

Eaton's Weatherhead®
Hose Assembly Master Catalog



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www.eaton.com/hydraulics

Additional Eaton Fluid Conveyance Products can be found in these catalogs:

Product Line	Catalog Number
Synflex™ Hose and Fittings	E-H00V-MC001-E1
Eaton Quick Disconnect Couplings	E-MEQD-MC001-E1
Walterscheid™ Tube Fittings	E-MEFI-MC002-E1
Eaton Swivel Joints	E-MESW-MC001-E
Eaton Brass Products	E-BRFI-MC001-E3
Weatherhead™ Crimp Specifications Manual	W-H00V-TM001-E2
Eaton Industrial Hose	E-H00V-MC003-E1

Introduction to Weatherhead

Weatherhead® products, which became part of Eaton Hydraulics in 2002, have one of the industry's broadest offerings of hydraulic hose, hose fittings, assembly equipment, tube fittings, couplings and support accessories. Weatherhead products are widely used in industrial and mobile fluid power and fluid conveyance applications. Eaton also supplies Weatherhead thermoplastic tubing in sizes from 1/8th through 1 inch for use in robotics, air tools, air and water supply, and beverage dispensing.

Eaton's Hydraulics Group is a worldwide leader in the design, manufacture and marketing of a comprehensive line of reliable, high-efficiency hydraulic systems and components for use in mobile and industrial applications. Mobile and industrial markets include agriculture, construction, mining, forestry, utility, material handling, earthmoving, truck and bus, machine tools, molding, primary metals, automotive, power generation, port machinery and entertainment.

Weatherhead has one of the industry's broadest offerings of hose and fittings that are widely used throughout multiple market applications.

Application Data

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Important Safety Information

⚠ 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 or brochure, including the recommendations on the selection of hose and fittings on the relevant 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's Weatherhead fitting tolerances are engineered to match Eaton's Weatherhead hose tolerances. The use of Weatherhead fittings on hose supplied by other manufacturers and/or the use of Weatherhead hoses with fittings supplied by other manufacturers may result in the production of unreliable and unsafe hose assemblies and is neither recommended nor authorized by Eaton Corporation 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 CORPORATION 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 WEATHERHEAD HOSE FITTINGS, HOSE AND WEATHERHEAD APPROVED EQUIPMENT, AND IN CONFORMANCE WITH EATON'S WEATHERHEAD 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 for 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.

Warranty

Current warranty information can be found at:
www.eaton.com/hydraulics/warranty

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.

Hose and Field Attachable Hose Fittings

Weatherhead Hose and Field Attachable Hose Fittings have been engineered and designed as a complete hose assembly system. Component compatibility along with the use of quality components insures the production of reliable hose assemblies when assembled properly. The use or intermixing of fittings and hose not specifically engineered and designed for use with each other may result in the production of unsafe or unreliable hose assemblies.

This can result in hose assembly leakage, hose separation or other failures which can cause serious bodily injury or property damage from spraying fluids, flying projectiles, or other substances. The Eaton warranty is limited to apply only when Weatherhead Field Attachable Hose Fittings are used on compatible Weatherhead hose. See www.eaton.com/hydraulics/warranty for warranty information.

Weatherhead Hose, Hose Fittings and Assembly Equipment Compatibility

Weatherhead Equipment, Weatherhead Hose Fittings and Weatherhead Hose have been engineered and designed as a complete hose assembly system. Each component of the Weatherhead hose assembly system is compatible with other Weatherhead components to which it relates. Component compatibility, along with the use of quality components, insures the production of reliable hose assemblies when assembled properly. The use or intermixing of fittings and hose not specifically engineered and designed for use with each other and Weatherhead equipment is not recommended and may result in the production of unsafe or unreliable hose assemblies. This can result in hose assembly leakage, hose separation or other failures which can cause serious bodily injury or property damage from spraying fluids, flying projectiles, or other substances. The Eaton warranty is limited to apply only when Weatherhead Hose Fittings and compatible Weatherhead Hose are used with Weatherhead assembly equipment.

Hose Selection Chart

How to use chart: Locate the hose I.D. required and move to the right to the correct pressure. Then move up or down in this column for data on material, temperature, etc. to quickly determine whether the hose meets your requirements. For complete information on any hose refer to hose catalog page number at bottom of column.

⚠ WARNING

Selection of hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of the hose for your application can result in hose leaking,

bursting, or other failure which can cause serious bodily injury or property damage from spraying fluids or flying projectiles. You should carefully review the information in this catalog.

Hydraulic

HOSE	H017	H039	H104	H114	H145	H145R	H146	H190	H190H	H245	H245L	H280
Page	B-3	B-2	B-3	B-6	B-6	B-7	B-7	B-4	B-5	B-9	B-10	B-11
Usage	General Purpose Hydraulic	Suction	Hydraulic	Ag. Hyd. & Hyd. Synthetic	Hydraulic	Construction	Ag. Hyd. & Hyd. Synthetic	Diamond Advantage	High Temp. Hydraulics	Hydraulic	Low Temp Flexing	Diamond Advantage
Meets	USCG MSHA	USCG ABS MSHA	USCG MSHA ABS	MSHA	ABS USCG MSHA	—	—	MSHA, USCG, ISO 1436a, EN 853 Type 1SN	MSHA, ISO1436a	USCG MSHA ABS	USCG ² MSHA	ABS, USCG, MSHA, ISO 1436, EN 857, Type 2SC
SAE No.	J1942/1, 100R3	100R4 J1942/1	J1942 1/1 100R1AT	—	J1942/1, 100R17	100R17	—	J1942/1, 100R1 AT, Type S	100R1 AT, 1SN, EN853	J1942 100R16	100R16	J1942, Code H, 100R16, Type S
Temp. Range °F	-40°F +212°F	-40°F +275°F	-40°F +212°F	-40°F +250°F	See Page 55	-40°F +212°F	-65°F +250°F	-40°F +260°F	-40 - +302°F	-40°F +212°F	-70 - +212°F	-40°F +260°F
Inner Tube	Nitrile	CPE	Nitrile	Hytrel ¹	Nitrile	Nitrile	Hytrel ¹	Nitrile	CPE	Nitrile	Low Temp. Nitrile	Nitrile
Reinforcement	2 Fiber Braids	2 Fiber Ply & Helical Wire	1 Steel Braid	1 Steel Braid	1 Steel Braid†	1-2 Steel Braids	1 Steel Braid	1 Steel Braid	1 Steel Braid	2 Steel Braids	2 Wire Braids	2 Steel Braids
Cover	Neoprene	Neoprene	Neoprene	Neoprene	Neoprene	UHMWPE	Polyester Braid	Weather-SHIELD™	CPE	Neoprene	Weather-SHIELD™	Weather-SHIELD™
Hose I.D. - Maximum Recommended Operating Pressure - PSI												
3/16												
1/4	1250		2750	3000	3045	3000	3000	3700	3265	5000	6000	6500
5/16												
3/8	1125		2250	3000	3045	3000	3000	3400	2610	4000	5000	5300
13/32												
7/16												
1/2	1000		2000	3000	3045	3000	3000	2900	2320	3500	4500	4500
5/8			1500		3045	3000		1885	1885	2750	4000	4000
3/4	750	300†	1250		3045	3000		2000	1525	2250	3500	3500
7/8												
1	565	250†	1000		3045	3000		1500	1275	2000	2800	3000
1-1/8												
1-1/4	375	200†	625					1000	900	1625	2300	2500
1-1/2		150						750			2000	2000
1-3/8												
1-13/16												
2		100						600			1500	1600
2-3/8												
3												
Hose Fittings												
C-O-C	J-39-57	J-38, J-39-57, J-58-68, J-69-94	J-38, J-39-57, J-69-94	J-38, J-39-57	J-69-94, J-38, J-39-57, J-58-68	J-69-94	J-39-57	J-69-94	J-69-94	J-69-94, J-38, J-39-57, J-58-68	J-69-94	J-69-94
Field Attach.	—	K-14, K-15	K-16-18	—	—	—	—	—	—	—	—	—

¹ Hypalon® is a registered trademark of E.I. DuPont.

**At 70° F.

† When used with 'U' Series Ends.

² Firesleeve required for fuel applications.

Hose Selection Chart



WARNING
Selection of hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of the hose for your application can result in hose leaking,

bursting, or other failure which can cause serious bodily injury or property damage from spraying fluids or flying projectiles. You should carefully review the information in this catalog.

Hydraulic

HOSE	H290	H290H	H324	H325	H335	H336	H345	H350	H400	H421	H425	H430	H430R
Page	B-13	B-13	B-2	B-10	B-19	B-19	B-5	B-8	B-9	B-18	B-12	B-14	B-15
Usage	Diamond Advantage	High Temp. Hydraulics	Power Steering	Low Temp. Hydraulic	Thermo-plastic Non-Conductive	Thermo-plastic	Pressure Washer	Hydraulic	Very High Pressure Hydraulic	Hyd. Jacking System	Hydraulic	Very High Pressure Hydraulic	Very High Pressure Hydraulic
Meets	USCG, MSHA, ISO 1436, EN 853, Type 2SN	MSHA	—	—	EN 855 Type R8	EN 855 Type R8	MSHA	MSHA	MSHA	—	USCG MSHA ABS	USCG MSHA, ABS	—
SAE No.	J1942/1, 100R2 AT, Type S	100R2, 2SN, EN853	—	—	100R8 Non-Cond.	100R8	—	—	—	—	J1942/1, 100R2AT	J1942, 100R12	100R12
Temp. Range °F	-40°F +260°F	-40 - +302°F	-40°F +250°F	-67°F +175°F	See page 79	See page 79	See Page 60	-40°F +212°F	-40°F +212°F	-40 - +212°F	-40°F +212°F	-40°F +260°F	-40°F +250°F
Inner Tube	Nitrile	CPE	Neoprene	Synthetic Rubber	Nylon	Nylon	Nitrile	Synthetic Rubber	Nitrile	Synthetic Rubber	Nitrile	Nitrile	Nitrile
Reinforcement	2 Steel Braids	2 Steel Braids	2 Fiber Braids	2 Steel Braids	Multi Yarn Braids	Multi Fiber Braids	1 Steel Braid	2 Steel Braids†	2 Steel Braids	2 Wire Braids	2 Steel Braids	4 Spiral Steel Plies	Steel Plies
Cover	Weather-SHIELD™	CPE	Neoprene	Synthetic Rubber	Orange Polyurethane	Black Polyurethane Perforated	Blue Vinyl Nitrile	Neoprene	Vinyl Nitrile	Synthetic Rubber	Neoprene	Weather-SHIELD™	UHMW
Hose I.D. - Maximum Recommended Operating Pressure - PSI													
3/16					5000	5000							
1/4	6500	5800		5000	5000	5000	3000			10000	5000		
5/16													
3/8	5800	4800	1500	4000	4000	4000	3000	3500		10000	4000	6500	4000
13/32													
7/16													
1/2	5000	4000		3500	3500	3500	3000	3500			3500	6000	4000
5/8	4000	3630						3500	4000		2750	6000	4000
3/4	3500	3120		2250		2250		3500	4000		2250	5500	4000
7/8		2400			2250								
1	3000			2000	2000	2000		3500			2000	5100	4000
1-1/8													
1-1/4	2500	2250									1625	4500	3000
1-1/2	2000	1750									1250	4000	2500
1-3/8													
1-13/16													
2	1600	1500									1125	4000	2500
2-3/8													
3													
Hose Fittings													
C-O-C	J-69-94	J-69-94	J-39-57	J-39-57	J-15-18	J-15-18	J-69-94	J-69-94, J-39-57, J-58-68	J-69-94	J-69-94	J-69-94, J-38, J-39-57, J-58-68	J-58-68	J-58-68
Field Attach.	—	—	—	—	—	—	—	—	—	—	K-27-29	—	—

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**At 70° F.

† When used with 'U' Series Ends.

Hose Selection Chart



WARNING
Selection of hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of the hose for your application can result in hose leaking,

bursting, or other failure which can cause serious bodily injury or property damage from spraying fluids or flying projectiles. You should carefully review the information in this catalog.

Hydraulic									General Purpose				
HOSE	H435	H436	H464	H470	H471	H485	H487	H545	H100	H101	H115	H116	H201
Page	B-20	B-21	B-16	B-15	B-16	B-17	B-17	B-8	C-2	C-3	C-4	C-4	C-5
Usage	Thermo-plastic Non-Conductive	Thermo-plastic	Hydraulics	Very High Pressure Hydraulic	Very High Pressure Hydraulic	Very High Pressure Hydraulics	Very High Pressure Hydraulics	Hydraulic	Air, Oil, Water, Diesel Fuel	Air, Oil, Water, Diesel Fuel	Air Tool & Water	Pneumatic Tools	Air, Oil, Water, Diesel Fuel
Meets	—	—	MSHA	USCG** MSHA, ABS	MSHA	—	EN856, MSHA	—	—	MSHA	—	—	MSHA (Black only)
SAE No.	100R7	100R7	EN856, 4SH [†]	J1942/1, 100R13	100R13	100R15	—	—	—	—	—	—	—
Temp. Range °F	-40°F +200°F	-40°F +200°F	-40 - +212°F	See page 64	-40 - +260°F	-40 - +250°F	-70 - +212°F	-40°F +250°F	-40°F +212°F	-40°F +212°F	-40°F +160°F	-40 - +180°F	-40°F +200°F
Inner Tube	Nylon 11	Nylon 11	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Reinforcement	2 Fiber Braids	2 Fiber Braids	4 Spiral Steel Plies	Multi Spiral Steel	Multi Spiral	Multi-Spiral Steel	Multi Spiral	1 Steel Braid*	1 Fiber Braid	1 Fiber Braid	Multi Fiber Braid	Multi-Fiber Braids	1 Fiber Braid
Cover	Orange Polyurethane	Polyurethane Perforated	Nitrile	Vinyl Nitrile	Weather-SHIELD	Vinyl Nitrile	Vinyl Nitrile	Abrasive Resistant Nylon	Fiber Braid	Neoprene	Red Vinyl Nitrile	Vinyl Nitrile	Neoprene (black), Vinyl Nitrile (colors)
Hose I.D. - Maximum Recommended Operating Pressure - PSI													
3/16							—						
1/4	2750	2750						3000	350	350	300	225	300
5/16	2500	2500							350	350	300	225	
3/8	2250	2250						3000	350	350	300	225	300
13/32													
7/16													
1/2	2000	2000		5000				3000	350	350	300	225	300
5/8								3000	350	350			300
3/4	1250	1250	6090	5000	5076		6090	3000	350	350	300		300
7/8													
1	1000	1000	5510	5000	5076	6000	6090	3000			300		
1-1/8													
1-1/4			5075	5000	5076	6000	6090				225		
1-1/2			4350	5000	5076	6000	6090				225		
1-3/8													
1-13/16													
2			3625	5000	5076		5076						
2-3/8													
3													
Hose Fittings													
C-O-C	J-2-8	J-2-8	J-92-102	J-19-23, J-95-105	J-95-105	J-95-105	J-95-105	J-38, J-39-57, J-58-68	—	—	J-39-57, J-58-68, J-69-94	J-39-57, J-58-68, J-69-94	—
Field Attach.	K-30-31	K-30-31	—	—	—	—	—	—	K-5-7	K-5-7	K-3-4, K-8	K-3-4, K-8	K-5-7

* Minimum Burst Pressure

¹ Hypalon® is a registered trademark of E.I. DuPont.

**At 70° F.

** Size -12 thru -20.

† 2 Steel Braids -06 thru -12.

† When used with 'U' Series Ends.

4 Steel Spirals size -16.

Hose Selection Chart



WARNING
Selection of hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of the hose for your application can result in hose leaking,

bursting, or other failure which can cause serious bodily injury or property damage from spraying fluids or flying projectiles. You should carefully review the information in this catalog.

General Purpose							Industrial						
HOSE	H009	H209	H265	H275	H332	H1571	H0105	H0106	H285	H160	H1719	H1776/7	H1812
Page	C-2	C-5	C-6	C-6	C-7	C-7	D-2	D-2	D-3	D-4	D-4	D-5	D-5
Usage	Lube	Car Wash	Air, Water, Air Tools, Washdown	Air & Water	Air, Oil, Water, Diesel Fuel	Air and Water Transfer	Air & Water	Air/Water Apps.	Food & Beverage, Air, Water, Chemicals	Food & Beverage A/C Drainage	General Purpose	Pneumatic Tools	Fertilizer and Pesticides
Meets	USCG MSHA	—	—	—	—	—	—	—	FDA/NSF	FDA/NSF	—	—	—
SAE No.	J1942/1, 100R6	—	—	—	—	—	—	—	—	—	—	—	—
Temp. Range °F	-40°F +212°F	-40°F +200°F	-20°F +180°F	-10°F +150°F	-40 +302°F	-20° +150°F	See page 73	See page 73	-15° +150°F	-15° +150°F	-15° +150°F	-40° +180°F	-40° +180°F
Inner Tube	Nitrile	Nylon 11	Modified PVC	PVC	CPE	Modified PVC	EPDM	EPDM	PVC	PVC	Polyvinyl Chloride PVC	Nitrile	EPDM
Reinforcement	1 Fiber Braid	1 Fiber Braid	2 Fiber Spirals	2 Fiber Spirals	1 Fiber Braid	4 Fiber Spiral	Multi Fiber Spiral	2 Spiral	Fiber	—	2 Fiber Spiral	1 or 2 Fiber Braid	2 Fiber Braid
Cover	Neoprene	Polyurethane	Blue Rubber Modified Thermoplastic	Red PVC	CPE	PVC/Nitrile Blend	Red EPDM	EPDM	PVC	PVC	Polyvinyl Chloride PVC	Red Vinyl Nitrile	Red EPDM
Hose I.D. - Maximum Recommended Operating Pressure - PSI													
3/16									250	55			
1/4	400	2250	350**	250**	250		300†	200	250	55		325	275
5/16	400	1750							250	50		325	
3/8	400	1350	350**	250**	250		300†	200	225	55		325	275
13/32													
7/16													
1/2	400	1000	300**	250**	250		300†	200	200	45		325	250
5/8					250		300	200	200	40	150	325	250
3/4			250**	250**	250	400	225		150	35	150	325	250
7/8										30			
1			200**	200**			200†		125	25		325	250
1-1/8													
1-1/4			150	200			200		100	20		325	250
1-1/2			150	200			200		100	35		325	250
1-3/8													
1-13/16													
2			125	125					75	35			
2-3/8													
3													
Hose Fittings													
C-O-C	J-2-8	J-2-8	J-2-8, J-32, J-69-94	J-2-8, J-32, J-69-94	—	J-39-57, J-69-94	J-39-57	J-39-57	—	—	—	J-39-57, J-58-68, J-69-94	J-39-57, J-58-68, J-69-94
Field Attach.	K-2	—	—	—	K-5-7	—	K-3-4, K-8	K-3-4, K-8	—	—	—	—	—

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**At 70° F.

† When used with 'U' Series Ends.

Hose Selection Chart

⚠ WARNING

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	Industrial			Fuel							Silicone		
HOSE	H1981/2	H1987	H9949	EH049	EH089	H057	H059	H077	H366	H900	EH225	EH226	EH227
Page	D-6	D-7	D-7	E-2	E-2	E-3	E-3	E-4	E-4	E-5	F-2	F-2	F-3
Usage	Air and Water Transfer	Contractors Water	Non-Conductive	Fuel	Fuel	Fuel & Oil	Fuel Oil/ Lube	Elec. Fuel Inject.	LPG	Propane	Engine	Engine	Engine
Meets				EPA	EPA	—	ABS NMMA USCG	—	UL 21	UL 21			
SAE No.						30R7	J1942/1	30R9	—		J20R3 Class A	J20R4 Class A	
Temp. Range °F	-40° +180°F	-30°F +160°F	-40°F +180°F	-25°F +150°F	-25°F +150°F	-40°F +275°F	-40°F +212°F	-30°F +275°F	-40°F +300°F	-40°F +140°F	-65°F +350°F	-65°F +350°F	-65°F +500°F
Inner Tube	Blended Nitrile	EPDM	Nitrile (Non-Conductive)	PVDF	PVDF	Nitrile	Nitrile	Fluoro-elastomer Veneer	Nitrile	Nitrile	Silicone	Silicone	Silicone
Reinforcement	2 or 4 Spiral	2 Fiber Spiral	2 Fiber Braid		Fiber	1 Fiber Braid	1 Wire 1 Fiber Braid	Multi Fiber Braid	1 Fiber & 1 S.S. Braid	Fiber Braid	1 Ply Polyester	4 Plies Polyester	4 Plies Aramid
Cover	Neoprene Pinpricked	EPDM Perforated	Vinyle Nitrile (Non-Conductive)	PVC	PVC	Hypalon ¹	Blue Neoprene	ECO	Fiber Braid	Vinyl Nitrile Perforated	Silicone	Silicone	Silicone
Hose I.D. - Maximum Recommended Operating Pressure - PSI													
3/16						50	500						
1/4	200/300		275	50	250	50	500	125		350	400		
5/16	200/300			50	250	50	500	125	350		300	1080	
3/8	200/300		275	50	250	50		125		350	250	1060	
13/32							500		350				
7/16						35							
1/2	200/300		275				500			350	250	872	
5/8	300	600					500				250	797	
3/4	225/300	600	275							350	200	754	
7/8											200	732	
1	200		275				500			350	175	699	
1-1/8												658	
1-1/4												617	
1-1/2												521	
1-3/8												550	
1-13/16													
2												442	
2-3/8												400	
3												317	
Hose Fittings													
C-O-C	J-39-57, J-69-94	—	J-39-57, J-69-94	J-32	J-32	—	K-9-12, K-33	—	J-9-12	J-39-57	—	—	—
Field Attach.	—	—	—	K-3-4	K-3-4	K-3-4	K-22-26	Clamps M-24	K-12-13, K-22-26	—	—	—	—

¹ Hypalon[®] is a registered trademark of E.I. DuPont.

**At 70° F.

† When used with 'U' Series Ends.

Hose Selection Chart



WARNING
 Selection of hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of the hose for your application can result in hose leaking,

bursting, or other failure which can cause serious bodily injury or property damage from spraying fluids or flying projectiles. You should carefully review the information in this catalog.

	A/C		Truck									Tefflon	
HOSE	H757	GH134W	H069	H166	H169	H213	H229	H239	H338	H429	H569	H243	H277
Page	G-2	G-2	H-6	H-4	H-4	H-5	H-2	H-2	H-3	H-3	H-7	I-2	I-2
Usage	Air Cond. R12 & R134a	Air Cond. R404a, HFC134a, R22, R407C	Truck & Hydraulic	High Temp. Truck	Hydraulic	High Temp. Truck	Air & Hydraulic	Transmission Oil Cooler, Diesel Fuel, Air Brake	Air Brake	Transmission Oil Cooler, Fuel and Diesel Lines	A/B & Hydraulic	Hydraulic/Air/Steam	Hydraulic/Air/Steam w/ Conductive Static Dissipating Liner
Meets	—	—	DOT All+ ABS	DOT All	MSHA	DOT All	DOT All	DOT All	DOT A	—	ABS* DOT All + USCG	FDA	—
SAE No.	J2064 Type C, CL-1	J2064 Type E Class 1	J1402 All 100R5	J1402 Type All	—	J1402 Type All	J1402 Type All	J1402 Type All	J1402 Type A	J1019	100R5 J1942 /1 J1402 Type All	—	—
Temp. Range °F	See page 49	-40°F +257°F	See page 36	See page 42	-40°F +212°F	See page 43	See page 43	See page 44	-40°F +200°F	-55°F +302°F	See page 53	-65°F +450°F	-65°F +450°F
Inner Tube	Rubber/ Nylon/ Rubber	Polyamide Veneer	Nitrile	Nitrile	Nitrile	CPE	Nitrile	CPE	EPDM	CPE	CPE	Teflon	Teflon
Reinforcement	1 Fiber Braid	Rubber Backing, 1 Fiber Braid	1 Fiber & Steel Braid	1 Fiber & 1 S.S. Braid	1 Steel Braid	1 Fiber & 1 Wire Braid	2 Fiber Braids	2 Fiber	Multi Fiber Braid	1 Wire Braid	1 Fiber & 1 Steel Braid	1 S.S. Braid	1 S.S. Braid
Cover	Butyl Perforated	Chlorobutyl	Fiber Braid	Fiber Braid	Neoprene (Perforated)	Fiber Braid	Fiber Braid	Fiber Braid	EPDM	Fiber Braid	Blue Fiber Braid	Stainless Steel Braid	Stainless Steel Braid
Hose I.D. - Maximum Recommended Operating Pressure - PSI													
3/16			3000	1500	3000	2000	225	225			3000	3000	3000
1/4			3000	500	3000	1500					3000	3000	3000
5/16	400		2250	500	2250	1500	225				2250	2500	2500
3/8		500							225			2000	2000
13/32	400		2000	500	2000	1250	225	225		250	2000		
7/16													
1/2	350	500	1750	450	1750	1000	225	225	225	250	1750	1750	1750
5/8	350	500	1500	450	1500	750	225	225			1500		
3/4		500										1000	1000
7/8			800	250	800	400	225	225			800		
1												1000	1000
1-1/8			625	250	625			225			625		
1-1/4													
1-1/2													
1-3/8			500		500								
1-13/16			350		350								
2													
2-3/8			350										
3			200										
Hose Fittings													
C-O-C	J-24-31	—	J-9-12	J-9-12	J-9-12	—	J-9-12, J-33	J-9-12, J-33	J-24-31	J-24-31, J-32	J-9-12	J-2-8	J-2-8
Field Attach.	—	K-37-58	K-12-13, K-22-26	K-12-13, K-22-26	K-12-13, K-22-26	K-19-21	K-12-12, K-22-26	K-22-26	K-9-11	—	K-22-26	—	—

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**At 70° F.
 † When used with 'U' Series Ends.

Hose Selection

There are several factors which affect selection of a hose sized such that it will provide the desired rate of flow at the required pressure; these are:

- Hose size
- Hose length
- Hose fittings
- Material conveyed
- Bends
- Static head pressure

Hose Size

Undersized pressure lines produce excessive pressure drop with attendant energy loss and heating, and undersized suction lines cause cavitation at the pump inlet. Oversized hose assemblies, on the other hand, are excessively costly and generally too heavy.

In selecting hose for hydraulic systems, the following empirical values can be used to achieve minimum pressure drop consistent with reasonable hose size (see Chart 2):

Velocity of pressure lines 7 to 15 ft./sec. Velocity of short pressure lines to 20 ft./sec. Velocity of suction lines 2 to 5 ft./sec. To use Chart 2, lay a straight-edge across the chart as shown by the dotted line. To minimize pressure drop, always use the next larger size hose shown if the line passes between sizes listed.

Hose Length

Chart 1 gives the pressure drop in different-sized hoses based on hoses of 100-foot length, and is based on water as the material conveyed. For hoses of a different length, these values must be corrected. For example, a 100-foot length of 1/2" hose causes a pressure drop of 100 lbs./in.² at a flow rate of 10 gal./min. If the hose in question is 50 feet long, the pressure drop derived from Chart 1 must be corrected by multiplying the value by the ratio of the actual length to 100 feet, or 50/100, or 0.5. Therefore, the actual

pressure drop caused by a 50-foot length of 1/2" hose, at a flow rate of 10 gal./min. is 50 lbs./in.² (0.5 x 100 = 50 lb./in.²).

Hose Fittings and Fluid Conveyed

In most cases, the end fitting openings are slightly smaller than the hose itself. However, this varies widely with hose fitting designs from 'full-flow' ends which have the same I.D. as the hose, down to as much as 1/8" smaller I.D. than the hose bore. To allow for this, assume a 10-to-15% greater flow rate than actually measured in the system when determining pressure drop.

Chart 1 is based on water as the material conveyed, and for other fluids it is necessary to correct for the difference in specific gravity and viscosity. Chart 3 lists common fluids, their specific gravities, viscosities, and corresponding correction factors. To determine the pressure drop for a specific fluid, first determine the pressure drop from Chart 1 for the hose length then divide this by the correction factor found in Chart 3. For example, the 50-foot length of 1/2" hose just described had a pressure drop of 50 lbs./in.² at a flow of 10 gal./min. of water. To determine the pressure drop if #2 fuel oil is the material conveyed, divide by 0.752 (from Chart 3) $50 \div 0.752 = 66.5$ lbs./in.² pressure drop. If, on the other hand, the material conveyed is Type #3 gasoline, the pressure drop would be $50 \div 1.19 = 42$ lbs./in.²

⚠ WARNING

For important safety information concerning hose selection, see pages A-2-3 of this catalog.

CHART 1. Hose Flow Rate vs. Pressure Drop

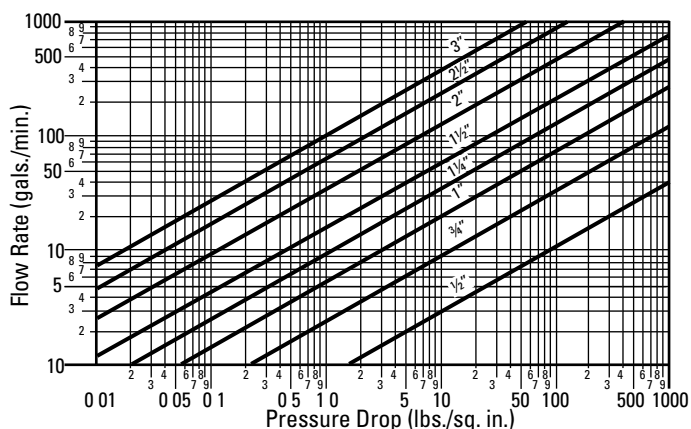
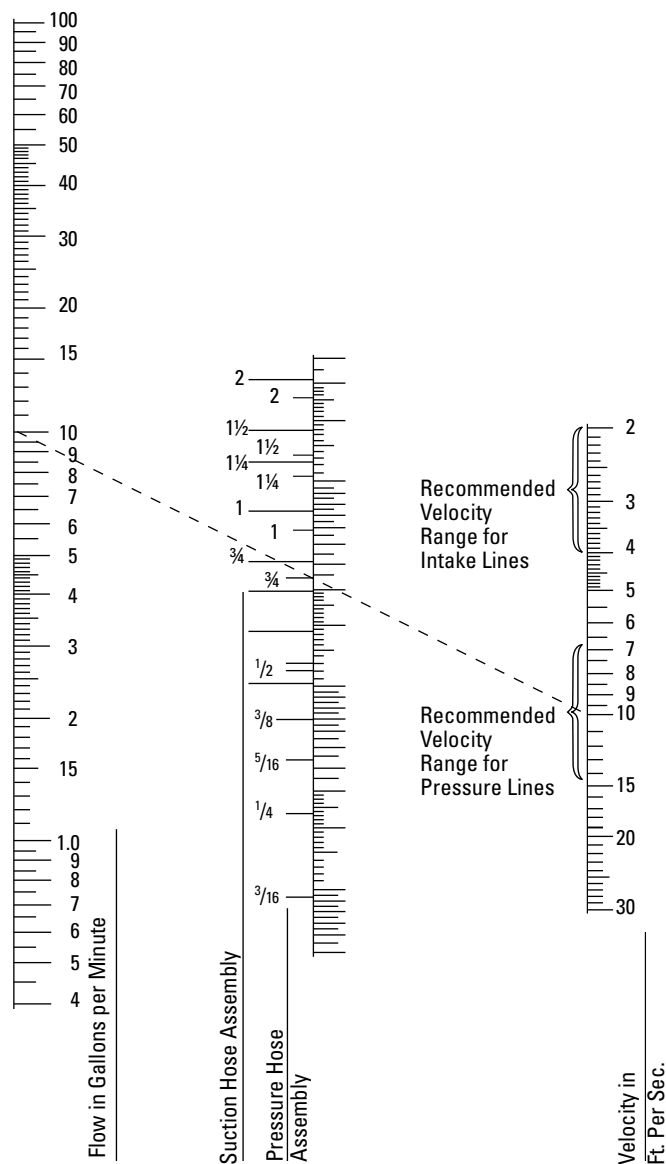


CHART 2. Hose Flow Capacity



Hose Selection

⚠ WARNING

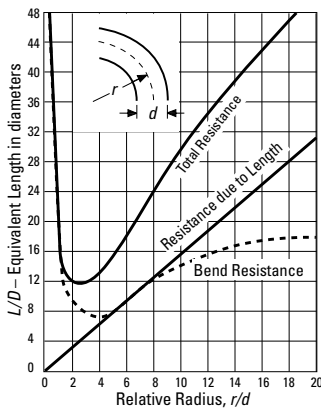
For important safety information concerning hose selection, see pages A2-3 of this catalog.

CHART 3. Fluid Flow Correction Factors

Liquid	Specific Gravity	Viscosity	Viscosity	Correction Factor R.	
		Centistokes	Centipoises		
		CS	CP		
Acetic Acid – 100%	1.05	–	1.3	0.975	
Acetic Acid – 70%	1.07	–	2.7	0.843	
Ammonia Liquid – 100%	0.66	0.30	–	1.290	
Ammonia Liquid – 26%	0.907	–	1.3	0.943	
Asphalt* @ 120°F	1.40	–	300.0	0.350	
Beer*	1.01	1.15	–	0.990	
Benzene Benzol	0.88	0.744	–	1.08	
Brine Calcium Chloride – 25%	1.23	3.80	–	0.78	
Brine Sodium Chloride – 25%	1.19	2.07	–	0.88	
Butyl Alcohol	0.81	3.64	–	0.783	
Castor Oil*	0.96	900.00	–	0.27	
Crude Petroleum Typical*					
1. Pennsylvania Crude@100°F	0.80	–	3.0	0.78	
2. California Crude @ 150°F	0.915	–	9.0	0.64	
3. #33 API Crude @ 100°F	0.86	7.2	–	0.685	
4. Texas Crude @ 150°F	0.875	–	3.0	0.792	
5. Mexican Crude @ 150°F	0.96	–	550.0	0.287	
Decane - n	0.73	1.24	–	0.975	
Ethyl Alcohol @ 100°F	0.794	–	1.25	0.93	
Ethyl Alcohol @ 95°F	0.808	–	1.45	0.904	
Ethyl Alcohol @ 40°F	0.939	–	3.00	0.807	
Ethyl Glycol	1.12	–	24.00	0.55	
Formic Acid	1.22	–	–	0.94	
Fuel Oils*					
No. 1 @ 100°F Sp Gr 82-95 Visc 30 to 40 SSU	0.88	2.45	–	0.85	
No. 2 @ 100°F Sp Gr 82-95 Visc 35 to 50 SSU	0.88	4.50	–	0.752	
No. 3 @ 100°F Sp Gr 82-95 Visc 55 SSU max	0.88	8.6	–	0.66	
No. 5 @ 100°F Sp Gr 82-95 Visc 60 to 450 SSU	0.88	55.0	–	0.47	
No. 6 @ 122°F Sp Gr 82-95 Visc 430 to 2900 SSU	0.88	38.0	–	0.493	
Gasoline (representative)*					
Type #1	0.74	0.88	–	1.04	
Type #2	0.72	0.64	–	1.11	
Type #3	0.68	0.46	–	1.19	
Glycerine (Glycerol) – 100% @ 150°F	1.26	–	75.0	0.45	

* These figures are approximate or averages of those values available.

CHART 4. Resistance of 90° Bends



Problem: Determine the equivalent length, in terms of hose inside diameters, of a 90° and a 180° bend whose relative radii are 12 inches.

Bends

If a hose of a given length is bent, the pressure drop will increase by some definite amount...the sharper the bend and the smaller the radius of bend the greater the pressure drop. The effect of a bend may be neglected if it is slight or if there are but few bends in a long length of hose. This is because the additional pressure drop caused by these bends is not significant when compared to the total pressure drop.

Solution: Referring to the "total resistance curve," the equivalent length for a 90° bend is 34.5 hose diameters. The equivalent length of a 180° bend is 34.5 diameters for resistance due to length, and 15.8 ÷ 2 diameters for bend resistance. Adding these 34.5, 18.7, and 15.8 ÷ 2 = 61.1 diameters for a 180° bend.* Note that this loss is less than the sum of losses through two 90° bends separated by tangents.

Liquid	Specific Gravity	Viscosity	Viscosity	Correction Factor R.	
		Centistokes	Centipoises		
		CS	CP		
Glycerine & Water – 50%	1.13	–	6.5	0.717	
Heptaine – n	.684	0.60	–	1.16	
Hexane – n	.66	0.49	–	1.21	
Hydrochloric Acid – 31.5%	1.16	–	1.92	0.92	
Isobutyl Alcohol	0.817	–	3.90	0.745	
Isopropyl Alcohol	0.785	–	2.20	0.828	
Kerosene	0.80	2.23	–	0.892	
Lubricating Oil (Machine Oil)	0.90	–	198.0	0.35	
Lubricating Oil (Automotive)	0.893	–	110.0	0.39	
Methyl Alcohol (Methanol) – 100%	0.79	.74	0.60	1.072	
Methyl Alcohol – 90%	0.824	–	0.77	1.03	
Methyl Alcohol – 40%	0.937	–	2.00	0.863	
Milk*	1.03	1.15	–	0.99	
Motor Oil	0.893	–	110.0	0.39	
Naphthalene	1.15	0.9	–	1.04	
Nitric Acid – 95%	1.50	–	1.13	1.07	
Nitric Acid – 60%	1.37	–	2.35	0.913	
Nonane - n	0.718	.97	–	1.02	
Octane - n	0.70	.77	–	1.068	
Olive Oil	0.91	93.0	–	0.41	
Pentane - n	0.63	0.37	–	1.24	
Propyl Alcohol	0.804	2.8	–	0.828	
Rapeseed Oil	0.91	180.0	–	0.36	
Sodium Hydroxide – 50%	1.53	–	95.0	0.443	
Soya Bean Oil	0.924	86.0	–	0.418	
Sperm Oil	0.88	21.0	–	0.55	
Sugar Solution – 20%	1.08	1.9	–	0.895	
Sugar Solution – 40%	1.18	5.3	–	0.728	
Sugar Solution – 60%	1.29	44.0	–	0.475	
Sulfuric Acid – 100%	1.83	14.6	–	0.59	
Sulfuric Acid – 95%	1.83	14.5	–	0.593	
Sulfuric Acid – 60%	1.50	4.4	–	0.755	
Toluene	0.866	–	0.6	1.092	
Turpentine	0.86	1.83	–	0.90	
Water (Fresh)	1.0	1.10	–	1.00	
Water (Salt)	1.03	1.10	–	1.00	
Xylene (Xylol)	0.87	0.93	–	1.03	

Static Head Pressure

Static head is the difference in height between the inlet and outlet ends of a hose. Before using Chart 1, it is necessary to correct for static head pressure because the values in Chart 1 are pressure losses due to friction only. To correct for static head pressure, the difference in height is determined and multiplied by 0.433 to convert the head to an equivalent pressure in PSI (one foot of water exerts 0.433 PSI pressure).

If the inlet is higher than the outlet, the pressure equivalent is added to the pump pressure. If the outlet is higher than the inlet, the pressure equivalent is subtracted from the pump pressure. In both cases, it is assumed that the pump pressure is the pressure available at the inlet end and that the pump is outside of the hose system.

Installation Design

Hose should not be twisted or put in torsion either during the installation or while in service. Sharp or excessive bends may cause the hose to kink or rupture. Be sure to allow enough slack to provide for changes in length which will occur when pressure is applied. This change in length can vary from +2% to -4%. Design the installation so the hose assembly is accessible for inspection and easy removal. Bend radius is important. A good working rule is that the minimum bend radius should be five or more times the O.D. dimension of the hose.

**In a continuous bend of 180 degrees the second 90 degree bend produces approximately one-half the resistance of the first bend.*

Bend radius is important. A good working rule is that the minimum bend radius should be five or more times the O.D. dimension of the hose.

Hose Selection

Chemical Compatibility Chart

These tables alphabetically list commonly used materials of various chemical composition. After each fluid listing you will find the basic hose tube and fitting materials rated according to their chemical resistance to each individual fluid. The chart is intended to be used as a guide only. Consult Eaton Technical Support for further information.

⚠ WARNING

Selection of Hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of the hose for your application can result in serious bodily injury or property damage from spraying fluids or flying projectiles. In order to avoid serious bodily injury or property damage resulting from selection of the wrong hose, you should carefully review the information in this catalog.

⚠ WARNING

Proper Selection of Hose Fittings: Selection of the proper fittings for the hose fitting application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to the selection of the fittings for your application can result in serious bodily injury or property damage resulting from spraying fluids or flying projectiles. In order to avoid serious bodily injury or property damage resulting from selection of the wrong fitting, you should carefully review the information in this catalog.

⚠ WARNING

The following list of chemicals is offered as a guide to the chemical resistance properties of the tube material of the hoses shown. It should be used as a guide only, as the degree of resistance of any elastomer to a particular fluid depends upon such variables as temperature, concentration, pressure conditions, velocity of flow, duration of exposure, aeration, stability of the fluid, etc.

Therefore, when in doubt, it is advisable not to use the hose. If this is not practical, tests should be devised that simulate actual service conditions as nearly as possible. Eaton offers additional technical assistance. Contact your Eaton Customer Support representative for assistance or call Technical Support at 1-888-258-0222.

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Chemical Compatibility Chart

FLUID	HOSE MATERIAL											HOSE FITTINGS		
	PVC	Nitrile	Vinyl Nitrile	Neoprene	Teflon	Nylon/Nylon II	EPDM	Hypalon ²	Hytrel ¹	Polyurethane	CPE	Brass	Steel	316 Stainless
Acetaldehyde	X	X	X	X	G	G	G	F	X	X	-	X	X	G
Acetic Acid (Concentrated)	X	X	X	X	G	X	G	X	X	X	G	X	X	G
Acetic Acid (Diluted)	F	X	X	F	G	F	G	F	G	X	G	X	X	G
Acetic Anhydride	X	G	G	X	G	X	G	F	X	X	G	X	F	G
Acetone	X	X	X	X	G	G	G	F	F	X	G	G	G	G
Acrylonitrile	G	X	X	X	G	G	X	X	-	X	G	-	G	G
Air ▲	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Alcohols (Methanol & Ethanol)	X	G	G	G	G	G	G	G	G	X	G	G	F	G
Aluminum Chloride	G	G	G	G	G	X	G	G	G	G	X	X	F	G
Aluminum Fluoride	G	G	G	F	G	X	G	G	-	G	X	X	X	G
Aluminum Hydroxide	G	G	G	G	G	G	G	G	-	G	X	X	F	G
Aluminum Sulfate	G	G	G	G	G	G	G	G	G	G	X	X	G	G
Alums	G	G	G	G	G	F	G	G	X	G	X	X	F	G
Ammonia, Anhydrous	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ammonia Solution (10%)	G	G	G	F	G	G	G	X	X	X	X	X	G	G
Ammonium Chloride	G	G	G	G	G	X	G	G	G	G	X	X	G	F
Ammonium Hydroxide	X	F	F	F	G	G	G	X	X	G	X	F	G	G
Ammonium Nitrate	G	G	G	G	G	G	G	G	X	G	-	-	G	G
Ammonium Phosphate	F	G	G	G	G	G	G	G	F	G	X	X	X	G
Ammonium Sulfate	G	G	G	G	G	G	G	G	G	G	X	X	F	G
Amyl Acetate	X	X	X	X	G	G	F	X	X	X	X	G	F	G
Amyl Alcohol	X	G	G	F	G	G	G	G	X	G	G	F	F	G
Aniline	X	X	X	X	G	X	X	X	X	X	X	X	G	G
Aniline Dyes	X	F	F	F	G	X	G	F	X	X	X	X	F	G
Animal Oils and Fats	G	G	G	X	G	G	F	F	G	X	F	G	G	G
Anti-Freeze (Glycol Base)	G	G	G	G	G	F	G	G	X	G	X	G	G	G
Aqua Regia	X	X	X	X	G	X	X	X	X	X	-	X	X	X
Asphalt	X	G	G	X	G	G	X	X	-	X	F	G	G	G
Barium Chloride	G	G	G	G	G	X	G	G	G	G	X	F	G	G
Barium Hydroxide	G	G	G	G	G	G	G	G	X	G	X	G	G	G
Barium Sulfide	G	G	G	G	G	X	G	G	X	G	X	X	G	G
Beet Sugar Liquors	G	G	G	G	G	X	G	G	X	G	X	G	G	G
Benzaldehyde	X	X	X	X	G	G	F	X	X	X	F	F	G	G
Benzene, Benzol	X	X	X	X	G	X	X	X	X	F	G	X	G	G
Benzoic Acid	X	X	X	G	X	X	X	X	X	F	F	X	F	G
Black Sulfate Liquor	X	F	F	G	G	F	G	F	G	X	F	X	G	G
Borax	G	F	F	G	G	G	G	G	G	G	G	G	G	G
Boric Acid	G	G	G	G	G	G	G	G	G	X	X	X	G	G
Brake Fluid (Glycol Ether Base)	X	X	X	F	G	G	X	-	X	G	X	X	G	G
Brine	G	G	G	G	G	G	G	G	X	G	-	X	F	G
Butane	Use H366 Hose only													
Butyl Acetate	X	X	X	X	G	G	F	X	F	X	F	G	G	G
Butyl Alcohol, Butanol	X	G	G	G	G	G	G	G	X	G	X	G	G	G

Codes:

- G** Good resistance.
- F** Fair resistance.
- X** Incompatible.
- No data available.
- ▲ In all applications, the cover must be pinpricked.
- 1 Hytrel® is a registered trademark of E.I. DuPont.
- 2 Hypalon® is a registered trademark of E.I. DuPont.

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Hose Selection

Chemical Compatibility Chart

Chemical Compatibility Chart

FLUID	HOSE MATERIAL											HOSE FITTINGS		
	PVC	Nitrile	Vinyl Nitrile	Neoprene	Teflon	Nylon/Nylon II	EPDM	Hypalon ²	Hytrel ¹	Polyurethane	CPE	Brass	Steel	316 Stainless
Calcium Bisulfite	G	G	G	G	G	F	G	G	X	G	X	X	X	X
Calcium Chloride	G	G	G	G	G	X	G	G	G	G	G	X	F	F
Calcium Hydroxide	G	F	F	G	F	G	F	G	X	G	F	G	G	F
Calcium Hypochlorite	G	F	F	F	F	G	F	G	F	X	G	F	G	F
Cane Sugar Liquors	G	G	G	G	G	G	G	G	X	G	F	G	G	G
Carbon Dioxide (Dry)	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Carbon Dioxide (Wet)	-	G	G	G	G	G	G	-	G	-	F	G	G	G
Carbon Disulfide (Bisulfide)	X	X	X	X	G	X	X	X	X	X	G	G	G	G
Carbon Monoxide (Hot)	X	F	F	F	G	X	F	G	G	F	G	X	F	G
Carbon Tetrachloride	X	X	X	X	G	G	X	X	F	X	X	G	G	G
Carbonic Acid	X	G	G	G	G	X	G	G	X	F	X	X	X	F
Castor Oil	G	G	G	F	G	G	F	G	F	G	G	G	G	G
Cellosolve Acetate	X	X	X	X	G	F	F	F	X	X	X	X	G	G
Chlorinated Solvents	X	X	X	X	G	F	X	X	X	X	X	G	G	F
Chloroacetic Acid	X	X	X	X	G	X	F	X	X	X	X	X	F	F
Chlorobenzene	X	X	X	X	G	G	X	X	X	X	X	F	F	G
Chloroform	X	X	X	X	G	G	X	X	X	X	G	G	G	G
Chlorosulfonic Acid	X	X	X	X	G	X	X	X	X	X	X	F	X	X
Chromic Acid (Under 25%)	F	X	X	X	G	X	G	G	X	X	X	X	X	F
Chromic Acid (Over 25%)	X	X	X	X	G	X	G	X	X	X	X	X	F	F
Citric Acid	G	F	F	G	G	X	G	G	G	X	X	X	G	G
Coke Oven Gas	X	X	X	X	F	X	X	X	-	X	X	F	G	G
Copper Chloride	G	G	G	F	G	G	G	G	G	G	X	X	G	G
Copper Sulfate	G	G	G	G	G	G	G	G	G	G	X	X	G	G
Corn Syrup (non-food)	G	G	G	F	G	G	F	G	G	-	-	G	G	G
Cottonseed Oil	F	G	G	X	G	F	F	G	G	F	G	G	G	G
Cresosote	X	F	F	X	G	X	X	F	X	F	F	-	G	G
Cresol	X	X	X	X	G	X	X	X	X	G	-	G	G	G
Dextrose (food grade)	X	X	X	X	G	X	X	X	X	X	G	G	G	G
Diaminoethane	X	X	X	X	G	X	F	X	-	X	-	G	G	G
Dibromoethane	X	X	X	X	G	G	X	X	-	X	-	-	-	-
Dichlorobenzene	X	X	X	X	G	G	X	X	X	X	-	-	G	G
Diesel Fuel	X	G	G	X	G	G	X	F	F	F	G	G	G	G
Diethanolamine	-	F	F	X	G	X	G	X	X	X	G	X	G	G
Diethylenetriamine	-	F	F	X	G	X	G	X	X	G	-	-	-	-
Dowtherm A	X	X	X	X	G	X	X	X	X	X	X	F	G	G
Enamel (Solvent Base)	X	F	F	X	G	G	X	X	X	X	G	-	G	G
Ethanolamine	X	F	F	X	G	X	G	X	-	X	G	X	G	G
Ethers (Ethyl Ether)	X	X	X	X	G	F	X	X	X	F	G	G	G	G
Ethyl Alcohol (To 150°)	F	G	G	G	G	G	G	G	G	G	F	G	G	G
Ethyl Acetate	X	X	X	X	G	G	G	X	F	X	F	G	G	G
Ethyl Acrylate	X	X	X	X	G	G	F	X	X	X	F	-	G	G

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FLUID	HOSE MATERIAL											HOSE FITTINGS		
	PVC	Nitrile	Vinyl Nitrile	Neoprene	Teflon	Nylon/Nylon II	EPDM	Hypalon ²	Hytrel ¹	Polyurethane	CPE	Brass	Steel	316 Stainless
Ethylamine	X	X	X	X	G	X	F	X	-	X	-	G	-	G
Ethyl Cellulose	-	F	F	F	G	G	F	F	G	F	G	F	G	F
Ethyl Chloride	X	X	X	X	G	G	X	X	X	F	X	F	F	G
Ethylene Dichloride	X	X	X	X	G	G	X	X	X	X	X	X	G	X
Ethylene Glycol	G	G	G	G	G	F	G	G	G	F	G	F	G	G
Ethylene Oxide	X	X	X	X	G	G	X	X	G	X	X	F	F	F
Ethyl Methacrylate	X	X	X	X	G	F	X	X	X	F	X	F	F	G
Fatty Acids	G	F	F	X	G	F	X	G	X	F	F	F	F	G
Ferric Chloride	G	G	G	G	G	G	G	G	G	F	G	X	X	X
Ferric Sulfate	G	G	G	G	G	G	G	G	G	G	G	X	X	F
Fertilizer Solution (Water Base)	G	F	F	F	G	F	G	G	G	-	-	-	-	G
Formaldehyde	X	F	F	F	G	G	X	F	X	G	F	X	G	G
Formic Acid	X	F	F	F	G	X	G	X	X	G	F	X	G	G
Freon 12*	X	F	F	F	G	G	X	X	X	F	G	F	G	G
Fuel Oil	F	G	G	F	G	G	X	X	G	F	G	F	G	G
Furfural	X	X	X	X	G	F	F	G	X	F	F	F	G	G
Gasoline (Refined)	X	F	F	X	G	G	X	X	G	F	G	G	G	G
Gasoline (Unleaded)	X	G	G	X	G	G	X	F	X	X	G	G	G	G
Gasoline (10% Ethanol)	X	G	G	X	G	G	X	X	X	X	G	G	G	G
Gasoline (10% Methanol)	X	F	F	X	G	G	X	X	X	X	G	G	G	G
Glycerine, Glycerol	G	G	G	G	G	G	G	G	G	X	G	G	G	G
Greases	G	G	G	F	G	G	X	F	G	G	G	X	G	G
Green Sulfate Liquor	G	F	F	F	G	X	G	X	G	X	G	X	X	G
Heptane	X	G	G	F	G	G	X	F	G	F	G	G	G	G
Hexane	X	G	G	F	G	G	X	F	G	F	G	G	G	G
Houghto Safe 273 to 640	F	G	G	G	G	G	G	-	-	X	G	G	G	G
Houghto Safe 5046, 5047F	G	G	G	G	G	G	X	X	X	G	G	G	G	G
Houghto Safe 1000 Series	X	X	X	X	G	G	G	X	-	X	-	G	G	G
Hydraulic Oils														
Straight Petroleum Base	G	G	G	F	G	G	X	F	G	G	G	G	G	G
Water Petroleum Emulsion	-	G	G	F	G	G	X	F	G	X	G	G	G	G
Water Glycol	-	G	G	G	G	G	G	-	X	X	G	G	G	G
Straight Phosphate Ester	X	X	X	X	G	G	X	-	X	G	G	G	G	G
Phos. Ester/Petroleum Blend	X	X	X	X	G	G	X	X	X	-	G	G	G	G
Polyol Ester	-	G	X	X	G	G	X	-	X	G	G	G	G	G
Hydrobromic Acid	G	X	X	X	G	X	G	G	X	X	G	X	X	X
Hydrochloric Acid	G	X	X	X	G	X	G	G	X	X	G	X	X	X
Hydrocyanic Acid	G	F	F	X	G	X	F	G	X	X	X	X	F	G
Hydrofluoric Acid (Under 50%)	F	X	X	X	G	X	F	G	X	X	X	X	X	G
Hydrofluoric Acid (Over 50%)	X	X	X	X	G	X	X	G	X	X	X	X	X	G
Hydrofluosilicic Acid	G	F	F	X	G	X	G	G	X	X	G	X	X	X
Hydrogen	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydrogen Peroxide	-	X	X	X	G	X	F	X	X	-	G	X	X	G
Hydrogen Sulfide	-	X	X	X	X	X	X	F	G	-	X	F	F	F
Hydrolube	-	G	G	F	G	G	-	-	G	X	-	G	G	G
Isopropyl Alcohol	G	G	G	G	G	G	G	G	G	X	G	G	G	G
Isopropylamine	X	X	X	F	G	X	F	X	-	-	-	G	-	G
Iso-Octane	X	G	G	F	G	G	X	F	G	X	G	G	G	G
Jet Fuel (Transfer Only)	X	G	G	F	G	G	X	X	X	-	G	F	G	G
Kerosene	X	G	G	F	G	G	X	F	F	G	G	G	G	G
Lacquer	X	X	X	X	G	G	X	X	X	F	G	X	G	G
Lacquer Solvents	G	X	X	X	G	G	X	X	F	X	F	G	X	G
Lactic Acid	G	X	X	G	G	X	F	G	X	X	X	F	F	G
Lime Sulfur	G	X	X	G	F	G	F	-	-	-	X	-	G	G
Lindol	-	X	X	X	G	G	G	X	-	X	-	F	G	G
Linseed Oil	G	G	G	X	G	G	X	F	F	F	G	F	G	G
Lubricating Oils	G	G	G	F	G	G	X	F	F	F	G	F	G	G
Lye	G	F	F	G	G	X	G	G	-	-	G	F	X	G

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Hose Selection

Chemical Compatibility Chart

Chemical Compatibility Chart

FLUID	HOSE MATERIAL											HOSE FITTINGS		
	PVC	Nitrile	Vinyl Nitrile	Neoprene	Teflon	Nylon/Nylon II	EPDM	Hypalon ²	Hytrel ¹	Polyurethane	CPE	Brass	Steel	316 Stainless
Magnesium Chloride	G	G	G	G	G	X	G	G	F	G	G	F	F	G
Magnesium Hydroxide	G	F	F	G	G	X	G	F	F	X	G	G	G	G
Magnesium Sulfate	G	G	G	G	G	G	G	G	X	G	F	G	G	G
Mercuric Chloride	F	F	F	G	G	X	G	G	-	G	X	X	X	X
Mercury	F	G	G	G	G	G	G	G	G	G	X	G	G	G
Methanol	X	G	G	G	G	G	G	G	F	G	F	G	G	G
Methyl Acrylate	X	X	X	X	G	X	F	X	X	X	F	G	G	G
Methyl Chloride	X	X	X	G	F	X	X	X	X	X	F	G	G	G
Methylene Chloride	X	X	X	X	G	G*	X	X	X	X	X	G	G	G
Methyl t-Butyl Ether (MTBE)	X	F	F	X	G	G	X	X	-	-	-	-	G	G
Methyl Ethyl Ketone	X	X	X	X	G	G	F	X	G	X	X	G	G	G
Methyl Isobutyl Ketone	X	X	X	X	G	G	F	X	X	X	X	G	G	G
Methyl Isopropyl Ketone	X	X	X	X	G	G	F	X	X	X	X	G	G	G
Methyl Methacrylate	X	X	X	X	G	F	X	X	X	X	-	G	G	G
Mineral Oil	F	G	G	F	G	G	X	F	G	G	G	G	G	G
Mineral Spirits	X	G	G	F	G	G	X	X	G	G	G	G	G	G
Naphtha	X	F	F	F	G	G	X	X	G	F	G	F	G	G
Naphthalene	X	X	X	X	G	G	X	X	F	F	G	-	-	-
Nickel Acetate	G	X	X	G	G	G	G	G	X	X	G	X	X	F
Nickel Chloride	G	G	G	F	G	G	G	G	X	X	G	X	X	F
Nitric Acid (Under 35%)	G	X	X	X	G	X	F	F	X	X	X	X	X	G
Nitric Acid (35% to 60%)	F	X	X	X	G	X	X	X	X	X	X	X	X	G
Nitric Acid (Over 60%)	X	X	X	X	G	X	X	X	X	X	X	X	X	G
Nitrobenzene	X	X	X	X	G	G	X	X	X	X	X	F	G	G
Nitrogen Gas à	G	G	G	G	G	G	-	G	G	G	-	-	-	-
Nitrous Oxide	X	X	X	X	G	X	X	X	X	X	X	G	G	G
Oleic Acid	F	F	F	X	G	G	F	F	G	F	G	F	F	G
Oleum (Fuming Sulfuric Acid)	X	X	X	X	G	X	X	X	X	X	X	F	G	G
Oxalic Acid	G	X	X	X	G	X	X	X	-	G	F	X	G	G
Paint (Solvent Base)	X	F	F	X	G	X	X	-	-	-	G	G	G	G
Palmitic Acid	F	F	F	F	G	G	F	X	G	X	X	F	F	F
Pentane	X	G	G	F	G	G	X	F	G	G	G	G	G	G
Perchloroethylene	X	X	X	X	G	G	X	X	X	X	X	F	G	G
Petroleum Ether	X	G	F	X	G	G	X	X	G	G	G	G	G	G
Petroleum Oils	G	G	G	F	G	G	X	F	G	G	G	G	G	G
Phenol	X	X	X	X	G	X	X	X	X	X	G	F	X	F
Phosphoric Acid (to 85%)	G	X	X	F	G	X	G	G	X	X	X	X	X	F
Picric Acid (Molten)	X	X	X	X	G	X	X	F	X	X	X	X	X	F
Picric Acid (Solution)	X	F	F	X	G	X	F	G	X	F	X	X	X	F
Potassium Chloride	G	G	G	G	G	G	G	G	G	G	G	F	X	G
Potassium Cyanide	G	G	G	G	G	G	G	G	G	G	G	X	G	G
Potassium Dichromate	G	X	X	X	G	F	G	X	G	G	G	X	G	G
Potassium Hydroxide	G	F	F	F	G	G	G	G	F	X	G	F	X	G
Potassium Sulfate	G	G	G	G	G	G	G	G	G	G	G	F	F	G
Propane Liquid														
Propylene Glycol	F	G	F	G	G	G	G	G	-	-	G	F	G	G
Pyridine	X	X	X	X	G	X	F	X	X	X	X	F	G	G
Sea Water	G	G	G	G	G	G	G	G	G	X	G	G	F	G
Skydrol (Transfer Only)	X	X	X	X	G	G	G	X	-	X	G	G	G	G
Soap Solution	G	G	G	F	G	G	G	G	G	G	G	G	G	G
Sodium Bisulfate	G	G	G	G	G	G	G	G	X	G	G	F	F	F
Sodium Carbonate	G	G	G	G	G	G	G	G	G	G	G	X	G	G
Sodium Chloride	G	G	G	G	G	G	G	G	G	G	G	X	F	G
Sodium Cyanide	G	G	G	G	G	G	G	G	G	G	G	X	F	G
Sodium Hydroxide	G	F	F	G	G	X	G	G	F	X	X	F	X	G
Sodium Hypochlorite	G	X	X	X	G	X	G	G	X	F	X	X	X	F
Sodium Nitrate	G	G	F	G	F	G	G	G	G	F	F	X	G	G
Sodium Perborate	G	G	G	X	G	G	X	G	X	X	F	F	F	G

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	PVC	Nitrile	Vinyl Nitrile	Neoprene	Teflon	Nylon/Nylon II	EPDM	Hypalon ²	Hytrel ¹	Polyurethane	CPE	Brass	Steel	316 Stainless
Sodium Peroxide	X	F	F	F	G	X	G	F	G	X	X	X	F	G
Sodium Phosphates	G	G	G	F	G	G	G	G	F	G	X	F	F	F
Sodium Silicate	G	G	G	G	G	G	G	G	G	G	F	F	F	G
Sodium Sulfate	G	G	G	G	G	G	G	G	G	G	G	F	F	G
Sodium Sulfide	G	G	G	G	G	G	G	G	G	G	X	X	G	G
Sodium Thiosulfate	G	G	G	G	G	G	G	G	-	G	G	X	X	G
Soybean Oil	F	G	G	F	G	G	F	G	G	G	G	G	G	G
Stannic Chloride	G	G	G	X	G	X	G	G	G	G	G	X	X	X
Steam 450°	X	X	X	X	G	X	G	X	X	X	X	F	F	G
Stearic Acid	F	F	F	F	G	G	F	F	G	G	G	X	X	G
Stoddard Solvent	X	G	G	F	G	G	X	X	G	G	G	G	G	G
Sulfur	F	X	X	X	X	X	X	F	-	-	G	X	X	G
Sulfur Chloride	X	X	X	X	G	F	X	F	X	X	G	X	X	X
Sulfur Dioxide	X	X	X	X	G	X	G	X	X	-	X	X	-	G
Sulfuric Acid (Under 50%)	G	X	X	X	G	X	G	X	X	X	X	X	X	X
Sulfuric Acid (51% to 70%)	G	X	X	X	G	X	F	G	X	X	X	X	X	X
Sulfuric Acid (71% to 95%)	X	X	X	X	G	X	F	F	X	X	X	X	X	X
Sulfuric Acid (96% to 98%)	X	X	X	X	G	X	X	X	X	X	X	X	X	X
Styrene	X	X	X	X	G	G	X	X	X	X	X	X	G	G
Tannic Acid	G	F	F	F	G	X	G	G	G	G	G	F	X	G
Tar	X	F	F	F	G	X	X	X	G	F	G	F	F	G
Tartaric Acid	G	G	G	F	G	X	G	G	G	G	G	F	X	F
Tetrachloroethane	X	X	X	X	G	G	X	X	X	X	X	-	-	G
Tetrahydrofuran (THF)	X	X	X	X	G	G	X	X	-	X	X	-	-	G
Toluene	X	X	X	X	G	G	X	X	X	X	X	G	G	G
Transmission Oil (Petrol. Based)	G	G	G	F	G	G	X	F	G	G	G	G	G	G
Trichloroethane	X	X	X	X	G	X	X	X	X	X	X	X	G	G
Trichloroethylene	X	X	X	X	G	G	X	X	X	X	X	G	G	G
Tung Oil	-	G	G	F	G	G	X	F	G	X	X	F	G	G
Turpentine	X	F	F	X	G	G	X	X	F	X	F	F	G	G
Urea (Water Solution)	G	X	X	G	G	G	G	G	G	G	G	-	G	G
Varnish	X	X	X	X	G	G	X	X	-	X	F	G	G	G
Vegetable Oil (Non-food)	F	G	G	X	G	X	G	-	G	-	G	G	G	G
Vinyl Acetate	X	X	X	X	G	F	X	X	X	-	-	-	-	-
Water	G	G	G	G	G	G	G	G	G	G	G	F	F	G
Water-Glycol mixture	-	G	G	G	G	G	G	X	X	G	F	G	G	G
Water-Petroleum mixture	-	G	G	F	G	G	X	F	G	X	G	F	G	G
Xylene	X	X	X	X	G	G	X	X	F	X	X	X	G	G
Zinc Chloride	G	G	G	G	G	X	G	X	G	X	X	X	X	X
Zinc Sulfate	G	G	G	G	G	G	G	-	G	X	X	X	X	G

*This chemical has some deteriorative effects, but the elastomer is still adequate for moderate service.

Codes:

- G** Good resistance.
- F** Fair resistance.
- X** Incompatible.
- No data available.
- ▲** In all applications, the cover must be pinpricked.
- 1 Hytrel[®] is a registered trademark of E.I. DuPont.
- 2 Hypalon[®] is a registered trademark of E.I. DuPont.

Note:

All data given herein is believed to be accurate and reliable, but presented without guarantee, warranty, or responsibility of any kind, express or implied, on our part. Chemical resistance will vary with the wide diversity of possible mixtures and service conditions. It is therefore not possible to give any guarantee whatsoever in individual cases.

For compatibility of fluids not listed with this chart, contact Technical Support at 1-888-258-0222.

Hose Selection

Hose Fitting Pressure Charts

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	Code Letter or Number	Hose Fitting Size									
		-04	-05	-06	-08	-10	-12	-16	-20	-24	-32
Male British Pipe (BSP)	150	5,000		4,000	4,000	3,500	4,000	3,500	2,500	2,000	2,000
Female British Pipe (BSP)	05P, 70P, 350	5,000		4,000	4,000	3,500	4,000	3,500	2,500	2,000	2,000
Female Pipe (JIS)	00L	5,000		5,000	5,000		4,000	4,000			

Maximum Working Pressure (PSI)

Hose Fitting Connection	Code Letter or Number	Hose Fitting Size									
		-06	-08	-10	-12	-15	-18	-22	-28	-35	-42
Din Light	00A, 00C, 00D, 50D	3625	3625	3625	3625	3625	2325	2325	1450	1450	1450

Temperature vs. Pressure Table for Reinforced PVC Hose

Temperature		Allowable % of Original Work. Pressure		Temperature		Allowable % of Original Work. Pressure	
°C	°F	2-Spiral	4-Spiral	°C	°F	2-Spiral	4-Spiral
20	68	100%	100%	50	120	40%	53%
25	77	86%	90%	55	131	33%	47%
30	86	75%	81%	60	140	27%	43%
35	95	65%	73%	65	149	23%	40%
40	104	56%	66%	70	158	20%	38%
45	113	47%	59%	75	167	17%	37%
				80	176	15%	35%

Note: For additional information on a specific hose, refer to the hose descriptions on pages B1 thru I-2.

Hose Selection

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 Ratings¹

Dash Size	Inch Size	37° JIC	Male Pipe	Female Pipe ²	Male ORB ORS Adapters	Male ORB Non-ORS Adapters	Adjustable ORB ORS Adapters	Adjustable ORB Non-ORS Adapters	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	-

Notes:

- 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.

Fitting Thread Size Comparison Chart

The male connections have (Male unified thread class 2 fit) UN-2A specification threads and the female connections have (Female unified thread class 2 fit) UN-2B specification threads. The exceptions are male and female pipe threads.

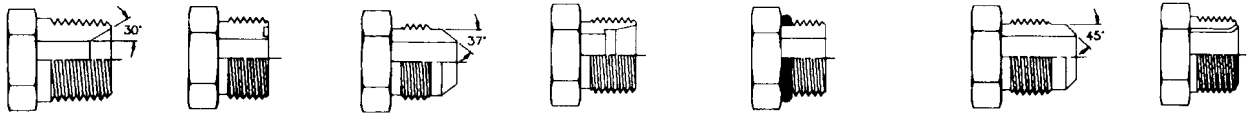
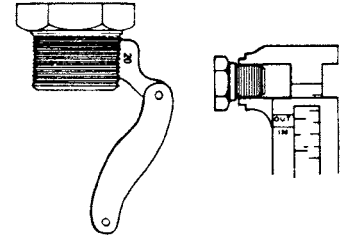
Tube Fittings

There are four basic types of tube fittings: Flare, Flareless, Straight Thread O-ring, and Flat Face O-ring Seal (FOR-SEAL™). Tube fittings seal in two ways. Flare and Flareless fittings use metal to metal contact joints. Straight Thread O-ring and Flat Face O-ring fittings use a rubber O-ring. Where extreme vibration is present, use Flareless, Straight Thread or Flat Face O-ring Seal fittings.

Sizing

For accuracy, it is recommended the male thread be measured. Measure the outside diameter. For our example use 7/16" Next measure the threads per inch – use 20. Our fitting size measures 7/16-20. Refer to the thread chart on this page for appropriate tube size and illustration.

See page N-60 for Thread Measuring Kits.



Size	Pipe	FOR-SEAL®	37° Flare Flare-Twin®	Ermeto® 7000 Series	Straight Thread O-ring SAE	45° Flare	Inverted Flare
1/8	1/8-27	—	5/16-24	5/16-24	5/16-24	5/16-24	5/16-28
3/16	—	—	3/8-24	3/8-24	3/8-24	3/8-24	3/8-24
1/4	1/4-18	9/16-18	7/16-20	7/16-20	7/16-20	7/16-20	7/16-24
5/16	—	—	1/2-20	1/2-20	1/2-20	1/2-20	1/2-20
3/8	3/8-18	11/16-16	9/16-18	9/16-18	9/16-18	5/8-18	5/8-18
7/16	—	—	—	—	—	11/16-16	11/16-18
1/2	1/2-14	13/16-16	3/4-16	3/4-16	3/4-16	3/4-16	3/4-18
5/8	—	1-14	7/8-14	7/8-14	7/8-14	7/8-14	7/8-18
3/4	3/4-14	1-3/16-12	1-1/16-12	1-1/16-12	1-1/16-12	1-1/16-14	1-1/16-16
7/8	—	—	1-3/16-12	1-3/16-12	1-3/16-12	—	1-3/16-16
1	1-11-1/2	1-7/16-12	1-5/16-12	1-5/16-12	1-5/16-12	—	1-5/16-16
1 1/4	1-1/4-11-1/2	1-11/16-12	1-5/8-12	1-5/8-12	1-5/8-12	—	—
1 1/2	1-1/2-11-1/2	2-12	1-7/8-12	1-7/8-12	1-7/8-12	—	—
2	2-11-1/2	—	2-1/2-12	2-1/2-12	2-1/2-12	—	—
2 1/2	2-1/2-8	—	3-12	—	—	—	—
3	3-8	—	3-1/2-12	—	—	—	—

Pipe Fittings

The American Society of Automotive Engineers in cooperation with industry set up a standard for improvement in pipe threads. This improvement is known as the Dryseal Pipe Thread. All Weatherhead pipe threads are American Standard Taper Dryseal Pipe Threads (NPTF). The metal to metal seal is formed by contact at the thread crest and root.

Nominal pipe sizes do not agree with either the I.D., O.D., or thread sizes. To determine pipe size (up to 1-1/4") measure the diameter of the threads and subtract 1/4" For example, subtract 1/4" from a 1" pipe to obtain the nominal pipe size of 3/4".

Pipe sizes can also be given in 'dash numbers.' A dash number is always the numerator of an inch over 16th. For instance, if the pipe O.D. measures 1/2" that would be converted to 16ths (8/16), but be written as -8.



Fitting Identification

Identifying metric, or non-USA, threaded connections is similar to identifying the connections that have been commonly used

in the United States. The following text covers how to identify the different styles of metric connections offered by Eaton.

BSPP & BSPT Thread Chart

BSPP Thread Size	1/8-28	1/4-19	3/8-19	1/2-14	5/8-14	3/4-14	1-11	1-1/4-11	1-1/2-11	2-11
Male Thread Diameter	9.72 (.375)	13.16 (.518)	16.66 (.656)	20.96 (.825)	22.91 (.902)	26.44 (1.041)	33.25 (1.309)	41.91 (1.650)	47.80 (1.882)	59.51 (2.347)
Female Thread Diameter	8.73 (.343)	11.66 (.459)	15.37 (.605)	18.90 (.744)	20.85 (.821)	24.38 (.960)	30.61 (1.205)	39.24 (1.545)	45.24 (1.781)	55.94 (2.242)
Pitch	.91 (.036)	1.34 (.053)	1.34 (.053)	1.81 (.071)	1.81 (.071)	1.81 (.071)	2.31 (.091)	2.31 (.091)	2.31 (.091)	2.31 (.091)

Figure 4a. Dimension Note: mm (in)

Threads

The thread forms and their corresponding specifications listed below are used on all of the metric styles of connections which will be discussed later. These cover the basic forms of the threads but not the style of connection.

Parallel Threads ('G')

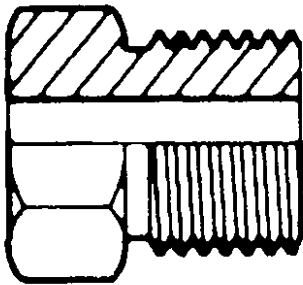


Figure 1.

Tapered Threads ('R')

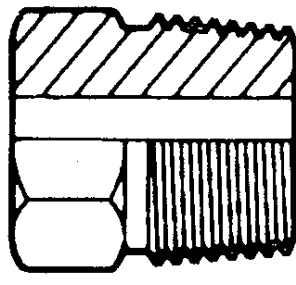


Figure 2.

Note:

BS British Standards Institution

ISO International Standards Organization

DIN Deutsche Industrie Norme

To identify metric connections, you will need instruments that can accurately measure thread inside and outside diameters, thread pitch and fitting seat angles. The TA-1002 Thread Measuring Guide and Tool Kit is a basic kit that will help you in identifying most of the connections you will be encountering on imported equipment.

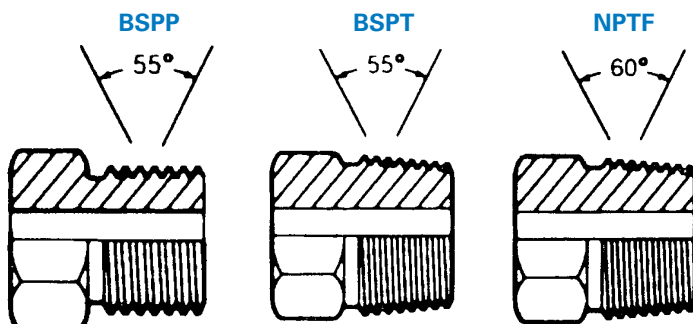


Figure 3.

Thread Type

Specifications

British Parallel Pipe Threads	BS 2779, ISO/R 228
British Taper Pipe Threads	BS 21, ISO/R 7
Metric Parallel Threads	DIN 3852, ISO/R 6149
Metric Taper Threads	DIN 3852

Parallel and Tapered Threads

The first step in identifying thread forms is to determine if the thread is parallel or tapered. Parallel threads are not used for sealing fluids. Sealing is achieved by an elastomeric O-ring, metal seal, machined ring into the hex itself or a seat machined into the end of the fitting. This style is similar to straight thread O-ring port connections where the threads are used for retention of the sealing method against a machine port. Parallel threads can be determined by laying a straight edge along the threads. If the threads are parallel to the center line of the fitting, then the fitting has parallel threads. See Figure 1.

Tapered threads seat by the interference caused by the male and female threads. These threads create a pressure-tight joint by metal deformation when they are tightened. Sealants on the threads are commonly used in this style of connection. Laying a straight edge on the threads, compare this line with the center line of the fitting. If this line tapers slightly away from the center line, then the threads are tapered. See Figure 2.

British Pipe Threads

There are two forms of British Standard Pipe Threads that are used in the world today. They are BSPP (British Standard Pipe Parallel) and BSPT (British Standard Pipe Tapered). The BSPT male thread mates with the female BSPT thread similar to an NPTF connection. The 30° BSPP male adapters connect to a female BSPP thread with a 30° cone. This style is comparable to an NPSM swivel style. These threads are almost identical to the NPTF Pipe Thread except for the flank angle. This angle is 55° versus 60° on the NPTF. See Figure 3. Because of this difference, the two forms are NOT interchangeable.

Identifying BSP threads starts with determining if it is a parallel or tapered thread. Next, referencing Figure 4 and 4a, measure the lead thread diameter. Compare this measurement to the listed dimensions to determine size. If instruments are not available to measure this, you can compare it end-to-end with a known NPTF thread to approximately arrive at the nominal BSP size. Finally, measure the pitch and compare it to the chart on Figure 4 to complete the identification. These dimensions will be the same for both BSPP and BSPT.

Metric Threads

Metric threads are similar to inch-sized threads except for the sizing which is based on standard metric units. Identifying metric threads starts with determining if it is a parallel or tapered thread. Next, measure the thread diameter. Compare this measurement to the dimensions listed in Figure 5 to determine size. Finally, measure the pitch and compare to chart. These dimensions will be common for both parallel and tapered threads.

DIN 3901/3902L, 3901/3902S

The most popular metric flareless, or bite-type, fitting style is the 24° Metric Tube Seat. This style incorporates a tapered seat in the fitting body with a bite-type sleeve, or ferrule, for the connection. When the nut is tightened, the tapered seat forces the sleeve into the tube creating a positive seal. This style of connection is available in both a Light and Heavy series and is designed for medium and high pressure applications respectively. The two series have different parallel thread sizes in

relationship to the nominal tube outside diameter, but share a common sleeve. This style can be identified by the combination of the 24° internal seat and a male metric parallel thread. The series can be determined by measuring the seat counterbore, which is the approximate tube outside diameter, and comparing it to the thread size. Compare these dimensions to those shown in Figure 6 to determine the series. The nominal sleeve size is taken directly from the tube outside diameter dimension.

Metric Thread Size	Male Thread Diameter		Female Thread Diameter		Pitch	
	mm	in	mm	in	mm	in
M10 x 1.0	10.0	.394	8.5	.335	1.0	.039
M12 x 1.5	12.0	.472	10.5	.413	1.5	.059
M14 x 1.5	14.0	.551	12.5	.492	1.5	.059
M16 x 1.5	16.0	.630	15.5	.610	1.5	.059
M18 x 1.5	18.0	.709	16.5	.650	1.5	.059
M20 x 1.5	20.0	.787	18.5	.728	1.5	.059
M22 x 1.5	22.0	.866	20.5	.807	1.5	.059
M24 x 1.5	24.0	.945	22.5	.886	1.5	.059
M26 x 1.5	26.0	1.024	24.5	.964	1.5	.059
M27 x 2.0	27.0	1.063	25.5	1.004	2.0	.079
M30 x 2.0	30.0	1.181	28.5	1.122	2.0	.079
M33 x 2.0	33.0	1.299	31.5	1.240	2.0	.079
M36 x 2.0	36.0	1.417	34.5	1.358	2.0	.079
M42 x 2.0	42.0	1.653	40.5	1.594	2.0	.079

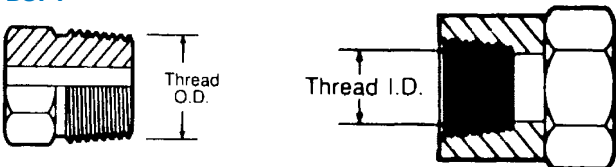
Figure 5.

Tube O.D.			Nom. O.D. Light - l.Rh.	Series-Thread Heavy - s.Rh.
mm	in	mm		
8	.315	8	M14 x 1.5	M16 x 1.5
10	.394	10	M16 x 1.5	M18 x 1.5
12	.472	12	M18 x 1.5	M20 x 1.5
14	.551	14	—	M22 x 1.5
15	.591	15	M22 x 1.5	—
16	.630	16	—	M24 x 1.5
18	.709	18	M26 x 1.5	—
20	.787	20	—	M30 x 2.0
22	.866	22	M30 x 2.0	—
25	.984	25	—	M36 x 2.0
28	1.102	28	M36 x 2.0	—
30	1.181	30	—	M42 x 2.0

Figure 6.

See page N-60 for Thread Measuring Kits.

BSPT



BSPP

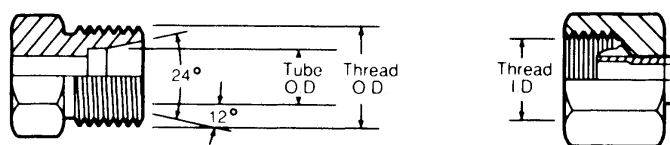
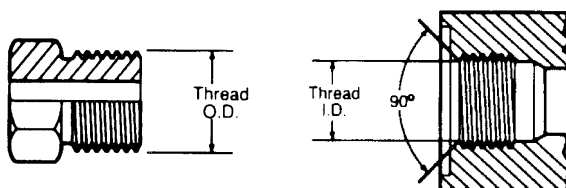
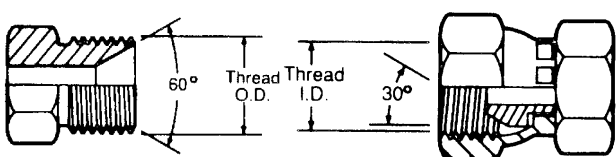


Figure 4.

Metric Flareless Connections Metric 60° Tube Seat DIN 7631

This series combines an internal 60° seat with parallel metric Light series threads. Mating with female metric swivel fittings with a globe seal made to DIN 3863L, this connection provides a metal to metal seal when tightened. This style can be identified by the internal 60° seat on the male metric threaded portion. Reference Figure 7 for thread information.

Japanese 30° Flare

The Japanese 30° flare style is similar to the 37° JIC flare connection except for two things. The seat angle is 30° and threads are metric straight threads. This fitting is often referred to as a 'Komatsu' style connection. To identify this style, first verify the seat angle is 30°. Next establish the metric thread size by measuring the thread outside diameter. Compare this dimension to those shown in Figure 9. The threads in this series will conform to Japanese Industrial Standard (JIS) B 0207.

Japanese 30° Flare (JIS)

Similar to BSPP and a 30° seat. The seal is made when contact is made between the male and female flares, with the threads retaining the connection. The JIS 30° flare is similar to the 37° flare connection. To determine the difference between the JIS 30° flare and the JIC 37° flare, carefully measure the seat angle. The threads in this series conform to Japanese Industrial Standard (JIS) B 0202.

Metric Split Flange Fittings

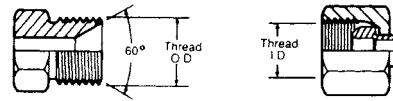
Metric split flanges are found in applications where high pressure and high vibration conditions exist. A flange clamp is used to secure the split flange head and O-ring against a machined port to provide an elastomeric and metal-to-metal seal. They are used in applications up to 3000 PSI. The physical dimensions are similar to the SAE Code 61 standard pressure series which makes the two styles fully interchangeable. To identify, referencing Figure 10, simply measure the flange head diameter to arrive at the nominal flange size.

Note: To prevent leakage when replacing this type of fitting with standard Code 61 hose fitting, make sure to use the existing flange halves and hardware with a new SAE-style O-ring. Also note that in this series there is a 5/8 nominal size which is a non-standard SAE size and require a special O-ring. Failure to reuse flange halves and hardware will result in an improper connection which could cause the hose assembly to fail.

⚠ WARNING

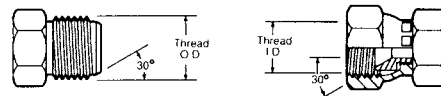
Proper selection of hose and hose fittings is critical for proper operation and safe use of the hose and hose fittings. See pages A2-3 of this catalog for important safety information.

Figure 7



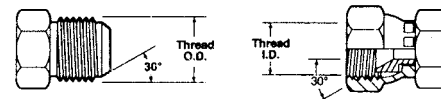
Metric Thread Size	Male Thread Diameter		Female Thread Diameter		Pitch	
	mm	in	mm	in	mm	in
M12 x 1.5	12.0	.472	10.5	.413	1.5	.059
M14 x 1.5	14.0	.551	12.5	.492	1.5	.059
M16 x 1.5	16.0	.630	15.5	.610	1.5	.059
M18 x 1.5	18.0	.709	16.5	.650	1.5	.059
M22 x 1.5	22.0	.866	20.5	.807	1.5	.059
M26 x 1.5	26.0	1.024	24.5	.964	1.5	.059

Figure 8



Metric Tube Size mm	Thread Size mm	Male Thread Diameter		Female Thread Diameter		Pitch	
		mm	in	mm	in	mm	in
6	M14x1.5	14	.551	12.5	.492	1.5	.059
9	M18x1.5	18	.709	16.5	.650	1.5	.059
12	M22x1.5	22	.866	20.5	.807	1.5	.059
16	M24x1.5	24	.945	22.5	.886	1.5	.059
19	M30x2.0	30	1.181	28.5	1.122	1.5	.059
25	M33x2.0	33	1.299	31.5	1.240	1.5	.059
32	M42x2.0	42	1.653	40.5	1.594	1.5	.059

Figure 9



Inch size	Thread size	Male Thread O.D.		Female Thread I.D.	
		in	mm	in	mm
1/4	1/4-19	17/32	13.7	1/2	12.4
3/8	3/8-19	11/16	17.2	5/8	16.0
1/2	1/2-14	27/32	21.5	25/32	19.8
3/4	3/4-14	1-1/16	26.9	1	25.4
1	1-11	1-11/32	34.0	1-1/4	31.8
1-1/4	1-1/2-11	1-29/32	48.5	1-27/32	46.2
2	2-11	2-3/8	60.4	2-5/16	58.2

Figure 10



Nominal Flange Size	Flange Head O.D.		O-ring Groove Dia "A"		Dia. "B"		
	mm	in	mm	in	mm	in	
12.7	1/2	30	1.19	18.5	.73	25.0	.98
15.9	5/8	34	1.34	20.1	.79	28.0	1.10
19.0	3/4	38	1.50	21.5	.85	31.0	1.22
25.4	1	44	1.75	28.5	1.12	38.0	1.50
31.8	1-1/4	51	2.00	34.5	1.36	44.0	1.73
38.1	1-1/2	60	2.38	44.4	1.75	54.0	2.12
50.8	2	71	2.81	56.5	2.22	65.0	2.56

Hose

1. Weatherhead hose is generally designated with the letter 'H.'*
2. Each hose is assigned a three or four digit base number from 001-9999, i.e., H069, H425, H470, H571.
3. The last two digits indicate inside hose diameter (I.D.) in sixteenths of an inch. In the example used above 08 is equal to 8/16" – or 1/2" I.D. hose.

Exceptions: H059, H069, H166, H169, H213, H229, H239, H366, H429, H569 and H757. The I.D. sizes of these hose deviate somewhat from the above standard. The sizing method used on these hoses is based on deducting twice the wall thickness from the O.D. of the connecting tubing to determine the I.D. of the hose. In other words, match the inside diameters rather than the dash sizes when going from tubing to hose. See example 1.

Table 1 shows standard hose size and H069 type hose sizes and dash numbers. Wherever these hoses are listed in this catalog, the size is listed and the dash number is the last two digits of the Catalog Number.

Examples:

	Actual Hose I.D.	Nominal Hose I.D.	Tubing I.D.	Tubing O.D.
H06906	5/16	3/8	5/16	3/8
H06910	1/2	5/8	1/2	5/8

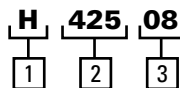


Table 1 – Catalog Numbers for Hose Sizes

Actual Hose I.D.	Standard Catalog Number	H069 Type Catalog Numbers
3/16	03	04
1/4	04	05
5/16	05	06
3/8	06	
13/32		08
7/16	07	
1/2	08	10
5/8	10	12
3/4	12	
7/8		16
1	16	
1-1/8		20
1-1/4	20	
1-3/8		24
1-1/2	24	
1-13/16		32
2	32	
2-3/8		40
3		48

Hose Fittings

Every type of Weatherhead hose fitting is designed to fit a certain group of hose with limiting dimensions and tolerances. For your convenience the hoses used on each fitting style are indicated in the hose fitting catalog listings.

Crimp

- The first two digits indicate hose size (I.D.) in sixteenths of an inch. The exceptions to this are the spiral and truck hose. Spiral hose fittings use the hose base number as a prefix to the size. Example: 47012E. Truck hose fittings use the base number 069 as a prefix to the size. Example: 06908E. Refer to the top of the catalog page where these hose fittings are detailed for recommended hose types.

08 U-2 58

① ② ③ ④

- Hose fitting type and material. Refer to Table 2. This letter is always followed by a dash.
- The first number or letter indicates the style of the end connection. See individual hose fitting catalog listings or refer to the hose fitting configuration chart on pages A-23-28
- The last two digits indicate the size of the end connection in sixteenths of an inch. Refer to individual catalog listing for metric and specialty ends.

425 08 N-2 58

① ② ③ ④ ⑤

Hose Assemblies

Catalog numbers for hose assemblies are basically the same as hose fittings, except both the ends must be specified as well as the overall length. This process is detailed below:

- Type of desired hose (see hose selection guide pages A-4-9 or individual hose listings).
- Hose size (I.D.) in sixteenths of an inch (04 = 4/16" = 1/4"). Exception: 13/32" I.D. hose.
- End style and material. Refer to Table 2 (above).
5. Style and size of each hose fitting. Refer to the individual hose fitting catalog listings or the Hose Fitting Configuration Chart on pages A-23-28 for available styles and sizes. Example: P04 Male Straight Thread O-ring 1/4", 604 SAE 37° Female Swivel 1/4."
- Length of assembly. The first three digits specify a length in inches. The last two digits are for fractions of an inch expressed in decimal hundredths (01250 = 12 1/2").

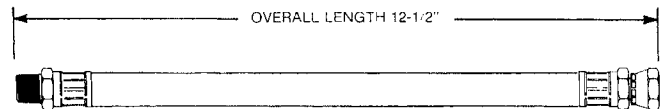
Table 2 – Standard Hose Fitting and Material Code

Code Letter	Coupling Type	Material
B	Field Attachable	Brass
C	Crimped	Brass
D	Field Attachable*	Steel*
E	Crimp	Steel
K	Clamp Type	Steel
N	Field Attachable	Steel
P	Crimp	Brass
S	Crimp Stainless	Steel
T	Field Attachable*	Brass
U	Crimp	Steel
Z	Crimp	Steel

*High Flow Hose Assemblies

Field Attachable

- Description of basic hose. The exceptions are the 247 series and clamp type ends. These ends are designed for use with a variety of hose types. Refer to the top of the catalog page where these hose fittings are detailed for recommended hose types.
- Hose size (I.D.) in sixteenths of an inch, or as shown in Table 1.
- Hose fitting type and material. Refer to Table 2. This letter is always followed by a dash.
- The first number or letter indicates the style of the end connection. See individual hose fitting catalog listings or refer to the hose fitting configuration chart on pages A-23-28.
- The last two digits indicate the size of the end connection in sixteenths of an inch. Refer to individual catalog listing for metric and specialty ends.



42504 U - P04 604 01250

① ② ③ ④ ⑤ ⑥

Note: To determine the hose only length when making a hose assembly, subtract each hose fitting cut-off factor from the overall hose assembly length. Please see the individual hose fitting listings for cut-off factor information.

To determine Hose Cut-Off Factors reference page A-30.

Numbering Systems

The chart to the side is designed to offer quick identification of Weatherhead hose fitting series. Included in this chart are: base numbers, descriptions, hose fitting series, and page number in which the configuration appears. Catalog numbers may be derived by adding the size in sixteenths of an inch to the base.

Example: 100 series 3/4" male pipe rigid. 3/4" = 12/16" thus 100 + 12 = 112.

Denotes Coll-O-Crimp Hose Fittings

Part # Suffix	Hose Fitting	Style	009 'B'	057 'B'	100 'B'	105 'B'	057 'P'	338 'B'	069 'D'	'E'	069 'E'	336 'E'	470 'E'	757 'E'	'K'	039 'K'	104 'N'	213 'N'	247 'N'	425 'N'	436 'N'	229 'P'	265 'P'	338 'P'	'S'	'U'	430 'U'	'Z'	4SP/6SP
00A	Male DIN (Light)	Rigid																									J-89	J-100	
00C	Female DIN (Light)	Swivel											J-18													J-44	J-57	J-88	
00D	Female DIN 45° (Light)	Swivel																								J-48		J-88	
00E	Female Din 2 1/4" 45° Tube Elbow	Swivel																										J-89	
00F	Male DIN (Heavy)	Rigid											J-17													J-39	J-90	J-90	
00K	Female 30° Flare (Komatsu)	Swivel								J-11																J-44	J-58	J-87	
00L	Female JIS 30° Flare	Swivel								J-4																J-45	J-87	J-87	
00P	Female Flat Face BSPP	Swivel																								J-46			
00S	Ready Lok®	Rigid																								J-46	J-58		
0PW	Pressure Washer	Swivel																										J-85	
30T	Straight Tube-Metric	Rigid																								J-47	J-84	J-84	
40P	Brit. Std. 60° Cone Parallel Female Pipe 45°	Swivel											J-19													J-50	J-59	J-86	
50C	Female DIN (Heavy)	Swivel																								J-44	J-57	J-89	
50D	Female DIN 90° (Light)	Swivel																								J-52	J-88	J-88	
50E	Female DIN 90° (Heavy)	Swivel																								J-52	J-90	J-100	
70P	Brit. Std 60° Cone Parallel Female Pipe 90°	Swivel								J-7			J-21													J-53	J-62	J-86	
050	Female Straight Pipe	Swivel										J-14														J-43	J-69	J-69	
100	Male Pipe	Rigid										J-13	J-17													J-37	J-55	J-68	
150	Male Pipe, British Standard Tapered	Rigid																									J-38	J-86	
200	Female Pipe	Rigid																								J-42	J-69	J-69	
250	Female Pipe	Swivel																								J-43	J-69	J-69	

Numbering Systems

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Example: 100 series 3/4" male pipe rigid. 3/4" = 12/16" thus 100 + 12 = 112.

Denotes Coll-O-Crimp
Hose Fittings

Part # Suffix	Hose Fitting	Style	4SP/6SP	'Z'	430 'U'	'U'	'S'	338 'P'	265 'P'	229 'P'	436 'N'	425 'N'	247 'N'	213 'N'	104 'N'	039 'K'	'K'	757 'E'	470 'E'	336 'E'	069 'E'	'E'	069 'D'	338 'B'	057 'P'	105 'B'	100 'B'	057 'B'	009 'B'
300	SAE 45° Male	Rigid		J-74		J-40												J-23		J-14						K-5	K-3		
350	Brit. Std 60° Cone Parallel Female Pipe	Swivel		J-85	J-58	J-45												J-18				J-4							
380	SAE 45° Male 45° Elbow	Rigid																J-25				J-4							
400	SAE 45° Female	Swivel		J-73		J-44		J-34		J-31	K-31							J-24		J-15		J-4				K-7			
440	SAE 45° Female 90° Tube Elbow Long	Swivel		J-74		J-51																							
460	SAE 45° Female 90° Tube Elbow Short	Swivel																J-27				J-12							
480	SAE 45° Female 45° Tube Elbow	Swivel		J-73		J-48												J-26				J-11							
500	JIC 37° Male	Rigid		J-73		J-40																J-9							
550	JIC 37° Female 90° Tube Elbow	Swivel				J-54																							
600	JIC 37° Female	Swivel	J-102	J-70	J-57	J-43													J-18	J-15	J-10	J-4				K-6			
640	JIC 37° Female 90° Tube Elbow Long	Swivel		J-72		J-51														J-16		J-7							
660	JIC 37° Female 90° Tube Elbow	Swivel	J-102	J-72	J-63	J-52													J-20	J-16	J-12	J-6							
680	JIC 37° Female 45° Tube Elbow	Swivel	J-102	J-71	J-60	J-49													J-19	J-15	J-11	J-6							
750	Flareless Tube Ermeto®	Rigid		J-78		J-41												J-23				J-3							
950	Flareless Tube Ermeto® 45°	Rigid		J-78		J-48																							
970	Flareless Tube Ermeto® 90°	Rigid		J-78		J-52																							
A00	Inverted Female	Rigid		J-78																									
A20	Female For-Seal® 90° Tube Elbow Short	Swivel		J-75	J-63	J-53													J-21	J-16		J-8							

Numbering Systems

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Example: 100 series 3/4" male pipe rigid. 3/4" = 12/16" thus 100 + 12 = 112.

Denotes Coll-O-Crimp Hose Fittings

Part # Suffix	Hose Fitting	Style	4SP/6SP	'Z'	430 'U'	'U'	'S'	338 'P'	265 'P'	229 'P'	436 'N'	425 'N'	247 'N'	213 'N'	104 'N'	039 'K'	'K'	757 'E'	470 'E'	336 'E'	069 'E'	'E'	069 'D'	338 'B'	057 'P'	105 'B'	100 'B'	057 'B'	009 'B'
A60	Female For-Seal® 90° Tube Elbow Long	Swivel		J-76	J-63	J-54																J-8							
B00	Inverted Male	Swivel		J-79		J-40							K-23	K-19								J-10					K-6		
B20	Inverted Male Swivel Extended	Swivel									J-48		K-23									J-5							
B40	Inverted Male 45° Tube Elbow	Swivel									J-50											J-6							
B60	Inverted Male 90° Tube Elbow	Swivel		J-80																							K-4		
BD00	Cat Flange 22.5" Elbow	Code 62	J-96																										
BD30	Cat Flange 30" Elbow	Code 62	J-96																										
BD60	Cat Flange 60" Elbow	Code 62	J-96																										
BE00	Cat Flange 67.5" Elbow	Code 62	J-96																										
C00	Male Pipe 90° Elbow	Rigid																									K-7		
C30	Female Grease Tap	Rigid				J-42																							
C60	SAE 37° Female 60° Tube Elbow	Swivel			J-61																								
D00	Flange Straight	Code 62			J-59														J-19										
D40	Flange 45° Tube Elbow	Code 62			J-61														J-20										
D70	Flange 90° Tube Elbow	Code 62			J-64														J-21										
E00	Inverted Male 90° Elbow	Swivel											K-25	K-21								J-12							
E40	Inverted Male 45° Tube Elbow	Swivel											K-25	K-20								J-11							
E60	Male For-Seal® Straight	Rigid		J-77	J-56	J-39																							
G00	Flange Straight	Code 61		J-80	J-59	J-46													J-18										
G09	Flange Straight (Komatsu)	Special		J-83	J-46	J-46																							

Numbering Systems

Application Data

The chart to the side is designed to offer quick identification of Weatherhead hose fitting series. Included in this chart are: base numbers, descriptions, hose fitting series, and page number in which the configuration appears. Catalog numbers may be derived by adding the size in sixteenths of an inch to the base.

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Denotes Coll-O-Crimp Hose Fittings

Part # Suffix	Hose Fitting	Style	4SP/6SP	'Z'	430 'U'	'U'	'S'	338 'P'	265 'P'	229 'P'	436 'N'	425 'N'	247 'N'	213 'N'	104 'N'	039 'K'	'K'	757 'E'	470 'E'	336 'E'	069 'E'	'E'	069 'D'	338 'B'	057 'P'	105 'B'	100 'B'	057 'B'	009 'B'
G40	Flange 45° Tube Elbow	Code 61	J-94	J-81	J-49	J-49						K-29			K-18				J-20										
G69	Flange 45° Tube Elbow (Komatsu)	Special		J-83		J-50																							
G70	Flange 90° Tube Elbow	Code 61	J-94	J-82	J-64	J-54						K-29							J-21										
G99	Flange 90° Tube Elbow	Special		J-83																									
H00	Flange 22-1/2° Tube Elbow	Code 61		J-81	J-60																								
H20	Flange 30° Tube Elbow	Code 61			J-60																								
H50	Flange 60° Tube Elbow	Code 61			J-62																								
H60	Flange 67-1/2° Tube Elbow	Code 61			J-62																								
H70	Flange 100° Tube Elbow	Code 61			J-65																								
H80	Flange 110° Tube Elbow	Code 61			J-65																								
H90	Flange 135° Tube Elbow	Code 61			J-65																								
J00	Male Pipe	Swivel			J-56	J-39		J-34												J-13		J-2							
J33	Female For-Seal® 90° Tube Elbow Med.	Swivel	J-101	J-76		J-53																							
J63	Female For-Seal® Straight	Swivel	J-101																										
K00	Flange Straight "Cat Flange"	Code 62	J-96																										
K30	Flange 45° Tube Elbow "Cat Flange"	Code 62	J-96																										
K60	Flange 90° Tube Elbow "Cat Flange"	Code 62	J-96																										
L00	Banjo (Ford Tractor)	Special				J-47																							
L10	JIC 37° Female 30° Tube Elbow	Swivel		J-71		J-47																							
L40	Male 45° Tube Elbow O-Ring Port	Swivel			J-49																								

Numbering Systems

Application Data

The chart to the side is designed to offer quick identification of Weatherhead hose fitting series. Included in this chart are: base numbers, descriptions, hose fitting series, and page number in which the configuration appears. Catalog numbers may be derived by adding the size in sixteenths of an inch to the base.

Example: 100 series 3/4" male pipe rigid. 3/4" = 12/16" thus 100 + 12 = 112.

Denotes Coll-O-Crimp Hose Fittings

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Part # Suffix	Hose Fitting	Style	4SP/6SP	'Z'	430 'U'	'U'	'S'	338 'P'	265 'P'	229 'P'	436 'N'	425 'N'	247 'N'	213 'N'	104 'N'	039 'K'	'K'	757 'E'	470 'E'	336 'E'	069 'E'	'E'	069 'D'	338 'B'	057 'P'	105 'B'	100 'B'	057 'B'	009 'B'
X20	30° Flare Female (P.T.T. Thread for Diesel Applications)	Swivel																			J-10		K-13						
X60	SAE 37° Male 90° Elbow	Rigid				J-51																J-5							
X80	Compressor Discharge (Teflon® Hose)	Flange																											
Y00	Hose Mender	Rigid																						K-10					
Y20	Male Connector	Rigid																						K-9					
Y30	Male Connector w/ Spring Guard	Rigid																						K-9					
Y33	Hose Splicer	Special																	J-24										
Y50	Air Brake Connection Tube	Rigid																				J-3							
Y60	Air Brake Slider	Rigid																				J-3							
Y70	Air Brake	Swivel																						K-9					
Y80	Female Connector	Swivel																						K-10					
Z00	Bumped Tube O-Ring Male	Swivel																	J-23										
Z20	Bumped Tube O-Ring 45° Tube Elbow	Swivel																											
Z40	Bumped Tube O-Ring Female	Swivel																											
Z50	Bumped Tube O-Ring Female w/Service Port	Swivel																											
Z60	Bumped Tube O-Ring Male 90° Tube Elbow	Swivel																											
Z80	Bumped Tube O-Ring Female 90° Tube Elbow	Swivel																											
Z90	Bumped Tube O-Ring 90° Tube Elbow w/Service Port	Swivel																											

Conversion Chart

Inches Fraction	Decimal	mm	Inches Fraction	Decimal	mm	Inches Fraction	Decimal	mm	Inches Fraction	Decimal	mm
—	.0004	.0100	21/32	.6560	16.6690	1-3/4	1.7500	4.4500	3-1/16	3.0620	77.7880
—	.0040	.1000	—	.6693	17.0000	—	1.7717	45.0000	—	3.0709	78.0000
—	.0100	.2500	43/64	.6720	17.0660	1-25/32	1.7810	45.2440	3-3/32	3.0940	78.5810
1/64	.0156	.3970	11/16	.6875	17.4630	—	1.8110	46.0000	—	3.1102	79.0000
—	.0197	.5000	45/64	.7030	17.8590	1-13/16	1.8125	46.0380	3-1/8	3.1250	79.3750
—	.0295	.7500	—	.7087	18.0000	1-27/32	1.8440	46.8310	—	3.1496	80.0000
1/32	.0313	.7940	23/32	.7190	18.2560	—	1.8504	47.0000	3-5/32	3.1560	80.1690
—	.0394	1.0000	—	.7283	18.5000	1-7/8	1.8750	47.6250	3-3/16	3.1875	80.9630
3/64	.0469	1.1910	47/64	.7340	18.6530	—	1.8898	48.0000	—	3.1890	81.0000
—	.0590	1.5000	—	.7480	19.0000	1-29/32	1.9062	48.4190	3-7/32	3.2190	81.7560
1/16	.0620	1.5880	3/4	.7500	19.0500	—	1.9291	49.0000	—	3.2283	82.0000
5/64	.0781	1.9840	49/64	.7656	19.4470	1-15/16	1.9375	49.2130	3-1/4	3.2500	82.5500
—	.0787	2.0000	25/32	.7810	19.8440	—	1.9685	50.0000	—	3.2677	83.0000
3/32	.0940	2.3810	—	.7874	20.0000	1-31/32	1.9690	50.0060	3-9/32	3.2810	83.3440
—	.0984	2.5000	51/64	.7970	20.2410	2	2.0000	50.8000	—	3.3071	84.0000
7.64	.1090	2.7780	13/16	.8125	20.6380	—	2.0079	51.0000	3-5/16	3.3120	84.1377
—	.1181	3.0000	—	.8268	21.0000	2-1/32	2.0313	51.5940	3-11/32	3.3440	84.9314
1/8	.1250	3.1750	53/64	.8280	21.0340	—	2.0472	52.0000	—	3.3464	85.0000
—	.1378	3.5000	27/32	.8440	21.4310	2-1/16	2.0620	52.3880	3-3/8	3.3750	85.7250
9/64	.1410	3.5720	55/64	.8590	21.8280	—	2.0866	53.0000	—	3.3858	86.0000
5/32	.1560	3.9690	—	.8662	22.0000	2-3/32	2.0940	53.1810	3-13/32	3.4060	86.5190
—	.1575	4.0000	7/8	.8750	22.2250	2-1/8	2.1250	53.9750	—	3.4252	87.0000
11/64	.1720	4.3660	57/64	.8906	22.6220	—	2.1260	54.0000	3-7/16	3.4380	87.3130
—	.1770	4.5000	—	.9055	23.0000	2-5/32	2.1560	54.7690	—	3.4646	88.0000
3/16	.1875	4.7630	29/32	.9062	23.0190	—	2.1650	55.0000	3-15/32	3.4690	88.1060
—	.1969	5.0000	59/64	.9220	23.4160	2-3/16	2.1875	55.5630	3-1/2	3.5000	88.9000
13/64	.2030	5.1590	15/16	.9375	23.8130	—	2.2047	56.0000	—	3.5039	89.0000
—	.2165	5.5000	—	.9449	24.0000	2-7/32	2.2190	56.3560	3-17/32	3.5310	89.6940
7/32	.2190	5.5560	61/64	.9530	24.2090	—	2.2440	57.0000	—	3.5433	90.0000
15/64	.2340	5.9530	31/32	.9690	24.6060	2-1/4	2.2500	57.1500	3-9/16	3.5620	90.4877
—	.2362	6.0000	—	.9843	25.0000	2-9/32	2.2810	57.9440	—	3.5827	91.0000
1/4	.2500	6.3500	63/64	.9844	25.0030	—	2.2835	58.0000	3-19/32	3.5940	91.2810
—	.2559	6.5000	1	1.0000	25.4000	2-5/16	2.3120	58.7380	—	3.6220	92.0000
17/64	.2656	6.7470	—	1.0236	26.0000	—	2.3228	59.0000	3-5/8	3.6250	92.0750
—	.2756	7.0000	1-1/32	1.0312	26.1940	2-11/32	2.3440	59.5310	3-21/32	3.6560	92.8960
9/32	.2810	7.1440	1-1/16	1.0620	26.9880	—	2.3622	60.0000	—	3.6614	93.0000
—	.2953	7.5000	—	1.0630	27.0000	2-3/8	2.3750	60.3250	3-11/16	3.6875	93.6630
19/64	.2970	7.5410	1-3/32	1.0940	27.7810	—	2.4016	61.0000	—	3.7008	94.0000
5/16	.3120	7.9380	—	1.1024	28.0000	2-13/32	2.4060	61.1190	3-23/32	3.7190	94.4560
—	.3150	8.0000	1-1/8	1.1250	28.5750	2-7/16	2.4380	61.9130	—	3.7401	95.0000
21/64	.3280	8.3340	—	1.1417	29.0000	—	2.4409	62.0000	3-3/4	3.7500	92.2500
—	.3350	8.5000	1-5/32	1.1560	29.3690	2-15/32	2.4690	62.7060	—	3.7795	96.0000
11/32	.3440	8.7310	—	1.1811	30.0000	—	2.4803	63.0000	3-25/32	3.7810	96.0440
—	.3543	9.0000	1-3/16	1.1875	31.1630	2-1/2	2.5000	63.5000	3-13/16	3.8125	96.8380
23/64	.3590	9.1280	1-7/32	1.2190	30.9560	—	2.5197	64.0000	—	3.8189	97.0000
—	.3740	9.5000	—	1.2205	31.0000	2-17/32	2.5310	64.2940	3-26/32	3.8440	97.6310
3/8	.3750	9.5250	1-1/4	1.2500	31.7500	—	2.5590	65.0000	—	3.8583	98.0000
25/64	.3910	9.9220	—	1.2598	32.0000	2-9/16	2.5620	65.0880	3-7/8	3.8750	98.4250
—	.3937	10.0000	1-9/32	1.2810	32.5440	2-19/32	2.5940	65.8810	—	3.8976	99.0000
13/32	.4060	10.3190	—	1.2992	33.0000	—	2.5984	66.0000	3-29/32	3.9062	99.2190
—	.4130	10.5000	1-5/16	1.3120	33.3380	2-5/8	2.6250	66.6750	—	3.9370	100.0000
27/64	.4220	10.7160	—	1.3386	34.0000	—	2.6380	67.0000	3-15/16	3.9375	100.0130
—	.4331	11.0000	1-11/32	1.3440	34.1310	2-21/32	2.6560	67.4690	3-31/32	3.9690	100.8060
7/16	.4380	11.1130	1-3/8	1.3750	34.9250	—	2.6772	68.0000	—	3.9764	101.0000
29/64	.4530	11.5090	—	1.3779	35.0000	2-11/16	2.6875	68.2630	4	4.0000	101.6000
15/32	.4690	11.9060	1-13/32	1.4060	35.7190	—	2.7165	69.0000	4-1/16	4.0620	103.1880
—	.4724	12.0000	—	1.4173	36.0000	2-23/32	2.7190	69.0560	4-1/8	4.1250	104.7750
31/64	.4840	12.3030	1-7/16	1.4380	36.5130	2-3/4	2.7500	69.8500	—	4.1338	105.0000
—	.4920	12.5000	—	1.4567	37.0000	—	2.7559	70.0000	4-3/16	4.1875	106.3630
1/2	.5000	12.7000	1-15/32	1.4690	37.3060	2-25/32	2.7810	70.6439	4-1/4	4.2500	107.9500
—	.5118	13.0000	—	1.4961	38.0000	—	2.7953	71.0000	4-5/16	4.3120	109.5380
33/64	.5156	13.0970	1-1/2	1.5000	38.1000	2-13/16	2.8125	71.4376	—	4.3307	110.0000
17/32	.5310	13.4940	1-17/32	1.5310	38.8940	—	2.8346	72.0000	4-3/8	4.3750	111.1250
35/64	.5470	13.8910	—	1.5354	39.0000	2-27/32	2.8440	72.2314	4-7/16	4.4380	112.7130
—	.5512	14.0000	1-9/16	1.5620	39.6880	—	2.8740	73.0000	4-1/2	4.5000	114.3000
9/16	.5630	14.2880	—	1.5748	40.0000	2-7/8	2.8750	73.0250	—	4.5275	115.0000
—	.5710	14.5000	1-19/32	1.5940	40.4810	2-29/32	2.9062	73.8190	4-9/16	4.5620	115.8880
37/64	.5790	14.6840	—	1.6142	41.0000	—	2.9134	74.0000	4-5/8	4.6250	117.4750
—	.5906	15.0000	1-5/8	1.6250	41.2750	2-15/16	2.9375	74.6130	4-11/16	4.6875	119.0630
19/32	.5940	15.0810	—	1.6535	42.0000	—	2.9527	75.0000	—	4.7244	120.0000
39/64	.6090	15.4780	1-31/32	1.6562	42.0690	2-31/32	2.9690	75.4060	4-3/4	4.7500	120.6500
5/8	.6250	15.8750	1-11/16	1.6875	42.8630	—	2.9921	76.0000	4-13/16	4.8125	122.2380
—	.6299	16.0000	—	1.6929	43.0000	3	3.0000	76.2000	4-7/8	4.8750	123.8250
41/64	.6406	16.2720	1-23/32	1.7190	43.6560	3-1/32	3.0312	76.9940	—	4.9212	125.0000
—	.6496	16.5000	—	1.7323	44.0000	—	3.0315	77.0000	4-15/16	4.9375	125.4130
—									5	5.0000	127.0000

Hose Cut-Off Factor

Select the proper hose and ends and cut hose to length. The cut length of the hose is determined by subtracting the cut-off factor for each end from the overall length of the assembly. See individual catalog listings for hose cut-off factors.

Skiving Weatherhead Hose (When using H470 hose with 470 'E' series hose fittings)

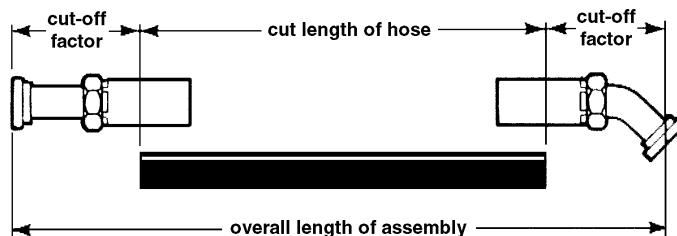
The outer protective covering of wire-wrapped hose must be carefully removed (skived) to the wire to allow proper installation of crimped hose fittings and to assure the best possible hose service. When skiving a hose, it is advisable to skive a practice piece of hose to determine:

- That covering is properly removed and that the hose wire-wrap reinforcements are not displaced, damaged or cut in the process.
- The hose should be checked for correct skive length.
- The hose should be checked for 100% cover removal.

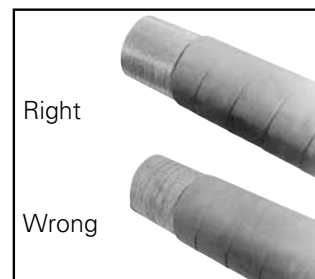
Hand-Tool Method

Skiving heads are shipped preset for proper skive length. Depending on hose cover thickness, the skiving blade may require adjustment. The skiving blade may need periodic adjustment. Directions are packed with the skive tool.

1. Clamp hose in a vise or other suitable holding device. Be sure not to clamp so tight as to damage hose.
2. Lubricate hose I.D. and skiving tool mandrel with oil/soap solution.
3. Carefully align mandrel with hose I.D.; apply steady pressure and start mandrel into hose.
4. When cutting head contacts hose fitting, slowly rotate skiving tool clockwise. Cutting head will remove hose covering while threading itself to a preset skive length when bottomed against hose fitting. Continue to rotate skiving tool clockwise to remove excess rubber from wire wrap while slowly pulling tool from hose. (See illustration to right.)
5. Wire-brush hose fitting to remove any remaining cover from wire wrap.
6. Inspect skive for 100% cover removal.

**Hose H470**

Hose I.D.	Skive Length	Cutting Head
1/2	1-1/4	T-410-50
3/4	1-13/16	T-410-52
1	2-1/8	T-410-53
1-1/4	2-7/8	T-410-54
1-1/2	3-1/8	T-410-55
2	3-3/8	T-410-56
T-410-36 T-410-37	Handle Replacement cutting	

**⚠ Important**

Clean hose I.D. by brushing, blowing compressed air, or by flushing. By doing so, contaminants are kept out of operating systems.

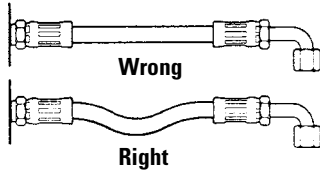
⚠ WARNING

Clean hose I.D. by brushing, blowing compressed air, or by flushing. By doing so, contaminants are kept out of operating systems.

Hose Installation

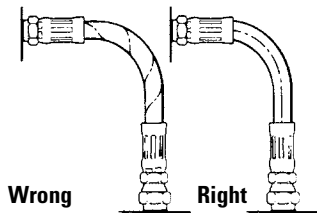
1. Provide for length change.

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%.



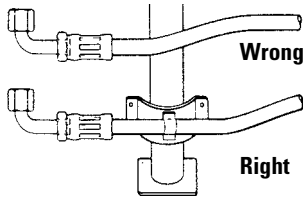
2. Avoid twisting and orient properly.

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.



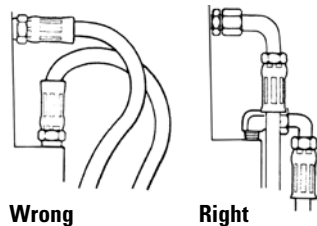
3. Protect from hazardous environment.

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 M-2.)



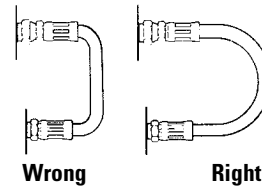
4. Avoid mechanical strain.

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.



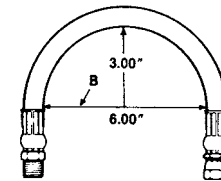
5. Use proper bend radius.

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).

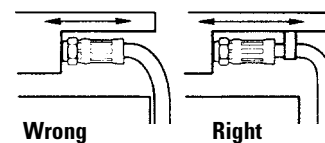
Minimum bend radius is measured on the inside bend of the hose. To determine minimum bend, divide the total distance between ends (B length) by 2. For example, B=6, minimum bend radius=3.



7. Secure for protection.

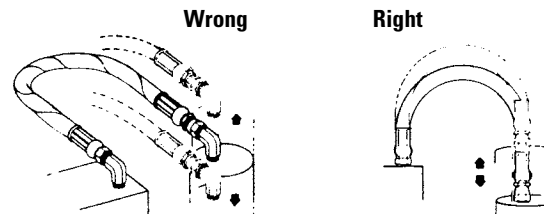
Install hose runs to avoid rubbing or abrasion. Use Weatherhead Hose Clamps to support long runs of hose or to keep hose away from moving parts. It is important that the clamps not allow the hose to move. This movement will cause abrasion and premature hose failure.


See Hose Clamps pages M-24-26.



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 Weatherhead hose installation on pages A-2-3.

- 1. Problem:** Hose has burst. Rusted wire, torn and rotted fibers are present. This was caused by abrasion damage. Exposure to elements will accelerate the deterioration.



Solution: Route the hose so it does not rub against other objects while under pressure. Suggest using clamps and spring guards to protect.

- 2. Problem:** Hose has burst on outside bend of hose. This hose has been bent past minimum bend radius. It has also taken a set in a bent position due to a kink in the inner tube or reinforcement.



Solution: Check minimum bend radius for hose. Refer to pages A-31-32 to determine minimum bend radius. Utilize bend tube elbows if possible.

- 3. Problem:** Excessive heat. Hose cover or inner tube is brittle and cracked and is not flexible at room temperature.



Solution: Use hose with higher temperature rating or protect from heat with shields. Examine entire system for potential heat source. For example: undersized lines, excessively long lines, too many bends and/or fittings, reservoir low on oil.

- 4. Problem:** Incompatible fluid. Portions of the inner tube are swollen and/or washed out. Cover may also be swollen.



Solution: Make sure hose used is compatible with fluid being used. Refer to chemical compatibility chart.

- 5. Problem:** Hose cover blistered and pulling away from carcass. Gas has effused through the tube and become trapped under the cover.



Solution: Use perforated, pin-pricked or fiber cover hose.

- 6. Problem:** End fitting blown off. Improper assembly procedures, incorrect hose fitting series, mixing competitor's components and Weatherhead components.



Solution: Refer to hose assembly procedures and Hose Fitting and Tool Selector Chart in this catalog. NEVER intermix components. Refer to pages A-2-3 for important safety information.

- 7. Problem:** Hose has burst cleanly with no random wire breakage and cover abrasion. This condition is caused by excessive pressure.



Solution: Use hose with higher pressure rating. Check pressure relief for damage or improper setting.

- 8. Problem:** Hose has burst. Hose is permanently twisted and kinked. Many broken wires in failure area.



Solution: Hose twisting can reduce hose life 90%. Tighten ends properly. Reroute hose to eliminate twist. Route hose to flex in only one plane. Use hose layline for a guide.

- 9. Problem:** End fitting blown off. This condition has been caused by improper skiving. Any remaining cover on hose in the crimping area will prohibit proper end retention.



Solution: Make sure hose is properly skived. Refer to page A-30 for hose skiving instructions.

- 10. Problem:** Hose fitting appears to have been pinched on one side.



Solution: This is an early sign of collet wear. Replace collet. New Weatherhead collets offer the feature of being rebuildable. See the tool section chart in the back of this catalog.

⚠ WARNING

Selection of Hose: Selection of the proper hose for the application is essential to the proper operation and safe use of the hose and related equipment. Inadequate attention to selection of hose for application can result in serious bodily injury or property damage. In order to avoid serious bodily injury or property damage resulting from selection of the wrong hose, you should carefully review the information in this catalog. Refer to Selection of Hose and Hose Installation (pages A-4-9 and pages A-31-32) for additional safety information. Hose failures can be caused by conditions such as excessive pressures, fluid incompatibility, extreme temperatures, and many more. Eaton has illustrated above some of the more common failures. If the conditions you are experiencing are not listed, please contact your Eaton representative for further assistance.

Qualified Hoses for Marine Applications

SAE J1942

Application Codes:

MAWP - Maximum Allowable Working Pressure

H - Hydraulic service

F - Fuel and Lube service

Hose Number	App. Code	Hose ID	MAWP (PSI)	Hose Fittings	Fire Sleeve Required
H009	H	1/4	400	009 'H'	--
H009	H	5/16	400	'E', 009 'H'	--
H009	H	3/8	400	'E', 009 'H'	--
H009	H	1/2	400	'E', 009 'H'	--
H017	H	1/4	1250	'U'	--
H017	H	3/8	1125	'U'	--
H017	H	1/2	1000	'U'	--
H017	H	3/4	750	'U'	--
H017	H	1	560	'U'	--
H017	H	1-1/4	375	'U'	--
H039	H	3/4	300	'U', 'S'	--
H039	H	1	250	'U', 'S'	--
H039	H	1-1/4	200	'U', 'S'	--
H039	H	1-1/2	150	430 'U'	--
H039	H	2	100	430 'U'	--
H059	F	3/16	500	069 'E', 229 'P', 247 'N'	--
H059	F	1/4	500	069 'E', 247 'N'	--
H059	F	5/16	500	069 'E', 229 'P', 247 'N'	--
H059	F	13/32	500	069 'E', 229 'P', 247 'N'	--
H059	F	1/2	500	069 'E', 229 'P', 247 'N'	--
H059	F	5/8	500	069 'E', 247 'N'	--
H059	F	7/8	500	069 'E', 247 'N'	--
H104	H	1/4	2750	'U', 104 'N', 'S', 'Z'	--
H104	H	3/8	2250	'U', 104 'N', 'S', 'Z'	--
H104	H	1/2	2000	'U', 104 'N', 'S', 'Z'	--
H104	H	5/8	1500	'U', 'Z'	--
H104	H	3/4	1250	'U', 104 'N', 'S', 'Z'	--
H104	H	1	1000	'U', 104 'N', 'S', 'Z'	--
H104	H	1-1/4	625	'U', 'S', 'Z'	--
H104*	F	1/4	500	'U', 104 'N', 'S', 'Z'	A6912
H104*	F	3/8	500	'U', 104 'N', 'S', 'Z'	A6914
H104*	F	1/2	500	'U', 104 'N', 'S', 'Z'	A6916
H104	F	5/8	500	'U', 'Z'	--
H104	F	3/4	500	'U', 104 'N', 'S', 'Z'	--
H104	F	1	500	'U', 104 'N', 'S', 'Z'	--
H104	F	1-1/4	500	'U', 'S', 'Z'	--
H145	H	1/4	3000	'Z', 'S'	--
H145	H	3/8	3000	'U', 'Z', 'S'	--
H145	H	1/2	3000	'U', 'Z', 'S'	--
--					
H145	H	5/8	3000	'U', 'Z'	--
H145	H	3/4	3000	'U', 'S'	--
H145	H	1	3000	430 'U', 'S'	--
H190	H	1/4	3700	'Z'	--
H190	H	3/8	3400	'Z'	--
H190	H	1/2	2900	'Z'	--
H190	H	5/8	1885	'Z'	--
H190	H	3/4	2000	'Z'	--
H190	H	1	1500	'Z'	--
H245	H	1/4	5000	'U', 'S', 'Z'	--
H245	H	3/8	4000	'U', 'S', 'Z'	--
H245	H	1/2	3500	'U', 'S', 'Z'	--

Hose Number	App Code	Hose ID	MAWP (PSI)	Hose Fittings	Fire Sleeve Required
H245	H	5/8	2750	'U', 'Z'	--
H245	H	3/4	2250	'U', 'S', 430 'U', 'Z'	--
H245	H	1	2000	'U', 'S', 430 'U', 'Z'	--
H245	H	1-1/4	1625	'U', 'S', 430 'U', 'Z'	--
H245*	F	1/4	500	'U', 'S', 'Z'	A6912
H245*	F	3/8	500	'U', 'S', 'Z'	A6914
H245*	F	1/2	500	'U', 'S', 'Z'	A6916
H245*	F	5/8	500	'U', 'Z'	A6920
H245*	F	3/4	500	'U', 'S', 'Z'	A6924
H245*	F	1	500	'U', 'S', 'Z'	A6928
H245*	F	1-1/4	500	'U', 'S', 'Z'	A6936
H280	H	1/4	6500	'Z'	--
H280	H	3/8	5300	'Z'	--
H280	H	1/2	4500	'Z'	--
H280	H	5/8	4000	'Z'	--
H280	H	3/4	3500	'Z'	--
H280	H	1	3000	'Z'	--
H290	H	1/4	6500	'Z'	--
H290	H	3/8	5800	'Z'	--
H290	H	1/2	5000	'Z'	--
H290	H	5/8	4000	'Z'	--
H290	H	3/4	3500	'Z'	--
H290	H	1	3000	'Z'	--
H425	H	1/4	5000	'U', 'S', 'Z'	--
H425	H	3/8	4000	'U', 'S', 425 'N', 'Z'	--
H425	H	1/2	3500	'U', 'S', 425 'N', 'Z'	--
H425	H	5/8	2750	'U', 'Z'	--
H425	H	3/4	2250	'U', 'S', 430 'U', 425 'N', 'Z'	--
H425	H	1	2000	'U', 'S', 430 'U', 425 'N', 'Z'	--
H425	H	1-1/4	1625	'U', 'S', 430 'U', 425 'N', 'Z'	--
H425	H	1-1/2	1250	430 'U', 'Z'	--
H425	H	2	1125	430 'U', 425 'N', 'Z'	--
H425*	F	1/4	500	'U', 'S', 425 'N', 'Z'	A6912
H425*	F	3/8	500	'U', 'S', 425 'N', 'Z'	A6916
H425*	F	1/2	500	'U', 'S', 425 'N', 'Z'	A6920
H425*	F	5/8	500	'U', 'Z'	A6920
H425*	F	3/4	500	'U', 'S', 425 'N', 'Z'	A6924
H425*	F	1	500	'U', 'S', 425 'N', 'Z'	A6928
H425*	F	1-1/4	500	'U', 'S', 425 'N', 'Z'	A6936
H430	H	3/4	5500	430 'U'	--
H430	H	1	5100	430 'U'	--
H430	H	1-1/4	4500	430 'U'	--
H430	H	1-1/2	4000	430 'U'	--
H430	H	2	4000	430 'U'	--
H470	H	3/4	5000	470 'E'	--
H470	H	1	5000	470 'E'	--
H470	H	1-1/4	5000	470 'E'	--
H569	H	3/16	3000	069 'E'	--
H569	H	5/16	2250	069 'E', 247 'N'	--
H569	H	13/32	2000	069 'E', 247 'N'	--
H569	H	1/2	1750	069 'E', 247 'N'	--
H569	H	5/8	1500	069 'E', 247 'N'	--
H569	H	7/8	800	069 'E'	--
H569	H	1-1/8	625	069 'E'	--

*Fire sleeve required for fuel applications

Qualified Hoses for the American Bureau of Shipping

ABS Steel Vessel Rules 2000 (4-6-2/5.7)

Intended Service: Fuel Oil, Hydraulic Fluid and Water Systems for Marine and Offshore Applications

Hose Number	Hose ID	Mawp (PSI)	Hose Fittings Series	Fire Sleeve
H03912	3/4	300	'U', 'S', 039 'K', 'Z'	A6924
H03916	1	250	'U', 'S', 039 'K', 'Z'	A6928
H03920	1-1/4	200	'U', 'S', 039 'K', 'Z'	A6932
H03924	1-1/2	150	430 'U'	A6936
H03932	2	100	430 'U'	A6948
H05904	3/16	500	247 'N', 229 'P', 069 'E'	--
H05905	1/4	500	247 'N', 069 'E'	--
H05906	5/16	500	247 'N', 229 'P', 069 'E'	--
H05908	13/32	500	247 'N', 229 'P', 069 'E'	--
H05910	1/2	500	247 'N', 229 'P', 069 'E'	--
H05912	5/8	500	247 'N', 069 'E'	--
H05916	7/8	500	229 'P', 069 'E'	--
H06904	3/16	3000	069 'E', 247 'N'	--
H06905	1/4	500	069 'E', 247 'N'	--
H06906	5/16	2250	069 'E', 247 'N'	--
H06908	13/32	2000	069 'E', 247 'N'	--
H06910	1/2	1750	069 'E', 247 'N'	--
H06912	5/8	1500	069 'E', 247 'N'	--
H06916	7/8	800	069 'E', 247 'N', 069 'D'	--
H06920	1-1/8	625	069 'E'	--
H06924	1-3/8	500	069 'E'	--
H06932	1-13/16	350	069 'E'	--
H10404	1/4	2750	'U', 'S', 104 'N', 'Z'	--
H10406	3/8	2250	'U', 'S', 104 'N', 'Z'	--
H10408	1/2	2000	'U', 'S', 104 'N', 'Z'	--
H10410	5/8	1500	'U', 'Z'	--
H10412	3/4	1250	'U', 'S', 104 'N', 'Z'	--
H10416	1	1000	'U', 'S', 104 'N', 'Z'	--
H10420	1-1/4	625	'U', 'S', 'Z'	--
H24504	1/4	5000	'U', 'S', 'Z'	--
H24506	3/8	4000	'U', 'S', 'Z'	--
H24508	1/2	3500	'U', 'S', 'Z'	--
H24510	5/8	2750	'U', 'Z'	--
H24512	3/4	2250	'U', 'S', 'Z'	--
H24516	1	2000	'U', 'S', 'Z'	--
H24520	1-1/4	1625	'U', 'S', 'Z'	--

Hose Number	Hose ID	MAWP (PSI)	Hose Fittings Series	Fire Sleeve
H42504	1/4	5000	'U', 'S', 425 'N', 'Z'	--
H42506	3/8	4000	'U', 'S', 425 'N', 'Z'	--
H42508	1/2	3500	'U', 'S', 425 'N', 'Z'	--
H42510	5/8	2750	'U', 'Z'	--
H42512	3/4	2250	'U', 'S', 425 'N', 'Z'	--
H42516	1	2000	'U', 'S', 425 'N', 'Z'	--
H42520	1-1/4	1625	'U', 'S', 425 'N', 'Z'	A6936
H42524	1-1/2	1250	430 'U', 425 'N', 'Z'	--
H42532	2	1125	430 'U', 425 'N', 'Z'	--
H43008	1/2	6000	430 'U'	--
H43012	3/4	5500	430 'U'	--
H43016	1	5100	430 'U'	--
H43020	1-1/4	4500	430 'U'	--
H43024	1-1/2	4000	430 'U'	--
H43032	2	4000	430 'U'	--
H47012	3/4	5000	570 'S'	--
H47016	1	5000	570 'S'	--
H47020	1-1/4	5000	570 'S'	--
H47024	1-1/2	5000	570 'S'	--
H47032	2	5000	570 'S'	--
H56906	5/16	2250	069 'E'	--
H56908	13/32	2000	069 'E'	--
H56910	1/2	1750	069 'E'	--
H56912	5/8	1500	069 'E'	--
H56916	7/8	800	069 'E'	--
H56920	1-1/8	625	069 'E'	--

MAWP - Maximum Allowable Working Pressure

Note: Restrictions on taper thread joints in hydraulic systems for steering gear, controllable pitch propellers, or other systems associated with propulsion or propulsion control are applicable.

See SVR 2000 4-6-2/5.5.5.

Split flanges, such as 570 'S' Series, are not permitted in steering gear systems. Each hose may only utilize end fitting series listed above.

These products/models are covered under ABS Product Design Assessment Certificate #00-HS191306-PDA dated 18-JAN-06. It will remain valid for five years from date of issue or until rules or specifications used in the assessment are revised (whichever occurs first).

JIC 37° and SAE 45° Flare Fittings For Zinc Plated Carbon without Thread Sealant or Lubrication

Size	Fraction	Decimal	Lb./In.	Lb./Ft.	Newton Meters	Add'l Turns of Hex-Flats**
-04	1/4"	0.250	130-150	11-12	15-17	2
-05	5/16"	0.312	165-195	14-16	19-22	2
-06	3/8"	0.375	235-265	20-22	27-30	1-1/4
-08	1/2"	0.500	525-575	44-48	59-65	1
-10	5/8"	0.625	600-700	50-58	68-79	1
-12	3/4"	0.750	950-1050	79-88	107-119	1
-16	1"	1.000	1400-1500	117-125	158-170	1
-20	1-1/4"	1.250	1900-2100	158-175	215-237	1
-24	1-1/2"	1.500	2250-2550	188-213	254-288	1
-32	2"	2.000	3000-3400	250-283	339-384	1

** Additional turns of Hex-Flats required after finger tightening.
THIS IS THE RECOMMENDED METHOD OF TIGHTENING BOTH 37° SWIVEL and 45° FLARE FITTINGS.

Straight Thread O-ring Fittings For Zinc Plated Steel without Sealant or Lubrication

Size	Fraction	Decimal	Lb./In.	Lb./Ft.	Newton Meters
-04	1/4"	0.250	156-180	13-15	18-20
-05	5/16"	0.312	204-228	17-19	23-26
-06	3/8"	0.375	264-288	22-24	30-33
-08	1/2"	0.500	480-516	40-43	54-58
-10	5/8"	0.625	516-576	43-48	58-65
-12	3/4"	0.750	816-900	68-75	92-102
-16	1"	1.000	1344-1476	112-123	152-167
-20	1-1/4"	1.250	1752-1932	146-161	198-218
-24	1-1/2"	1.500	1848-2040	154-170	209-231
-32	2"	2.000	2616-2880	218-240	296-325

FOR-SEAL® Fittings For Zinc Plated Steel without Thread Sealant or Lubrication

Size	Fraction	Decimal	For-Seal Swivel Nut Fitting			O-ring Boss Straight Thread O-ring Locknut		
			Lb./In.	Lb./Ft.	Newton Meters	Lb./In.	Lb./Ft.	Newton Meters
-04	1/4"	0.250	120-144	10-12	14-16	168-192	14-16	19-22
-06	3/8"	0.375	216-240	18-20	24-27	288-312	24-26	33-35
-08	1/2"	0.500	384-420	32-35	43-48	600-720	50-60	68-81
-10	5/8"	0.625	552-600	46-50	62-68	864-960	72-80	98-109
-12	3/4"	0.750	780-840	65-70	88-95	1500-1620	125-135	170-183
-16	1"	1.000	1104-1200	92-100	125-136	2400-2640	200-220	271-298
-20	1-1/4"	1.250	1500-1680	125-140	170-190	2520-3360	210-280	285-380
-24	1-1/2"	1.500	1800-1980	150-165	203-224	3240-4320	270-360	366-488

Torque Value Conversion Chart

Lb. / Inch	= Pound Foot (Lb./Ft.) x 12	Lb. / Foot	= Pound Inch (Lb./In.) x 0.083
Lb. / Inch	= Newton Meter x 8.850	Lb. / Foot	= Newton Meter x 0.737
Newton Meter	= Pound Inch (Lb./In.) x 0.113	Newton Meter	= Pound Foot (Lb./Ft.) x 1.356

Note: Please consult Eaton for other material torque ratings.

Tubing Types

Commercial tubing is available in a wide variety of materials, types of construction and quality. Each is best suited for certain specific applications.

Steel Tubing - Seamless SAE 1010 fully annealed and SAE welded types suitable for bending and flaring. This is the only tubing material approved without restrictions by SAE standards.

Stainless Steel Tubing - Both seamless *18-8 fully annealed and welded types suitable for bending and flaring. Stainless steel tubing is recommended for use with very high pressures and here large diameter tubing is required. It is also suited for many applications where corrosion is a problem. *(302, 303 and/or 304)

Aluminum Tubing - Seamless annealed is approved by SAE for low pressure applications.

Copper Tubing - Seamless fully annealed coils and fully annealed or quarterhard straight lengths can be used for systems that do not use petroleum based fluids (copper acts as an oil-oxidation catalyst, causing sludge). Copper also tends to work harden when flared or bent and has poor resistance to vibration. Therefore, the use of copper tubing is limited to low-pressure stationary applications and air circuits.

Special Alloy Tubing - May be required for specific corrosion problems. Information on these applications can be obtained from your tubing supplier or from tubing manufacturers.

Tubing Size

The two variables in tubing size are the inside diameter (I.D.) and the wall thickness. Each of these is dependent upon a number of factors.

Inside Diameter - The tubing I.D. will determine the flow and velocity of the fluid in the system. Flow is the volume of fluid that is to be moved through the line to perform a given job within a specified time. Flow rate is expressed in gallons per minute (gpm). Velocity is the rate of speed at which the fluid passes through the line. It is expressed in feet per second (fps). With a given flow rate, the velocity will increase as the inside diameter of the tubing decreases. To determine the appropriate tubing I.D. for specific flow rate and velocity, refer to the Velocity vs. Flow chart on page A-38.

Wall Thickness - The required wall thickness of the tubing depends upon operating pressure, safety factor, temperatures, and tubing material. Operating Pressure is the pressure of the fluid in the system. It is expressed in pounds per square inch (psi). Safety Factor is a multiplier applied to the wall thickness that compensates for additional mechanical strains and hydraulic shocks to which the tubing may be subjected during operation. To determine the appropriate wall thickness, refer to the data on pages A-39-42.

Pressure Drop

Total pressure supplied to a line must equal usable pressure (or output) plus the pressure that is lost through fluid transmission, which is referred to as pressure drop. These pressure drops cause loss of energy and should be kept to a minimum. Elements which cause pressure drop in the transmission of fluids include sudden enlargements or contractions, bends, fittings and valves.

Mathematical analysis of pressure drop, although possible, is not precise because of the interrelationship of factors such as fluid velocity, density, flow area and friction coefficients. Therefore, to obtain optimum efficiency, the system (or the questionable portions of the system) should be mocked-up to obtain empirical pressure drop data.

WARNING

Refer to safety information regarding tubing selection on pages A-2-3.

To select tubing for a particular installation, two factors must be determined:

1. **Tubing Type** - material and construction and
2. **Size** - inside diameter (I.D.) and wall thickness.
Information listed below will aid in your tubing selection.

⚠ WARNING

Refer to safety information regarding tubing selection on pages A-2-3.

Following is a typical problem that illustrates, step by step, the procedure for determining tube size.

Select 1010 steel tubing with the appropriate I.D. and wall thickness for the following conditions:

- Flow 5 gpm
- Velocitynot to exceed 10 fps
- Pressure 2000 psi
- Safety Factor4:1

Solution:

1. Using the Flow/Velocity chart on Page A-38, follow the horizontal flow line (5 gpm) until it intersects the vertical velocity line (10fps). From this point, follow the diagonal line upward to get the required tube I.D. (.444). If the horizontal flow line and the vertical velocity line intersect between two diagonal lines, normally the larger inside diameter would be selected since it would mean less velocity.
2. Refer to the chart of Standard Size Hydraulic Tubing, at right. Note that .444 I.D. tubing is not listed. If you want to use standard tubing, select one with a larger I.D. Do not select a smaller size since this would increase the velocity to over the 10 fps limit. Therefore, by going to the next largest size, you would select the 5/8" O.D. tubing having an I.D. of .459 and a wall thickness of .083.
3. To determine whether this tubing will meet the pressure and safety factor requirements, refer to the Recommended Wall Thickness data on pages 31-34. For 5/8" O.D. tubing at 2000 psi, the chart for 1010 steel indicates that the minimum wall thickness with a safety factor of 4:1 is .04545. Since you have selected a tubing with a .083 wall, this would easily fulfill the requirements. However, for savings on weight and cost, you can select another tubing with a thinner wall that will still meet the performance requirements. Therefore, refer again to the chart on standard size tubing and select a tubing with a wall thickness closer to the minimum requirements. This would be the 5/8" O.D. tubing with a .527 I.D. and a .049 wall. This tubing will handle the pressure requirements of 2000 psi with a safety factor of 4:1, and also provides the required flow while keeping the velocity within the 10 fps limitation.

Tube O.D.	Tube I.D.	Wall	Tube O.D.	Tube I.D.	Wall
1/8"	.055	.035	3/4"	.584	.083
	.061	.032		.606	.072
	.065	.030		.620	.065
3/16"	.069	.028	.634	.058	
	.117	.035	.652	.049	
	.123	.032	.680	.035	
1/4"	.127	.030	7/8"	.657	.109
	.120	.065		.685	.095
	.134	.058		.709	.083
5/16"	.152	.049	.731	.072	
	.166	.042	.745	.065	
	.180	.035	.759	.058	
3/8"	.190	.030	.777	.049	
	.182	.065	1"	.760	.120
	.196	.058		.782	.109
.214	.049	.810		.095	
1/2"	.228	.042	.834	.083	
	.242	.035	.856	.072	
	.248	.032	.870	.065	
5/8"	.245	.065	.884	.058	
	.259	.058	.902	.049	
	.277	.049	1-1/4"	.982	.134
.291	.042	1.010		.120	
.305	.035	1.032		.109	
3/4"	.311	.032	1.060	.095	
	.310	.095	1.084	.083	
	.334	.083	1.106	.072	
1"	.358	.072	1.120	.065	
	.370	.065	1.134	.058	
	.384	.058	1.152	.049	
1-1/8"	.402	.049	1-1/2"	1.232	.134
	.416	.042		1.260	.120
	.430	.035		1.282	.109
1-1/4"	.436	.032	1.310	.095	
	.435	.095	1.334	.083	
	.459	.083	1.356	.072	
1-3/8"	.481	.072	1.370	.065	
	.495	.065	2"	1.732	.134
	.509	.058		1.760	.120
.527	.049	1.782		.109	
1-1/2"	.541	.042	1.810	.095	
	.555	.035	1.834	.083	
	.532	.109	1.856	.072	
1-3/4"	.560	.095	1.870	.065	

Tubing Selection

To Find the Required Tube I.D. Flow—20 gpm • Velocity—9 fps

Follow horizontal flow line (20 gpm) until it intersects vertical velocity line (9 fps). From this point follow diagonal line to get required Tube I.D.—(.944).

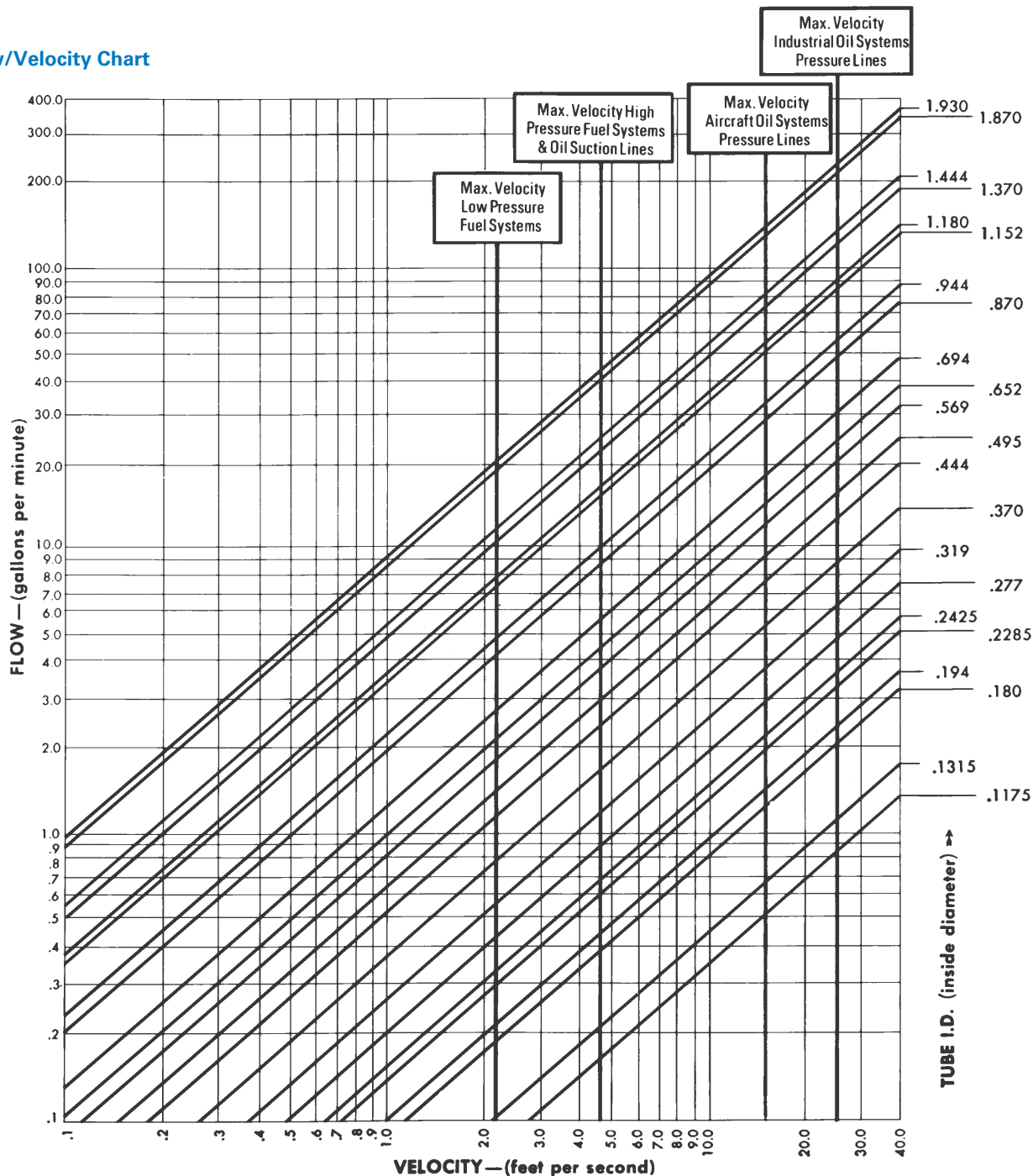
To Find Permissible Flow Velocity—15 fps • Tube I.D.—.495

Follow vertical velocity line (15 fps) until it intersects diagonal line representing .495 tube I.D. Then project this point horizontally to get the permissible flow—(9 gpm).

To Find Velocity of Fluid in System Flow—6 gpm • Tube I.D.—.694

Follow horizontal flow line (6 gpm) until it intersects diagonal line representing .694 tube I.D. Then project this point vertically downward to get the velocity of fluid—(5 fps).

Flow/Velocity Chart



⚠ WARNING Refer to safety information regarding tubing selection on pages A-2-3.

With the following Recommended Wall Thickness tables the tubing wall can be selected that is best suited for a particular application. The data given in these tables are raw figures based on the equation – $t = \frac{Dp(FS)}{2S}$

t–wall thickness (inches)

D–O.D. of tube (inches)

p–pressure (psi)

FS–Safety Factor

S–tensile strength of tubing material

Therefore, many of the wall thicknesses given in these tables are not found on standard tubing, but serve to establish the minimum wall required.

Safety Factor – The standard safety factors indicate three grades of severity of service:

- 4:1 – mechanical and hydraulic shocks not excessive
- 6:1 – considerable mechanical strain and hydraulic shock
- 8:1 – hazardous applications with severe service conditions

The wall thickness shown in these tables are based on ultimate strength of material and a safety factor of 4:1.

Recommended Wall Thickness Tables

1010 STEEL Based on 55,000#/in.2 Strength (F S=4)

Hose O.D.	Working Pressure (psi)				
	1,000	2,000	3,000	4,000	5,000
1/8	.00455	.00909	.01364	.01818	.02273
3/16	.00682	.01364	.02045	.02727	.03409
1/4	.00909	.01818	.02727	.03636	.04545
5/16	.01136	.02273	.03409	.04545	.05682
3/8	.01364	.02727	.04091	.05455	.06818
1/2	.01818	.03636	.05455	.07273	.09091
5/8	.02273	.04545	.06818	.09091	.11364
3/4	.02727	.05455	.08182	.10909	.13636
7/8	.03182	.06364	.09545	.12727	.15909
1	.03636	.07273	.10909	.14545	.18182
1-1/4	.04545	.09091	.13636	.18182	.22727
1-1/2	.05455	.10909	.16364	.21818	.27273
2	.07273	.14545	.21818	.29091	.36364

4130 STEEL Based on 90,000#/in.2 Strength (F S=4)

Hose O.D.	Working Pressure (psi)				
	1,000	2,000	3,000	4,000	5,000
1/8	.00278	.00556	.00833	.01111	.01389
3/16	.00417	.00833	.01250	.01667	.02083
1/4	.00556	.01110	.01667	.02222	.02778
5/16	.00694	.01389	.02083	.02778	.03472

Hose O.D.	Working Pressure (psi)				
	1,000	2,000	3,000	4,000	5,000
3/8	.00833	.01667	.02499	.03333	.04167
1/2	.01111	.02222	.03333	.04444	.05556
5/8	.01389	.02778	.04167	.05556	.06944
3/4	.01667	.03333	.04999	.06667	.08333
7/8	.01944	.03889	.05833	.07778	.09722
1	.02222	.04444	.06667	.08889	.11111
1-1/4	.02778	.05556	.08333	.11111	.13889
1-1/2	.03333	.06667	.09999	.13333	.16667
2	.04444	.08889	.13333	.17778	.22222

To obtain the recommended wall for a specific pressure based on a safety factor of 6:1, multiply the wall thickness indicated in the table by 1.5. For a safety factor of 8:1, multiply by 2:

Temperature – The wall thickness found by using these tables can be corrected for temperature by multiplying the wall thickness by the appropriate correction factor given in the chart below. The table is based on strength reduction due to increased temperature.

Temperature	1010 Steel	Stainless Steel	Copper	Aluminum
+100F.	1.00	1.00	1.00	1.00
+200F.	1.00	1.00	1.08	1.00
+300F.	1.00	1.00	1.22	1.08
+400F.	1.00	1.00	2.30	1.41
+500F.	1.00	1.00	–	2.10
+600F.	1.00	1.00	–	–
+700F.	1.00	1.00	–	–
+800F.	1.08	1.07	–	–
+900F.	1.32	1.13	–	–
+1000F.	1.66	1.22	–	–

1020 STEEL Based on 65,000#/in.2 Strength (F S=4)

TUBE O.D.	Working Pressure (psi)				
	1,000	2,000	3,000	4,000	5,000
1/8	.00385	.00790	.01154	.01538	.01923
3/16	.00577	.01154	.01731	.02308	.02885
1/4	.00769	.01538	.02308	.03077	.03846
5/16	.00962	.01923	.02885	.03846	.04808
3/8	.01154	.02308	.03462	.04615	.05769
1/2	.01538	.03077	.04615	.06154	.07692
5/8	.01923	.03846	.05769	.07692	.09615
3/4	.02308	.04615	.06923	.09231	.11538
7/8	.02692	.05385	.08077	.10769	.13462
1	.03077	.06154	.09231	.12308	.15385
1-1/4	.03846	.07692	.11538	.15385	.19231
1-1/2	.04615	.09231	.13846	.18462	.23077
2	.06154	.12308	.18462	.24615	.30769



WARNING

Refer to safety information regarding tubing selection on pages A-2-3.

TUBE O.D.	STAINLESS STEEL (304) ANNEALED BASED ON 75,000#/IN ² STRENGTH (F.S. -4)					STAINLESS STEEL (304) ANNEALED BASED ON 105,000#/IN ² STRENGTH (F.S. -4)				
	working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.00333	.00666	.00999	.01333	.01666	.00238	.00476	.00714	.00952	.01190
3/16	.00499	.00999	.01498	.01999	.02499	.00357	.00714	.01071	.01429	.01786
1/4	.00666	.01332	.01998	.02667	.03333	.00476	.00952	.01429	.01905	.02381
5/16	.00833	.01665	.02497	.03333	.04165	.00595	.01190	.01786	.02381	.02976
3/8	.0099	.01998	.02997	.03999	.04998	.00714	.01429	.02143	.02857	.03571
1/2	.01332	.02664	.03996	.05333	.06664	.00957	.01904	.02857	.03810	.04762
5/8	.01665	.03333	.04995	.06666	.08330	.01190	.02381	.03571	.04762	.05952
3/4	.01998	.03996	.05994	.07999	.09996	.01429	.02857	.04286	.05714	.07143
7/8	.02331	.04662	.06996	.09333	.11662	.01667	.03333	.05000	.06666	.08333
1	.02664	.05328	.07992	.10666	.13328	.01904	.03810	.05714	.07619	.09524
1-1/4	.03333	.06666	.09999	.13333	.16666	.02381	.04762	.07143	.09524	.11905
1-1/2	.03996	.07992	.11988	.15999	.19992	.02857	.05714	.08371	.11429	.14286
2	.05328	.10656	.15984	.21333	.26666	.03810	.07619	.11428	.15238	.19048

TUBE O.D.	ANNEALED COPPER BASED ON 30,000#/IN ² STRENGTH (F.S. -4)					COPPER (UNS C12200 LIGHT DRAWN) BASED ON 40,000#/IN ² STRENGTH (F.S. -4)				
	working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.00833	.01667	.02500	.03333	.04167	.00625	.01250	.01875	.02500	.03125
3/16	.01250	.02499	.03750	.04999	.06250	.00938	.01875	.02812	.03750	.04688
1/4	.01667	.03333	.05000	.06666	.08333	.01250	.02500	.03750	.05000	.06250
5/16	.02083	.04167	.06250	.08333	.10417	.01562	.03125	.04688	.06250	.07812
3/8	.02499	.04999	.07500	.09999	.12499	.01875	.03750	.05625	.07500	.09375
1/2	.03333	.06667	.10000	.13333	.16667	.02500	.05000	.07500	.10000	.12500
5/8	.04167	.08333	.12500	.16666	.20883	.03125	.06250	.09375	.12500	.15625
3/4	.04999	.09999	.15000	.19999	.24999	.03750	.07500	.11250	.15000	.18750
7/8	.05833	.11667	.17500	.23333	.29166	.04375	.08750	.13125	.17500	.21875
1	.06667	.13333	.20000	.26666	.33333	.05000	.10000	.15000	.20000	.25000
1-1/4	.08333	.16667	.25000	.33333	.41667	.06250	.12500	.18750	.25000	.31250
1-1/2	.09999	.19999	.30000	.39999	.49999	.07500	.15000	.22500	.30000	.37500
2	.13333	.26667	.40000	.53333	.66667	.10000	.20000	.30000	.40000	.50000

TUBE O.D.	ALUMINUM 3003 (H-14) BASED ON 20,000#/IN ² STRENGTH (F.S. -4)					ALUMINUM 5052 (H-32) BASED ON 31,000#/IN ² STRENGTH (F.S. -4)				
	working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.01250	.02500	.3750	.05000		.00806	.01613	.02419	.03226	.04032
3/16	.01875	.03750	.05650	.07500		.01210	.02419	.03629	.04839	.06048
1/4	.02500	.05000	.07500	.10000		.01613	.03226	.04839	.06452	.08065
5/16	.03125	.06250	.09375	.12500		.02016	.04032	.06048	.08065	.10081
3/8	.03750	.07500	.11250	.15000		.02419	.04839	.07258	.09677	.12097
1/2	.05000	.10000	.15000	.20000		.03227	.06452	.09677	.12903	.16129
5/8	.06250	.12500	.18750	.25000		.04032	.08065	.12097	.16129	.20161
3/4	.07500	.15000	.22500	.30000		.04839	.09677	.14516	.19355	.24194
7/8	.08750	.17500	.26250	.35000		.05645	.11290	.16935	.22581	.28226
1	.10000	.20000	.30000	.40000		.06452	.12903	.19355	.25806	.32258
1-1/4	.12500	.25000	.37500	.50000		.08065	.16129	.24194	.32258	.40323
1-1/2	.15000	.30000	.45000	.60000		.09677	.19355	.29032	.38710	.48387
2	.20000	.40000	.60000	.80000		.12903	.25806	.38710	.51613	.64516

TUBE O.D.	CUPRO-NICKEL 30% BASED ON 52,000#/IN ² STRENGTH (F.S. -4)				
	working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000
1/8	.00481	.00962	.01442	.01923	.02404
3/16	.00721	.01442	.02163	.02885	.03606
1/4	.00962	.01923	.02885	.03846	.04808
5/16	.01202	.02404	.03606	.04808	.06010
3/8	.01442	.02885	.04327	.05769	.07212
1/2	.01923	.03846	.05769	.07692	.09615
5/8	.02404	.04808	.07212	.09615	.12019
3/4	.02885	.05769	.08654	.11538	.14423
7/8	.03365	.06731	.10096	.13462	.16827
1	.03846	.07692	.11538	.15385	.19231
1-1/4	.04808	.09615	.14423	.19231	.24038
1-1/2	.05769	.11538	.17308	.23077	.28846
2	.07692	.15385	.23077	.30769	.38462

SHADED AREAS

Tubing wall thickness listed in the shaded areas are generally either too light or too heavy for practical applications, and are listed only to provide data for accurate computation.

⚠ WARNING

Refer to safety information regarding tubing selection on pages A-2-3. These tables provide data on required wall thickness for various sizes and pressures, and when to use flared or flareless fittings.

Although heavier wall tubing can be ordered for higher operating pressures, only standard size hydraulic tubing is listed in these tables. High temperature effects are not considered in these tables.

1010 STEEL TUBING WALL THICKNESS

TUBE O.D.	4:1 SAFETY FACTOR					6:1 SAFETY FACTOR					8:1 SAFETY FACTOR				
	working pressure (psi)					working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.028	.028	.028	.028	.028	.028	.028	.028	.028	.035	.028	.028	.028	.035	-
3/16	.030	.030	.030	.030	.035	.030	.030	.030	-	-	.030	.030	-	-	-
1/4	.030	.030	.030	.042	.049	.030	.030	.042	.058	-	.030	.035	.058	-	-
5/16	.032	.032	.035	.049	.058	.032	.032	.058	.065	-	.032	.049	.065	-	-
3/8	.032	.032	.042	.058	-	.032	.042	.058	-	-	.032	.058	-	-	-
1/2	.032	.042	.058	.072	-	.032	.058	.083	-	-	.042	.072	-	-	-
5/8	.035	.049	.072	.095	-	.035	.072	-	-	-	.049	.095	-	-	-
3/4	.035	.058	.083	.109	-	.049	.083	-	-	-	.058	.109	-	-	-
7/8	.049	.065	.095	-	-	.049	.095	-	-	-	.065	-	-	-	-
1	.049	.072	.109	-	-	.058	.109	-	-	-	.072	-	-	-	-
1-1/4	.049	.095	-	-	-	.072	-	-	-	-	.095	-	-	-	-
1-1/2	.065	.109	-	-	-	.083	-	-	-	-	.109	-	-	-	-
2	.072	-	-	-	-	.109	-	-	-	-	-	-	-	-	-

1020 STEEL TUBING WALL THICKNESS

TUBE O.D.	4:1 SAFETY FACTOR					6:1 SAFETY FACTOR					8:1 SAFETY FACTOR				
	working pressure (psi)					working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.028	.028	.028	.028	.028	.028	.028	.028	.028	.030	.028	.028	.028	.030	-
3/16	.030	.030	.030	.030	.030	.030	.030	.030	.035	-	.030	.030	.035	-	-
1/4	.030	.030	.030	.030	.042	.030	.030	.035	.049	.058	.030	.030	.049	-	-
5/16	.032	.032	.032	.042	.049	.032	.032	.042	.058	-	.032	.042	.058	-	-
3/8	.032	.032	.035	.049	.058	.032	.035	.058	.065	-	.032	.049	-	-	-
1/2	.032	.032	.049	.065	.083	.032	.049	.072	-	-	.032	.065	-	-	-
5/8	.035	.042	.058	.083	-	.035	.058	.095	-	-	.042	.083	-	-	-
3/4	.035	.049	.072	.095	-	.035	.072	.109	-	-	.049	.095	-	-	-
7/8	.049	.058	.083	-	-	.049	.083	-	-	-	.058	.109	-	-	-
1	.049	.065	.095	-	-	.049	.095	-	-	-	.065	-	-	-	-
1-1/4	.049	.083	.120	-	-	.058	.120	-	-	-	.083	-	-	-	-
1-1/2	.065	.095	-	-	-	.072	-	-	-	-	.095	-	-	-	-
2	.065	-	-	-	-	.095	-	-	-	-	.134	-	-	-	-

 Both SAE 37° SINGLE FLARE FLARE-TWIN or ERMETO® flareless recommended.

 ERMETO® flareless only.

Note: Refer Only Weatherhead Ermeto flareless fittings can be used with high pressure, heavy wall tubing which is impractical to flare.

⚠ WARNING

Refer to safety information regarding tubing selection on pages A-2-3. These tables provide data on required wall thickness for various sizes and pressures, and when to use flared or flareless fittings.

Although heavier wall tubing can be ordered for higher operating pressures, only standard size hydraulic tubing is listed in these tables. High temperature effects are not considered in these tables.

STAINLESS STEEL (304) ANNEALED TUBING WALL THICKNESS

TUBE O.D.	4:1 SAFETY FACTOR					6:1 SAFETY FACTOR					8:1 SAFETY FACTOR				
	working pressure (psi)					working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.028	.028	.028	.028	.028	.028	.028	.028	.028	.035	.028	.028	.028	.028	.035
3/16	.030	.030	.030	.030	.030	.030	.030	.030	.030	.035	.030	.030	.030	.035	-
1/4	.030	.030	.030	.030	.035	.030	.030	.030	.042	.058	.030	.030	.035	.058	.065
5/16	.032	.032	.032	.035	.042	.032	.032	.035	.058	.065	.032	.032	.049	.065	-
3/8	.032	.032	.032	.042	.058	.032	.042	.065	.083	-	.032	.042	.058	-	-
1/2	.032	.032	.042	.058	.072	.032	.042	.065	.083	-	.032	.058	.083	-	-
5/8	.035	.035	.058	.072	.083	.035	.058	.083	.095	-	.035	.065	-	-	-
3/4	.035	.049	.065	.083	.109	.035	.065	.095	-	-	.049	.083	-	-	-
7/8	.049	.049	.072	.095	-	.049	.072	.109	-	-	.049	.095	-	-	-
1	.049	.058	.083	.109	-	.049	.083	.120	-	-	.058	.109	-	-	-
1-1/4	.049	.072	.109	-	-	.058	.109	-	-	-	.065	.134	-	-	-
1-1/2	.065	.083	.120	-	-	.065	.120	-	-	-	.083	-	-	-	-
2	.065	.109	-	-	-	.083	-	-	-	-	.109	-	-	-	-

STAINLESS STEEL (304) 1/8 HARD TUBING WALL THICKNESS

TUBE O.D.	4:1 SAFETY FACTOR					6:1 SAFETY FACTOR					8:1 SAFETY FACTOR				
	working pressure (psi)					working pressure (psi)					working pressure (psi)				
	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000	1,000	2,000	3,000	4,000	5,000
1/8	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028
3/16	.030	.030	.030	.030	.030	.030	.030	.030	.030	.030	.030	.030	.030	.030	.035
1/4	.030	.030	.030	.030	.030	.030	.030	.030	.030	.035	.030	.030	.030	.042	.049
5/16	.032	.032	.032	.032	.032	.032	.032	.032	.035	.049	.032	.032	.035	.049	.058
3/8	.032	.032	.032	.032	.042	.032	.032	.032	.042	.058	.032	.032	.042	.058	-
1/2	.032	.032	.032	.042	.049	.032	.032	.042	.058	.072	.032	.042	.058	.083	-
5/8	.035	.035	.042	.049	.065	.035	.035	.058	.072	.095	.035	.049	.072	.095	-
3/4	.035	.035	.049	.058	.072	.035	.049	.065	.095	.109	.035	.058	.095	-	-
7/8	.049	.049	.058	.072	.083	.049	.058	.083	.109	-	.049	.065	.109	-	-
1	.049	.049	.058	.083	.095	.049	.058	.095	-	-	.049	.072	-	-	-
1-1/4	.049	.049	.072	.095	.120	.049	.072	.109	-	-	.049	.095	-	-	-
1-1/2	.065	.065	.095	-	-	.065	.095	-	-	-	.065	-	-	-	-
2	.065	.083	.120	-	-	.065	-	-	-	-	.083	-	-	-	-

 Both SAE 37° SINGLE FLARE FLARE-TWIN or ERMETO® flareless recommended.

 ERMETO® flareless only.

Note: Refer Only Weatherhead Ermeto flareless fittings can be used with high pressure, heavy wall tubing which is impractical to flare.

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