molykote* Type G), lubricants containing chloride are not recommended. Other material combinations use standard petroleum lubricants. Hold the nipple with hex in vise. Push hose over nipple with twisting motion until seated against nipple chamfer. Push socket forward and hand start threading of socket to nipple.



Step 4

Wrench tighten nipple hex until clearance with socket hex is 1/32" or less. Tighten further to align corners of nipple and socket hexes. Recommendations for cleaning, inspection and testing are summarized on page A-52.

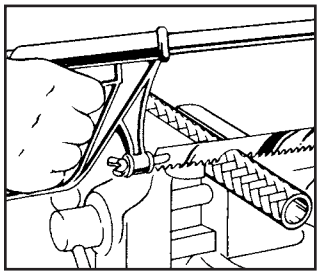
To disassemble: Unscrew and remove nipple; slide socket back on hose by tapping against flat surface; remove sleeve with pliers. New sleeves are recommended upon reuse of the fitting.

*Molykote Type G is a registered trademark of the Dow Corning Corporation.

Hose and reusable fittings

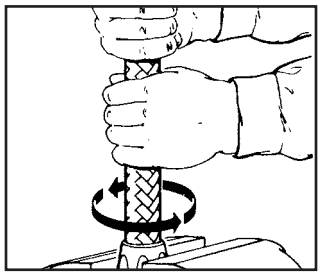
Mandrel type fittings— standard reusable fittings with single wire braid, multiple textile braid, hydraulic, LPG hose, engine and air brake hose

FC234, FC300, FC321, FC350, FC355, 1503, 2580, 2651



Step 1

Cut hose square to length required with fine-tooth hacksaw or cut-off wheel. Clean hose bore.

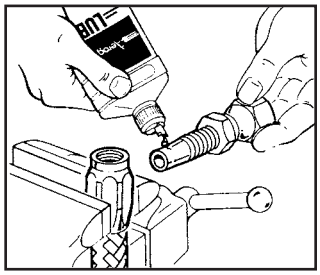


Step 2

Put socket in vise. Screw hose counterclockwise into socket until hose bottoms. Back off 1/4 turn.

When assembling long lengths of hose, it may be preferred to put hose in vise just tight enough to prevent from turning, and screw socket into the hose counterclockwise until it bottoms. Back off 1/4 turn.

Back off FC300, FC350 and FC355 hose 1/4 to 1/2 turn.

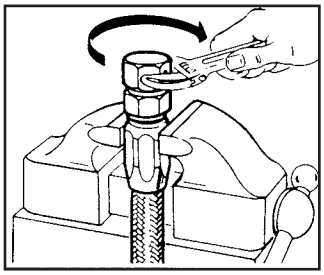


Step 3

MALE ENDS: Push assembly tool into nipple.

SWIVEL ENDS: Tighten nipple and nut on assembly tool.

Lubricate nipple, mandrel and inside of hose liberally. Use heavy oil or Eaton 222070 hose assembly lube.



Step 4

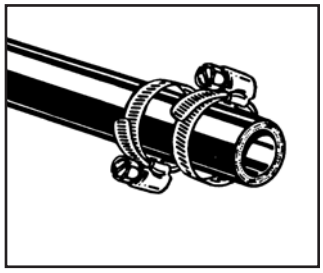
MALE ENDS: Screw nipple clockwise into socket and hose. Leave a 1/32" to 1/16" clearance between nipple hex and socket.

SWIVEL ENDS: Screw nipple clockwise into socket and hose. Leave 1/32" to 1/16" clearance between nut and socket.

Recommendations for cleaning, inspection and testing are summarized on page A-52. Disassemble in reverse order.

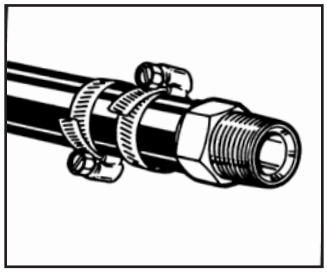
Nipple and clamp with suction hose

2661, FC619



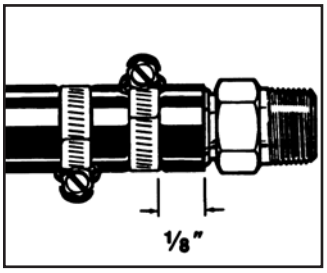
Step 1

Cut hose square to length required using a fine-tooth hacksaw or cut-off wheel. Clean hose bore. Slide band clamp over hose cover.



Step 2

Insert nipple into hose until hose end bottoms on nipple shoulder.



Step 3

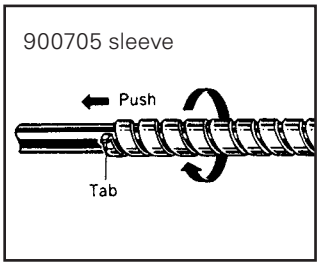
Evenly space two band clamps from end of hose to end of nipple (see above). The band clamps should be tightened 180° from each other. Tighten clamps to 100 in-lbs. Recommendations for cleaning, inspection and testing are summarized on page A-52.

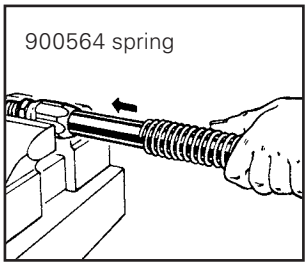
A

Accessories

Steel protective coil sleeve
900705

Steel protective coil spring
900564





Step 1
Follow the appropriate assembly instructions through the assembly of one end fitting. Insert one end fitting in vise.

Step 2
Cut coil length. Coil should be cut to overall assembly length "OA" minus the sum of the overall length of each end fitting. ("A" dimension).

Step 3
3a) 900705 Steel Protective Coil Sleeve

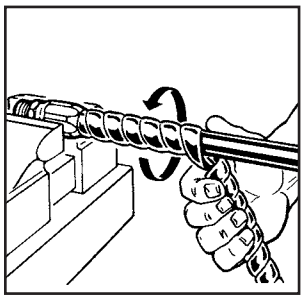
The hose and the coil should be held straight. Taping or capping the hose end can prevent frayed wire ends from snagging on the coil. Bend one end to the coil outward to form a slight tab to assist grasping. (Cut off or bend back when installation is complete.) Hold the tab with the thumb of one hand while twisting the coil clockwise approximately one foot back from the coil tab. When the coil opens up sufficiently, slip the tab end to the coil over the hose. Move the coil onto the hose by pulling at the tab end while pushing with the other hand. Be careful not to exceed the resiliency of the coil by stretching it too far.

3b) 900564 Steel Protective Coil Spring

Slide coil over hose.

Step 4
Proceed with assembly of second end fitting.

Plastic coil sleeve
900952



Step 1
Follow the appropriate hose assembly instructions through the assembly of both end fittings. Insert end fitting in vise.

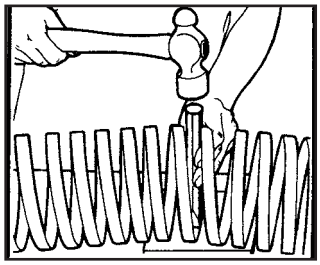
Step 2
Cut coil length. Coil should be cut to overall assembly length "OA" minus the sum of the overall length of each end fitting. ("A" dimension).

Step 3
Wrap the coil on the hose.

Accessories

Internal support coils

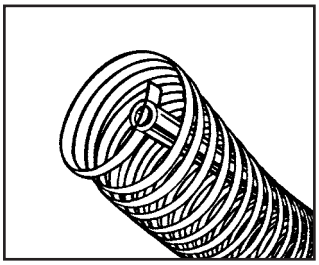
222005, 222022



Step 1

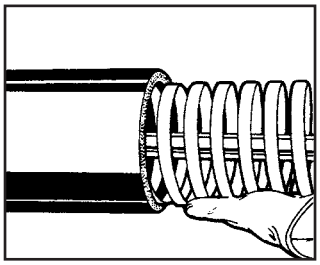
Cut coil length. The coils should be cut to the hose length, minus the nipple intrusion. For any given hose assembly the support coil length equals the overall hose assembly length minus the sum of the overall lengths of each end fitting. ("A" dimensions.)

Small size of the coil can usually be cut with strap cutters or sheet metal shears. The larger sizes are best cut with a heavy sharp chisel or bolt cutter. With small sizes skip directly to Step 3.



Step 2

Compress the coil (large sizes only). It is necessary to reduce the coil diameter slightly in order to insert it into the hose. The easiest approach is to use a length of pipe with a notch cut in one end. Clamp the plain end of the pipe in a vise, slide the coil over the pipe and insert the free end of the coil into the notched end of the pipe. Then clamp the coil and pipe firmly together. Twist the coil to compress it prior to installation into the hose.



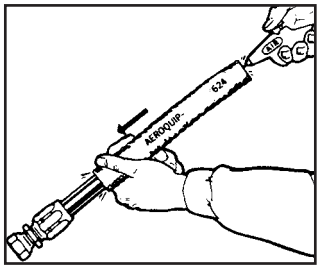
Step 3

Small sizes: The coil can be worked into the hose by hand without difficulty. Remove all burrs from the coil prior to insertion. This will prevent cutting of the hose tube. Position the coil midway between hose ends.

Large sizes: With the pipe still in position, as in Step 2, assemble the hose over the coil. With the coil fully centered in the hose, remove the pipe and clamp.

Firesleeve

624

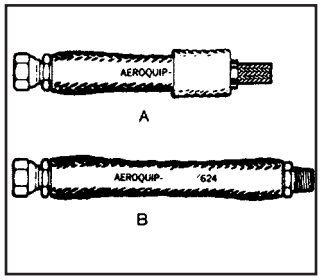


Step 1

Follow the appropriate hose assembly instructions through the assembly of one end fitting. Cut firesleeve to same length as hose; using Firesleeve End Dip (AE13702–003) dip ends of firesleeve to a depth of three quarters of an inch and allow to dry at room temperature.

Start firesleeve over cut end of hose.

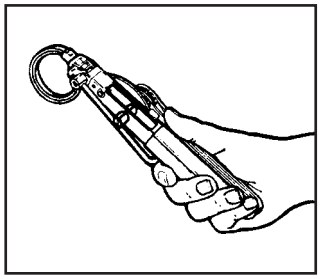
Notes: If applying sleeve over PTFE or stripped cover assemblies, wrap exposed wire with tape. Grasp sleeve and slip over the hose assembly as illustrated.



Step 2

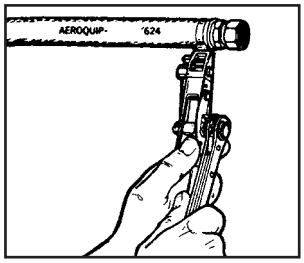
Skin sleeve back from cut end of hose enough to allow assembly of second end fitting. (2A)

Then center sleeve so that it completely covers both sockets. (2B)



Step 3

Insert tail of band clamp into hand clamping tool.



Step 4

Position band clamp over sleeve as shown and then draw tight with hand tool. Remove tool and cut free end of band clamp. Repeat on other end of assembly. To complete, bend protruding tail of clamp over clamp buckle. Also repair any scuffs or minor abrasions of firesleeve by brush application of End Dip AE13702–003.