Seven Easy Steps for Selecting the Proper Hose

An effective way to remember hose selection criteria is to remember the word...

STAMPED

S = Size

T = Temperature

A = Application

M = Material to be conveyed

P = Pressure

E = Ends or couplings

D = Delivery (volume and velocity)

1. Hose Size (Dash Numbers)

The inside diameter of the hose must be adequate to keep pressure loss to a minimum and avoid damage to the hose due to heat generation or excessive turbulence. See hose sizing Nomographic Chart.

To determine the replacement hose size, read the layline printed on the side of the original hose. If the original hose layline is painted over or worn off, the original hose must be cut and the inside diameter measured for size.

NOTE: Before cutting an original hose assembly, measure the overall assembly length and fitting orientation. These measurements will be required to build the replacement assembly.

The hydraulics industry has adopted a measuring system called Dash Numbers to indicate hose and coupling size. The number which precedes the hose or coupling description is the dash size (see table). This industry standard number denotes hose I.D. in sixteenths of an inch. (The exception to this is the SAE100R5 hoses C5C, C5D, C5E, C5M as well as, C14 and AC134a, where dash sizes denote hose I.D. equal to equivalent tube O.D.) See chart to the right.

	Hose I.D. (Inches)			
	All Except C5 Series, C14 and AC134a		C5 Series, C14 and AC134a	
Dash No.	Inches	Millimeters	Inches	Millimeters
-2	1/8	3.2	--	--
-3	3/16	4.8	--	--
-4	1/4	6.4	3/16	4.8
-5	5/16	7.9	1/4	6.4
-6	3/8	9.5	5/16	7.9
-8	1/2	12.7	13/32	10.3
-10	5/8	15.9	1/2	12.7
-12	3/4	19.0	5/8	15.9
-14	7/8	22.2	--	--
-16	1	25.4	7/8	22.2
-20	1-1/4	31.8	1-1/8	28.6
-24	1-1/2	38.1	1-3/8	34.9
-32	2	50.8	1-13/16	46.0
-36	2-1/4	57.6	--	--
-40	2-1/2	63.5	2-3/8	60.3
-48	3	76.2	--	--
-56	3-1/2	88.9	--	--
-64	4	101.6	--	--
-72	4-1/2	115.2	--	--

Selecting the Proper Hose — con't.

Hose O.D. can be a critical factor when hose routing clamps are used or hoses are routed through bulkheads. Check individual hose specification tables for O.D.'s.

2. Temperature

When selecting a replacement assembly, two areas of temperature must be considered. These are fluid temperature and ambient temperature. The hose selected must be capable of withstanding the minimum and maximum temperature seen by the system. Care must be taken when routing near hot manifolds and in extreme cases a heat shield may be advisable.

See the Gates Hydraulic Hose Selection Guide; Hose Specification Pages; and/or the Additional Temperature Limits for Gates Hydraulic Hoses Chart for temperature ranges and limits for water, water/oil emulsions and water/glycol solutions.

3. Application

Determine where or how the replacement hose or assembly is to be used. Most often only a duplicate of the original hose will have to be made. To fulfill the requirements of the application, additional questions may need to be answered, such as:

- Where Will Hose be Used?
- Fluid and/or Ambient Temperature?
- Hose Construction?
- Equipment Type?
- Fluid Compatibility?
- Thread End Connection Type?
- Working and Surge Pressures?
- Environmental Conditions?
- Permanent or Field Attachable Couplings?
- Suction Application?
- Routing Requirements?
- Thread Type?
- Government and Industry Standards Being Met?
- Unusual Mechanical Loads?
- Minimum Bend Radius?
- Non-Conductive Hose Required?
- Excessive Abrasion?

4. Material to be Conveyed

Some applications require specialized oils or chemicals to be conveyed through the system. Hose selection must ensure compatibility of the hose tube, cover, couplings and O-rings with the fluid used. Additional caution must be exercised in hose selection for gaseous applications such as refrigerants and LPG.

NOTE: All block type couplings contain nitrile O-rings which must be compatible with the fluids being used.

5. Pressure

Most important in the hose selection process is knowing system pressure, including pressure spikes. Published working pressures must be equal to or greater than the system pressure. Pressure spikes greater than the published working pressure will shorten hose life and must be taken into consideration. Gates DOES NOT recommend using hoses on applications having pressure spikes greater than published working pressures of the hose.

6. Ends of Couplings

Identify end connections using Gates coupling templates and measuring tools or Coupling Identification section. Once thread ends have been identified, consult the appropriate section of the catalog for specific part number selection.

7. Delivery (Volume and Velocity)

If the same I.D. of the original hose is used, assume the system is properly sized to efficiently transport fluid. If the system is new or altered, determine the hose I.D. needed to transport required fluid volume flow by using the Nomographic Chart.

Agency Specifications and Hose Selection Guide

INDUSTRY AGENCIES

ABS — American Bureau of Shipping
AS — Australia Standard
DIN — Deutsch Industry Norm, German
DNV — Det Norske Veritas for North Sea Floating Vessels
EN — European Norm/Standard
GL — Germanischer Lloyds
IJS — Industrial Jack Specifications
RCCC — Regular Commom Carrier Conference for Fleet Truck and Bus
SAE — Society of Automotive Engineers

GOVERNMENT AGENCIES

DOT/FMVSS — U.S. Department of Transportation/ Federal Motor Vehicle Safety Standard
MSHA — U.S. Mine Safety and Health Administration
USCG — U.S. Coast Guard

Meets These Agency Specifications

Hose Type	ABS	AS	DIN	DNV	EN	GL	IJS	RCCC	SAE	DOT/ FMVSS	MSHA	USCG J1942	
												Fuel Oil	Power
EFG6K, G6K	X	X	20023 4SH/4SP	X	EN 856 4SH/4SP	X			100R15		X		X
EFG5K, G5K	X	X	20023 4SH/4SP	X	EN 856 4SH/4SP	X			100R13		X		X
EFG4K, G4K	X	X	20023 4SP	X	EN 856 4SP	X			100R12		X		X
EFG3K, G3K	X		20023 4SP		EN 856 4SP	X			100R12		X		X
M5K		X		X		X							
M4K+	X	X		X		X			100R19		X		X
M4KH	X					X			100R19		X		X
G2XH									100R2 Type AT		X		X
G2AT-HMP									100R2 Type AT		X		X*
M2T®	X	X		X	EN 853 2SN				100R16		X		X
M2T® Plus					EN 853 2SN				100R16		X		
CM2T				X	EN 857 2CS	X			100R16		X		
G2		X	20022 2SN	X	EN 853 2SN	X			100R2 Type AT		X		X
G2H		X		X	EN 853 2SN				100R2 Type AT		X	X	X
J2AT							X				X		
M3K	X	X		X	EN 857	X			100R17		X		X
M3K -12, -16	X	X		X	EN 857	X			100R17, 100R9		X	X	X
G1		X	20022 1SN	X	EN 853 1SN	X			100R1 Type AT		X		X
G1H				X	EN 853 1SN				100R1 Type AT		X	X	
MegaTech™									J1402, J1405	106-74 (-4 to -10)			
TR500									J1402	106-74			
NABT									J844				
C5C								RP305(B)	100R5	106-74 Type AI (-4 to –10)			
C5E									J1405	106-74 Type AI			
C5D									J1405	106-74 Type AII			
C5M	X								J30R2, J1527		X	X	
G3H					EN 854 R3				100R3				
GTH, GTHX					EN 854 R6				100R6				
GMV	X@	X							100R4		X		X
LOL											X		
THERMOPLASTIC													
TH7, TH7NC***									100R7				
TH8, TH8NC									100R8				
TH18, TH18NC									100R18				
C14									100R14				
REFRIGERANT													
PolarSeal® AC134a									J51 Type 2, J2064				
POWER STEERING													
PS188									2050				

* Except 1/4"
** Except 3/8" & 1/2"

*** TH7NC meets ANSI A92.2 for vehicle mounted aerial devices (-3 to -8)

@ to be used with a fire sleeve

Characteristics of Hose Stock Types

The characteristics shown below are for the normal or usual range of these specific stocks. Stocks can be changed somewhat through different compounding to meet the requirements of specialized applications.

Tube and cover stocks may occasionally be upgraded to take advantage of improved materials and technology.

For detailed information on a specific hose tube or cover stock, check the Chemical Resistance Table and also the specific hose page.

Characteristics							
	Neoprene (Poly-Choroprene) Type A	**Nitrile (Acrylonitrile and Butadiene) Type C**	**Nylon Type Z**	**Hypalon* (Chlorosulfonated Polyethylene) Type M**	**EPDM (Ethylene Propylene Diene) Type P**	**CPE (Chlorinated Polyethylene) Type J**	**PTFE (Poly-tetrafluoro-ethylene) Type T**
Flame Resistance	Very Good	Poor	Good	Good	Poor	Good	Good
Petroleum Base Oils	Good	Excellent	Good to Excellent	Good	Poor	Very Good	Excellent
Diesel Fuel	Fair to Good	Good to Excellent	Good to Excellent	Good	Poor	Good	Excellent
Resistance to Gas Permeation	Good	Good	Good To Excellent	Good to Excellent	Fair to Good	Good	Good to Excellent
Weather	Good to Excellent	Poor	Excellent	Very Good	Excellent	Good	Excellent
Ozone	Good to Excellent	Poor for Tube; Good For Cover	Excellent	Very Good	Outstanding	Good	Excellent
Heat	Good	Good	Good	Very Good	Excellent	Excellent	Excellent
Low Temperature	Fair to Good	Poor to Fair	Excellent	Poor	Good to Excellent	Good	Excellent
Water-Oil Emulsions	Excellent	Excellent	Good to Excellent	Good	Poor	Excellent	Excellent
Water/Glycol Emulsions	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Diesters	Poor	Poor	Excellent	Fair	Excellent	Very Good	Excellent
Phosphate Esters	Fair (For Cover)	Poor	Excellent	Fair	Very Good	Very Good	Excellent
Phosphate Ester Base Emulsions	Fair (For Cover)	Poor	Excellent	Fair	Very Good	Very Good	Excellent

*Registered trademark of DuPont.

Cover Abrasion Resistance

These comparisons are based on test results per ISO 6945 abrasion testing. The table shows the expected number of times of extended cover service life as compared to a standard cover.

	Modified Nitrile (Standard cover)	**Nylon Sleeve**	**XtraTuff™**	**MegaTuff®**
Relative Abrasion Resistance	1	**15 X** Standard Cover	**25 X** Standard Cover	**300 X** Standard Cover

Gates Hydraulic Hose Selection Guide

Standard Industry Specification	Gates Description	Construction (Reinforcement)	Use	Stock			
				Tube		Cover	
				Name	Type	Name	Type
Gates Proprietary Design	G8K	6-spiral, wire	Extremely High Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils	Neoprene	A	Neoprene	A
ISO 3862 R15 SAE 100R15 EN 856 TYPE 4SP/4SH	EFG6K	4&6-spiral, wire	Extremely High Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	Neoprene	A
	EFG6K-MTF	4&6-spiral, wire	Extremely High Abrasion Resistant, Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
ISO 3862 R13 SAE 100R13 EN 856 TYPE 4SP/4SH	EFG5K	4&6-spiral, wire	Extremely High Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	Neoprene	A
	EFG5K-MTF	4&6-spiral, wire	Extremely High Abrasion Resistant, Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
ISO 3862 R12 SAE 100R12 EN 856 Type 4SP ++	EFG4K	4&6-spiral, wire	Extremely High Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	Neoprene	A
	EFG4K-MTF	4&6-spiral, wire	Extremely High Abrasion Resistant, Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
ISO 3862 R12 SAE 100R12 EN 856 Type 4SP	EFG3K	4-spiral, wire	Extremely High Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	Neoprene	A
	EFG3K-MTF	4-spiral, wire	Extremely High Abrasion Resistant, Pressure & Impulse Cycle Life, High Temperature, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
Gates Proprietary Design	M-XP	2-braid, wire	Extremely High Pressure & Impulse Cycle Life, High Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
Gates Proprietary Design	M6K	2-braid, wire	High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
Gates Proprietary Design	M5K	2-braid, wire	High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
Gates Proprietary Design	M5K-XTF	2-braid, wire	High Abrasion Resistant, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	XtraTuff	Nitrile/PVC
Gates Proprietary Design	M5K-MTF	2-braid, wire	Extremely High Abrasion Resistant, High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
ISO 11237 R19 SAE 100R19	M4K	2-braid, wire	High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
	M4K-XTF	2-braid, wire	High Abrasion Resistant, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	XtraTuff	Nitrile/PVC
	M4K-MTF	2-braid, wire	Extremely High Abrasion Resistant, High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
	M4KH	2-braid, wire	High Temperature, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Chloroprene	CR
	M4KH-MTF	2-braid, wire	Extremely High Abrasion Resistant, High Temperature, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
ISO 11237 R17 SAE 100R17	M3K	1 & 2-braid, wire	High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
	M3K-XTF	1 & 2-braid, wire	High Abrasion Resistant, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	XtraTuff	Nitrile/PVC
	M3K-MTF	1 & 2-braid, wire	Extremely High Abrasion Resistant, High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
	M3KH	1 & 2-braid, wire	High Temperature, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Chloroprene	CR
	M3KH-MTF	1 & 2-braid, wire	Extremely High Abrasion Resistant, High Temperature, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	-
ISO 11237 2SC R16 EN 857 2SC SAE 100R16	M2T®	2-braid, wire	High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
	M2T®-XTF	2-braid, wire	High Abrasion Resistant, Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	XtraTuff	Nitrile/PVC
	M2T®-MTF	2-braid, wire	Extremely High Abrasion Resistant, High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	MegaTuff	UHMWPE
Exceeds ISO 1436 2SC R16 SAE 100R16, EN 857 2SC	CM2TDL	2-braid, wire	High Pressure, Impulse Cycle Life & Flexibility, Tight Bend Radius, Petroleum Oils, Environmental Fluids	Nitrile	C	Nitrile	C2
ISO 1436 2SN R2 SAE 100R2 Type AT EN 853 Type 2SN	G2	2-braid, wire	High Pressure, Petroleum Oils & Environmental Fluids	Nitrile	C	NBR/PVC	C2
	G2L	2-braid, wire	High Pressure, Low Temperature, Petroleum Oils & Environmental Fluids	Nitrile	C	Neoprene	A
	G2H	2-braid, wire	High Pressure, Temperature, Petroleum Oils & Environmental Fluids	Nitrile	C	Hypalon+	M
	G2XH	2-braid, wire	Extremely High Heat, High Pressure, Petroleum Oils & Environmental Fluids	CPE	J	Hypalon+	(BLUE)
IJ100	J2AT	2-braid, wire	Industrial Jack Hose Applications	Nitrile	C	Nitrile	C2
IJ100	J2AT-MTF	2-braid, wire	Industrial Jack Hose Applications	Nitrile	C	MegaTuff	-
ISO 1436 1SN R1 SAE 100R1 Type AT EN 853 Type 1SN	G1	1-braid, wire	Medium Pressure, Petroleum Oils & Environmental Fluids	Nitrile	C	Nitrile	C2
SAE 100R1 Type AT EN 853 Type 1SN	G1H	1-braid, wire	High Temperature, Medium Pressure, Petroleum Oils & Environmental Fluids	Nitrile	C	Hypalon+	M
Gates Proprietary Design	RFS	1-braid, wire	Low Pressure, Powder Fire Suppressant Applications	Nitrile	C	Nitrile (RED)	C2

Gates Hydraulic Hose Selection Guide (cont.)

Standard Industry Specification	Gates Description	Construction (Reinforcement)	Use	Stock			
				Tube		Cover	
				Name	Type	Name	Type
SAE J1405 SAE J1402/DOT*** SAE100R2****	MegaTech™ G5TB	1 & 2-braid, wire, textile	Extremely High Heat, Hot Oil Pressure & Return Lines, High Temperature Rotary Oil/Air, Air Compressor, Petroleum Oils	CPE	J	Textile	-
	MegaTech™ II	2-braid, wire, textile	Extremely High Heat, Hot Oil Pressure & Return Lines, High Temperature Rotary Oil/Air, Air Compressor, Petroleum Oils	CPE	J	Textile (Blue)	-
	MegaTech™ 1000	1-braid, wire, textile	Extremely High Heat, Hot Oil Pressure & Return Lines, High Temperature Rotary Oil/Air, Air Compressor, Petroleum Oils, Air Brake	CPE	J	Textile	-
	MegaTech™500	1-braid, wire, textile	Extremely High Heat, Hot Oil Pressure & Return Lines, High Temperature Rotary Oil/Air, Air Compressor, Petroleum Oils	CPE	J	Textile	-
	MegaTech™ 250	1-braid, wire, textile	Extrememly High Heat, Hot Oil Pressure & Return Lines, High Temperature Rotary Oil/Air, Air Compressor, Petroleum Oils, Transmission Oil Cooler	CPE	J	Textile	-
	MegaTech™ LOC	1-braid, textile	Extremely High Heat, Hot Oil Pressure & Return Lines, High Temperature Rotary Oil/Air, Air Compressor, Petroleum Oils, Transmission Oil Cooler	CPE	J	Textile	-
SAE 100R3 EN 854 TYPE R3	G3H	2-braid, textile	Petrol. Oils, Antifreeze, Water, High Temperature	Nitrile	C	Neoprene	A
SAE 100R6 EN 854 TYPE R6	GTH,	1-braid, textile	Petrol. Oils, Antifreeze, Water, High Temperature	Nitrile	C	Neoprene	A
SAE 100R6 EN 854 TYPE R6	GTHX	1-spiral, textile	Petrol. Oils, Antifreeze, Water, High Temperature	Nitrile	C	Neoprene	A
SAE 100R4	G4H	2-spiral, textile, helical wire	Return & Suction High Temperature	Nitrile	C	Neoprene	A
SAE 100R4	GMV	2-spiral, textile, helical wire	Return & Suction High Temperature	Nitrile	C	Neoprene	A
SAE 30R2 Type 1 & 2, B20 Biodiesel	RLA	1-braid, textile	Return & Suction Low Pressure, Biodiesel up to 125°F	Nitrile	C	Nitrile	C2
Gates Proprietary Design	RLC	3-braid, textile	Return & Low Pressure	Nitrile	C	Nitrile	C2
SAE 30R2, SAE 30R6, SAE 30R7 and B20 Biodiesel	LOC	1-braid, textile	Petrol, Oils, Antifreeze, Water, Air & Biodiesel up to 125°F	Nitrile	C	Textile	-
Gates Proprietary Design	LOL	1-braid, textile	Petrol, Oils, Antifreeze, Water & Air	Nitrile	C	***	A/C2
SAE J1402, DOT FMVSS106-74	TR500	2-braid, wire, textile	Petrol & Syn. Fluids, Air Brakes	Nitrile	C	Textile	—
SAE 100R5, DOT FMVSS106-74, Type AII	*C5C	3-braid, T-W-T	Petr. Oil, Air Brake, Power Steering	*Nitrile	C	Textile	—
SAE J1402, DOT FMVSS106-74, Type AII	C5D	3-braid, T-W-T	Petrol & Syn. Fluids, Air Brakes	CPE	J	Textile	—
SAE J1527, SAE J1942, ISO 7840	C5M	1-braid, wire	Marine Fuel & Oil	Nitrile	C	NBR/PVC	C2
DOTFMVSS106-74, Type AI	C5E	3-braid, T-W-T	Air Brake, Power Steering, Lube	Nitrile	C	Textile	—
PTFE							
SAE 100R14	C14	1-braid, stainless steel	High Temperature, Multi Fluid, Nonconductive	PTFE	—	Stainless Steel	—
SAE 100R14	C14CT	1-braid, stainless steel	High Temperature, Multi Fluid, Conductive	PTFE	—	Stainless Steel	—
Thermoplastic							
SAE 100R7	TH7	1-braid, polyester	Petroleum & Synthetic Fluids	Nylon	Z	Urethane	U
SAE 100R7	TH7NC/TH7NCDL	1-braid, polyester	Non-conductive	Nylon	Z	Urethane	U
SAE 100R7	TH7DL	1-braid, polyester	Petroleum & Synthetic Fluids, Dual Line	Nylon	Z	Urethane	U
SAE 100R7	TH7NCDL	1-braid, polyester	Non-conductive, Dual Line	Nylon	Z	Urethane	U
SAE 100R8	TH8	2-braid, Polyester	Petroleum & Synthetic Fluids	Nylon	Z	Urethane	U
SAE 100R8	TH8NC	2-braid, Polyester	Non-conductive	Nylon	Z	Urethane	U
SAE 100R18	TH18	1-braid, Synthetic Fiber	Petroleum & Synthetic Fluids	Nylon	Z	Polyester	U
SAE 100R18	TH18NC	2-braid, Synthetic Fiber	Non-conductive	Nylon	Z	Polyester	U
Refrigerant							
SAE J51 Type AII Dimensions/ Type D PerformanceJ2064, Type C, Class II Performance	PolarSeal® AC134a	Nylon barrier, 2-spiral, Polyester	Air Conditioning (R12 and R134a)	Chloroprene	A	EPDM	P
SAE J2064 Type C, Class1	PolarSeal® ACC-PSII		Reduced Barrier Construction, Air Conditioning (R12, R13A and R22)	Elastomeric/ Nylon	-	Elastomeric	-

* -4 and -5 sizes have a Neoprene tube, ** Nitrile or Neoprene, ***MegaTech1000 sizes -4, 6, -8, -10, ****MegaTech II, ++ -16 & -20 EFG4K, † Registered trademark of DuPont

Gates Hydraulic Hose Selection Guide

Description	Temp. Range (°F)	Dash Size vs. Rated Working Pressure (psi)														
		-2	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24	-32	-40	-48	-56	-64
G8K	-40 +250								8,000	8,000							
EFG6K	-40 +250					6,000	6,000	6,000	6,000	6,000	6,000	6,000					
EFG5K	-40 +250					5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000				
EFG4K	-40 +250					4,000	4,000	4,000	4,000	4,000	4,000						
EFG3K	-40 +250										3,000	3,000	3,000				
M-XP	-40 +212			4,000		4,000	4,000	4,000	4,000								
M2T®	-40 +212			6,000	5,500	5,000	4,300	3,800	3,500	2,500							
CM2TDL	-40 +212			4,800		4,000											
M6K	-40 +212			6,000													
M5K	-40 +212			5,000	5,000	5,000	5,000										
M4K	-40 +212			4,000	4,000	4,000	4,000	4,000	4,000	4,000							
M4KH	-40 +250			4,000	4,000	4,000	4,000	4,000	4,000								
M3K	-40 +212		3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250							
M3KH	-40 +250		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000							
G2	-40 +212		6,000	5,800		4,800	4,000	3,625	3,100	2,400	1,825	1,300	1,175				
G2H	-40 +275										1,650	1,300	1,175				
G2XH	-40 +300			6,000		5,000	4,250	3,625	3,100	2,500	2,250						
G2L	-70 +212			5,800		4,800	4,000	3,625	3,100	2,400	1,825	1,300					
J2AT	-40 +120			10,000		10,000											
G1	-40 +212		3,625	3,275	3,125	2,600	2,325	1,900	1,525	1,275	925	725	600				
G1H	-40 +275			2,750		2,250	2,000	1,500	1,250	1,000	625	725	600				
G3H	-40 +275			1,250		1,125	1,000		750	565	375						
GTH	-40 +275		500	400	400	400	400	350	300								
GTHX	-40 +275					400											
G4H	-40 +275								300	250	200						
GMV	-40 +275								300	250	200	162	112	68	62	56	56
RLA	-40 +212		250	250	250	250	200	200	200	160							
RLC	-40 +275									200	200	200	200	150	150	150	
LOC	-40 +250			300		300	300	300	300								
LOL	-40 +212		300	300	300	300	300	300	300								
TR500	-40 +250			500		500	500	500	500	500	500						
MegaTech™ II	-40 +300										2,250	1,500	1,300				
MegaTech™ G5TB	-40 +300			3,000		3,000	3,000	1,000	1,000	1,000	1,000	500	500	500	500		
MegaTech™ 3000	-40 +300			3,000		3,000	3,000										
MegaTech™ 1000	-40 +300			1,000		1,000	1,000	1,000	1,000	1,000	1,000						
MegaTech™ 500	-40 +300											500	500	500	500		
MegaTech™ 250	-40 +300			250		250	250	250	250	250	250						
MegaTech™ LOC	-40 +300			300		300	300	300	300	300							
C5C	-40 +212			3,000	3,000	2,250	2,000	1,750	1,500	800	625	500	350	350			
C5D	-40 +300•			1,500	1,500	1,500	1,250	1,250	750	400							
C5M	-40 +212				500	500	500	500	500	500							
C5E	-40 +300•			1,500	1,500	1,500	1,250	1,250	750	400	300						
C14	***			1,500	1,500	1,500	1,000	800	800	800							
C14 (Static)	-62 +72			3,000	3,000	2,500	2,000	1,500	1,200	1,000							
C14CT	***					1,500	1,000										
C14CT (Static)	72					2,500	2,000										
Thermoplastic																	
TH7	-65 +200	2,500	3,000	2,750	2,500	2,250	2,000		1,250	1,000							
TH7NC	-65 +200	2,500	3,000	2,750	2,500	2,250	2,000		1,250	1,000							
TH7DL	-65 +200			2,750	2,500	2,250	2,000										
TH7NCDL	-65 +200			2,750		2,250	2,000										
TH8	-65 +200		5,000	5,000		4,000	3,500		2,250	2,000							
TH8NC	-65 +200			5,000		4,000	3,500										
TH18	-67 +212			3,000	3,000	3,000	3,000	3,000									
TH18NC	-67 +212			3,000	3,000	3,000	3,000	3,000									
Refrigerant																	
PolarSeal® AC134a	-22 +257					500	500	500	500								
PolarSeal® ACC-PSII	-22 +257					350	350	350	350	350							

*** Dynamic temperatures -65 +400; Static temperatures +73 +450 • All purpose fleet application service — 40°F to +300°F (-40°C to +149°C), air to +250°F

Additional Temperature Limits for Gates Hydraulic Hoses

Caution: Water, water/oil emulsions and water/glycol solutions must be kept below the temperatures listed in the table below, relative to line pressures.

Maximum Temperature Limits for Water, Water/Oil Emulsions and Water/Glycol Solutions

Hose	Pressure Lines	Return Lines
G8K, EFG6K, EFG5K, EFG4K, EFG3K, G2, G2L, M2T®, M6K, M5K, M4K, M3K, RFS, RLA, C5C, C5E, LOC, LOL	+200°F (+93°C)	+180°F (+82°C)
G2H, G1H, MegaTech® Line, G2XH, C5D, G3H, GTH, G4H, GMV, RLC, TR500, M3KH, M4KH	+225°F (+107°C)	+180°F (+82°C)

Caution: The fluid manufacturer's recommended maximum operating temperature for any given fluid must not be exceeded. If different than the above listed hose temperatures, the lower limit must take precedence. Actual service life at temperatures approaching the recommended limit will depend on the particular application and the fluid being used in the hose. Intermittent (up to 10 percent of operating time) refers to momentary temperature surges. Detrimental effects increase with increased exposure to elevated temperatures.

Do NOT expose hose to maximum temperature and maximum rated working pressure at the same time.

SAE Recommended Practices for Hydraulic Hose Assemblies

A summary of SAE J1273 FEB2009

Scope

This summary provides guidelines for safety, selection, routing, fabrication, installation, replacement, maintenance, and storage of hose and hose assemblies. These are the recommended practices for hydraulic hoses, but are also appropriate for many other hoses and systems.

Safety

Safety should be a paramount concern whenever working with a hydraulic system. The fluids conveyed are often at high temperatures and extremely high pressures which present unique dangers.

Hydraulic fluid injuries are generally very sever and may come in several forms. Fluid injections wounds may occur any time there is a leak in a hydraulic system. Never check for leaks or damage to a hydraulic system by feel, the best case scenario with a fluid injection wound is months of painful treatment to recover, addition risks include amputation and death. Due to the high temperatures any time a user is exposed to hydraulic fluids severe burns may result, this exposure may be a result of an assembly failure or even oil released during maintenance. Additionally there is a danger of fire or explosion if a hose fails around a hot engine or exhaust manifold, or if a static discharge takes place in a fluid spray.

Unconstrained hoses may whip on pressurization or in the event of failure and are extremely dangerous. Additionally during the release of pressure on the hydraulic system improperly secured booms or other cylinder supported components may drop suddenly.

A sometimes less recognized risk is that of electrical shock. Any equipment used to work around live electrical lines (such as lifts, etc) should be equipped with hydraulic hoses rated as non-conductive. This is because most hydraulic hoses have wire reinforcement and are inherently conductive. Also even with non-conductive hoses are used it is important to recognized that hydraulic fluids may also act as conductors.

Hose Selection

The Gates STAMED process is the industry accepted standard for hose selection, this process involves determining the following properties:

Size

- Internal diameter requirements will affect fluid velocity and outside diameter may also sometime be concern for routing purposes. When in doubt match existing specifications.

Temperature

- The maximum recommended hose temperature should never be exceeded, ether in the fluid conveyed or on the exterior of the hose. Similarly special hoses are available which will maintain flexibility at very low temperatures, always follow manufacturer guidelines.

Application

- Environmental conditions such as ultraviolet light, salt water, air pollutants, temperature, ozone, chemicals, electricity, abrasion and paint application will all negatively impact hose assembly life
- Static Discharge can become an issue when non-polar liquids or mixtures including non-polar liquids are conveyed in non-conductive hose. A static charge will build and on discharge perforate the hose tube, to avoid this use conductive tube products when conveying non-polar, or mixtures of non-polar, liquids.
- Electrical Conductivity of hydraulic hoses or conveyed fluids is an issue with equipment used to work around electrical lines. If hydraulic equipment is to be used around electrical lines, always use hydraulic hoses rated as non-conductive.
- The cleanliness requirements of a final hose assembly will be determined by the system it is to be applied too. Always follow the equipment manufacturer's recommended cleanliness standard.
- Be sure to select products which will meet any regulatory standards required in the application. Examples of these standards would include: SAE, USCG, EN/DIN, ABS, etc
- Never place hoses in a position where they are pulled on. Hoses are designed to hold pressure and convey fluids, exposing them to axial loads will cause premature failure.
- Any special or unusual applications should always be approved by the hose manufacturer, otherwise additional independent testing may be required.

Materials

- Permeation, or effusion, is the movement of a substance through the hose tube walls which may degrade the hose tube, cause cover blistering, or other undesired effects, and must be considered especially when conveying compressed gasses.
- Be sure to select a hose which is compatible and approved by the manufacturer for the fluid conveyed. Concentration, pressure, temperature and other factors may impact the compatibility of the hose and fluid.

Pressure

- The maximum working pressure of a hose assembly is the lowest working pressure of any component of the assembly.
- Hose should be sized with a working pressure equal to or above the maximum pressure encountered in a system. High frequency electronic transducers will be necessary to determine the maximum surge, or impulse, pressure in a system.
- If a hose assembly will be exposed to suction, be sure it is rated to hold the maximum suction and pressure in that portion of the system.
- Any time a hose assembly is to be exposed to external pressures, which may exceed the internal hose pressures, be sure to consult the hose manufacturer for recommendations.

Ends

- Always use manufacture approved couplings for hose assemblies. Be sure to select the appropriate end termination for a system working pressure and other requirements such as vibration resistance.

Delivery

- Always follow manufacture recommendations for maximum fluid velocity within a hose. Excessive fluid velocity may cause excessive pressure loss, heat generation, hose movement or whipping, system noise, and hammer effects.

Hose Routing

Proper attention to good hose routing and application practices will ensure reliable function of hose assemblies. The following is a short list of factors to consider when routing hose.

- Vibration: Consider vibration requirements when selecting hose and predicting service life. Clamps, dampers, and other mechanisms may be necessary to reduce vibration.
- Cover protection: Protect the hose cover from abrasion, erosion, snagging, and cutting. Special abrasion-resistant hoses and hose guards are available for additional protection. Route the hose to reduce abrasion from hose rubbing other hose or objects that may abrade it.
- External Physical Abuse: Route hose to avoid tensile (pulling) loads, side loads, flattening, thread damage, kinking, damage to sealing surfaces, abrasion and twisting.
- Swivel Adapters: Swivel-type fittings or adapters do not transfer torque to hose while being tightened. Use these as needed to prevent twisting during installation.
- Live Swivels: If two components in the system are rotating in relation to each other, live swivels may be necessary. These connectors reduce the torque transmitted to the hose.
- Slings and Clamps: Use slings and clamps to support heavy or long hose and to keep it away from moving parts. Use clamps that prevent hose movement that will cause abrasion. Care shall be taken to prevent the sling clamp from abraiding the hose. Avoid over tightening of slings or clamps.
- MBR: Routing during assembly and use at less than minimum bend radius may reduce hose life. Sharp bending at the hose/fitting juncture may result in leaking, hose rupturing, or the hose assembly blowing apart. A minimum straight length of 1.5 times the hose's outside diameter shall be allowed between the hose fitting and the point at which the bend starts.
- Elbows and Adapters: Use elbows or adapters to relieve hose strain due to routing.
- Lengths: Unnecessarily long hose can increase pressure drop and affect system performance. When pressurized, hose that is too short may pull loose from its fittings, or stress the hose fitting connections, causing premature metallic or seal failures.
- Motion Absorbtion: Provide adequate hose length to distribute movement and prevent bends smaller than the minimum bend radius.
- Hose Movement and Bending (multi plane bending): Hose allows relative motion between system components. Analyze this motion when designing hose systems. The number of cycles per day may significantly affect hose life. Also avoid multiple planes of motion and twisting motion.
- Hose and machine tolerances: Design hose to allow for changes in length due to machine motion and tolerances.
- Hose length change due to pressure: Design hose to accommodate length changes from changing pressures. Do not cross or clamp together high- and low-pressure hoses. The difference in length changes could wear the hose covers.

Hose Assembly Fabrication

- Component inspection: Before creating an assembly be sure to inspect all components to be sure they are the correct product, cut correctly, and do not have any visually identifiable defects.
- Couplings (compatibility): Hose fitting components from one manufacturer are not usually compatible with fitting components supplied by another manufacturer. Never mix and match hose and couplings from different manufactures, unless approved by both parties.
- Hose assembly equipment (crimpers): Hoses and fittings from one manufacturer should not generally be assembled with the equipment of another manufacturer.
- Safety Equipment: During fabrication, use proper safety equipment, including eye protection, respiratory protection, and adequate ventilation.

- Reuse of Hose and Fittings: Damaged hose and fittings shall not be used.
  - Never reuse: Field-attachable fittings that have blown or pulled off hose
  - Never reuse: Any part of hose fittings that were permanently crimped or swaged to hose
  - Never reuse: Hose that has been in service
- Cleanliness: Hose assemblies may be contaminated during fabrication. Clean hoses to specified cleanliness levels.
- Temperature: The fabrication of hose assemblies should be performed at an ambient temperature over 0 °C.
- Assembly inspection: After assembly, hose assemblies shall be inspected for visible defects and interior obstructions.
- Marking: Hose assemblies shall be marked in accordance with any relevant standards.

Hose Assembly Installation and Replacement

- Before installation inspect the hose assembly for:
  - Hose length and routing for compliance with original design
  - Correct style, size, length, and visible nonconformities
  - Coupling sealing surfaces for burrs, nicks, or other damage
- Handling during installation: Handle hose with care during installation. Kinking hose, or bending at less than minimum bend radius may reduce hose life. Avoid sharp bending at the hose/fitting juncture. Before and during installation, hose assemblies should be at a temperature above 0 °C.
- Twist angle and orientation: To avoid twisting, which shortens hose life, the hose layline can be used as a reference. Twisting can also be avoided through the use of two wrenches during the installation of swivel connectors.

Securement and protection: Install necessary restraints and protective devices. Determine that such devices do not create additional stress or wear points.

Assembly Torque: Always follow the manufacturer recommended coupling installation practices, and torque or flats values. Improper installation may result in a leaking connection.

System Checkouts: In hydraulic or other liquid systems, eliminate all air entrapment after completing the installation. Follow manufacturers' instructions to test the system for possible malfunctions and leaks.

Maintenance Inspection

As part of regular equipment maintenance, hose assemblies should always be checked for deterioration

Frequency: Evaluate factors such as the nature and severity of the application, past history, and manufacturers' information to establish the frequency of inspections.

Visual Inspection: Only visually inspect for leaks. NEVER attempt to feel a leak, which could cause a fluid injection wound. Look for leaks, weeping, hose cracking, deformation, hardening or softening, rust, noise, smells, and any other defect which indicates a hose assembly may require replacement.

Hose Storage

Age control: Store hose in a manner that facilitates age control and first-in, first-out usage based on manufacturing date on hose or hose assembly. Any hose or assembly in storage for more than two years should be visually inspected and proof pressure tested.

Storage Conditions will greatly affect hose shelf life, always store hoses in the manufacturers' original packaging. Avoid high temperatures, ozone, solvents and their vapors, corrosive (acid or basic) liquids and fumes, rodents, extremes in humidity, ultraviolet light, insects, radiation, strong, electro-magnetic fields, molds, and fungi.

Basic Testing for Usability:

Flex the hose to the minimum bend radius and compare it with new hose. After flexing, examine the cover and tube for cracks. If any appear, no matter how small, reject the hose.

If the hose is wire reinforced, and the hose is unusually stiff, or a cracking sound is heard during flexing, check for corrosion by cutting away a section of the cover from a sample. Corrosion would be another reason for rejection.

If doubt still persists, contact hose assembler to conduct proof-pressure tests or any other tests needed to verify hose quality.

References

All of the material presented here may be explored in more detail by obtaining the original standards from the appropriate regulatory agency.

Society of Automotive Engineers (SAE)

SAE J343 Test and Test Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies
SAE J514 Hydraulic Tube Fittings
SAE J517 Hydraulic Hose

International Standards Organization (ISO)

ISO 3457 Earth moving machinery—Guards and shields—Definitions and specifications
ISO 2230 Rubber products—Guidelines for storage
ISO 8331 Rubber and plastics hoses and hose assemblies—Guide to selection, storage, use and maintenance

DOT FMVSS 106-74

MOTOR VEHICLE SAFETY STANDARD FOR BRAKE HOSES

Gates has received an increasing number of inquiries about the Department of Transportation (DOT) regulation FMVSS-106 regarding air brake hose. The requirements of the standard were issued by the National Highway Traffic Safety Administration and are published in the Federal Register, 49 Code of Federal Regulations, Part 571 MVSS 106 Brake Hoses.

NOTE: Anyone making brake assemblies must be registered with the Department of Transportation.

What is FMVSS-106?

The standard is written with specifics on labeling, performance tests, tests procedures, and registration. It is not a standard for design specifications for motor vehicle brake hose, brake hose assemblies, or brake hose end fittings. The Standard No. 106 will ensure that each user of brake hose will be supplied only the highest quality of hose. DOT will conduct random performance testing in accordance with the test procedures to ensure that the hoses, couplings, and assemblies meet FMVSS 106.

"The purpose of the standard is to reduce deaths and injuries occurring as a result of brake system failure from pressure or vacuum loss due to hose or hose assembly rupture." The regulations will apply to all over-the-road vehicles including trailers and motorcycles. Off–the-road vehicles will not be regulated if they are designed to operate on those other than public roads.

Basic Provisions of FMVSS-106.

1. Three types of brake hose are covered (hydraulic, air, and vacuum brake) together with couplings and hose assemblies. At this point, we will only focus on air brake hose and assemblies.
2. Performance level for brake hose is established instead of design specifications.
3. Permanent as well as reusable fittings are permissible with air brake hose. Inside and outside diameters standards for air brake hose intended for use with field attachable couplings have been established. These hoses are identified as Type I and Type II.

Gates Customer/Assembler with Regard to FMVSS-106.

1. Test (dimensional and pressure) each assembly or per customer's requirements before it is packaged and delivered to the customer.

2. Two of every 100 air brake hose assemblies produced or per customer's requirements are subjected to hydrostatic pressure testing and tensile strength (destructive) testing.

Labeling of Air Brake Hose.

Any customer crimping air brake assemblies must be registered with the National Traffic Safety Administration (NHTSA).

The National Highway Traffic Safety Administration (NHTSA) requires:

1. Product DOT CERTIFICATION. (Gates Corporation responsibility. The Gates logo is our DOT registration.)
2. Registration of the assembler. (Customer/Distributor responsibility.)*
3. Permanent assembly identification. (Customer/Distributor responsibility.) Refer to Gates frosted air brake hose labels below.

* To begin the registration process, please complete the BRAKE HOSE REGISTRATION application form on the following page. You can mail or fax the completed form to the address and number listed on the form.

Frosted Air Brake Hose Labels

Product Number: 7484-0023

To assist you in complying with the NHTSA requirement for identifying brake hose assemblies, Gates now offers mylar hose labels.

- Self-adhesive
- 1" wide by 3-3/4" long, with a 1-1/2" by 1" white area on one end for printed information
- Format suitable for typewriters, computer printers or hand writing
- Accepts 9-10 typed characters per row, 4 or 5 on a row
- Wrap-around label resists damage from elements

Label application procedure:

1. Print appropriate information on label.
2. Wrap tag around hose assembly, printed end first.
3. Cover printed end with clear mylar tail of label.

Comes in 500 labels per pack.

Brake Hose Registration Application

"PLEASE TYPE or PRINT CLEARLY" AND SUBMIT BRAKE HOSE APPLICATION TO: JEANETTE GREENFIELD AT THE FOLLOWING NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) ADDRESS:

Jeanette Greenfield
Office of Vehicle Safety Compliance
400 Seventh Street, S.W. NSA-32
Washington, DC 20590
Phone (202) 366-5317
Fax (202) 366-1024
www.nhtsa.dot.gov

DATE:_____

BRAKE HOSE MANUFACTURER'S ADDRESS

Plant Name:_____

Post Office Box No.:_____

Street:_____

City:_____

* DESIGNATION SYMBOL(s):_____

State (Province):_____

Country:_____

Zip Code:_____

Plant Contact Person:_____

Phone Number:_____

Fax Number:_____

** (COMPLETE ONLY IF THIS IS A FOREIGN MANUFACTURER) BRAKE HOSE MANUFACTURER'S US AGENT

Agent Name:_____

Post Office Box No.:_____

Street:_____

City:_____

State:_____

Country:_____

Zip Code:_____

Agent Contact Person:_____

Agent Fax Number:_____

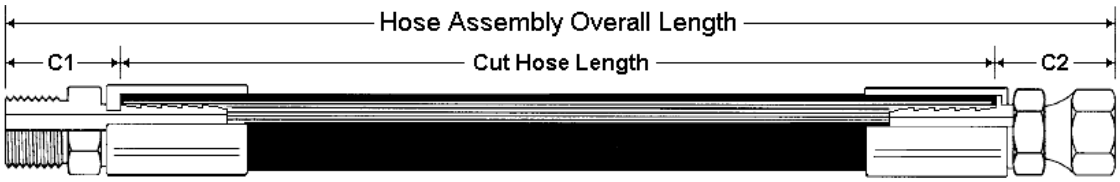
Agent Phone Number:_____

* DESIGNATION SYMBOL(s): May consist of block capital letters, numerals or a symbol.

How to Make Hose Assemblies of Specific Lengths

Overall Assembly Length – C1 – C2 = Hose Cut Length

The "C" length for each coupling is listed in the catalog, as shown below.

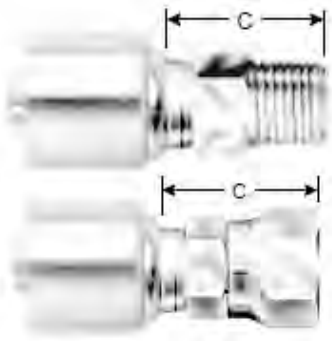


For the Gates Assembly 6M3K-8FJX-8MP-12.5

12.5" – 1.38" – 1.42" = 9.7" (Cut Hose Length)

Descr.	Prod. No.		C		
			in		mm
6G-8MP	7100-10095	3	1.42		36.1

Descr.	Prod. No.		C		
			in		mm
6GE-8FJX	7100-10955	3	1.38		35.1



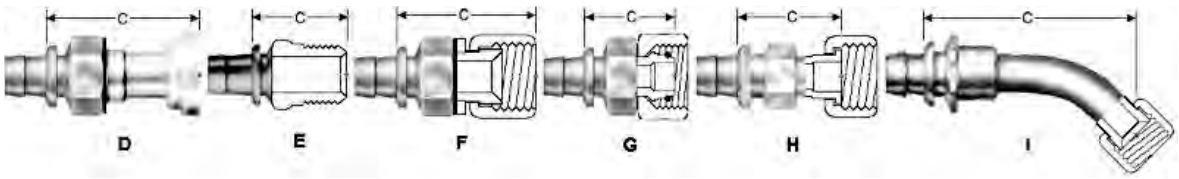
To meet SAE quality requirements: the final assembly must meet the dimensional requirements shown in the table on the right; the hose cut must be within 5° of perpendicular, on Ø 1" hose this is less than 3/32"; and coupling orientation must be within 2° of specification, orientation which is off as little as one percent can half the life of a hose assembly.

Assembly OAL (in)	Tolerance (in)
≤ 12	±0.125
12 < L ≤ 18	±0.1875
18 < L ≤ 36	±0.25
> 36	+ 1%*
*to the nearest 0.125 inches	

Assembly length tolerance (SAE J517)

Best practice to achieve these requirements is to begin by dry fitting all components of the assembly, then measure from one end of a coupling to the opposite end of the cut hose, crimp the coupling and measure the change in length. This will give a good estimate of change in hose length due to the crimping process, and allow for compensation. The use of witness marks to verify orientation and coupling insertion depth is also encouraged.

When measuring a hose assembly, the point at which the ends of the assembly are measured will depend on the style and construction of the couplings. A summary of measurement points is shown below. More detailed information is available in the tech note "Overall Length of Hose Assemblies."



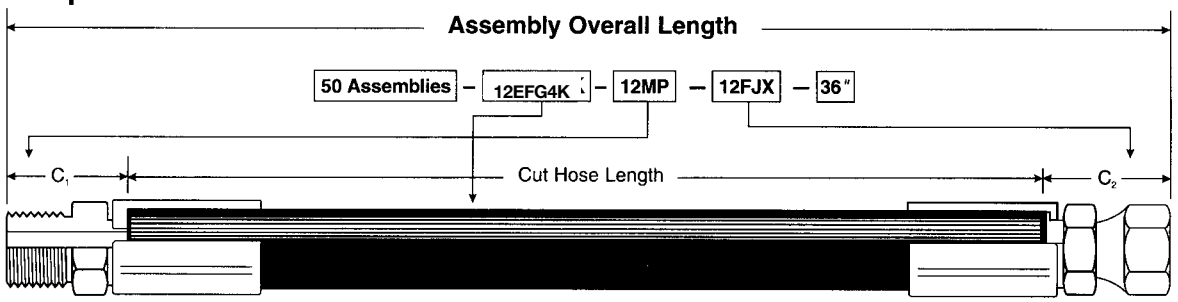
Coupling termination measurement points, from left to right: D) flange, E) straight male, F) US spec (SAE, JIC, NPSM), G) International spec(DIN, BSP, GAZ)., H) FFOR and I) bent (elbow) couplings

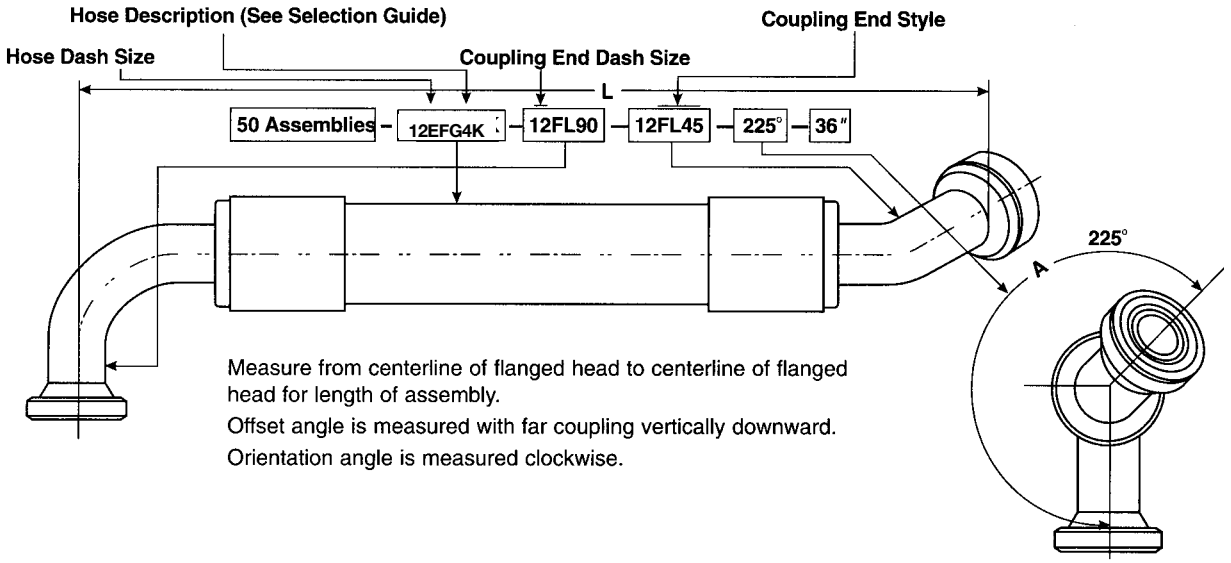
How to Describe Gates Hydraulic Hose Assemblies

When you order hydraulic assemblies, be sure the following information is included as shown in the illustrations below:

1. Quantity of assemblies required.
2. Hose catalog description (dash size and type).
3. First coupling dash size and end style.
4. Second coupling dash size and end style.
5. Offset angle or orientation of couplings must be specified if both couplings contain bent tube ends.
6. Assembly overall length.

Example:





Measure from centerline of flanged head to centerline of flanged head for length of assembly.

Offset angle is measured with far coupling vertically downward.

Orientation angle is measured clockwise.

Caution:

Rated working pressure of the application should always determine selection of hose. Used up to the recommended **rated working pressure**, the hose will provide normal service life before replacement is required.

When new, the hose described in this catalog will meet or exceed the **minimum burst pressure** listed in the hose specification tables. However—as with any hose in the industry—after the hose has been impulsed for a length of time, **minimum burst pressure** will decrease from the figure shown in the specification tables.

Temperature ranges specified for specific hoses refer to recommended temperature limits of fluids being conveyed or ambient temperatures. Exceeding these limits will cause degradation of material compounds and reduce hose service life.

How to Describe Gates Hydraulic Hose Assemblies – con't.

Coupling A Information

☐ Male ☐ Female

Angle ___° Drop: ☐S ☐M ☐L ☐XL
or Drop Length_____ (mm)

Thread

☐ JIC (37° Flare) _____
☐ NPTF _____
☐ O-Ring Boss _____
☐ Flat-Face O-Ring (ORFS) _____
☐ Code 61 _____
☐ Code 62 _____
☐ BSPP _____
☐ DIN (Light/Heavy) _____
☐ Other _____

Hose Type

Gates _____ I.D. _____
or
SAE 100R _____

Dash Size:

☐2 ☐3 ☐4 ☐5 ☐6
☐8 ☐10 ☐12 ☐16 ☐20
☐24 ☐32 ☐40 ☐48 ☐56
☐64

Temperature _____°

Working Pressure (psi):

☐100 ☐101-250
☐250-499 ☐500-1000
☐1001-2999 ☐3000-3999
☐4000-5999 ☐6000

Application

☐Return Line ☐Pressure Line
☐Intake Line ☐High Pressure Line
☐Special Fluid _____

Coupling B Information

☐ Male ☐ Female

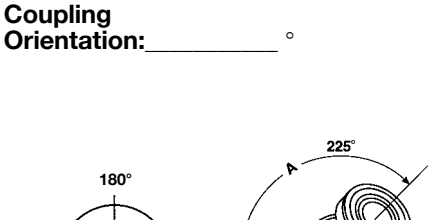
Angle ___° Drop: ☐S ☐M ☐L ☐XL
or Drop Length_____ (mm)

Thread

☐ JIC (37° Flare) _____
☐ NPTF _____
☐ O-Ring Boss _____
☐ Flat-Face O-Ring (ORFS) _____
☐ Code 61 _____
☐ Code 62 _____
☐ BSPP _____
☐ DIN (Light/Heavy) _____
☐ Other _____

Overall Length _____ ☐In. ☐mm

Coupling Orientation:_____ °



Measure from centerline of flanged head to centerline of flanged head for length of assembly.

Offset angle is measured with far coupling vertically downward.

Orientation angle is measured clockwise.

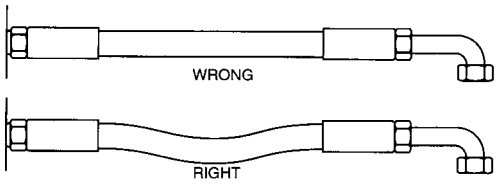
Hose Guards

	Full Length	Partial Length	From End of Coupling
LifeGuard™ Sleeve	☐	_____	_____
Wire Spring 	☐	_____	_____
Flat Armor Spring 	☐	_____	_____
Nylon Sleeve 	☐	_____	_____
Plastic Coil Sleeve 	☐	_____	_____

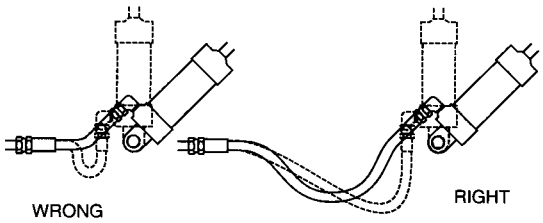
Hose Assembly Routing Tips

Proper hose installation is essential for satisfactory performance. If hose length is excessive, the appearance of the installation will be unsatisfactory and unnecessary cost of equipment will be involved. If hose assemblies are too short to permit adequate flexing and changes in length due to expansion or contraction, hose service life will be reduced.

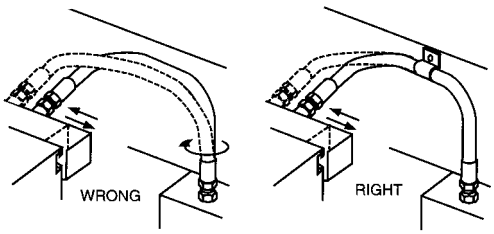
The following diagrams show proper hose installations which provide maximum performance and cost savings. Consider these examples in determining length of a specific assembly.



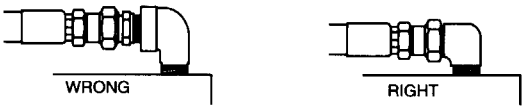
When hose installation is straight, allow enough slack in hose line to provide for length changes which will occur when pressure is applied.



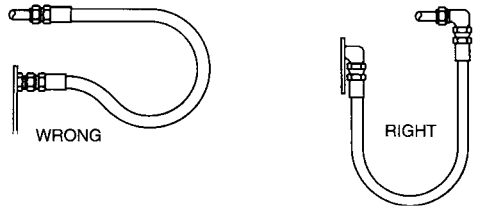
Adequate hose length is necessary to distribute movement on flexing applications and to avoid abrasion.



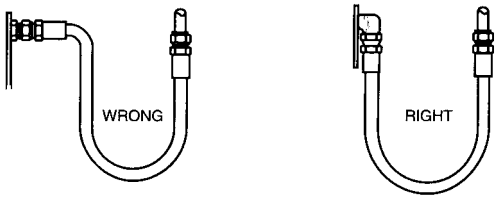
Avoid twisting of hose lines bent in two planes by clamping hose at change of plane.



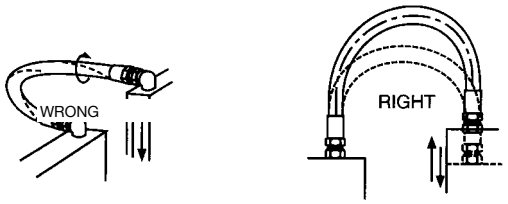
Reduce number of pipe thread joints by using hydraulic adapters instead of pipe fittings.



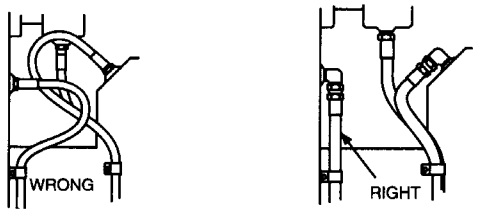
When radius is below the required minimum, use an angle adapter to avoid sharp bends.



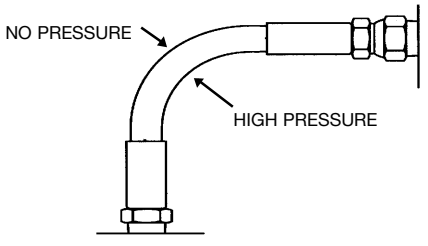
Use proper angle adapters to avoid tight bend in hose.



Prevent twisting and distortion by bending hose in same plane as the motion of the port to which hose is connected.

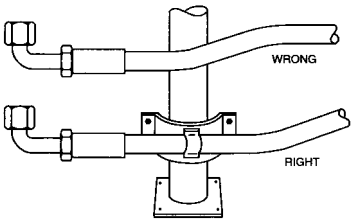


Route hose directly by using 45° and/or 90° adapter and fittings. Avoid excessive hose length to improve appearance.

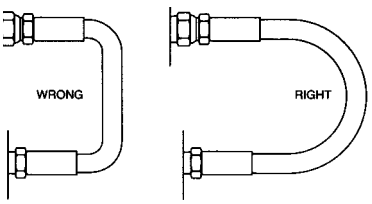


Note: To allow for length changes when hose is pressurized, do not clamp at bends so that curves will absorb changes. Do not clamp high and low pressure lines together.

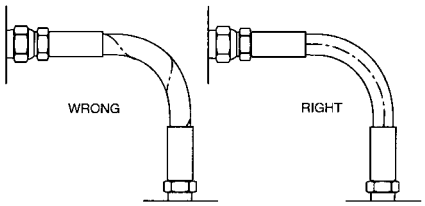
Hose Assembly Routing Tips – con't.



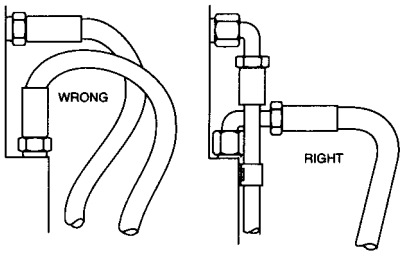
High ambient temperatures shorten hose life, so make sure hose is kept away from hot parts. If this is not possible, insulate hose.



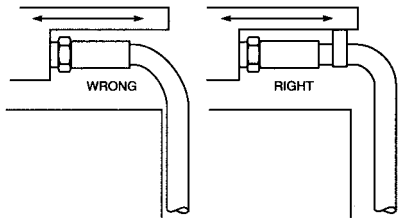
To avoid hose collapse and flow restriction, keep hose bend radius as large as possible. Refer to hose specification tables for minimum bend radius.



When installing hose, make sure it is not twisted. Pressure applied to a twisted hose can result in hose failure or loosening of connections.



Elbows and adapters should be used to relieve strain on the assembly, and to provide neater installations which will be more accessible for inspection and maintenance.



Run hose in the installation so that it avoids rubbing and abrasion. Often, clamps are required to support long hose runs or to keep hose away from moving parts. Use clamps of the correct size. A clamp too large allows hose to move inside the clamp and causes abrasion.

Hydraulic Flareless Assembly Procedure (per SAE J514 6.1.3 & 6.1.4)

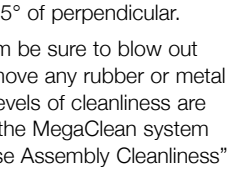
1. Bottom the tube in the coupling, and tighten the nut until the ferrule just grips the tube. With a little experience, the technician can determine this point by feel. If the couplings are bench assembled, the gripping action can be determined by rotating the tube by hand as the nut is drawn down. When the tube can no longer be turned by hand, the ferrule has started to grip the tube.
2. After the ferrule grips the tube, tighten the nut one full turn. This may vary slightly with different tubing materials, but for general practice, it is a good rule for the technician to follow.

Gates Field Attachable Coupling Installation

1. Cut the hose end square with fine-tooth hacksaw or cut-off saw, the cut must be within 5° of perpendicular.

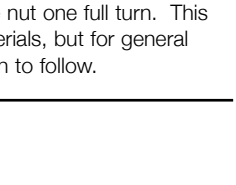
2. At a minimum be sure to blow out the hose to remove any rubber or metal dust, if higher levels of cleanliness are required utilize the MegaClean system or see the "Hose Assembly Cleanliness" tech note.

3. Be sure to thoroughly oil the stem and the inside of the hose. This is critical to ensure that the ferrule and stem are easily placed onto the hose, without removing tube or cover material.



4. Secure the ferrule in a vise or adjustable wrench, then using a clockwise motion, thread the hose into the socket until it bottoms out on the inside shoulder of the socket. Once fully inserted, using a counter-clockwise motion, turn the hose back one half turn.

5. With the hose and ferrule secured, thread the stem into the hose and socket in a clockwise motion until the stem hex contacts the ferrule. For production environments, a Gates field attachable coupling machine will speed up this installation.



6. Final clean the assembly to ensure that the desired cleanliness levels are achieved. Follow the same procedure as in step 2.

Installation of LifeGuard™ Line-of-Sight Sleeving

1. Determine LifeGuard sleeve length using the following guidelines:

Sleeve length should exceed the length of free hose (distance between clamps that hold sleeve on) by the following amount:

LifeGuard Sleeve Length = Free Hose Length (in) x 1.05

All the decimals are rounded **up** to a full inch

For example: 11 ¾" free hose length x 1.05 = 12.34" ~ 13" LifeGuard sleeve length

Note: A minimum of ¾" of sleeve must extend beyond the clamps to properly clamp the sleeve. Sleeve cannot extend over the hex part of the fitting.

2. A hot knife is recommended to cut the sleeve as it will seal the ends as it cuts and keep the sleeving from unraveling. Gates also sells a guide table which keeps the sleeving in the correct, slightly open position to help simplify this process. Failure to use the guide table with the hot knife could result in both edges of the sleeve being melted together, which in turn makes hose insertion impossible.

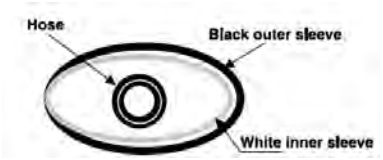
If a hot knife is not available, cut sleeve with sharp scissors, and seal the edges of the sleeve to prevent unraveling and to strengthen it. Use flame torch to seal the inside white lining to the black outer sheath. Make sure sleeve end is spread apart before sealing ends with flame.

3. Before inserting the stems and crimping, verify whether the LifeGuard sleeve and collars can be installed after the couplings are crimped or must be installed prior to crimping the couplings.

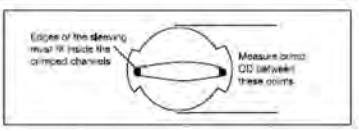
a. If the collars will fit over at least one of the couplings and also clear the backup hex nut, then the sleeve and collars can be assembled after the hose assembly is completely crimped.

b. If the collars will not freely clear the termination and backup hex of at least one of the stems, then the sleeve and collars must be slid over the hose before crimping. In certain cases it may be desirable to do this anyway, even if the collars will fit. (An example would be when an assembly that uses long drop 90° couplings at both ends.)

4. The LifeGuard line-of-sight sleeve consists of two sleeves woven one inside the other. When inserting the hose, it is critical that the hose is positioned inside the white inner sleeve. Be careful not to snag the inside lining of the sleeve while inserting hose. If hose does not glide in easily, use hose insertion tool.



6. The aluminum collars must be free of burrs, sharp edges, gash marks and surface cracks/indentations. Embossing of these collars is permissible. The crimp OD for the aluminum collars depends on the hose type and ferrule used. Look up the proper crimp OD in eCrimp (http://www.gates.com/ecrimp). The collars are listed numerically by product number. Match the collar product number to the hose type and ferrule product number being used. The collar crimp OD is listed in the table, directly to the right of the ferrule product number for each combination.



Note: Use PC707 LifeGuard die plate when making assemblies.

Note: The crimp OD tolerance for all aluminum collars used to hold LifeGuard line-of-sight nylon sleeving on hose assemblies is ±.005".

WARNING: Extra care must be taken when aligning the back-up hex of the coupling with the crimp dies during crimping of the LifeGuard assembly. Improperly positioned back-up hex can damage the die face.

8. Install proper die sets by first positioning the die plate in such manner as to let the notches rest against the back locator pins on the PC707 crimper. Then install the recommended die set taking extra care that the two die pins fit inside the two holes in the die plate.

9. Dial in crimp setting and crimp sleeve onto one end of the hose assembly.

10. To take the slack out of the sleeve, roll or twist the hose. This will take-up the excess in the sleeve, and help with crimping the other end of the assembly.

11. Pull back any remaining excess of the sleeve. Hold it in place and crimp the other end of the assembly.

12. LifeGuard crimp collars require specialized dies for their installation, since the final form of the collar is very different from a standard crimp. When crimping LifeGuard with the GC32-XD or FP120 crimper, use eCrimp to determine the appropriate die and setting based on the hose and coupling to which it is to be attached. Once the die has been selected, care must be taken to ensure the die fingers are installed correctly. When using the LifeGuard die set, the fingers are properly aligned when the colored stripe forms a straight line across the die.

CG32-XD

FP-120

13. Your LifeGuard assembly is now ready to go.

Coupling Selection

End Configuration Selection

It is important to keep in mind that the hose assembly (coupling and hose) is only one component of the system. In choosing the correct end terminations for the couplings attached to the hose, formal design standards and sound engineering judgement should be used.

In the absence of formal design standards, consider the following factors in choosing the proper end termination:

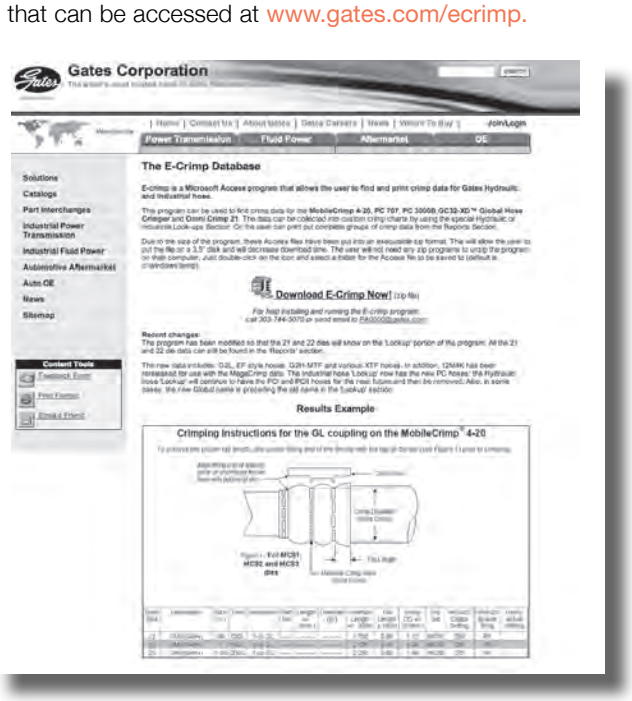
- Pressure
- Impulse frequency, amplitude and wave form
- Vibration
- Corrosion
- Dissimilar metals (galvanic corrosion)
- Maintenance procedures and frequency
- Installation reliability
- Connection's risk in the system
- Exposure to the elements
- Operator's and/or bystander's exposure to the connection
- Installation, operation and service activities and practices that affect safety

If there are any questions as to what end fittings should be used, Gates recommends that you consult your field sales representative or the Gates Hose and Connector Product Application Group for assistance.

Stem and Ferrule Selection

Choosing the proper stem and ferrule depends on the specific hose and termination to be used in the assembly. Check the Gates Crimp Data Manual to ensure proper hose assembly components and crimp specifications.

Gates also offers eCrimp™, an online crimp database that can be accessed at www.gates.com/ecrimp.

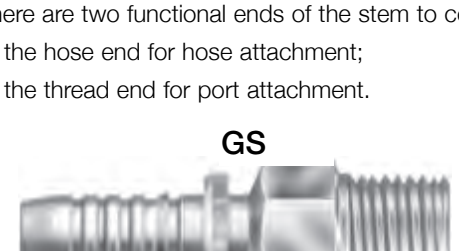


After determining the proper coupling components, refer to the Table of Contents in this catalog to find the proper coupling section. The ferrules are at the end of each coupling section.

Stem Selection

Different hoses may require different coupling styles.
To make your selection, determine the correct stem to be used.
There are two functional ends of the stem to consider:

1. the hose end for hose attachment;
2. the thread end for port attachment.



References to the coupling type(s) recommended for a specific hose are listed on the individual hose data pages; for example, EFG5K hose specifies GS couplings.

The thread end of a coupling (or adapter) can be identified by comparing the coupling being replaced or by measuring the port or thread end to which it is to be attached.

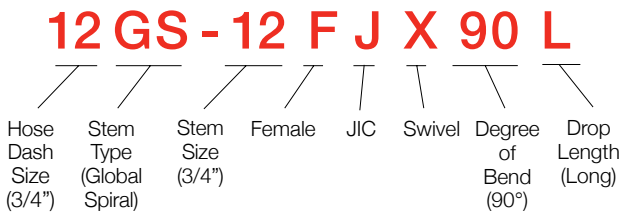
See thread end identification nomenclature.

Coupling Selection – con't.

Coupling and Adapter End Style Nomenclature

Gates couplings feature a meaningful description by combining end-style codes shown below that make thread end identification fast and easy. Always refer to Gates Crimp Data Manual when selecting hose and coupling combinations.

In the following example, the Gates description 12GS-12FJX90L identifies a GlobalSpiral™ Female JIC Swivel 90° Bend Long Drop coupling for -12 (3/4") hose size and -12 (3/4") stem size.



Code	Description
A	Adapterless
AB	Air Brake
API	API Unions
B	Brass
BBDS	British Bonded Seal
BJ	Banjo
BKHD	Bulkhead
BL	Block
BS	Bite Sleeve
BSPP	British Standard Pipe Parallel
BSPT	British Standard Pipe Tapered
C	Caterpillar Flang
CC	Clamping Collar
DH	DIN Heavy
DL	DIN Light
F	Female
FABX	Female Air Brake Swivel
FBFFOR	Female British Flat-Face O-Ring
FBO	Female Braze-on Stem
FF	Flat-Face
FFGX	Female French GAZ Swivel (Female Kobelco)
FFN	Female Flareless Nut
FOR	Flat-Face O-Ring
FFS	Female Flareless Sleeve
FG	Female Grease Thread
FKX	Female Komatsu Style Swivel
FL	Code 61 O-Ring Flange
FLC	Caterpillar Style O-Ring Flange
FLH	Code 62 O-Ring Flange Heavy
FLOS	Flange O-Ring Special
FT	Female SAE Tube
HLE	Hose Length Extender
HLEC	Hose Length Extender (Caterpillar)
HM	Hose Mender
HU	Hammer Union
I	Inverted Flare
J	JIC (37° Flare)
JIS	Japanese Industrial Standard
K	Komatsu Style (Japanese 30° Seat)

Code	Description
LH	Long Hex
LN	Lock Nut
M	Male
MB	Male Boss
MBAX	Male Boss Adapterless Swivel
MBDS	Metric Bonded Seal
MFA	Male Flareless Assembly (Ermeto)
MFG	Male French GAZ
MKB	Metric Kobelco
MM	Metric Male
MN	Metric Nut
MPG	Male Special Grease Fitting
MPLN	Male Pipe Long Nose
MLSP	Metric Light Stand Pipe
MSP	Metric Stand Pipe
NASP	North American Stand Pipe
OR	O-Ring
P	Pipe Thread (NPTF or NPSM)
PL	Press Lok®
PT	Port
PWX	Pressure Washer Swivel
QLD	Quick-Lok® Direct
QHD	Quick-Lok® High
R	Field Attachable
S	SAE (45° Flare)
SP	Special
SS	Stainless Steel
TS	Tube Sleeve
TSN	Tube Sleeve Nut
X	Swivel
Z	Parker Triple Thread
22	22-1/2° Bent Tube Angle
30	30° Bent Tube Angle
45	45° Bent Tube Angle
60	60° Bent Tube Angle
67	67-1/2° Bent Tube Angle
90	90° Bent Tube Angle
110	110° Bent Tube Angle
135	135° Bent Tube Angle

Coupling Selection – continued

Thread End Dash Sizes, Descriptions and Dimensions

Coupling Dash Size and End Style

Coupling dash size is a shorthand method of denoting the size of a particular end fitting (see Thread Chart).

EXAMPLE: 12MP denotes a 3/4" male pipe thread end fitting. The corresponding thread description for a 3/4" pipe thread is 3/4 -14 NPTF solid male.

EXAMPLE: 12FJX denotes a 3/4" female JIC swivel (37° seat) end fitting. The corresponding thread description for a 3/4" JIC thread is 1-1/16 – 12 JIC 37° flare swivel female.

EXAMPLE: 12FL denotes a 3/4" SAE standard pressure (Code 61) flange fitting. This is the standard fitting description for a 3/4" SAE standard pressure flange.

Termination Drop Lengths

Bent tube couplings carry a suffix designation that specifies the degree of bend and the length of the drop.

For example, a **12FJX90S** is a female JIC swivel with a 90 degree bend. The "S" designates an SAE J516 short drop length. The short and long drops are specified in SAE J516. Flat-face and metric couplings meet ISO-12151-1 drop length specifications. Medium drops are not specified and can vary from manufacturer to manufacturer.

S – Short Drop

M – Medium Drop

L – Long Drop

XL – Extra Long Drop

Special, non-industry standard drop lengths are designated with a numerical suffix instead of the S, M, L code. For example, a **12FJX90-075** designates a 75mm drop.

SAE J516 Drop Length Specifications

JIC 37°, Code 61, Code 62

Hose Size	Short Drop (mm)	Long Drop (mm)
-4	17.3	45.7
-6	21.6	55.4
-8	27.7	61.7
-10	31.2	65.3
-12	46.2	94.7
-16	54.4	110.0

ISO Drop Length Specifications

ISO 12151-S JIC and ISO 12151-3 Code 61 & Code 62

Hose Size	Short Drop (mm)	Medium Drop (mm)	Long Drop (mm)
-4	21	32	46
-6	23	38	54
-8	29	41	64
-10	32	47	80
-12	48	58	86
-16	56	71	114
-20	64	78	129
-24	69	76	129

Thread End Catalog Descriptions

Gates coupling ends shown on the following pages are accepted as industry standards. See detailed catalog listings for availability of specific hose/coupling combinations, detailed descriptions, thread end configurations such as swivels, bent tubes and special ends.

Sealing Types for Hydraulic Couplings

When identifying hydraulic couplings, it is important to identify the type of seal made. There are three major types of coupling interfaces used in hydraulics today: Thread Interface, O-Rings and Mated Angle or Mechanical Joint. These three interfaces have developed differently in different parts of the world. In the following pages, country of origin and the coupling styles found in each country are identified. Brief descriptions and dimensional data help identify your particular coupling style.

Identifying couplings is as easy as 1-2-3!

1. Determine Seal Type.

- Thread Interference
- O-Ring
- Mated Angle or Mechanical Joint
- Mated Angle with O-Ring

Thread Interference. A characteristic of this thread is that the male is thinner at the front than it is at the back. As the male is threaded into the female, the edges of the thread distort by flattening out. This distortion creates the seal.

O-Ring. The O-ring on the male being compressed against the corresponding female makes this seal. This type of seal is excellent for high-pressure applications. The threads pull the fitting against the port, trap the O-ring and flatten it to form a tight seal.

Mated Angle or Mechanical Joint. Different angles are used to create the seal. The seal takes place where the two angles meet and are wedged into one another. These can be cut with the angle either being inverted or standard. Standard seat couplings have the nose angle of the male on the outer surface of the coupling. Inverted seat couplings contain the nose angle of the male on the inside bore of the coupling.

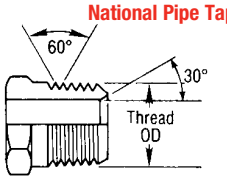
Mated Angle with O-Ring. These couplings are a hybrid, which use both the mated angle and the O-ring to make the seal.

2. Visual Identification.

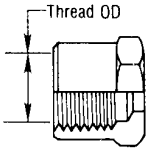
Thread Interference. These are the easiest because the only factor here is whether the termination is male or female. Couplings that use this seal are:

TAPERED THREAD

National Pipe Tapered

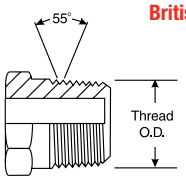


NPTF
Solid Male (MP)

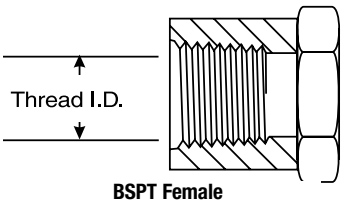


NPTF or NPSF
Solid Female (FP)

British Standard Pipe Tapered



BSPT Male (MBSPT)

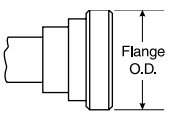


BSPT Female

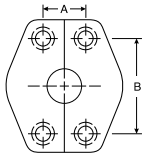
O-Ring. Two determinations are needed:
A. O-Ring Location – Flange Groove, Outside, or on the Nose Seat
B. Coupling Termination – Male or Female

O-Ring Location

Flange Groove
O-Ring Flange - SAEJ1518

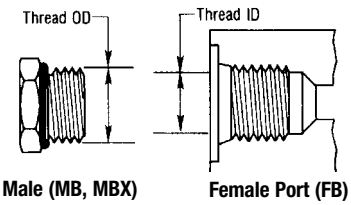


Flange Head
(FL/FLH, FLC)



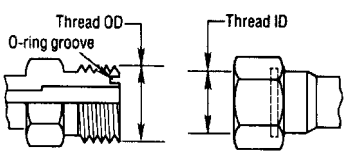
4-Bolt Split Flange

Outside
O-Ring Boss



Male (MB, MBX)

Female Port (FB)



Male (MFFOR)

Female (FFORX)

Sealing Types for Hydraulic Couplings – Continued

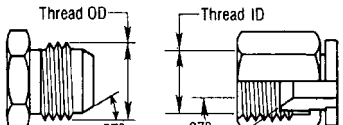
2. Visual Identification - Continued

Mated Angle or Mechanical Joint. Determine:

A. Nose Seat – Standard or Inverted
B. Seat Angle (See Measuring Seat Angles)
C. Coupling Termination

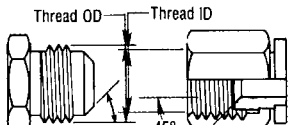
Standard Nose Seat

JIC 37° Flare



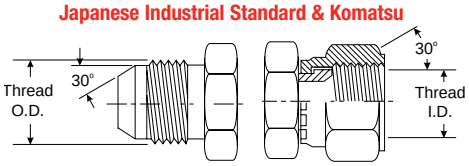
JIC 37° Male (MJ, MJLN)
JIC 37° Flare Swivel Female (FJX)

SAE 45° Flare



SAE 45° Flare Male (MS)
SAE 45° Flare Swivel Female (FSX)

Japanese Industrial Standard & Komatsu

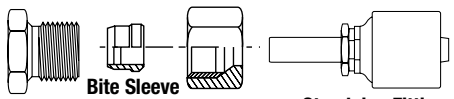


Male (MJIS, MK)
Female (FJIS, FKX)

37° Seat Angle | 45° Seat Angle | 30° Seat Angle

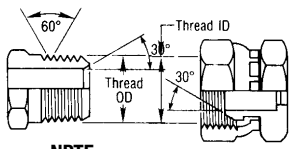
Inverted Nose Seats

North American or Metric Stand Pipe & Male Flareless Assembly



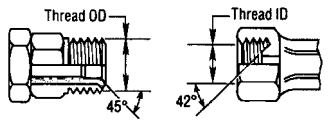
Male Fitting Body
Bite Sleeve
Nut
Standpipe Fitting (NASP, MSP, MFA)

National Pipe Straight Mechanical



NPTF Solid Male (MP)
NPSM Swivel Female (FPX)

SAE Inverted Flare



SAE Inverted Flare Swivel Male (MIX)
SAE Inverted Flare Solid Female

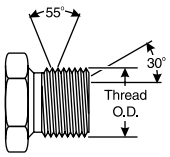
24° Seat Angle | 30° Seat Angle | 45° Seat Angle

Mated Angle with O-Ring. Determine:

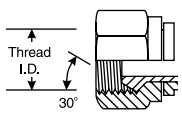
A. O-Ring Location
B. Nose Seat
C. Seat Angle (See Measuring Seat Angles)
D. Coupling Termination

Inside O-Ring Location with Inverted Nose Seat

British Standard Pipe Parallel

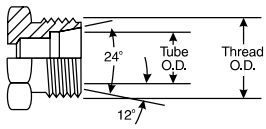


BSPP Male (MBSPP)

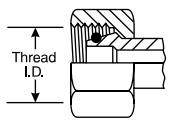


BSPOR Female (FBSPORX)

DIN 24° Cone



Male 24° Cone, DIN 2353 (MDL/MDH)



Female 24° Cone with O-Ring (FDLORX/FDHORX)

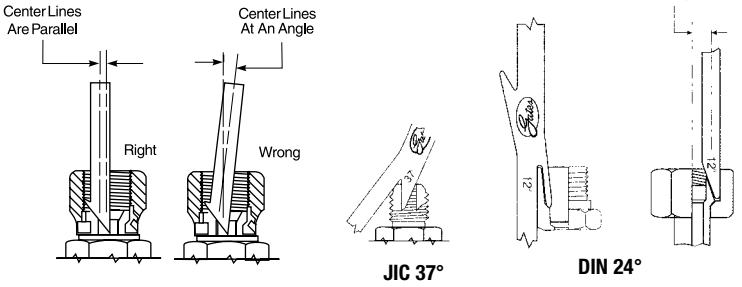
30° Cone Seat | 24° Cone Seat

For a wall poster representation of this information, order literature form number 35040.

Sealing Types for Hydraulic Couplings – Continued

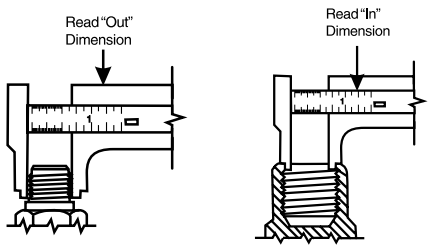
Measuring Seat Angles
Using the seat gauge, determine the angle of the seat, as illustrated. When the centerline of the seat gauge extends parallel with the projected longitudinal axis of the coupling, then the angles of the gauge and seat match.

NOTE: Thread binding will occur when different thread configurations are used. DO NOT mix thread configurations.

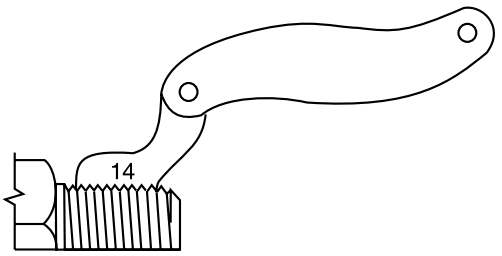


3. Measure Threads.

Because some couplings have very similar characteristics, the only way to determine the correct identification is by measuring the thread. Follow the procedure below when measuring coupling threads:



With the caliper measure the thread diameter of the largest point. (Outside diameter (O.D.) of male threads—Inside Diameter (I.D.) of female threads.)



Using the thread gauge, determine the number of threads per inch. Comparison of gauge and coupling threads against a lighted background will ensure an accurate reading.

Match the measurements taken above against those in the following tables that appear to be similar to the coupling under consideration.

Gates provides many useful tools to assist you in identifying the right coupling!

Coupling/Thread Identification Tools

Hydraulic Coupling Templates

Industrial Advertising Number: 39549

These templates provide a fast and easy way to measure North American threads, International threads, flange ends, seat angles (37° and 45°) and hose I.D.

Stainless Steel Digital Caliper

Product Number: 7369-0322

Caliper features an easy-to-read LCD screen clearly displaying the crimp diameter digitally. Capable of four-way measurement: inside, outside, depth and step. Constructed of hardened stainless steel and comes in a handy, protective carrying case.

International Thread Identification Kit

Product Number: 7369-0319

A sturdy, attractive carrying case suitable for counter display and field sales calls. Contains male metric and BSP plugs for identifying thread size, pocket thread I.D. kit, and flow chart with step-by-step instructions. For female thread identification, simply couple with the mating male.

Pocket Thread Identification Kit

Product Number: 7369-4318

To properly identify the correct replacement couplings, the measuring tools shown here should be used.

Contents:
- Calipers
- Seat Gauges (English)
- Seat Gauges (Metric)
- Thread Gauges
- Thread I.D. Guide.

Thread Chart

For All Hose I.D.'s Except C5 Series, C14 and AC134a.

DASH SIZE	2	3	4	5	6	7	8	10	12	14	16	20	24	32	40	48
NPTF Pipe Thread	1/8–27		1/4–18		3/8–18		1/2–14		3/4–14		1–11 1/2	1 1/4–11 1/2	1 1/2–11 1/2	2–11 1/2	2 1/2–8	3–8
NPSM Swivel Thread	1/8–27		1/4–18		3/8–18		1/2–14		3/4–14		1–11 1/2	1 1/4–11 1/2	1 1/2–11 1/2	2–11 1/2		
JIC 37° Flare Thread	5/16–24	3/8–24	7/16–20	1/2–20	9/16–18		3/4-16	7/8–14	1 1/16–12	1 3/16–12	1 5/16–12	1 5/8–12	1 7/8–12	2 1/2–12	3–12	3 1/2–12
SAE 45° Flare Thread	5/16–24	3/8–24	7/16–20	1/2–20	5/8–18	11/16–16	3/4-16	7/8–14	1 1/16–14							
SAE O-Ring Thread	5/16–24	3/8–24	7/16–20	1/2–20	9/16–18		3/4-16	7/8–14	1 1/16–12	1 3/16–12	1 5/16–12	1 5/8–12	1 7/8–12	2 1/2–12		
Flat-Face Thread			9/16–18		11/16-16		13/16-16	1–14	1 3/16–12		1 7/16–12	1 11/16–12	2–12			
Inverted Flare Thread	5/16-28	3/8–24	7/16–24	1/2–20	5/8–18	11/16–18	3/4–18	7/8–18	1 1/16-16							
Compression Thread	5/16–24	3/8–24	7/16–24	1/2–24	9/16–24	5/8–24	11/16–20	13/16–18	1–18							
Code 61 Flange Head O.D.							1.19	1.335	1.50		1.75	2.00	2.38	2.81	3.31	4.00
Code 62 Flange Head O.D.							1.25		1.62		1.88	2.12	2.50	3.12		
BSPP Thread	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		
BSPT Thread	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		
Japanese Pipe Tapered Thread	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		
Japanese Flare Thread	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		
Copper/Nylon Air Brake Thread			7/16–24		17/32–24		11/16–20	13/16–18	1–18							

METRIC (mm)	6	8	10	12	13	14	15	16	17	18	20	21	22	24	25	27	28	30	34	35	38	42
MDL	M12X1.5	M14X1.5	M16X1.5	M18X1.5		M20X1.5	M22X1.5			M26X1.5			M30X2.0				M36X2.0			M45X2.0		M52X2.0
MDH		M16X1.5	M18X1.5	M20X1.5		M22X1.5		M24X1.5			M30X2.0				M36X2.0			M24X2.0			M52X2.0	
Komatsu	M18X1.5	M22X1.5	M24X1.5	M30X1.5				M33X1.5			M36X1.5			M42X1.5								
GAZ*					M20X1.5				M24X1.5			M30X1.5				M36X1.5			M45X1.5			M52X1.5

*Gaz sizes are for catalog reference purposes, actual tube sizes are 13.25, 16.75, 21.25, 26.75, 33.5, 42.25

Coupling Identification

There are five coupling systems generally used for hydraulic connections today. They are identified geographically or by country as:

North American
British
French
German
Japanese

This section lists the origin and coupling style found in each country. Brief descriptions and dimensional data follows each coupling style.

North American Thread Types

Iron Pipe Thread Abbreviations

N National
P Pipe
S Straight Thread
T Tapered Thread
F Fuels
M Mechanical Joint

NPTF

National Pipe Tapered thread for Fuel is a dryseal thread. It is used for both male and female ends.

The NPTF male will mate with the NPTF, NPSF, or NPSM female.

The NPTF male has tapered threads and a 30° inverted seat. The NPTF female has tapered threads and no seat. The seal takes place by deformation of the threads. The NPSM female has straight threads and a 30° inverted seat. The seal takes place on the 30° seat.

The NPTF connector is similar to, but not interchangeable with, the BSPT connector. The thread pitch is different in most sizes. Also, the thread angle is 60° instead of the 55° angle found on BSPT threads.

NPT Pipe Thread

NPTF Solid Male (MP, MPLN)

NPTF or NPSF Solid Female (FP)

NPSM Swivel Female (FPX)

NPSF

National Pipe Straight thread for Fuels is sometimes used for female ends and properly mates with the NPTF male end. However, SAE recommends the NPTF thread in preference to the NPSF for female ends.

NPSM

National Pipe Straight thread for Mechanical Joint is used on the female swivel nut of iron pipe swivel adapters. The leak-resistant joint is not made by the sealing fit of threads, but by a tapered seat in the coupling end.

Dash Size	Nominal Size (In.)	No. Threads per Inch	Female Thread I.D. (In.)	Male Thread O.D. (In.)	Max. Torque Recommendation for Dry NPTF* (Ft. Lbs.)
-2	1/8	27	23/64	13/32	20
-4	1/4	18	15/32	35/64	25
-6	3/8	18	19/32	43/64	35
-8	1/2	14	3/4	27/32	45
-12	3/4	14	61/64	1-1/16	55
-16	1	11-1/2	1-13/64	1-5/16	65
-20	1-1/4	11-1/2	1-17/32	1-43/64	80
-24	1-1/2	11-1/2	1-25/32	1-29/32	95
-32	2	11-1/2	2-1/4	2-3/8	120

*NOTES:

1. Torque values can vary considerably depending on thread condition. Use only enough torque to achieve adequate sealing.
2. With female straight or parallel pipe threads (NPSM), maximum values are 50 percent of those listed in the table.
3. If thread sealant is used, maximum values shown should be decreased by 25 percent.

Coupling Identification

North American Thread Types (con't.)

*JIC (37° Flare)

The Society of Automotive Engineers (SAE) specifies a 37° angle flare or seat be used with high pressure hydraulic tubing. These are commonly called JIC couplings.

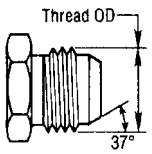
The JIC 37° flare male will mate with a JIC female only.* The JIC male has straight threads and a 37° flare seat. The JIC female has straight threads and a 37° flare seat. The seal is made on the 37° flare seat.

Some sizes have the same threads as the SAE 45° flare. Carefully measure the seat angle to differentiate.

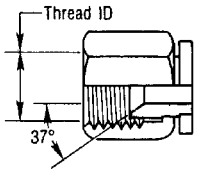
***Note:** Some C5, C5E and Lock-On couplings may have dual machined seats (both 37° and 45° seats).*

Dash Size	Nominal Size (In.)	Thread Size	Female Thread	Male Thread	Steel Torque Recommendation (Ft. Lbs.)	
			I.D. (In.)	O.D. (In.)	Min.	Max.
-2	1/8	5/16 – 24	17/64	5/16	–	–
-3	3/16	3/8 – 24	21/64	3/8	–	–
-4	1/4	7/16 – 20	25/64	7/16	10	11
-5	5/16	1/2 – 20	29/64	1/2	13	15
-6	3/8	9/16 – 18	1/2	9/16	17	19
-8	1/2	3/4 – 16	11/16	3/4	34	38
-10	5/8	7/8 – 14	13/16	7/8	50	56
-12	3/4	1-1/16 – 12	31/32	1-1/16	70	78
-14	7/8	1-3/16 – 12	1-7/64	1-3/16	–	–
-16	1	1-5/16 – 12	1-15/64	1-5/16	94	104
-20	1-1/4	1-5/8 – 12	1-35/64	1-5/8	124	138
-24	1-1/2	1-7/8 – 12	1-51/64	1-7/8	156	173
-32	2	2-1/2 – 12	2-27/64	2-1/2	219	243

JIC 37° Flare



JIC 37° Male (MJ)



JIC 37° Flare Female (FJX)

*SAE (45° Flare)

A term usually applied to fittings having a 45° angle flare or seat. Soft copper tubing is generally used in such applications as it is easily flared to the 45° angle. These are for low-pressure applications—such as for fuel lines and refrigerant lines.

The SAE 45° flare male will mate with an SAE 45° flare female only or a dual seat JIC/SAE 45°.*

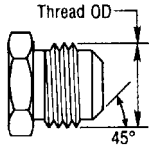
The SAE male has straight threads and a 45° flare seat. The SAE female has straight threads and a 45° flare seat. The seal is made on the 45° flare seat.

Some sizes have the same threads as the SAE 37° flare Carefully measure the seat angle to differentiate.

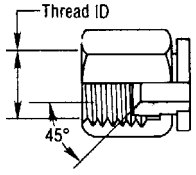
***Note:** Some C5, C5E and Lock-On couplings may have dual machined seats (both 37° and 45° seats).*

Dash Size	Nominal Size (In.)	Thread Size	Female Thread	Male Thread	Steel Torque Recommendation (Ft. Lbs.)	
			I.D. (In.)	O.D. (In.)	Min.	Max.
-2	1/8	5/16 – 24	17/64	5/16	–	–
-3	3/16	3/8 – 24	21/64	3/8	–	–
-4	1/4	7/16 – 20	25/64	7/16	10	11
-5	5/16	1/2 – 20	29/64	1/2	13	15
-6	3/8	5/8 – 18	9/16	5/8	17	19
-7	7/16	11/16 – 16	5/8	11/16	–	–
-8	1/2	3/4 – 16	11/16	3/4	34	38
-10	5/8	7/8 – 14	13/16	7/8	50	56
-12	3/4	1-1/16 – 14	63/64	1-1/16	70	78

SAE 45° Flare



SAE 45° Flare Male (MS)



SAE 45° Flare Swivel Female (FSX)

Special Power Steering Thread End

Dash Size	Nominal Size (In.)	Thread Size	Female Thread	Male Thread
			I.D. (In.)	O.D. (In.)
-6	3/8	11/16 – 18	5/8	11/16

Coupling Identification

North American Thread Types (con't.)

O-Ring Boss

The O-ring boss male will mate with an O-ring boss female only. The female is generally found on ports.

The male has straight threads, a sealing face and an O-ring. The female has straight threads and a sealing face. The seal is made at the O-ring on the male and the sealing face on the female.

Dash Size	Nominal Size (In.)	Thread Size	Female Thread	Male Thread	O-Ring		Steel Torque Recommendations (Ft. Lbs)			
							Below 4,000 psi Working Pressure		Above 4,000 psi Working Pressure	
			I.D. (In.)	O.D. (In.)	I.D. (In.)	DESCR	Min.	Max.	Min.	Max.
-2	1/8	5/16 – 24	17/64	5/16	0.239	–	–	–	–	–
-3	3/16	3/8 – 24	21/64	3/8	0.301	30R	–	–	8	10
-4	1/4	7/16 – 20	25/64	7/16	0.351	40R	14	16	14	16
-5	5/16	1/2 – 20	29/64	1/2	0.414	50R	–	–	18	20
-6	3/8	9/16 – 18	1/2	9/16	0.468	60R	24	26	24	26
-8	1/2	3/4 – 16	11/16	3/4	0.644	80R	37	44	50	60
-10	5/8	7/8 – 14	13/16	7/8	0.755	100R	50	60	72	80
-12	3/4	1-1/16 – 12	31/32	1-1/16	0.924	120R	75	83	125	135
-14	7/8	1-3/16 – 12	1-7/64	1-3/16	1.048	140R	–	–	160	180
-16	1	1-5/16 – 12	1-15/64	1-5/16	1.171	160R	111	125	200	220
-20	1-1/4	1-5/8 – 12	1-35/64	1-5/8	1.475	200R	133	152	210	280
-24	1-1/2	1-7/8 – 12	1-51/64	1-7/8	1.720	–	156	184	270	360
-32	2	2-1/2 – 12	2-27/64	2-1/2	2.337	–	–	–	–	–

SAE Straight Thread O-Ring Boss

O-Ring Boss Male (MB, MBX)

O-Ring Boss Female Port (FB)

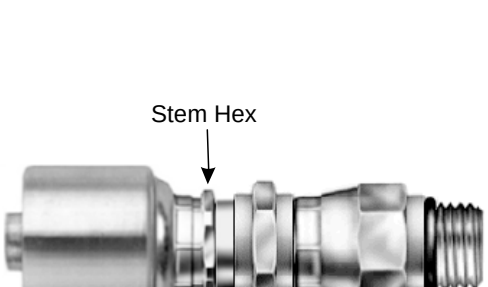
Gates Adapterless—MBAX

The Gates Adapterless coupling is designed for use in OEM assembly line applications. It eliminates the need for an adapter by directly connecting into the port, which reduces the number of possible leak points and reduces installation labor. It allows easy installation and eliminates the troubles of alignment on bent tube assemblies. It eliminates the performance limitations of the traditional male swivel. A jam nut locks the coupling into place.

Assemblies using the Gates Adapterless coupling can be serviced by replacing the assembly with an MB adapter in the port and a standard end termination (for example, an MB-MJ adapter and FJX couplings).

WARNING: *The tightening of the jam nut is* ***absolutely critical*** *to performance so that the Adapterless coupling does not become a "live swivel". A live swiveling condition can cause wearing of the internal seals and result in leaks.*

The Gates Adapterless coupling uses SAE O-Ring Boss threads. See the table above. The installation torque values are the same as SAE O-Ring Boss.



Coupling Identification

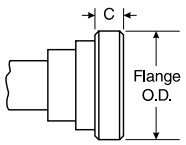
North American Thread Types (con't.)

O-Ring Flange—SAE J518

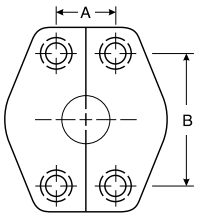
The SAE Code 61 and Code 62 4-bolt split flange is used worldwide, usually as a connection on pumps and motors. There are three exceptions.

1. The -10 size, which is common outside of North America, is not an SAE standard size (generally found on Komatsu equipment). All Komatsu flanges are the same as SAE code 61 except for the -10 size.
2. Caterpillar flanges, which are the same flange O.D. as SAE Code 62, have a thicker flange head ("C" dimension in Table).
3. Poclain flanges, which are completely different from SAE flanges.

SAE Code 61 and Code 62



Flange Head (FL/ FLH, FLC)



4-Bolt Split Flange Bolt Hose Dimensions

Dash Size	Nominal Flange Size (In.)	Code 61 (FL)				Code 62 (FLH)				Caterpillar Code 62 (FLC)			
		Flange O.D. (In.)	A (In.)	B (In.)	C (In.)	Flange O.D. (In.)	A (In.)	B (In.)	C (In.)	Flange O.D. (In.)	A (In.)	B (In.)	C (In.)
-8	1/2	1.188	.688	1.500	.265	1.250	.718	1.594	.305	–	–	–	–
-10	5/8	1.345	–	–	.265	–	–	–	–	–	–	–	–
-12	3/4	1.500	.875	1.875	.265	1.625	.937	2.000	.345	1.625	.938	2.000	.560
-16	1	1.750	1.031	2.062	.315	1.875	1.093	2.250	.375	1.875	1.094	2.250	.560
-20	1-1/4	2.000	1.188	2.312	.315	2.125	1.250	2.625	.405	2.125	1.250	2.625	.560
-24	1-1/2	2.375	1.406	2.750	.315	2.500	1.437	3.125	.495	2.500	1.438	3.125	.560
-32	2	2.812	1.688	3.062	.375	3.125	1.750	3.812	.495	3.125	1.750	3.812	.560
-40	2-1/2	3.312	2.000	3.500	.375	–	–	–	–	–	–	–	–
-48	3	4.000	2.438	4.188	.375	–	–	–	–	–	–	–	–
-56	3-1/2	4.500	2.750	4.750	.422	–	–	–	–	–	–	–	–
-64	4	5.000	3.062	5.125	.442	–	–	–	–	–	–	–	–
-80	5	6.000	3.625	6.000	.442	–	–	–	–	–	–	–	–

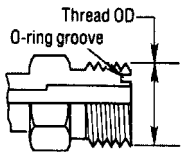
O-Ring Face Seal (ORFS)—SAE J1453

A seal is made when the O-ring in the male contacts the flat face on the female. Couplings are intended for hydraulic systems where elastomeric seals are acceptable to overcome leakage and leak resistance is crucial.

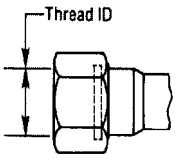
The solid male O-ring face seal fitting will mate with a swivel female O-ring face seal SAE J1453 fitting only.

An O-ring rests in the O-ring groove in the male.

O-Ring Face Seal



Male Flat-Face O-Ring (MFFOR)



Female Flat-Face O-Ring Swivel (FFORX)

Dash Size	Nominal Size (In.)	Thread Size	Female Thread I.D. (In.)	Male Thread O.D. (In.)	O-Ring Size
-4	1/4	9/16 – 18	1/2	9/16	-011
-6	3/8	11/16 – 16	5/8	11/16	-012
-8	1/2	13/16 – 16	3/4	13/16	-014
-10	5/8	1 – 14	15/16	1	-016
-12	3/4	1-3/16 – 12	1-1/8	1-3/16	-018
-16	1	1-7/16 – 12	1-11/32	1-7/16	-021
-20	1-1/4	1-11/16 – 12	1-19/32	1-11/16	-025
-24	1-1/2	2 – 12	1-29/32	2	-029

Coupling Identification

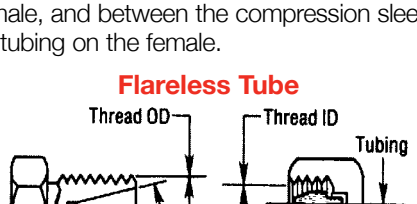
North American Thread Types (con't.)

Flareless Tube

The flareless solid male will mate with a female flareless nut and compression sleeve only.

The male has straight threads and a 24° seat. The female has straight threads and has a compression sleeve for a sealing surface. The seal is made between the compression sleeve and the 24° seat on the male, and between the compression sleeve and the tubing on the female.

Flareless Tube



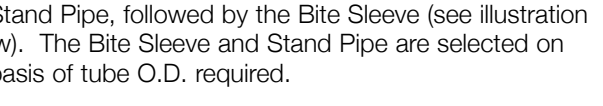
Solid Male (MFA) **Female Nut**

Dash Size	Tube Size (In.)	Nominal Size (In.)	Thead Size	Female Thread I.D. (In.)	Male Thread O.D. (In.)
-2	1/8	5/16	5/16 – 24	17/64	5/16
-3	3/16	3/8	3/8 – 24	21/64	3/8
-4	1/4	7/16	7/16 – 20	25/64	7/16
-5	5/16	1/2	1/2 – 20	29/64	1/2
-6	3/8	9/16	9/16 – 18	1/2	9/16
-8	1/2	3/4	3/4 – 16	11/16	3/4
-10	5/8	7/8	7/8 – 14	13/16	7/8
-12	3/4	1-1/16	1-1/16 – 12	31/32	1-1/16
-14	7/8	1-3/16	1-3/16 – 12	1-7/64	1-3/16
-16	1	1-5/16	1-5/16 – 12	1-15/64	1-5/16
-20	1-1/4	1-5/8	1-5/8 – 12	1-35/64	1-5/8
-24	1-1/2	1-7/8	1-7/8 – 12	1-51/64	1-7/8
-32	2	2-1/2	2-1/2 – 12	2-27/64	2-1/2

North American Stand Pipe (NASP)

A stand pipe assembly is comprised of three components attached to a male fitting. The components are a Stand Pipe Tube, Bite Sleeve and Nut. The Nut is placed over the Stand Pipe, followed by the Bite Sleeve (see illustration below). The Bite Sleeve and Stand Pipe are selected on the basis of tube O.D. required.

North American Stand Pipe



Male Fitting Body **Nut** **Standpipe Fitting (NASP)**

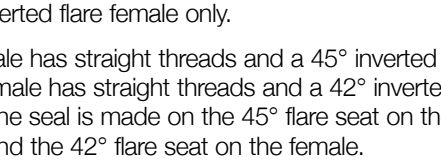
Dash Size	Tube O.D. (In.)	Tube Length (In.)
-4	0.25	0.88
-6	0.38	0.88
-8	0.50	1.00
-12	0.75	1.16
-16	1.00	1.12

SAE Inverted Flare

The SAE 45° inverted flare male will mate with an SAE 42° inverted flare female only.

The male has straight threads and a 45° inverted flare. The female has straight threads and a 42° inverted flare. The seal is made on the 45° flare seat on the male and the 42° flare seat on the female.

SAE Inverted Flare



SAE Inverted Flare Swivel Male (MIX) **SAE Inverted Flare Solid Female**

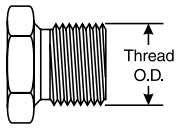
Dash Size	Nominal Size (In.)	Thread Size	Female Thread I.D. (In.)	Male Thread O.D. (In.)
-2	1/8	5/16 – 28	9/32	5/16
-3	3/16	3/8 – 24	21/64	3/8
-4	1/4	7/16 – 24	25/64	7/16
-5	5/16	1/2 – 20	29/64	1/2
-6	3/8	5/8 – 18	37/64	5/8
-7	7/16	11/16 – 18	5/8	11/16
-8	1/2	3/4 – 18	45/64	3/4
-10	5/8	7/8 – 18	13/16	7/8
-12	3/4	1-1/16 – 16	1	1-1/16

Coupling Identification

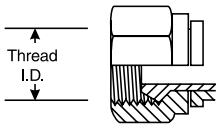
Air Brake Fittings

Female air brake swivels are designed to work exclusively with a male air brake adapter. Federal law requires only this combination to be used on air brake lines from the valve to the air brake diaphram chamber.

The male has straight threads and an inverted seat. The female has straight threads and a corresponding inverted flare. The seal is made on the flare seats of both the male and female.



Male Air Brake

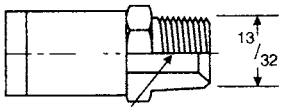


Female Air Brake Swivel

Dash Size	Thread Size	Female Thread I.D. (In.)	Male Thread O.D. (In.)
-6	3/4 – 20	23/32	3/4
-8	7/8 – 20	27/32	7/8

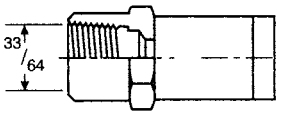
Grease Fittings

Special Male Grease Fitting



1/8–27 Pipe Thread

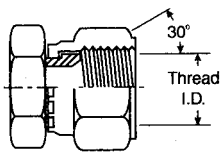
Special Female Grease Fitting



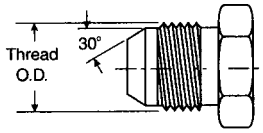
1/2–27 Tapered Thread

Parker Triple Thread Flare Fittings

Parker Triple Thread Flare Fittings



Swivel Female (FZX)



Solid Male (MZ)

Dash Size	Nominal Size (In.)	Thread Size	Female Thread I.D. (In.)	Male Thread O.D. (In.)
-16	1-5/16	1-5/16 – 14	1-1/4	1-5/16

Coupling Identification

Foreign Thread Types

Identifying Foreign Couplings

If you can identify the country of origin of the equipment you are working with, it is easy to identify the coupling style. Simply find the appropriate country in the following pages and locate the particular coupling in the table that follows.

British

It is a common misconception that all foreign threads are metric. This is not always the case. There are two common thread forms: Metric and Whitworth (BSP). The country of origin and the proper nomenclature for each is listed below.

British Standard Pipe Parallel

Popular couplings have British Standard Pipe (BSP) threads, also known as Whitworth threads. These can be parallel threads (BSPP) with a 30° inverted flare or tapered threads (BSPT), with a 30° inverted flare. Port connections are usually made with BSPP threads and a soft metal cutting ring for sealing.

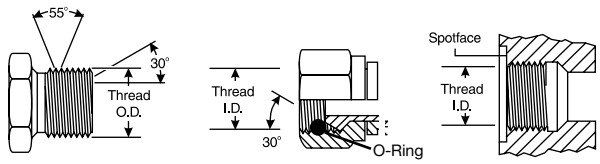
The BSPP (parallel) male will mate with a BSPOR (parallel) female or a female port.

The BSPP male has straight threads and a 30° seat. The BSPOR female has straight threads, a 30° seat, and O-ring. The female port has straight threads and a spotface. The seal on the port is made with an O-ring or soft metal washer on the male.

The BSPP (parallel) connector is similar to, but not interchangeable with, the NPSM connector. The thread pitch is different in most sizes, and the thread angle is 55° instead of the 60° angle found on NPSM threads.

Dash Size	Nominal Size (In.)	Thread Size	Female Parallel Thread	Male Parallel Thread	Torque Recommendation (Ft. Lbs.)	
			I.D. (In.)	O.D. (In.)	Min.	Max.
-2	1/8	1/8 – 28	11/32	3/8	7	9
-4	1/4	1/4 – 19	15/32	17/32	11	18
-6	3/8	3/8 – 19	19/32	21/32	19	28
-8	1/2	1/2 – 14	3/4	13/16	30	36
-10	5/8	5/8 – 14	13/16	29/32	37	44
-12	3/4	3/4 – 14	31/32	1-1/32	50	60
-16	1	1 – 11	1-7/32	1-11/32	79	95
-20	1-1/4	1-1/4 – 11	1-17/32	1-21/32	127	152
-24	1-1/2	1-1/2 – 11	1-25/32	1-7/8	167	190
-32	2	2 – 11	2-7/32	2-11/32	262	314

British Standard Pipe Parallel (BSPOR)



BSPP Male (MBSPP) | **BSPOR Female (FBSPORX)** | **BSPOR Female Port**

British Standard Pipe Tapered

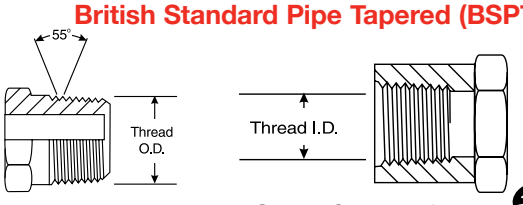
The BSPT (tapered) male will mate with a BSPT (tapered) female, or a BSPOR (parallel) female.

The BSPT male has tapered threads. When mating with either the BSPT (tapered) female or the BSPOR (parallel) female port, the seal is made on the threads.

The BSPT connector is similar to, but not interchangeable with, the NPTF connector. The thread pitch is different in most cases, and the thread angle is 55° instead of the 60° angle found on NPTF threads.

Dash Size	Nominal Size (In.)	Thread Size	Female Parallel Thread	Male Parallel Thread	Torque Recommendation (Ft. Lbs.)	
			I.D. (In.)	O.D. (In.)	Min.	Max.
-2	1/8	1/8 – 28	11/32	3/8	7	9
-4	1/4	1/4 – 19	15/32	17/32	11	18
-6	3/8	3/8 – 19	19/32	21/32	19	28
-8	1/2	1/2 – 14	3/4	13/16	30	36
-10	5/8	5/8 – 14	13/16	29/32	37	44
-12	3/4	3/4 – 14	31/32	1-1/32	50	60
-16	1	1 – 11	1-7/32	1-11/32	79	95
-20	1-1/4	1-1/4 – 11	1-17/32	1-21/32	127	152
-24	1-1/2	1-1/2 – 11	1-25/32	1-7/8	167	190
-32	2	2 – 11	2-7/32	2-11/32	262	314

British Standard Pipe Tapered (BSPT)



BSPT Male (MBSPT) | **BSPT Female (FBSPT)**

Coupling Identification

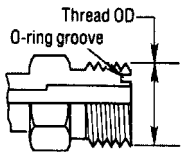
Foreign Thread Types – British (con't.)

British Flat-Face Seal

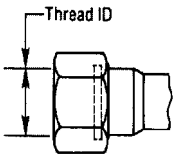
A seal is made when the O-ring in the male contacts the flat face on the female. These couplings are intended for hydraulic systems where elastomeric seals are acceptable to overcome leakage and leak resistance is crucial.

The solid male British O-ring face seal fitting will mate with a swivel female British O-ring face seal fitting only. An O-ring rests in the O-ring groove in the male.

Dash Size	Nominal Size (In.)	Thread Size	Female Parallel Thread	Male Parallel Thread	Torque Recommendation (Ft. Lbs.)	
			I.D. (In.)	O.D. (In.)	Min.	Max.
-6	3/8	3/8-19	19/32	21/32	18	20
-8	1/2	1/2-14	3/4	13/16	32	40
-12	3/4	3/4-14	31/32	1 1/32	65	80



Male British Flat-Face (MBFF)



Female British Flat-Face (FBFF)

French

Popular couplings are French GAZ. These have a 24° seat and metric threads. These are similar to German DIN couplings, but the threads are different in some sizes. Although both are metric threads, the French use fine threads in all sizes and German DIN couplings use coarse threads in larger sizes. Most port connections are flange connections. French flanges are different than SAE—they have a lip that protrudes from the flange face. These are called Poclain-style flanges.

GAZ 24°

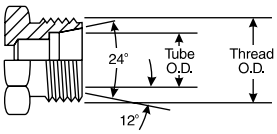
The French Metric (GAZ) male will mate with the female 24° cone or the female tube fitting.

The male has a 24° seat and straight metric threads. The female has a 24° seat or a tubing sleeve and straight metric threads and is interchangeable with female Kobelco.

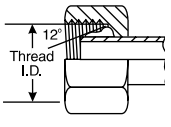
When measuring the flare angle with the seat angle gauge, use the 12° gauge. The seat angle gauge measures the angle from the connector centerline.

Metric Thread Size	Female Thread I.D. (mm)	Male Thread O.D. (mm)	Tube O.D. (mm)
M20x1.5	18.5	20.0	13.25
M24x1.5	22.5	24.0	16.75
M30x1.5	28.5	30.0	21.25
M36x1.5	34.5	36.0	26.75
M45x1.5	43.5	45.0	33.50
M52x1.5	50.5	52.0	42.25

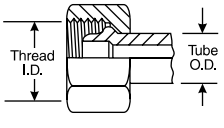
French Metric (GAZ)



Male 24° Cone



Female 24° Cone



Female Tube Fitting

Coupling Identification

Foreign Thread Types – French (con't.)

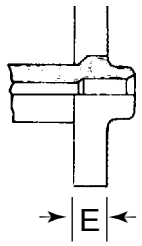
GAZ Poclain 24° Flange

The Poclain (French GAZ) 24° high pressure flange is usually found on Poclain equipment.

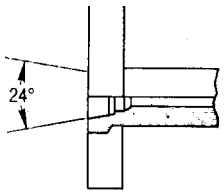
The male flange will mate with a female flange or port. The seal is made on the 24° seat.

Nominal Size (In.)	A (In.)	B (In.)	C (In.)	D (In.)	E (In.)	F (In.)
1/2	1.57	.72	2.20	1.89	.55	.35
5/8	1.57	.72	2.20	1.89	.55	.35
3/4	2.00	.94	2.75	2.38	.71	.43

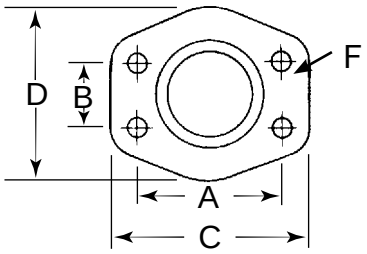
Poclain (French GAZ)



Male Flange



Female Flange



Flange Clamp

German DIN (Deutsche Industrial Norme)

Popular couplings are German DIN (Deutsche Industrial Norme). A coupling referred to as "metric" usually means a DIN coupling.

DIN 24° Cone

The DIN 24° cone male will mate with any of the females shown.

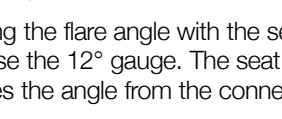
The male has a 24° seat, straight metric threads, and a recessed counterbore which matches the tube O.D. of the coupling used with it. The mating female is a 24° cone with O-ring, a metric tube fitting or a universal 24° and 60° cone.

There is a light and heavy series DIN coupling. Proper identification is made by measuring both the thread size and the tube O.D. (The heavy series has a smaller tube O.D. but a thicker wall section than the light.)

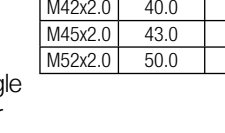
When measuring the flare angle with the seat angle gauge, use the 12° gauge. The seat angle gauge measures the angle from the connector centerline.

Metric Thread Size	Female Thread	Male Thread	Tube O.D.		Torque Recommendation (Ft. Lbs.)	
	I.D. (mm)	O.D. (mm)	Light Series (mm)	Heavy Series (mm)	Min.	Max.
M12x1.5	10.5	12.0	6	—	7	15
M14x1.5	12.5	14.0	8	—	15	26
M16x1.5	14.5	16.0	10	8	18	30
M18x1.5	16.5	18.0	12	10	22	33
M20x1.5	18.5	20.0	14	12	26	37
M22x1.5	20.5	22.0	15	14	30	52
M24x1.5	22.5	24.0	—	16	30	52
M26x1.5	24.5	26.0	18	—	44	74
M30x2.0	28.0	30.0	22	20	59	89
M36x2.0	34.0	36.0	28	25	74	111
M42x2.0	40.0	42.0	—	30	74	162
M45x2.0	43.0	45.0	35	—	133	184
M52x2.0	50.0	52.0	42	38	148	221

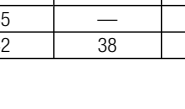
DIN 24° Male and Mating Females



Male 24° Cone, DIN 2353 (MDL/MDH)



Female 24° Cone with O-Ring (FDLORX/FDHORX)



Female Universal 24° and 60° Cone (FDLX/FDHX)

Coupling Identification

Foreign Thread Types – German DIN (con't.)

DIN 60° Cone

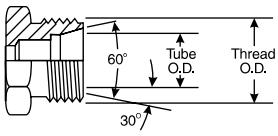
The DIN 60° cone male will mate with the female universal 24° or 60° cone connector only.

The male has a 60° seat and straight metric threads. The female has a 24° and 60° universal seat and straight metric threads.

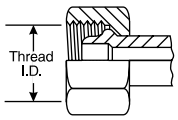
When measuring the flare angle with the seat angle gauge, use the 30° gauge. The seat angle gauge measures the angle from the connector centerline.

Metric Thread Size	Female Thread I.D. (mm)	Male Thread O.D. (mm)	Tube O.D. (mm)	Torque Recommendation (Ft. Lbs.) Min.	Max.
M14x1.5	12.5	14.0	8	15	26
M16x1.5	14.5	16.0	10	18	30
M18x1.5	16.5	18.0	12	22	33
M22x1.5	20.5	22.0	15	30	52
M26x1.5	24.5	26.0	18	44	74
M30x1.5	28.5	30.0	22	59	59
M38x1.5	36.5	38.0	28	74	111
M45x1.5	43.5	45.0	35	133	184
M52x2.0	50.5	52.0	42	148	221

DIN 60° Male and Mating Female



Male
60° Cone, DIN 6711



Female
Universal 24° and 60° Cone

Coupling Identification

Foreign Thread Types – German DIN (con't.)

DIN 3852 Couplings Type A & B (Parallel Threads)

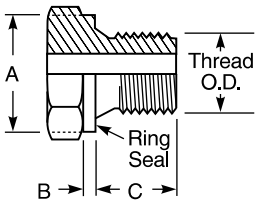
The male DIN 3852 Type A & B couplings will mate with the female DIN coupling shown below. Gates offers this thread as an adapter.

The male and female type A & B couplings have straight threads. The seal occurs when the ring seal (Type A) or the face seal (Type B) mates with the face of the female port.

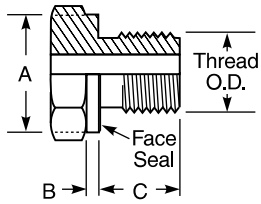
There are two series of DIN 3852 Type A & B couplings, the light (L) and the heavy (S) series.

Note: Commonly used threads on male metric adapters.

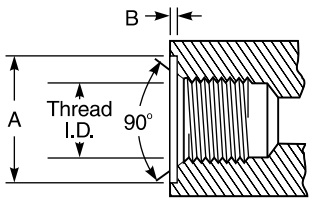
DIN 3852 Couplings Type A & B (Parallel Threads)



Male Type A



Male Type B



Female Types A & B

Series	Tube O.D.	Metric Thread Parallel								Whitworth Thread Parallel							
		Thread Size	Female			Male				Thread Size	Female (BSPOR)			Male (BSPP)			
			Thread I.D.	A	B	Thread O.D.	A	B	C		Thread I.D.	A	B	Thread O.D.	A	B	C
	(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)		(In.)	(mm)	(mm)	(In.)	(mm)	(mm)	(mm)
L Light	6	10x1.0	8.5	15	1.0	10	14	1.5	8	1/8-28	11/32	15	1.0	3/8	14	1.5	8
	8	12x1.5	10.5	18	1.5	12	17	2.0	12	1/4-19	15/32	19	1.5	1/2	17	2.0	12
	10	14x1.5	12.5	20	1.5	14	19	2.0	12	1/4-19	15/32	19	1.5	1/2	19	2.0	12
	12	16x1.5	14.5	22	1.5	16	21	2.5	12	3/8-19	19/32	23	2.0	21/32	21	2.5	12
	15	18x1.5	16.5	24	2.0	18	23	2.5	12	1/2-14	3/4	27	2.5	13/16	23	2.5	12
	18	22x1.5	20.5	28	2.5	22	27	3.0	14	1/2-14	3/4	27	2.5	13/16	27	3.0	14
	22	26x1.5	24.5	32	2.5	26	31	3.0	16	3/4-14	31/32	33	2.5	1-1/32	31	3.0	16
	28	33x2.0	31.5	40	2.5	33	39	3.0	18	1-11	1-7/32	40	2.5	1-5/16	39	3.0	18
	35	42x2.0	40.5	50	2.5	42	49	3.0	20	1-1/4-11	1-17/32	50	2.5	1-21/32	49	3.0	20
	42	48x2.0	46.5	56	2.5	48	55	3.0	22	1-1/2-11	1-25/32	56	2.5	1-7/8	55	3.0	22
S Heavy	6	12x1.5	10.5	18	1.5	12	17	2.0	12	1/4-19	15/32	19	1.5	1/2	17	2.0	12
	8	14x1.5	12.5	20	1.5	14	19	2.0	12	1/4-19	15/32	19	1.5	1/2	19	2.0	12
	10	16x1.5	14.5	22	1.5	16	21	2.5	12	3/8-19	19/32	23	2.0	21/32	21	2.5	12
	12	18x1.5	16.5	24	2.0	18	23	2.5	12	3/8-19	19/32	23	2.0	21/32	23	2.5	12
	14	20x1.5	18.5	26	2.0	20	25	3.0	14	1/2-14	3/4	27	2.5	13/16	25	3.0	14
	16	22x1.5	20.5	28	2.5	22	27	3.0	14	1/2-14	3/4	27	2.5	13/16	27	3.0	14
	20	27x2.0	25.5	33	2.5	27	32	3.0	16	3/4-14	31/32	33	2.5	1-1/32	32	3.0	16
	25	33x2.0	31.5	40	2.5	33	39	3.0	18	1-11	1-7/32	40	2.5	1-5/16	39	3.0	18
	30	42x2.0	40.5	50	2.5	42	49	3.0	20	1-1/4-11	1-17/32	50	2.5	1-21/32	49	3.0	20
	38	48x2.0	46.5	56	2.5	48	55	3.0	22	1-1/2-11	1-25/32	56	2.5	1-7/8	55	3.0	22

Coupling Identification

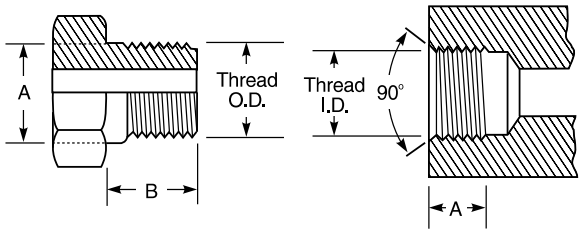
Foreign Thread Types – German DIN (con't.)

DIN 3852 Type C Metric and Whitworth Tapered (BSPT) Thread Connectors

The DIN 3852 Type C couplings are available with either metric or Whitworth British thread. The male will mate only with the female as shown.

The male and female couplings have tapered threads. The seal takes place on the threads. There are three series of DIN 3852 Type C Couplings: extra light (LL), light (L) and heavy (S).

DIN 3852 Type C Metric and Whitworth Tapered Thread Connectors



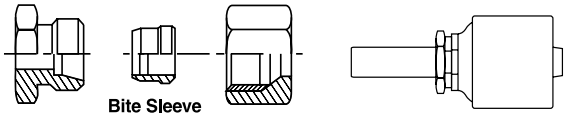
Male Female

Series	Tube O.D. (mm)	Metric Tapered Threads						Whitworth Tapered Threads					
		Thread Size	Female		Male			Thread Size	Female		Male		
			Thread I.D. (mm)	A (mm)	Thread O.D. (mm)	A (mm)	B (mm)		Thread I.D. (In.)	A (mm)	Thread O.D. (In.)	A (mm)	B (mm)
LL Extra Light	4	8x1.0	6.5	5.5	8	8.40	8	1/8-28	11/32	5.5	1/8	.392	8
	5	8x1.0	6.5	5.5	8	8.40	8	1/8-28	11/32	5.5	1/8	.392	8
	6	10x1.0	8.5	5.5	10	10.40	8	1/8-28	11/32	5.5	1/8	.392	8
	8	10x1.0	8.5	5.5	10	10.40	8	1/8-28	11/32	5.5	1/8	.392	8
L Light	6	10x1.0	8.5	5.5	10	10.40	8	1/8-28	11/32	5.5	1/8	.392	8
	8	12x1.5	10.5	8.5	12	12.53	12	1/4-19	15/32	8.5	1/4	.532	12
	10	14x1.5	12.5	8.5	14	14.53	12	1/4-19	15/32	8.5	1/4	.532	12
	12	16x1.5	14.5	8.5	16	16.53	12	3/8-19	19/32	8.5	3/8	.670	12
	15	18x1.5	16.5	8.5	18	18.53	12	1/2-14	3/4	8.5	1/2	.839	14
	18	22x1.5	20.5	10.5	22	22.65	14	1/2-14	3/4	10.5	1/2	.839	14
S Heavy	6	12x1.5	10.5	8.5	12	12.53	12	1/4-19	15/32	8.5	1/4	.532	12
	8	14x1.5	12.5	8.5	14	14.53	12	1/4-19	15/32	8.5	1/4	.532	12
	10	16x1.5	14.5	8.5	16	16.53	12	3/8-19	19/32	8.5	3/8	.670	12
	12	18x1.5	16.5	8.5	18	18.53	12	3/8-19	19/32	8.5	3/8	.670	12
	14	20x1.5	18.5	10.5	20	20.65	14	1/2-14	3/4	10.5	1/2	.839	14
	16	22x1.5	20.5	10.5	22	22.65	14	1/2-14	3/4	10.5	1/2	.839	14

Metric Stand Pipe Assembly

A metric stand pipe assembly is comprised of three components attached to a male fitting. The components are: a Stand Pipe Tube, Bite Sleeve and Metric Nut. The nut is placed over the Stand Pipe, followed by the Bite Sleeve (see illustration below). For DIN light assemblies, a DIN light metric nut is used. For DIN heavy assemblies, a DIN heavy metric nut is used. The Bite Sleeve and Stand Pipe are selected on the basis of tube O.D.

Metric Standpipe Assembly



DIN 2353 Male Fitting Body (MDL) Bite Sleeve Nut Standpipe Fitting (NASP)

Metric Stand Pipe DIN Tube O.D. (mm)	Bite Sleeve DIN Tube O.D. (mm)	Metric Nut Thread	
		Light	Heavy
6	6	M12x1.5	—
8	8	M14x1.5	M16x1.5
10	10	M16x1.5	M18x1.5
12	12	M18x1.5	M20x1.5
15	15	M22x1.5	—
16	16	—	M24x1.5
18	18	M26x1.5	—
20	20	—	M30x2.0
22	22	M30x2.0	—
25	25	—	M36x2.0
28	28	M36x2.0	—
30	30	—	M42x2.0
35	35	M45x2.0	—
38	38	—	M52x2.0
42	42	M52x2.0	—

Coupling Identification

Foreign Thread Types (con't.)

Japanese

There are two popular types of coupling styles in Japan, Japanese Industrial Standard and Komatsu. These couplings look similar to Male JIC and Female JIC Swivel couplings. However there are two major differences: The threads are BSP and the seat angle is only 30° instead of 37° for JIC.

1. **Japanese Industrial Standard.** Most Japanese equipment uses this type of coupling with a 30° seat and British Standard Pipe Parallel threads. **They are not interchangeable with British couplings, since the flare is not inverted.**
2. **Komatsu.** All Komatsu equipment uses couplings with a 30° seat and metric fine threads. All flanges are Code 61 or Code 62, except -10 which utilizes a special Komatsu-style flange that does not conform to SAE standard sizing.

Japanese 30° Flare Parallel Threads

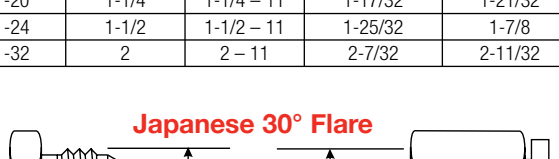
The Japanese 30° flare male connector will mate with a Japanese 30° flare female only.

The male and female have straight threads and a 30° seat. The seal is made on the 30° seat.

The threads on the Japanese 30° flare connector conform to JIS B 0202, which are the same as the BSPOR threads. Both the British and Japanese connectors have a 30° seat, but they are not interchangeable because the British seat is inverted.

Dash Size	Nominal Size (In.)	Thread Size	Female Thread I.D. (In.)	Male Thread O.D. (In.)
-2	1/8	1/8 – 28	11/32	3/8
-4	1/4	1/4 – 19	7/16	17/32
-6	3/8	3/8 – 19	19/32	21/32
-8	1/2	1/2 – 14	3/4	13/16
-10	5/8	5/8 – 14	13/16	29/32
-12	3/4	3/4 – 14	15/16	1-1/32
-16	1	1 – 11	1-13/16	1-15/16
-20	1-1/4	1-1/4 – 11	1-17/32	1-21/32
-24	1-1/2	1-1/2 – 11	1-25/32	1-7/8
-32	2	2 – 11	2-7/32	2-11/32

Japanese 30° Flare



Male (MJIS) **Female (FJISX)**

Japanese Tapered Pipe Thread

The Japanese tapered pipe thread connector is identical to and fully interchangeable with the BSPT (tapered) connector. **The Japanese connector does not have a 30° flare and will not mate with the BSPOR female.**

The threads conform to JIS B 0203, which are the same as BSPT threads.

The seal on the Japanese tapered pipe thread connector is made on the threads.

Dash Size	Nominal Size (In.)	Thread Size	Female Parallel Thread I.D. (In.)	Male Parallel Thread O.D. (In.)
-2	1/8	1/8 – 28	11/32	3/8
-4	1/4	1/4 – 19	7/16	17/32
-6	3/8	3/8 – 19	19/32	21/32
-8	1/2	1/2 – 14	3/4	13/16
-12	3/4	3/4 – 14	15/16	1-1/32
-16	1	1 – 11	1-13/16	1-15/16
-20	1-1/4	1-1/4 – 11	1-17/32	1-21/32
-24	1-1/2	1-1/2 – 11	1-25/32	1-7/8
-32	2	2 – 11	2-7/32	1-11/32
-32	2	2 – 11	2-7/32	2-11/32

Japanese Tapered Pipe Thread

Male (MBSPT) **Female (FBSPT)**

Coupling Identification

Foreign Thread Types – Japanese (con't.)

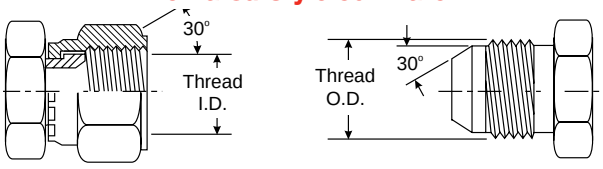
Komatsu Style 30° Flare Parallel Threads

The Komatsu style 30° flare parallel thread connector is identical to the Japanese 30° flare parallel thread connector except for the threads. The Komatsu style connector uses metric fine threads which conform to JIS B 0207. Gates identifies these as Komatsu-style by marking the hex nuts with two small notches.

The Komatsu style connector seals on the 30° flare.

Dash Size	Nominal Size (In.)	Nominal Size (mm)	Thread Size	Female Thread I.D. (mm)	Male Thread (O.D.) (mm)
-4	1/4	6.5	M14x1.5	12.5	14
-6	3/8	9.5	M18x1.5	16.5	18
-8	1/2	13	M22x1.5	20.5	22
-10	5/8	16	M24x1.5	22.5	24
-12	3/4	19	M30x1.5	28.5	30
-16	1	25	M33x1.5	31.5	33
-20	1-1/4	32	M36x1.5	34.5	36
-24	1-1/2	38	M42x1.5	40.5	42

Komatsu Style 30° Flare



Female (FKX) **Male (MK)**

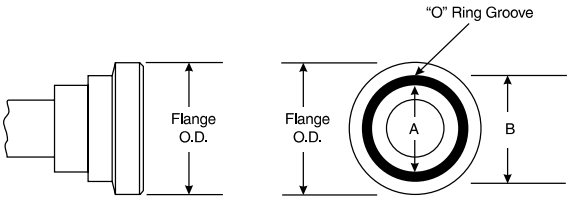
Komatsu Style Flange Fitting

The Komatsu style flange fitting is nearly identical to and fully interchangeable with the SAE Code 61 flange fitting. In all sizes the O-ring dimensions are different. When replacing a Komatsu style flange with an SAE style flange, an SAE style O-ring must always be used.

Dash Size	Nominal Size (In.)	Nominal Size (mm)	Flange O.D. (In.)	A (In.)	B (In.)
-8	1/2	12.7	1.188	.728	.984
-10*	5/8	15.9	1.345	.728	1.102
-12	3/4	19.1	1.500	.846	1.220
-16	1	25.4	1.750	1.122	1.496
-20	1-1/4	31.8	2.000	1.358	1.732
-24	1-1/2	38.1	2.375	1.750	2.125
-32	2	50.8	2.812	2.225	2.559

**(-10 is a non-SAE size flange)*

Komatsu Style Flange Fitting

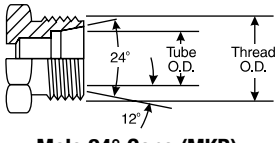


Flange (FL) **Flange Head**

Metric Kobelco Metric Bite Sleeve

These are similar to the German DIN 24° cone, but the DIN style uses courser threads. Therefore, the Kobelco and German DIN are not interchangeable for female Kobelco (see French GAZ 24° swivel).

Dash Size	Metric Thread Size	Female Thread I.D. (mm)	Male Thread O.D. (mm)
-22	M30X1.5	28	30
-28	M36X1.5	34	36
-35	M45X1.5	43	45



Male 24° Cone (MKB)

Gates Global Part Numbering System

Gates couplings feature a meaningful part number that makes coupling identification fast and easy. Always refer to Gates Crimp Data Manual when selecting hose and coupling combinations.

In the following example, the Global Part Number G25100-0808 identifies a MegaCrimp® Male Pipe (MP) coupling with -8 (1/2") stem size and -8 (1/2") thread size.

G25100-0808

- Series Stem Style (see below)
- Thread Configuration (see following pages)
- Stem Size
- Thread Size

Series Stem Styles:

G20—GlobalSpiral™
G21—GlobalSpiral One-Piece Couplings for MobileCrimp® Crimpers
G22—GlobalSpiral Plus (GSP)
G24—GlobalSpiral High (GSH)
G25—MegaCrimp®
G27—Field Attachable "Type T" for G1 Hose
G28—Field Attachable "Type T" for G2 Hose

G34—Field Attachable for C5, C5D, C5M
G35—Field Attachable for C5E
G36—Brass Push-on for Lock-on Hose

G40—Couplings for C14 Hose
G43—GL Couplings
G45—PolarSeal™ Couplings
G50—Power Steering
G51—PCTS Thermoplastic

Other Non-Stem Series Styles:

G30—Copper Tubing
G31—SureLock™ Fittings for Nylon Air Brake Tubing
G32—Compression Fittings
G33—Air Brake Fittings for Rubber Hose

G37—Single Bead Brass Couplings

G38—Barbed Stem
G42—GLP Coupling
G49—Automotive Adapters
G52—Clamping Collars
G55—Copper Tubing Industrial
G56—SureLok™ Industrial
G57—Mini Barb
G58—Compression PVC
G60—SAE to SAE Adapters
G62—British to SAE Adapters
G63—Metric Conversion Adapters
G64—International to International Adapters
G65—Japanese Conversion Adapters
G80—Hose Bend Restrictors
G81—Hose Guards
G82 & 83—Springs Guards
G94 & 95—Quick Disconnects

Gates Global Part Numbering System

Thread Configurations for Stem Styles

These three-digit numbers identify the various coupling thread configurations

100	— MP	Male Pipe (NPTF - 30° Cone Seat)
101	— MPLN	Male Pipe Long Nose
102	—MPAPI	Male Pipe for API Unions
103	—MPLH	Male Pipe Long Hex
105	—MPX	Male Pipe Swivel (NPTF - Without 30° Cone Seat)
106	—MPX90	Male Pipe Swivel - 90° Block (NPTF - Without 30° Cone Seat)
107	—MPX90L	Male Pipe Swivel - 90° Block Long (NPTF – Without 30° Cone Seat)
110	—FP	Female Pipe (NPTF - Without 30° Cone Seat)
111	—FPX	Female Pipe Swivel (NPSM - 30° Cone Seat)
112	—FPXT	Female Pipe Swivel Tapered Threads (NPTF)
120	—MB	Male O-Ring Boss
121	—MBX	Male O-Ring Boss Swivel
122	—MBX45	Male O-Ring Boss Swivel - 45° Block
123	—MBX90	Male O-Ring Boss Swivel - 90° Block
124	—MBX90L	Male O-Ring Boss Swivel - 90° Block Long
130	—MBAX	Male O-Ring Boss Adapterless Swivel
133	—MBAX45	Male O-Ring Boss Adapterless Swivel - 45° Bent Tube
134	—MBAX90M	Male O-Ring Boss Adapterless Swivel - 90° Bent Tube Medium Drop
135	—MBAX90S	Male O-Ring Boss Adapterless Swivel - 90° Bent Tube Short Drop
136	—MBAX90L	Male O-Ring Boss Adapterless Swivel - 90° Bent Tube Long Drop
140	—FMX	Female MegaSeal® Swivel
141	—FMXL	Female MegaSeal Swivel Long
142	—FMX30	Female MegaSeal Swivel - 30° Bent Tube
143	—FMX30L	Female MegaSeal Swivel - 30° Bent Tube Long Drop
144	—FMX45S	Female MegaSeal Swivel - 45° Bent Tube Short Drop
145	—FMX45	Female MegaSeal Swivel - 45° Bent Tube
146	—FMX45L	Female MegaSeal Swivel - 45° Bent Tube Long Drop
147	—FMX60	Female MegaSeal Swivel - 60° Bent Tube
148	—FMX60L	Female MegaSeal Swivel - 60° Bent Tube Long Drop
149	—FMX90S	Female MegaSeal Swivel - 90° Bent Tube Short Drop
150	—FMX90	Female MegaSeal Swivel - 90° Bent Tube
151	—FMX90L	Female MegaSeal Swivel - 90° Bent Tube Long Drop
152	—FMX90XL	Female MegaSeal Swivel - 90° Bent Tube Extra Long Drop
165	—MJ	Male JIC 37° Flare
166	—MJL	Male JIC 37° Flare Long
167	—MJ90BLK	Male JIC 37° Flare - 90° Block
170	—FJX	Female JIC 37° Flare Swivel
171	—FJXL	Female JIC 37° Flare Swivel Long
172	—FJX30	Female JIC 37° Flare Swivel - 30° Bent Tube
173	—FJX30L	Female JIC 37° Flare Swivel - 30° Bent Tube Long Drop
174	—FJX45S	Female JIC 37° Flare Swivel - 45° Bent Tube Short Drop
175	—FJX45	Female JIC 37° Flare Swivel - 45° Bent Tube
176	—FJX45L	Female JIC 37° Flare Swivel - 45° Bent Tube Long Drop
177	—FJX60	Female JIC 37° Flare Swivel - 60° Bent Tube
178	—FJX60L	Female JIC 37° Flare Swivel - 60° Bent Tube Long Drop
179	—FJX90S	Female JIC 37° Flare Swivel - 90° Bent Tube Short Drop
180	—FJX90M	Female JIC 37° Flare Swivel - 90° Bent Tube
181	—FJX90L	Female JIC 37° Flare Swivel - 90° Bent Tube Long Drop
182	—FJX90XL	Female JIC 37° Flare Swivel - 90° Bent Tube Extra Long Drop
183	—FJX90-000	Female JIC 37° Flare Swivel - 90° Bent Tube Non-ISO Drop (mm)
185	—FJXP	Female JIC 37° Flare Swivel Under Pressure
187	—FJX90BLK	Female JIC 37° Flare Swivel - 90° Block
195	—MS	Male SAE 45° Flare
196	—MS45	Male SAE 45° Flare - 45° Bent Tube
197	—MS90	Male SAE 45° Flare - 90° Bent Tube
199	—MS90BLK	Male SAE 45° Flare - 90° Block
200	—FSX	Female SAE 45° Flare Swivel
201	—FSXLT	Female SAE 45° Flare Swivel Long Tube
202	—FSX45	Female SAE 45° Flare Swivel - 45° Bent Tube
203	—FSX45L	Female SAE 45° Flare Swivel - 45° Bent Tube Long Drop
204	—FSX90S	Female SAE 45° Flare Swivel - 90° Bent Tube Short Drop
205	—FSX90	Female SAE 45° Flare Swivel - 90° Bent Tube
206	—FSX90L	Female SAE 45° Flare Swivel - 90° Bent Tube Long Drop
207	—FSX90XL	Female SAE 45° Flare Swivel - 90° Bent Tube Extra Long Drop
210	—FJSX	Dual Seat Female JIC 37°/SAE 45° Flare Swivel
211	—FJSX45	Dual Seat Female JIC 37°/SAE 45° Flare Swivel - 45° Bent Tube
212	—FJSX90	Dual Seat Female JIC 37°/SAE 45° Flare Swivel - 90° Bent Tube
213	—FJSX90L	Dual Seat Female JIC 37°/SAE 45° Flare Swivel - 90° Bent Tube Long Drop
225	—MFFOR	Male Flat-Face O-Ring
226	—MFFORBKHDLN	Male Flat-Face O-Ring Bulkhead Long Nose
229	—FFORXS	Female Flat-Face O-Ring Swivel Short
230	—FFORX	Female Flat-Face O-Ring Swivel
231	—FFORXL	Female Flat-Face O-Ring Swivel Long
234	—FFORX45S	Female Flat-Face Swivel - 45° Bent Tube Short Drop
235	—FFORX45	Female Flat-Face Swivel - 45° Bent Tube
239	—FFORX90S	Female Flat-Face Swivel - 90° Bent Tube Short Drop
240	—FFORX90M	Female Flat-Face Swivel - 90° Bent Tube
241	—FFORX90L	Female Flat-Face Swivel - 90° Bent Tube Long Drop
242	—FFORX90XL	Female Flat-Face Swivel - 90° Bent Tube Extra Long Drop
248	—FFORX135	Female Flat-Face Swivel - 135° Bent Tube
300	—FL	Code 61 O-Ring Flange
301	—FLL	Code 61 O-Ring Flange Long
302	—FL22	Code 61 O-Ring Flange – 22-1/2° Bent Tube
304	—FL30	Code 61 O-Ring Flange - 30° Bent Tube
305	—FL30L	Code 61 O-Ring Flange - 30° Bent Tube Long Drop

Gates Global Part Numbering System

Thread Configurations – continued

306 —FL45S Code 61 O-Ring Flange - 45° Bent Tube Short Drop
307 —FL45 Code 61 O-Ring Flange - 45° Bent Tube
309 —FL60 Code 61 O-Ring Flange - 60° Bent Tube
310 —FL60L Code 61 O-Ring Flange - 60° Bent Tube Long Drop
311 —FL67 Code 61 O-Ring Flange – 67-1/2° Bent Tube
312 —FL67L Code 61 O-Ring Flange – 67-1/2° Bent Tube Long Drop
313 —FL90XS Code 61 O-Ring Flange - 90° Bent Tube Extra Short Drop
314 —FL90S Code 61 O-Ring Flange - 90° Bent Tube Short Drop
315 —FL90 Code 61 O-Ring Flange - 90° Bent Tube
316 —FL90L Code 61 O-Ring Flange - 90° Bent Tube Long Drop
317 —FL90XL Code 61 O-Ring Flange - 90° Bent Tube Extra Long Drop
318 —FL90XXL Code 61 O-Ring Flange - 90° Bent Tube Extra Extra Long Drop
323 —FL100 Code 61 O-Ring Flange - 100° Bent Tube
325 —FL110 Code 61 O-Ring Flange - 110° Bent Tube
327 —FL120 Code 61 O-Ring Flange - 120° Bent Tube
329 —FL125 Code 61 O-Ring Flange - 125° Bent Tube
331 —FL135 Code 61 O-Ring Flange - 135° Bent Tube
342 —RFL905 Reuseable Flange - 90° Special
350 —FLH Code 62 O-Ring Flange Heavy
351 —FLHL Code 62 O-Ring Flange Heavy Long
352 —FLH22 Code 62 O-Ring Flange Heavy – 22-1/2° Bent Tube
354 —FLH30 Code 62 O-Ring Flange Heavy - 30° Bent Tube
357 —FLH45 Code 62 O-Ring Flange Heavy - 45° Bent Tube
358 —FLH45L Code 62 O-Ring Flange Heavy - 45° Bent Tube Long Drop
359 —FLH60 Code 62 O-Ring Flange Heavy - 60° Bent Tube
361 —FLH67 Code 62 O-Ring Flange Heavy – 67-1/2° Bent Tube
364 —FLH90S Code 62 O-Ring Flange Heavy - 90° Bent Tube Short Drop
365 —FLH90 Code 62 O-Ring Flange Heavy - 90° Bent Tube
366 —FLH90L Code 62 O-Ring Flange Heavy - 90° Bent Tube Long Drop
367 —FLH90XL Code 62 O-Ring Flange Heavy - 90° Bent Tube Extra Long Drop
370 —FLFF Flange Without O-Ring Groove (Code 62)
400 —FLC Caterpillar Style O-Ring Flange (Code 62)
401 —FLCL Caterpillar Style O-Ring Flange (Code 62) Long
402 —FLC22 Caterpillar Style O-Ring Flange (Code 62) - 22-1/2° Bent Tube
404 —FLC30 Caterpillar Style O-Ring Flange (Code 62) - 30° Bent Tube
407 —FLC45 Caterpillar Style O-Ring Flange (Code 62) - 45° Bent Tube
409 —FLC60 Caterpillar Style O-Ring Flange (Code 62) - 60° Bent Tube
411 —FLC67 Caterpillar Style O-Ring Flange (Code 62) - 67-1/2° Bent Tube
415 —FLC90 Caterpillar Style O-Ring Flange (Code 62) - 90° Bent Tube
416 —FLC90L Caterpillar Style O-Ring Flange (Code 62) - 90° Bent Tube Long Drop
450 —TBFL Two Bolt Flange (Code 61)
452 —TBFL45 Two Bolt Flange (Code 61) - 45° Bent Tube
454 —TBFL90 Two Bolt Flange (Code 61) - 90° Bent Tube
460 —ABC Air Brake Compression
461 —STA Straight Tube Assembly
470 —FPFL French Poclain Flange
500 —MIX SAE Male Inverted Swivel
501 —MIXL SAE Male Inverted Swivel Long
502 —MIX45 SAE Male Inverted Swivel - 45° Bent Tube
504 —MIX90 SAE Male Inverted Swivel - 90° Bent Tube
506 —MIX120 SAE Male Inverted Swivel - 120° Bent Tube
508 —FI Female Inverted
510 —MFA SAE Male Flareless Assembly
511 —MFA90 SAE Male Flareless - 90° Bent Tube
520 —SP Stand Pipe
521 —SPL Stand Pipe Long
522 —SP45 Stand Pipe - 45° Bent Tube
524 —SP90 Stand Pipe - 90° Bent Tube
527 —FBO Female Braze-On Stems
530 —PL Male Press-Loc Stems
531 —PL45 Male Press-Loc Stems - 45° Bent Tube
532 —PL90 Male Press-Loc Stems - 90° Bent Tube
535 —HLE Hose Length Extender
536 —HLE45 Hose Length Extender - 45° Bent Tube
537 —HLE 90 Hose Length Extender - 90° Bent Tube
538 —HLESG Hose Length Extender - Sight Glass
539 —HLET Hose Length Extender - Tee
540 —FABX Female Air Brake Swivel
541 —HLE180 Hose Length Extender - 180° Bent Tube
543 —TBFLX Two Bolt Flange Swivel
560 —MPG Male Special Grease Fitting
561 —FG Female Special Grease Fitting
562 —FZX Parker Triple Thread Female Swivel
563 —PWX Pressure Washer Swivel (Karcher)
564 —BJF Banjo (Ford Tractor)
570 —MST Male SAE 45° Flare - Straight Tube
571 —MST45 Male SAE 45° Flare - 45° Bent Tube
572 —MST90 Male SAE 45° Flare - 90° Bent Tube
579 —FTON134SP45 Female SAE Tube O-Ring Nut Swivel w/R134A Service Port - 45° Bent Tube
580 —MTON134SP Male SAE Tube O-Ring Nut w/R134a Service Port
581 — MTON134SP45 Male SAE Tube O-Ring Nut w/R134a Service Port - 45° Bent Tube
582 — MTON134SP90 Male SAE Tube O-Ring Nut w/R134a Service Port - 90° Bent Tube
583 — MTON Male SAE Tube O-Ring Nut
584 — MTON45 Male SAE Tube O-Ring Nut - 45° Bent Tube
585 — MTON90 Male SAE Tube O-Ring Nut - 90° Bent Tube
586 — FTONR12SP Female SAE Tube O-Ring Nut Swivel w/R12 Service Port
587 — FTONR12SP90 Female SAE Tube O-Ring Nut Swivel w/R12 Service Port- 90° Bent Tube
588 —FTON134SP Female SAE Tube O-Ring Nut Swivel w/R134a Service Port
589 —FTON134SP90 Female SAE Tube O-Ring Nut Swivel - 90° Bent Tube w/R134a Service Port
590 —FTON Female SAE Tube O-Ring Nut Swivel
591 —FTON45 Female SAE Tube O-Ring Nut Swivel - 45° Bent Tube

Gates Global Part Numbering System

Thread Configurations – continued

592 —FTON90 Female SAE Tube O-Ring Nut Swivel - 90° Bent Tube
593 —FTOMN Female SAE Tube O-Ring Metric Nut Swivel
594 —FTOMN45 Female SAE Tube O-Ring Metric Nut Swivel - 45° Bent Tube
595 —FTOMN90 Female SAE Tube O-Ring Metric Nut Swivel - 90° Bent Tube
596 —FTON90BL Female SAE Tube O-Ring Nut Swivel - 90° Block
597 —MIO Male Inverted O-Ring
598 —MIO45 Male Inverted O-Ring - 45° Bent Tube
599 —MIO90 Male Inverted O-Ring - 90° Bent Tube
600 —MIOBKHD Male Inverted O-Ring Bulkhead
601 —MIOBKHD45 Male Inverted O-Ring Bulkhead - 45° Bent Tube
602 —MIOBKHD90 Male Inverted O-Ring Bulkhead - 90° Bent Tube
604 —FTDON Female Tube Dual O-Ring Nut Swivel
605 —FTDON45 Female Tube Dual O-Ring Nut Swivel – 45° Bent Tube
606 —FTDON90 Female Tube Dual O-Ring Nut Swivel – 90° Bent Tube
607 —FTDOMN Female Tube Dual O-Ring Metric Nut Swivel
608 —FTDOMN45 Female Tube Dual O-Ring Metric Nut Swivel – 45° Bent Tube
609 —FTDOMN90 Female Tube Dual O-Ring Metric Nut Swivel – 90° Bent Tube
610 —FTON180 Female Tube O-Ring Nut Swivel 180°
611 —MIO134SP Male Inverted O-Ring w/R134a Service Port
612 —MIO134SP45 Male Inverted O-Ring Bulkhead w/R134a Service Port – 45° Bent Tube
613 —MIO134SP90 Male Inverted O-Ring w/R134a Service Port – 90° Bent Tube
614 —TORSP Universal T-Splicers English Threads
615 —MDL Male DIN Light Series 24° Inverted Cone
645 —FDLORX Female DIN Light Series O-Ring Swivel 24° Cone
650 —FDLORX45 Female DIN Light Series O-Ring Swivel 24° Cone - 45° Bent Tube
655 —FDLORX90 Female DIN Light Series O-Ring Swivel 24° Cone - 90° Bent Tube
670 —FDFFX Female DIN Flat-Face Swivel
675 —MFG Male French GAZ
680 —FFGX Female French GAZ Swivel
685 —FFGX45 Female French GAZ Swivel - 45° Bent Tube
690 —FFGX90 Female French GAZ Swivel - 90° Bent Tube
715 —MDH Male DIN Heavy Series 24° Inverted Cone
720 —FDHORX Female DIN Heavy Series O-Ring Swivel 24° Cone
725 —FDHORX45 Female DIN Heavy Series O-Ring Swivel 24° Cone - 45° Bent Tube
730 —FDHORX90 Female DIN Heavy Series O-Ring Swivel 24° Cone - 90° Bent Tube
735 —MKB Metric Kobelco
750 —MSP Metric Stand Pipe
751 —MSP45 Metric Stand Pipe - 45° Bent Tube
752 —MSP90 Metric Stand Pipe - 90° Bent Tube
795 —MBSPT Male British Standard Pipe Tapered / Japanese Tapered Thread
800 —FBSPT Female British Standard Pipe Tapered / Japanese Tapered Thread
810 —MBSPP Male British Standard Pipe Parallel
811 —MBSPPLN Male British Standard Pipe Parallel Long Nose
830 —FBSPORX Female British Standard Parallel Pipe O-Ring Swivel
831 —FBSPORX45 Female British Standard Parallel Pipe O-Ring Swivel - 45° Bent Tube
832 —FBSPORX90 Female British Standard Parallel Pipe O-Ring Swivel - 90° Bent Tube
845 —FBSPORX90BL Female British Standard Parallel Pipe O-Ring Swivel - 90° Block
847 —FBX90BLK Female British Standard Pipe Parallel - 90° Block
850 —BSPBJ BSPP Banjo
855 —FBFFX Female British Flat-Face Swivel
904 —MK Male Komatsu
910 —FKX Female Komatsu Style Japanese Metric Swivel
911 —FKX45 Female Komatsu Style Japanese Metric Swivel - 45° Bent Tube
913 —FKX90 Female Komatsu Style Japanese Metric Swivel - 90° Bent Tube
930 —FJISX Female Japanese Industrial Standard Swivel
935 —MMFA Male Metric Flareless Assembly
947 —FSLTORSP Female (Ford) Spring Lock "T" O-Ring Splicer
948 —FSLSP Female (Ford) Spring Lock Liquid Line Splicer
949 —MSL45 Male (Ford) Spring Lock - 45° Bent Tube
950 —MSL Male (Ford) Spring Lock
951 —MSL90 Male (Ford) Spring Lock - 90° Bent Tube
952 —FSL Female (Ford) Spring Lock
953 —FSL90 Female (Ford) Spring Lock - 90° Bent Tube
954 —R12SP Hose Splicer w/R12 7/16-20 Thread Service Port
955 —FSL45 Female (Ford) Spring Lock - 45° Bent Tube
956 —R134SP Hose Splicer w/R134AService Port
957 —R134SPRL Female Rotalok w/R134a Service Port – 90° Block
958 —CFTON90 Compressor Female Tube O-Ring Nut - 90° Bent Tube
959 —CFTON90BL Compressor Female Tube O-Ring Nut - 90° Block
960 —CFTON134SP90BL Compressor Female Tube O-Ring Nut w/ R134A Service Port - 90° Block
961 —CBSR12SP90 Compressor Pad Block – Single With Switch or Service Port
962 —CBSRR12SP90 Compressor Pad Block – Single Reversed With Switch or Service Port

Gates Global Part Numbering System

Air Brake

In the following example, the Global Part Number G31100-0808 identifies a SureLok™ Male Pipe (MP) coupling with -8 (1/2") tube size and -8 (1/2") thread size.

G 31 1 0 0 - 0 8 0 8

Series Stem Style (see below)

Thread Configuration (see below)

Stem Size (1/2")

Thread Size (1/2")

Series Stem Styles:

G31—SureLok™ Fittings (Description = AB)
G32—Compression Fittings (Description = ABC)
G33—Air Brake Fittings for Rubber Hose (Description = ABR)

Thread Configurations

These three-digit numbers identify the various coupling thread configurations

021 — MP-ATDV	Air Tank Drain Valve
027 — MP-CV	One Way Check Valve
030 — MAB-MP	Air Brake Adapter
031 — GH	Glad Hand
032 — GHS	Gladhand Seal
040 — TSI-AB	Tube Sleeve Insert
050 — TS-AB	Tube Sleeve
060 — TSN-AB	Tube Sleeve Nut
061 — SGN-ABR	Spring Guard Nut
100 — AB-MP	Air Brake to Male Pipe (NPTF - 30° Cone Seat)
102 — AB-MP45	Air Brake to Male Pipe - 45°
104 — AB-MP90	Air Brake to Male Pipe - 90°
105 — AB-MP-Port90	Air Brake to Male Pipe - 90° with Port
110 — ABRSG-MP	Air Brake to Male Pipe with Spring Guard
111 — ABRI-MP	Air Brake to Male Pipe without Nut
112 — SGABR	Air Brake Spring Guard
122 — AB-MPX45	Air Brake to Male Pipe Swivel - 45°
124 — AB-MPX90	Air Brake to Male Pipe Swivel - 90°
130 — MP-AB-AB	Male Pipe to Air Brake - Tee
131 — MP-AB-AB	Male Pipe to Air Brake - Tee Jump UP
132 — MP-AB-AB	Male Pipe to Air Brake - Tee Jump DOWN
134 — AB-AB-MP	Air Brake to Male Pipe - Tee
135 — AB-AB-MP	Air Brake to Male Pipe - Tee Jump UP
136 — AB-AB-MP	Air Brake to Male Pipe - Tee Jump DOWN
138 — AB-AB-MP45	Air Brake to Male Pipe - Tee - 45°
140 — MPX-AB-AB	Male Pipe Swivel to Air Brake - Tee
142 — AB-AB-MPX	Air Brake to Male Pipe Swivel - Tee
150 — AB-FP	Air Brake to Female Pipe
151 — ABR-FP	Air Brake to Female Pipe with Adapter
154 — AB-FP90	Air Brake to Female Pipe - 90°
160 — AB-AB-FP	Air Brake to Female Pipe - Tee
167 — MP-AB-FP	Male Pipe to Air Brake to Female Pipe - Tee
300 — AB-AB-BKHD	Air Brake Bulkhead
301 — AB-AB-BKHDS	Air Brake Bulkhead – Short
302 — AB-AB-BKHDL	Air Brake Bulkhead – Long
350 — AB-MFA-BKHD	Air Brake to Male Flareless Assembly Bulkhead
360 — AB-FP-BKHD	Air Brake to Female Pipe Bulkhead
377 — AB-GH-BKHD	Air Brake to Glad Hand Bulkhead
400 — AB-AB	Air Brake Union
404 — AB-AB90	Air Brake Union - 90°
450 — AB-AB-AB	Air Brake Union - Tee
451 — AB-AB-AB	Air Brake Union - Tee Jump UP
452 — AB-AB-AB	Air Brake Union - Tee Jump DOWN
453 — AB-AB-AB	Air Brake Union - Tee with Bracket
601 — AB-MP-TV	Air Brake to Male Pipe Truck Valve - 90°
602 — MP-ABC-TV	Male Pipe to Air Brake Truck Valve - 90°
610 — MP-MS90-TV	Male Pipe to Male SAE 45° Flare Truck Valve - 90°
612 — MS-MP90-TV	Male SAE 45° Flare to Male Pipe Truck Valve - 90°
620 — SB-MP90-TV	Single Bead Male Pipe Truck Valve - 90°
622 — SB-MP90-TVP	Single Bead Male Pipe Truck Valve with Pin Handle - 90°
630 — FP-MP90-TV	Female Pipe to Male Pipe Truck Valve - 90°
650 — MP-FP-FP3WTV	3-Way Truck Valve
655 — FP-FP-FP4WTV	4-Way Truck Valve – Short Handle
656 — FP-FP-FP4WTV-L	4-Way Truck Valve – Long Handle
701 — MFA-MFASC	Male Flareless Assembly to Male Flareless Assembly Shut-Off Cock
705 — MFA-MPSC	Male Flareless Assembly to Male Pipe Shut-Off Cock
710 — MP-FPSC	Male Pipe to Female Pipe Shut-Off Cock
715 — FP-FPSC	Female Pipe to Female Pipe Shut-Off Cock
720 — MS-MPSC	Male SAE 45° Flare to Male Pipe Shut-Off Cock
730 — MS-MSSC	Male SAE 45° Flare to Male SAE 45° Flare Shut-Off Cock
801 — MP-ADC	Male Pipe Air Drain Cock
805 — FP-MPADC	Female Pipe to Male Pipe Air Drain Cock
832 — MP-ADCBN	Male Pipe Air Drain Cock – Bibb Nose
850 — ATNKV	Air Tank Valve
970 — AB-MAN	6-Port Manifold

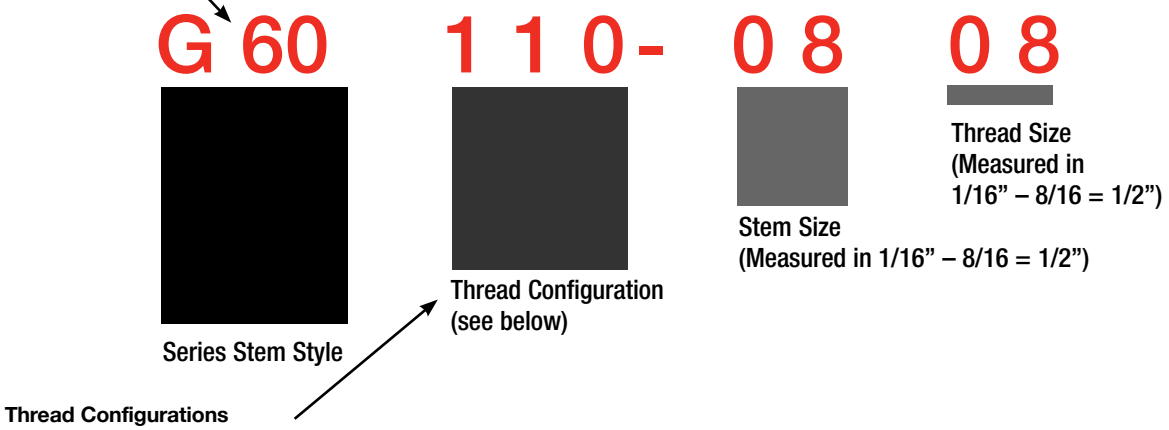
Gates Global Part Numbering System

Adapters

In the following example, the Global Part Number G60110-0808 identifies a Male Pipe NPTF (MP) to Male Pipe NPTF (MP) adapter with -8 (1/2") pipe thread and -8 (1/2") pipe thread size. **Meets SAE100R2 working pressures except where noted.**

Series Stem Styles:

G60—SAE to SAE **G62**—British to SAE **G63**—Metric to SAE **G64**—International to International **G65**—Japanese Conversion



Thread Configurations

These three-digit numbers identify the various coupling thread configurations

SAE to SAE

60050— FFN Female Flareless Nut
60051— FFS Female Flareless Sleeve
60102— MP-PLUG Male Pipe NPTF Plug
60110— MP-MP Male Pipe NPTF to Male Pipe NPTF
60115— MP-MP90 Male Pipe NPTF to Male Pipe NPTF - 90°
60130— MP-FPS Male Pipe NPTF to Female Pipe NPTF Reducer Bushing – Short
60132— MP-FPL Male Pipe NPTF to Female Pipe NPTF Increasing Bushing – Long
60136— MP-FP90 Male Pipe NPTF to Female Pipe NPTF - 90°
60140— MP-FPX Male Pipe NPTF to Female Pipe Swivel NPSM
60142— MP-FPX45 Male Pipe NPTF to Female Pipe Swivel NPSM – 45°
60144— MP-FPX90 Male Pipe NPTF to Female Pipe Swivel NPSM – 90°
60152— FP-FP Female Pipe NPTF to Female Pipe NPTF
60156— FP-FP90 Female Pipe NPTF to Female Pipe NPTF – 90°
60160— FP-FPX Female Pipe NPTF to Female Pipe Swivel NPSM
60162— FP-FPX45 Female Pipe NPTF to Female Pipe Swivel NPSM – 45°
60164— FP-FPX90 Female Pipe NPTF to Female Pipe Swivel NPSM – 90°
60181— FP-FP-FP Female Pipe NPTF – Tee
60183— FP-FP-MP Female Pipe NPTF on Run to Male Pipe NPTF – Tee
60184— FPX-FPX-FPX Female Pipe Swivel NPSM – Tee
60186— FPX-FPX-MP Female Pipe Swivel NPSM on Run to Male Pipe NPTF – Tee
60248— OR O-Rings for Straight Thread Boss Fittings
60250— MB-PLUG Male O-Ring Boss Plug
60275— MB-FP Male O-Ring Boss to Female Pipe NPTF
60285— MB-FPX Male O-Ring Boss to Female Pipe Swivel NPTF
60287— MB-FPX45 Male O-Ring Boss to Female Pipe Swivel NPTF – 45°
60289— MB-FPX90 Male O-Ring Boss to Female Pipe Swivel NPTF – 90°
60291— FB-MP Female O-Ring Boss to Male Pipe NPTF
60301— MB-MJ Male O-Ring Boss to Male JIC 37° Flare
60308— MB-MJ45 Male O-Ring Boss to Male JIC 37° Flare – 45°
60312— MB-MJ90 Male O-Ring Boss to Male JIC 37° Flare – 90°
60350— MJ-MJ-MB Male JIC 37° Flare on Run to Male O-Ring Boss – Tee
60352— MB-MJ-MJ Male O-Ring Boss to Male JIC 37° Flare to Male JIC 37° Flare – Tee
60394— TS Tube Sleeve
60395— TSN Tube Sleeve Nut
60399— LN Locknuts for Bulkhead Fittings
60401— FJ-CAP Female JIC 37° Flare Cap
60402— MJ-PLUG Male JIC 37° Flare Plug
60405— MJ-FBO Male JIC 37° Flare to Female Braze-On
60410— MJ-MJ Male JIC 37° Flare to Male JIC 37° Flare
60420— MJ-FJ Male JIC 37° Flare to Female JIC 37° Flare
60422— MJ-FJX Male JIC 37° Flare to Female JIC 37° Flare Swivel
60424— MJ-FJX45 Male JIC 37° Flare to Female JIC 37° Flare – 45°
60445— MJ-BKHD Male JIC 37° Flare to Male JIC 37° Flare Bulkhead
60446— MJ-BKHD45 Male JIC 37° Flare to Male JIC 37° Flare Bulkhead – 45°
60447— MJ-BKHD90 Male JIC 37° Flare to Male JIC 37° Flare Bulkhead – 90°
60469— MJ-MJ-MJ Male JIC 37° Flare – Tee
60470— MJ-MJ-FJX Male JIC 37° Flare on Run to Female JIC 37° Flare Swivel – Tee
60471—MJ-MJ-MJBKHD Male JIC 37° Flare on Run to Male JIC 37° Flare Bulkhead – Tee
60472— MJ-MJBKHD-MJ Male JIC 37° Flare to Male JIC 37° Flare Bulkhead to Male JIC 37° Flare – Tee
60473— MJ-FJX-MJ Male JIC 37° Flare to Female JIC 37° Flare Swivel to Male JIC 37° Flare – Tee
60490— MJ-MP Male JIC 37° Flare to Male Pipe NPTF
60497— MJ-MP45 Male JIC 37° Flare to Male Pipe NPTF – 45°
60499— MJ-MP90 Male JIC 37° Flare to Male Pipe NPTF – 90°
60510— MJ-FP Male JIC 37° Flare to Female Pipe NPTF
60514— MJ-FP90 Male JIC 37° Flare to Female Pipe NPTF – 90°
60520— FJX-MP Female JIC 37° Flare Swivel to Male Pipe NPTF
60524— FJX-MP90 Female JIC 37° Flare Swivel to Male Pipe NPTF – 90°
60530— FJX-FP Female JIC 37° Flare Swivel to Female Pipe NPTF
60541— MJBKHD-MP Male JIC 37° Flare Bulkhead to Male Pipe NPTF
60551— MJ-MJ-MP Male JIC 37° Flare on Run to Male Pipe NPTF – Tee
60650— MS-MP Male SAE 45° Flare to Male Pipe NPTF – Brass
60654— MS-MP90 Male SAE 45° Flare to Male Pipe NPTF – Brass – 90°
60660— MS-FP Male SAE 45° Flare to Female Pipe NPTF – Brass
60664— MS-FP90 Male SAE 45° Flare to Female Pipe NPTF – Brass –90°
60698— ORFF O-Rings for Flat Face Fittings
60701— FF-CAP Female Flat-Face O-Ring Cap
60702— MFFOR-PLUG Male Flat-Face O-Ring Plug
60724 — MFFOR-FFORX90 Male Flat-Face O-Ring to Female Flat-Face Swivel–90°
60742 — MFFOR-MFFOR-FFORX Male Flat-Face O-Ring on Run to Female Flat-Face Swivel – Tee
60770— MFFOR-MP Male Flat-Face O-Ring to Male Pipe NPTF
60800— MFFOR-MB Male Flat-Face O-Ring to Male O-Ring Boss
60801— MFFOR-MBL Male Flat-Face O-Ring to Male O-Ring Boss – Long
60805— MFFOR-MB45 Male Flat-Face O-Ring to Male O-Ring Boss – 45°

Gates Global Part Numbering System — Adapters (Continued)

Thread Configurations (Continued)

60810— MFFOR-MB90 Male Flat-Face O-Ring to Male O-Ring Boss – 90°
60820 — MFFOR-MFFOR-MB Male Flat-Face O-Ring on Run to Male O-Ring Boss – Tee
60821 — MFFOR-MB-MFFOR Male Flat-Face O-Ring to Male O-Ring Boss to Male Flat-Face O-Ring – Tee
60880 — FFORX-MJ Female Flat-Face O-Ring Swivel to Male JIC 37° Flare
60897 — FL-CAP Code 61 O-Ring Flange Cap
60898 — FLOR O-Rings for Code 61, Code 62 and Caterpillar-Style Flange Fittings
60899 — CFHS Flange Half Set (Code 61 – SAE J518)
60900 — FL-MJ Code 61 O-Ring Flange to Male JIC 37° Flare
60901 — FL4K-MJ / FL5K-MJ Code 61 O-Ring Flange to Male JIC 37° Flare High Pressure
60905 — FL-MJ45 Code 61 O-Ring Flange to Male JIC 37° Flare–45°
60906— FL4K-MJ45/ FL5K-MJ45 Code 61 O-Ring Flange to Male JIC 37° Flare High Pressure – 45°
60910 — FL-MJ90 Code 61 O-Ring Flange to Male JIC 37° Flare–90°
60911 — FL4K-MJ90 / FL5K-MJ90 Code 61 O-Ring Flange to Male JIC 37° Flare High Pressure – 90°
60915 — FL4K-MFFOR / FL5K-MFFOR Code 61 O-Ring Flange to Male Flat-Face O-Ring High Pressure
60920— FL4K-MFFOR45/ FL5K-MFFOR45 Code 61 O-Ring Flange to Male Flat-Face O-Ring High Pressure– 45°
60925 — FL4K-MFFOR90/ FL5K-MFFOR90 Code 61 O-Ring Flange to Male Flat-Face O-Ring High Pressure– 90°
60927 — FLH-CAP Code 62 O-Ring Flange Cap
60929 — FHHS Flange Half Set (Code 62 – SAE J518)
60930 — FLH6K-MJ Code 62 O-Ring Flange Heavy to Male JIC 37° Flare (6,000 PSI)
60935 — FLH6K-MJ45 Code 62 O-Ring Flange Heavy to Male JIC 37° Flare – 45° (6,000 PSI)
60940 — FLH6K-MJ90 Code 62 O-Ring Flange Heavy to Male JIC 37° Flare - 90° (6,000 PSI)
60945 — FLH6K-MFFOR/ FLH6K-MFFOR Code 62 O-Ring Flange Heavy to Male Flat-Face O-Ring (6,000 PSI)
60950 — FLH4K-MFFOR45/ FLH6K-MFFOR45 Code 62 O-Ring Flange Heavy to Male Flat-Face O-Ring - 45° (6,000 PSI)
60955 — FLH4K-MFFOR90/ FLH6K-MFFOR90 Code 62 O-Ring Flange Heavy to Male Flat-Face O-Ring - 90° (6,000 PSI)
60959— CATFHS Caterpillar-Style Flange Halve Sets

British Conversion to SAE

62150 — MBSPT-MJ Male British Standard Pipe Tapered Thread to Male JIC 37° Flare
62153 — MBSPT-MJ45 Male British Standard Pipe Tapered Thread to Male JIC 37° Flare – 45°
62155 — MBSPT-MJ90 Male British Standard Pipe Tapered Thread to Male JIC 37° Flare – 90°
62200 — MBSPP-MP Male British Standard Pipe Parallel to Male Pipe NPTF
62220 — MBSPP-FP Male British Standard Pipe Parallel to Female Pipe NPTF
62300 —MBSPP-MJ Male British Standard Pipe Parallel to Male JIC 37° Flare
62305 —MBSPP-MJ45 Male British Standard Pipe Parallel to Male JIC 37° Flare – 45°
62310 —MBSPP-MJ90 Male British Standard Pipe Parallel to Male JIC 37° Flare – 90°
62320 —MBSPP-FJX Male British Standard Pipe Parallel to Female JIC 37° Flare Swivel
62450 —MBSPPOR-MJ Male British Standard Pipe Parallel with O-Ring to Male JIC 37° Flare
62460 —MBSPPOR-MJ90 Male British Standard Pipe Parallel with O-Ring to Male JIC 37° Flare – 90°
62470— MBSPPOR-MFFOR Male British Standard Pipe Parallel with O-Ring to Male Flat-Face O-Ring
62473 — MBSPPOR-MFFOR45 Male British Standard Pipe Parallel with O-Ring to Male Flat-Face O-Ring – 45°
62475 — MBSPPOR-MFFOR90 Male British Standard Pipe Parallel with O-Ring to Male Flat-Face O-Ring – 90°
62500 — FBSPP-MP Female British Standard Pipe Parallel to Male Pipe NPTF
62520 — FBSPP-FP Female British Standard Pipe Parallel to Female Pipe NPTF
62550 — FBSPP-MJ Female British Standard Pipe Parallel to Male JIC 37° Flare
62605 — FBSPPX-MP90 Female British Standard Pipe Parallel Swivel to Male Pipe NPTF – 90°
62650 — FBSPPX-MJ Female British Standard Pipe Parallel Swivel to Make JIC 37° Flare
62660 — FBSPPX-FJX Female British Standard Pipe Parallel Swivel to Female JIC 37° Flare Swivel
62750 — FBSPPX-MJ Female British Standard Pipe Parallel Swivel to Male JIC 37° Flare
62801 — FBFFOR-MJ Female British Flat-Face O-Ring to Male JIC 37° Flare

Metric Conversion

63099 — MM-PLUG Male Metric O-Ring Plug
63120 — MM-FP Male Metric with O-Ring to Female Pipe NPTF
63150 — MM-MJ Male Metric with O-Ring to Male JIC 37° Flare
63160 — MM-MJ90 Male Metric with O-Ring to Male JIC 37° Flare–90°
63350 — MDL-MJ Male DIN 24° Cone – Light Series to Male JIC 37° Flare
63450 — FDLX-MJ Female DIN 24° Cone Swivel – Light Series to Male JIC 37° Flare
63650 — MDH-MJ Male DIN 24° Cone – Heavy Series to Male JIC 37° Flare
63750 — FDHX-MJ Female DIN 24° Cone Swivel – Heavy Series to Male JIC 37° Flare
63980 — MKB-PLUG Male Kobelco Plug
63990 — MKB-MJ Male Kobelco to Male JIC 37° Flare

International to International

64075 — BBDS British Bonded Seal
64094 — MBSPOR-PLUG Male British Standard Pipe Parallel with O-Ring Plug
64095 — ORFBSPP O-Rings for British Standard Parallel Pipe (BSPP Couplings)
64097 — FBSPP-CAP Female British Standard Pipe Parallel Cap
64098 — MBSPT-PLUG Male British Standard Pipe Tapered Plug
64099 — MBSPP-PLUG Male British Standard Pipe Parallel Plug
64350 — MBSPP-FBSPPX Male British Standard Pipe Parallel to Female British Standard Pipe Parallel Swivel
64775 — MBDS Metric Bonded Seal
64780 — ORDINL O-Rings for DIN Light Series (MegaCrimp® and GlobalSpiral™ Couplings)
64781 — ORDINH O-Rings for DIN Heavy Series (MegaCrimp® and GlobalSpiral™ Couplings)
64782 — ORDIN O-Rings for DIN Heavy Series (PC, PCM & PCS Couplings)
64787 — BS Metric Bite Sleeve
64788 — MNL Metric Bite Nut – Light
64789 — MNH Metric Bite Nut – Heavy
64790 — MM-PLUG Male Metric Plug
64792 — MDL-PLUG Male DIN 24° Cone – Light Series Plug
64793 — FDL-CAP Female DIN 24° Cone – Light Series Cap
64794 — MDH-PLUG Male DIN 24° Cone – Heavy Series Plug
64795 — FDH-CAP Female DIN 24° Cone – Heavy Series Cap

Japanese Conversion

65097 — FJIS-CAP Female Japanese Industrial Standard Cap
65099 — MJIS-PLUG Male Japanese Industrial Standard Plug
65100 — FJIS-MJ Female Japanese Industrial Standard to Male 37° Flare
65597 — FK-CAP Female Komatsu Cap
65599 — MK-PLUG Male Komatsu Plug
65600 — FK-MJ Female Komatsu to Male JIC 37° Flare
65700 — MK-MK Male Komatsu to Male Komatsu
65750 — MK-MJ Male Komatsu to Male JIC 37° Flare
65800 — MK-FK90 Male Komatsu to Female Komatsu – 90°
65950 — MK-FK-MK Male Komatsu to Female Komatsu to Male Komatsu – Tee

Gates Global Part Numbering System
Quick Disconnect Couplers

Gates Quick Disconnect couplers feature a meaningful part number that makes coupling identification fast and easy. Always refer to Gates Cross Reference Charts when selecting a quick disconnect coupler for a competitive interchange.

G940 Series - Agricultural Standard—Ball Valve

G94021-0808 D

Coupling Series (see below)	Body Style (see right)	Thread Style (see right)	Nominal Coupling Size	Thread Size	Letter Optional– (Double Acting Sleeve)

Body Style Identification

0 Assembly
1 Male Tip (Nipple)
2 Female Coupler
3 Repair Kit
5 O-Ring
6 Backup Ring
8 Dust Plug
9 Dust Cap

Thread Style

0 Not Applicable
1 Female Pipe
2 Female O-Ring Boss
3 Bulkhead Mounts
4 Female British Parallel Pipe

Miscellaneous

D Double-Acting Sleeve
P Connect-Under-Pressure Option

Coupling Series Indentification

MQBA	Male Quick Disconnect Ball Agricultural
FQBA(DA)	Female Quick Disconnect Ball Agricultural (Double Acting Sleeve)

G941 Series - Agricultural Standard—Poppet Valve

MQPA	Male Quick Poppet Agricultural
FQPA	Female Quick Poppet Agricultural

G942 Series - John Deere Old Style

MQBAJD	Male Quick Ball Agricultural John Deere
FQBAJD	Female Quick Ball Agricultural John Deere

G943 Series - International Harvester Old Style

MQBAIHC	Male Quick Ball Agricultural International Harvester

G944 Series - J.I. Case Old Style

MQBAJIC	Male Quick Ball Agricultural J.I. Case

G945 Series - Industrial ISO 7241-1—Series B

MQPI	Male Quick Poppet Industrial
FQPI	Female Quick Poppet Industrial

G949 Series - Flush Face, HTMA

MQFF	Male Quick Flush Face
CPMQFF	Male Quick Disconnect Flush Face (Connect-Under-Pressure)
FQFF	Female Quick Flush Face
CPFQFF	Female Quick Disconnect Flush Face (Connect-Under-Pressure)

G950 Series - High Pressure Flush Face

MQFFH	Male Quick Flush Face (High Pressure)
FQFFH	Female Quick Flush Face (High Pressure)

G951 Series - Wing Nut

MQW	Male Quick Wing
FQW	Female Quick Wing

G952 Series - High Pressure Wing Nut

MQWH	Male Quick Wing (High Pressure)
FQWH	Female Quick Wing (High Pressure)

G953 Series - Very High Pressure Flush Face

MQFFVH	Male Quick Flush Face (Very High Pressure)
FQFFVH	Female Quick Flush Face (Very High Pressure)

G956 Series - Industrial ISO 7241-1—Series A

MQP	Male Quick Poppet
FQP	Female Quick Poppet

G959 Series - Agricultural Adapters

MJD	John Deere Old Style
MISO	ISO Style
MIHC	International Harvester Style

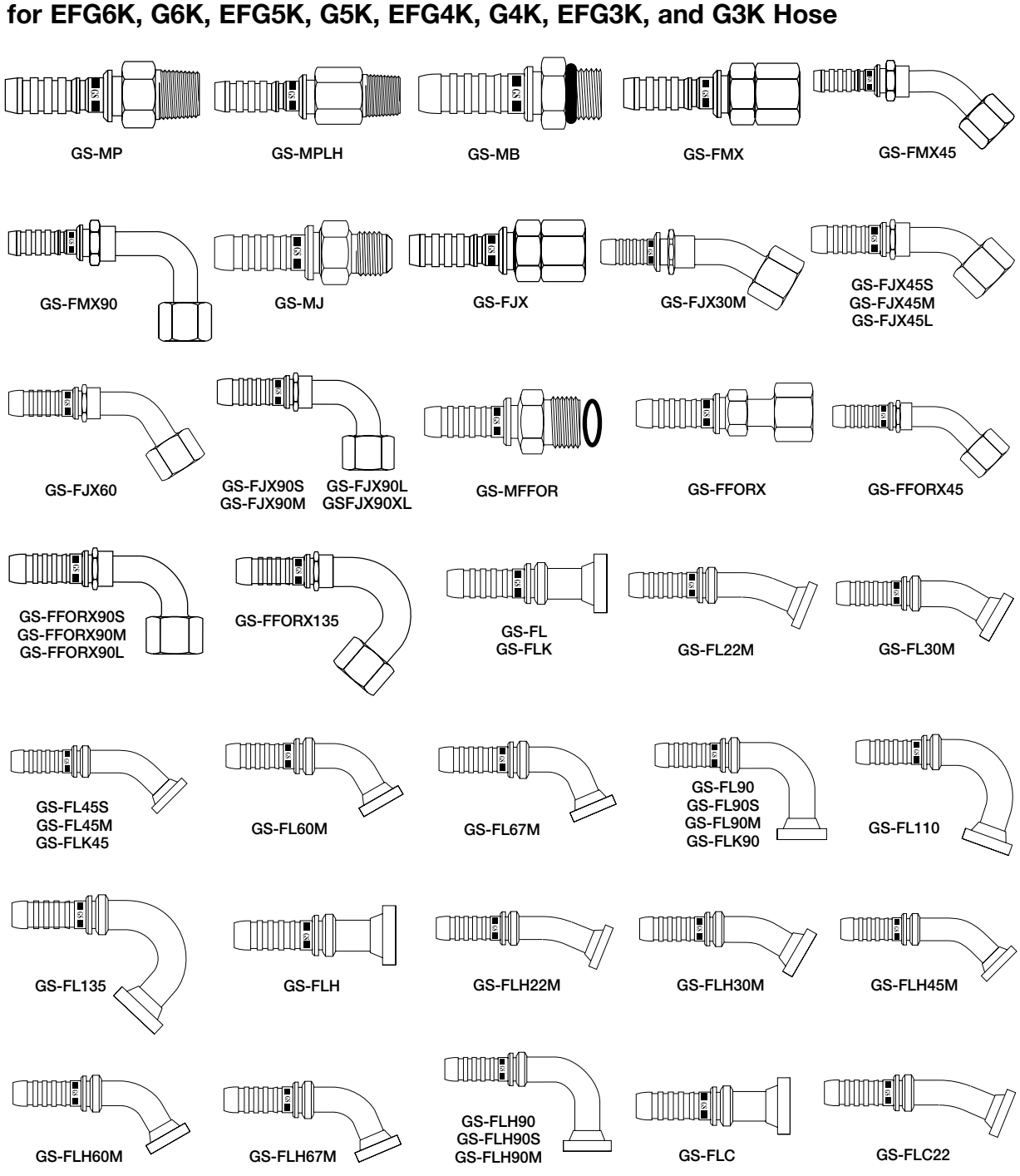
Miscellaneous

DA	Double Acting Sleeve
ISO	Industrial Standards Organization
DP	Dust Plug
DC	Dust Cap
DSO	Double Shut Off
FP	Female Pipe
FB	Female O-Ring Boss
QDAOR	G940 Series O-Ring for Female Coupler
QDIBR	G945 Series Backup Ring for Female Coupler
QDIOR	G945 Series O-Ring for Female Coupler
QDOR	G956 Series O-Ring for Female Coupler
QDBR	G956 Series Backup Ring for Female Coupler

Coupling/Thread Configurations

GlobalSpiral™ (GS) Couplings

for EFG6K, G6K, EFG5K, G5K, EFG4K, G4K, EFG3K, and G3K Hose

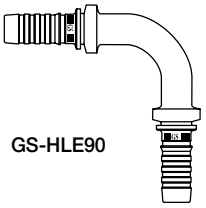


Coupling/Thread Configurations

GlobalSpiral™ (GS) Couplings

for EFG6K, G6K, EFG5K, G5K, EFG4K, G4K, EFG3K and G3K Hose (Continued)


GS-HLE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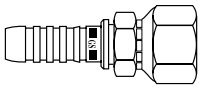
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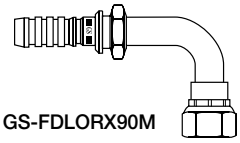
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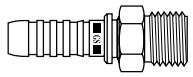
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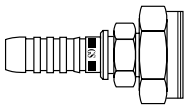
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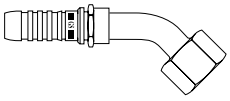
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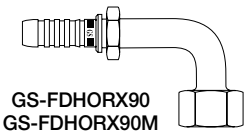
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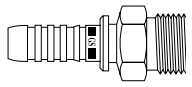
GS-FDHORX90M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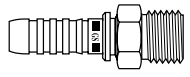
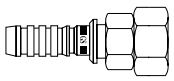

GS-MBSPP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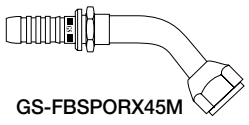
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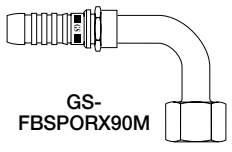
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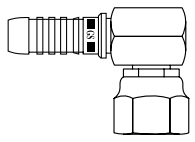
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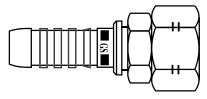
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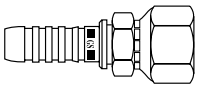
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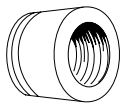
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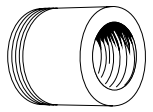
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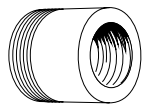
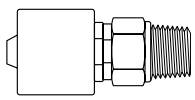
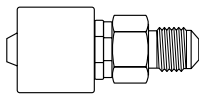

GSIF-6

GlobalSpiral™ (GS) Couplings –

One-Piece Couplings for Use with MobileCrimp® Crimpers

for EFG6K, G6K, EFG5K, G5K, EFG4K, G4K, EFG3K and G3K Hose


MGS-MP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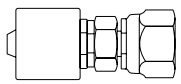
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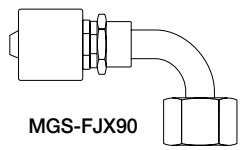
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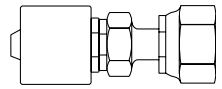
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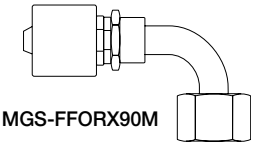
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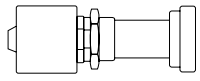
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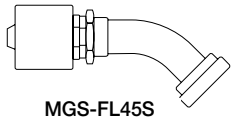
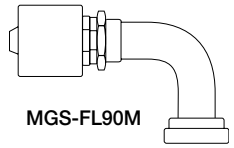

MGS-FL45S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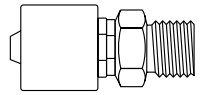
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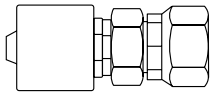
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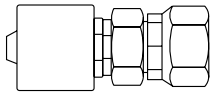
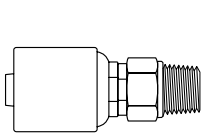

MGS-FBSPORX

MegaCrimp® Couplings
for High and Medium Pressure Hoses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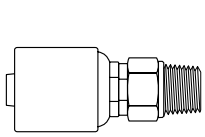
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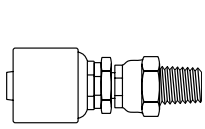
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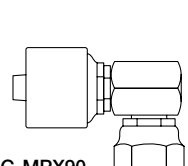
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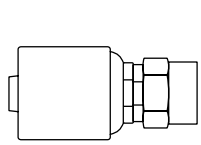
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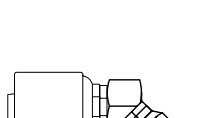
G-FPX


G-MB

G-MBX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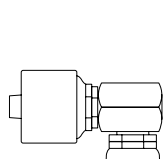
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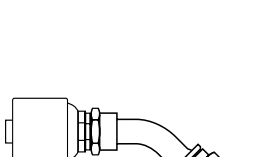
G-MBAX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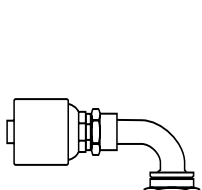
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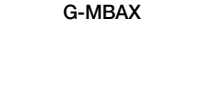
G-MJ

G-FJX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G-FJX45S
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G-FJX90S
G-FJX90M
G-FJX90L


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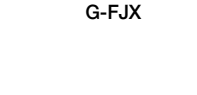
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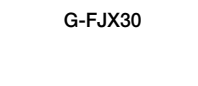
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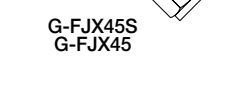
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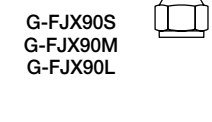
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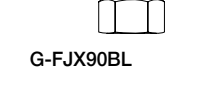
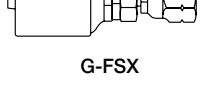

G-MFFOR


G-FFORX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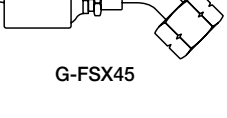
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G-FFORX90M
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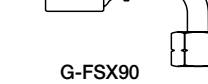
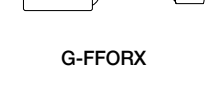

G-FL
G-FLK


G-FL22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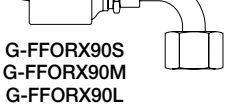
G-FL45
G-FLK45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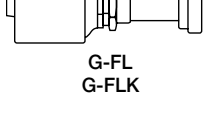
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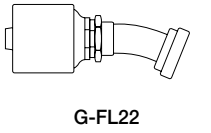
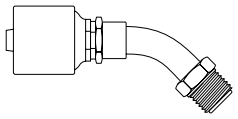

G-FL90
G-FLK90


G-MIX

Coupling/Thread Configurations

MegaCrimp® Couplings

for High and Medium Pressure Hoses (Continued)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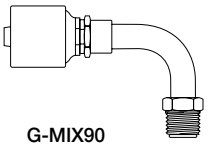
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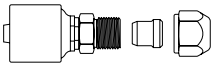
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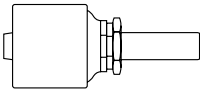
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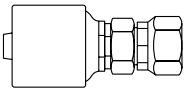
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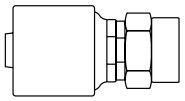
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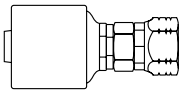
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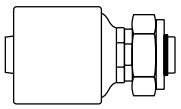
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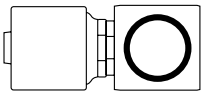
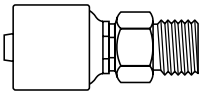

G-BJ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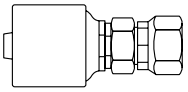
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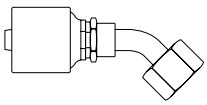
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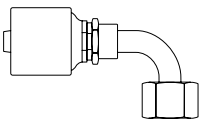
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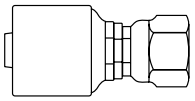
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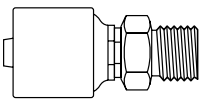
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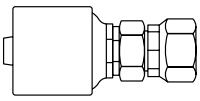
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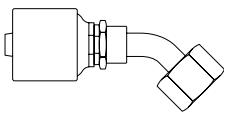
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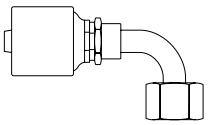
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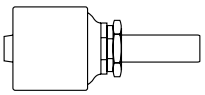
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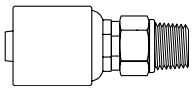
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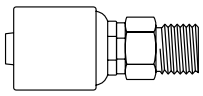
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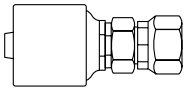
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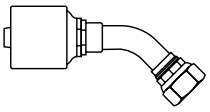
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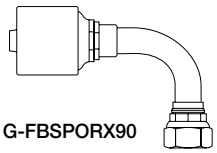
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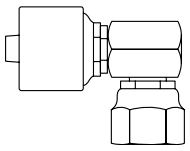
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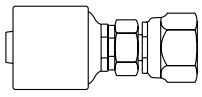
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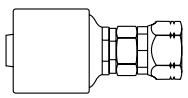
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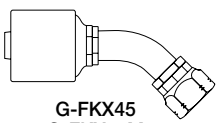
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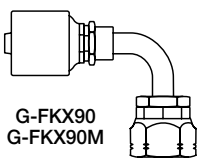
G-FKX45M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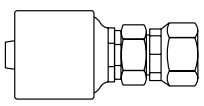
G-FKX90M


G-FJISX

Chemical Resistance Ratings for Gates Hose Polymers, Couplings and Adapter Materials

The Chemical Resistance Table lists the relative resistance of hose and coupling materials to more common chemicals. These ratings do not cover all possible variations of all factors, such as temperature, concentration, degradation or fluid contamination, etc. Testing under actual conditions is the best way to ensure chemical compatibility for critical applications.

For specific information, contact Gates Hose/ Connector Product Application, Denver, Colorado.

Rating Scale

"1"	Excellent resistance
"2"	Good resistance
"X"	Not recommended
"—"	Testing recommended

How to Use the Chemical Resistance Table

1. Chemicals are listed alphabetically.
2. Find the hose, coupling and adapter material type that has a resistance rating of "1" or "2" (See Rating Scale).
3. Find hose(s) with compatible polymer(s) in the Gates Hydraulic Hose Selection Guide.
4. Look for compatible couplings for the selected hose(s) by following the hose page references in the Selection Guide.

NOTE: O-rings used with couplings also must be considered for chemical compatibility with the fluid to be conveyed. This includes couplings containing internal O-rings; for example, MPX (Male Pipe Swivel). Gates standard O-ring is made of Nitrile. If O-rings other than Nitrile are required, contact Gates Hose/ Connector Product Application at 303-744-5070.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers: Trade Names A	C	C_2	J			Z		Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
	Neoprene	Nitrile	Nitrile/PVC	CPE	Hypalon	Urethane (cover rating only)	PTFE	Nylon					
A													
Absorption Oil	2	1	2	1	2	-	1	1	-	-	-	-	1
Acetaldehyde	X	X	X	-	X	1	1	2	1	1	1	1	1
Acetamide	1	2	-	-	-	X	1	-	-	-	-	-	-
Acetic Acid, 5-20%	2	X	2	1	2	X	1	1	X	2	2	2	X
Acetic Acid, 25%	2	X	2	1	2	-	1	X	X	2	2	2	X
Acetic Acid, 30%	2	X	-	1	-	-	1	2	X	2	1	2	X
Acetic Acid, 50%	2	X	2	1	-	-	1	2	X	2	2	2	X
Acetic Acid, 50% Boiling	X	X	-	-	-	-	1	X	X	X	2	-	-
Acetic Acid, 80%	X	X	-	-	-	-	1	X	X	2	2	2	X
Acetic Acid, 80% Boiling	X	X	-	-	-	-	1	X	X	X	2	X	X
Acetic Acid, 100%	X	X	-	-	-	-	1	X	X	X	2	2	X
Acetic Acid, 100% Boiling	X	X	-	-	-	X	1	X	X	X	2	-	X
Acetic Acid, 100% (Hot) Vapors	2	2	-	-	-	-	-	X	X	X	2	2	X
Acetic Acid, Air Free	-	-	-	-	-	-	1	-	X	X	X	-	X
Acetic Acid, Anhydride	X	X	X	1	2	-	1	X	X	2	2	2	X
Acetic Acid, Areated	-	-	-	-	-	-	1	-	X	X	X	-	X
Acetic Acid, Crude	X	X	-	-	-	-	1	1	X	2	1	2	X
Acetic Acid, Glacial	X	X	X	1	X	X	1	X	X	2	2	2	-
Acetone (Dimethylketone)	X	X	X	1	X	X	1	1	1	1	1	1	1
Acetonitrile (Methyl Cyanide)	2	X	2	1	2	-	-	-	-	-	-	-	-
Acetylene	2	2	1	1	-	-	1	1	1	1	1	1	2
Acrylonitrile (Vinyl Cyanide)	X	X	X	1	X	-	-	-	1	1	1	2	1
Aero Lubriplate	1	1	-	-	-	-	-	-	1	1	1	1	-
Aero-Safe 2300	X	X	-	-	-	X	-	-	1	1	1	1	1
Aeroshell Type 1A, 1AC, 4	2	1	-	-	-	1	-	-	-	-	-	-	-
Aeroshell 7AGrease	2	1	-	-	-	X	-	-	1	1	1	1	-
Aeroshell 17 Grease	2	1	-	-	-	X	-	-	1	1	1	1	-
Aeroshell 750	X	2	-	-	-	X	-	-	1	1	1	1	-
Air, Ambient	1	1	1	1	1	1	1	1	1	1	1	1	1
Air, 150°F	1	1	1	1	1	1	1	1	1	1	1	1	1
Air, 180°F	2	2	2	1	2	2	1	1	1	1	1	1	1
Air, 200°F	X	X	X	1	X	2	1	2	1	1	1	1	1
Aircraft Hyd. Oil AA	-	1	-	-	-	-	-	-	1	1	1	1	1
Alcohol	1	1	-	-	-	-	1	-	1	1	1	1	1
Alcohol, Amyl	2	2	-	-	-	-	1	1	-	2	1	2	-
Alcohol, Benzyl	X	X	-	1	2	2	1	-	1	1	1	-	-
Alcohol, Butyl	2	X	2	-	2	1	1	1	1	1	1	1	1
Alcohol, Denatured	1	1	-	-	1	-	1	1	1	1	1	1	1
Alcohol, Diacetone	-	X	-	-	2	-	1	-	1	1	1	1	1
Alcohol, Ethyl (Ethanol)	1	1	1	1	1	2	1	1	1	1	1	1	2
Alcohol, Furfural	2	X	X	1	2	-	1	-	2	1	1	1	1
Alcohol, Hexyl (Hexanol)	2	1	-	-	X	-	1	-	1	1	1	1	2
Alcohol, Isobutyl	2	2	-	-	1	-	1	1	1	1	1	1	2
Alcohol, Isopropyl (Isopropanol)	2	2	2	-	2	2	1	1	1	1	1	1	2
Alcohol, Methyl (100%) (Methanol)	1	1	1	1	1	-	1	1	1	1	1	1	2
Alcohol, Methyl (6%)	1	1	1	-	1	-	1	1	1	1	1	1	2
Alcohol, Octyl	2	2	-	-	-	-	1	1	1	1	1	1	-
Alcohol, Propyl	1	1	-	-	-	-	1	X	2	1	1	1	1
Alkazene	X	X	X	-	X	X	-	-	1	1	-	-	-
Aluminum Chloride	1	1	1	1	1	2	1	X	X	2	2	X	X
Aluminum Fluoride	1	1	1	1	1	2	1	X	X	2	2	2	X
Aluminum Hydroxide	1	1	1	1	1	-	1	1	-	1	1	-	1
Aluminum Hydroxide, Saturated	1	1	-	-	-	-	1	1	-	1	1	-	-
Aluminum Nitrate	1	1	1	1	1	2	1	-	X	1	1	2	-
Aluminum Sulfate	1	1	1	1	1	X	1	1	X	X	2	X	X
Alums (Ammonium or Potassium)	1	1	1	1	1	-	1	-	X	2	2	X	X
Ammonia, Aqueous	1	2	1	-	1	-	1	1	-	1	1	-	X
Ammonium Carbonate	2	X	-	-	-	-	-	-	1	1	1	-	-
Ammonium Chloride, 1%	X	2	1	1	1	1	1	1	X	2	2	X	X
Ammonium Chloride, 10% Boiling	X	X	-	-	-	-	1	X	X	2	2	X	X
Ammonium Chloride, 28% Boiling	X	X	-	-	-	-	1	X	X	2	2	X	X
Ammonium Chloride, 50% Boiling	X	X	-	-	-	-	1	X	X	2	2	X	X
Ammonium Hydroxide	2	2	2	1	1	X	1	1	2	1	1	-	X
Ammonium Hydroxide, 3 Molar	1	X	-	-	-	2	1	-	X	2	2	X	X
Ammonium Hydroxide, Concentrated	1	X	-	1	-	X	1	1	X	2	2	X	X
Ammonium Metaphosphate	2	2	2	-	2	-	1	-	1	1	1	X	-
Ammonium Nitrate, Fertilizer	1	2	1	1	1	1	1	X	1	1	1	2	X
Ammonium Nitrite	1	1	-	-	-	-	-	1	2	1	1	X	-
Ammonium Persulfate	X	X	X	1	-	X	-	X	X	2	2	X	X
Ammonium Persulfate, 5%	1	X	-	-	-	-	-	X	X	2	2	X	X
Ammonium Persulfate, 10%	1	X	-	-	-	X	-	X	X	2	2	X	X
Ammonium Phosphate (Mono, Di, Tri, Basic)	1	1	1	1	1	1	1	2	X	2	2	X	-
Ammonium Sulfate	1	2	1	1	1	1	1	X	X	X	2	X	X
Ammonium Thiocyanate	1	1	-	1	1	-	1	-	1	1	1	-	-
Amyl Acetate	X	X	X	2	X	2	1	1	X	1	1	X	2
Amyl Alcohol	2	2	2	1	-	-	1	1	1	1	1	1	1
Amyl Borate	2	2	2	-	-	-	-	-	-	-	-	-	-
Amyl Chloride	X	-	X	2	X	-	1	2	-	1	1	-	-
Amyl Chloronaphthalene	X	X	X	-	X	-	1	-	-	1	1	-	-
Amyl Naphthalene	X	X	X	-	X	-	1	-	-	1	1	-	-
Amyl Phenol	-	-	-	-	-	-	1	-	-	1	1	-	-
AN-0-3 Grade M	1	1	-	-	-	-	-	-	-	-	-	-	-
AN-0-6	1	1	-	-	-	-	-	-	-	-	-	-	-
AN-0-366	1	1	-	-	-	-	-	-	-	-	-	-	-
Anderol, L-774 (Diester)	X	2	-	-	-	-	1	X	-	-	-	-	-
Anderol, L-826 (Diester)	X	2	-	-	-	-	1	X	-	-	-	-	-
Anderol, L-829 (Diester)	X	2	-	-	-	-	1	X	-	-	-	-	-
ANG-25 (Glyceral Ester)	2	2	-	-	-	-	1	2	-	-	-	-	-
ANG-25 (Diester Base, TG749)	X	2	-	-	-	-	1	X	1	1	1	1	-
Aniline	X	X	X	2	X	X	1	2	2	1	1	X	X
Aniline Dyes	X	X	-	2	-	-	1	X	2	1	1	2	X
Aniline Hydrochloride	X	X	-	2	-	-	1	-	X	1	1	-	-
Animal Gelatin	1	1	-	1	-	-	1	-	-	1	1	-	-
Animal Fats	2	1	-	1	-	-	1	1	1	1	1	1	X
Animal Oil (Lard Oil)	2	1	-	1	-	-	1	-	1	1	1	1	-
Antifreeze, Alcohol Base	2	2	2	2	2	-	1	-	1	1	1	1	-
Antifreeze, Glycol Base	2	1	1	1	1	-	1	1	1	1	1	1	1
Antimony Chloride, 50%	-	1	-	-	-	-	1	X	X	X	X	-	-
AN-VV-0-366B Hydraulic Fluid	1	-	-	-	-	-	-	2	-	-	-	-	-
Aqua Regia (Concentrated)	X	X	X	2	X	X	1	X	X	X	X	X	-
Arco A.T.F. Dexron	-	1	-	-	-	-	-	-	-	-	-	-	-
Arco C2, 100	-	1	-	-	-	-	-	-	-	-	-	-	-
Aromatic Fuel 30%, Mil.	-	-	-	-	-	-	1	-	-	-	-	-	-
Aromatic Fuel 50%	X	2	-	-	-	-	1	-	-	-	-	-	-
Aromatic Hydrocarbons	X	X	-	-	X	2	1	-	2	1	2	2	2
Arsenic Acid	-	-	-	1	-	-	1	-	2	-	1	2	-
Askarel, Transformer Oil	X	X	X	-	X	-	1	-	1	1	1	-	1
Asphalt, Under 180°F	2	2	2	X	X	1	1	-	1	1	1	-	2
Asphalt, Cut Back	X	2	2	-	X	1	1	1	1	1	1	2	2
Asphalt, Topping	1	X	-	-	-	-	1	-	1	1	1	-	-
ASTM Oil No.	1	1	1	1	1	2	1	1	1	1	1	1	1
ASTM Oil No.	2	2	1	-	2	-	1	1	1	1	1	1	1
ASTM Oil No. 3	X	1	X	X	X	-	1	1	1	1	1	1	1
ASTM Oil No. 4	X	2	-	-	-	-	1	-	1	1	1	1	-
ASTM Reference Fuel A	②	1	①	1	1	-	1	1	1	1	1	1	1
ASTM Reference Fuel B	②	1	②	2	X	-	1	-	1	1	1	1	1
ASTM Reference Fuel C	X	2	X	2	X	-	1	-	1	1	1	-	1
ATL-857	X	2	-	-	-	-	-	-	-	-	-	-	-
Atlantic Dominion F	2	1	-	-	-	-	-	-	-	-	-	-	-

○Cover stock rating only; Rating for tube stock "X" *Use Gates fuel hose or contact Denver Product Applications Department.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers (Trade Names) A: Neoprene	A: Nitrile	C: Nitrile/PVC	C_2: CPE	J: Hypalon	J: Urethane (cover rating only)	Z: PTFE	Z: Nylon	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
Aurex 903R (Mobil)	2	1	-	-	-	-	-	-	-	-	-	-	-
Automatic Brake Fluid	2	X	-	-	-	-	1	-	1	1	1	1	-
Automatic Transmission Fluid - ATF	2	1	-	1	-	-	1	-	1	1	1	1	-
Aviation Gasoline, Mil.	-	2	-	-	-	-	-	-	1	1	1	1	-
B													
Baltic Types 100, 150, 200, 300, 500	-	1	-	-	-	-	1	-	-	-	-	-	-
Banvel, Concentrated (Ag Spray)	-	-	-	-	-	-	1	1	-	-	1	-	-
Bardol B	X	X	X	-	X	-	1	-	1	1	1	-	-
Barium Carbonate	1	1	1	1	1	-	1	1	2	1	1	X	1
Barium Chloride	X	1	1	1	1	1	1	1	X	2	2	X	2
Barium Chloride, 5%	X	1	-	-	-	-	1	X	2	1	1	X	-
Barium Chloride, Aqueous Solution (Hot)	X	1	-	-	-	-	1	X	2	2	2	X	-
Barium Hydroxide	1	1	1	1	1	X	1	1	X	1	1	X	X
Barium Sulfate	1	1	-	1	2	-	1	1	2	1	1	2	2
Barium Sulfate, Aqueous Solution (Hot)	X	-	-	-	-	-	1	X	2	1	1	2	-
Barium Sulfide	2	1	1	1	1	-	1	2	X	1	1	X	X
Bayol D	-	1	-	-	-	-	-	-	-	-	-	-	-
Bayol 35	-	1	-	-	-	-	-	-	-	-	-	-	-
Beet Sugar Liquors	X	1	1	1	1	X	1	-	2	2	2	2	X
Bellows 80-20 Hydraulic Oil	-	1	-	-	-	2	1	-	-	-	-	-	-
Benzaldehyde	X	X	X	2	X	1	1	1	1	1	1	1	1
Benzene, Benzol	X	X	X	X	X	2	1	1	1	1	1	1	1
Benzene Sulfonic Acid	X	-	-	-	-	-	1	-	X	-	2	X	-
Benzine, Petroleum Ether	X	2	X	1	-	2	1	-	1	1	1	1	1
Benzoic Acid 21°C (70°F)	X	X	X	1	-	-	1	-	1	1	1	1	1
Benzol	X	X	X	X	-	-	1	1	1	1	1	1	1
Benzyl Alcohol	X	X	-	1	-	-	1	X	1	1	1	1	-
Benzyl Benzoate	-	-	-	-	-	-	1	-	1	1	1	-	-
Benzyl Chloride	X	X	X	X	-	-	1	2	1	-	-	-	-
Biodiesel**	-	-	-	-	-	-	1	1	-	1	1	-	-
Bismuth Carbonate	X	-	-	-	-	-	1	-	1	1	1	-	-
Black Point 77	-	1	-	-	-	-	-	-	-	-	-	-	-
Black Sulfate Liquor	2	2	2	2	2	-	1	1	1	1	1	-	1
Blast Furnace Gas	X	X	X	-	X	X	1	-	1	1	1	2	1
Borax, Sodium Borate	X	2	2	1	1	1	1	X	2	1	1	X	2
Bordeaux Mixture	2	2	2	-	-	1	1	1	X	-	1	1	X
Boric Acid	1	1	1	-	1	1	1	X	X	2	2	1	X
Boron Fuels, HEF	X	X	-	-	-	-	-	-	-	-	-	-	-
Brake Fluid, Petroleum Base	2	1	2	1	X	-	1	-	1	1	1	-	1
Brake Fluid, Synthetic Base	X	X	X	1	X	-	1	1	1	1	1	1	1
Bray GG - 130	X	2	-	-	-	-	-	-	-	-	-	-	-
Brayco 719-r (VV-H-910)	2	X	-	-	-	-	-	-	-	-	-	-	-
Brayco 885 (MIL-L-6085A)	X	2	-	-	-	-	-	-	-	-	-	-	-
Brayco 910	2	2	-	-	-	-	-	-	-	-	-	-	-
Brine	1	1	1	1	-	-	1	1	2	1	1	-	2
Brom-113	X	2	-	-	-	-	-	-	-	-	-	-	-
Brom-114	2	2	-	-	-	-	-	-	-	-	-	-	-
Bromine, Dry	X	X	X	-	-	-	x	-	X	X	X	-	X
Bunker Oil	X	2	2	-	X	2	1	1	1	1	1	1	1
Butadiene	X	2	-	-	-	-	1	1	-	1	1	-	1
Butane	X	X	X	-	X	X	1	X	1	1	1	-	1
Butter Oil	2	-	-	-	-	-	1	-	1	1	1	1	1
Butyric Acid	X	-	-	1	-	-	1	X	X	1	1	-	2
Butyl Acetate	X	X	X	2	X	-	1	-	2	1	1	1	1
Butyl Alcohol	1	1	1	1	-	-	1	1	1	1	1	1	1
Butyl Amine	-	-	-	-	-	-	1	1	1	1	1	1	1
Butyl Carbitol	2	2	-	1	-	-	1	-	1	1	1	1	1
Butyl Mercaptan	-	-	-	-	-	-	1	-	-	1	1	1	-
Butyl Stearate	X	2	2	2	-	-	1	-	1	1	1	1	1
Butyraldehyde	X	X	-	2	-	-	1	-	-	-	-	-	1

○Cover stock rating only; Rating for tube stock "X"

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers (Trade Names) A: Neoprene	A: Nitrile	C: Nitrile/PVC	C_2: CPE	J: Hypalon	J: Urethane (cover rating only)	Z: PTFE	Z: Nylon	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
C													
Calcium Acetate	X	X	X	1	X	-	1	-	2	2	2	X	1
Calcium Arsenate	-	-	-	-	-	1	1	1	-	-	-	-	-
Calcium Bisulfate	1	1	2	1	1	-	1	-	-	2	1	-	X
Calcium Bisulfide	1	1	2	1	1	1	1	-	-	2	2	X	X
Calcium Bisulfite	1	1	1	1	1	-	1	1	X	1	1	1	X
Calcium Carbonate	1	1	1	1	1	1	1	1	2	1	1	X	1
Calcium Chlorate	1	1	1	-	1	-	1	-	2	2	1	1	-
Calcium Chloride	1	1	1	1	1	1	1	1	X	2	1	X	-
Calcium Hydroxide	1	2	2	1	1	X	1	-	X	X	1	-	2
Calcium Hydroxide, 10% Boiling	-	2	-	-	-	-	1	X	2	1	1	X	X
Calcium Hydroxide, 20% Boiling	-	-	-	-	-	-	1	X	-	1	1	X	X
Calcium Hydroxide, 50% Boiling	-	-	-	-	-	-	1	X	-	X	2	X	X
Calcium Hypochlorite, 5% (Under 100°F)	X	2	X	1	2	-	1	X	X	X	2	X	X
Calcium Hypochlorite, 15% (Under 100°F)	X	-	X	1	2	-	1	X	-	X	2	X	X
Calcium Nitrate	1	1	1	1	1	-	1	1	X	2	2	X	1
Calcium Silicate	-	2	-	1	2	-	1	-	1	1	1	1	1
Calcium Sulfate	1	1	1	1	1	-	1	-	2	1	1	2	1
Calcium Sulfide	1	2	-	1	-	-	1	2	2	1	1	2	-
Caliche Liquors	1	2	-	1	1	1	1	-	1	1	1	-	-
Cane Sugar Liquors	1	1	2	1	-	-	1	-	1	1	1	1	2
Carbolic Acid, Phenol	X	X	X	1	X	X	1	X	X	1	1	2	X
Carbon Dioxide, Dry	2	1	1	1	1	1	1	-	1	1	1	1	1
Carbon Dioxide, Wet	2	1	1	1	1	-	1	-	1	1	1	1	1
Carbon Disulfide	X	X	-	2	X	2	1	1	2	1	1	2	X
Carbon Monoxide, Under 150°F (Hot)	2	2	2	1	1	-	1	2	1	1	1	1	1
Carbon Tetrachloride, 5%-10%	-	-	-	-	-	-	1	-	-	X	-	-	-
Carbon Tetrachloride, Pure	X	X	X	2	X	X	1	X	X	X	2	2	2
Carbonic Acid	1	1	1	1	1	X	1	-	X	1	1	2	X
Castor Oil	2	2	2	1	2	2	1	1	1	1	1	1	1
Caustic Soda, 20%	2	X	X	1	1	X	1	2	2	1	1	X	X
Caustic Soda, 50%	2	X	X	1	1	X	1	2	2	1	1	X	X
Cellosolve Acetate, Under 100°F	X	X	X	2	X	-	1	-	2	2	2	1	-
Cellosolve, Butyl, Under 100°F	X	X	X	-	X	-	1	-	2	2	2	2	-
Cellosolve, Union Carbide, Under 100°F	X	X	-	-	-	-	1	-	2	2	2	2	-
Cellugard, Cellugard 200	1	1	-	-	-	-	1	-	1	1	1	1	1
Cellulube 90, 150, 220, 300, 550	X	X	X	-	X	-	1	-	1	1	1	1	1
Cellulube 1000, 220A, ST220, A60	X	X	X	-	X	-	1	-	1	1	1	1	1
Cellutherm 2505A	X	2	-	-	-	-	-	-	-	-	-	-	-
Chevron Fr-10,13,20.8	-	-	-	-	-	-	1	-	1	1	1	-	1
Chlordane	X	X	X	-	X	-	1	1	-	-	-	-	-
Chlorinate Paraffin & Petroleum Oil	-	-	-	-	-	-	1	-	1	1	1	1	1
Chlorine Gas, Dry	N/A	X	N/A	N/A	-	-	1	-	2	X	X	-	2
Chlorine Gas, Wet	N/A	X	N/A	N/A	-	-	1	-	X	X	X	X	X
Chlorine Trifluoride	X	X	-	-	-	-	-	-	1	1	1	1	-
Chlorine Water, 3% Chlorine	X	X	X	-	-	-	1	-	-	X	X	-	-
Chlorine Water, 25% Chlorine	X	X	X	-	2	2	1	2	-	X	X	-	-
Chloroacetic Acid (Under 100°F)	X	X	X	-	2	-	1	X	X	X	X	-	2
Chlorobenzene	X	X	X	X	X	-	1	X	2	2	2	X	1
Chlorobromo Methane	X	X	X	-	X	-	1	-	2	2	2	X	1
Chloroform	X	X	X	X	X	-	1	X	2	1	1	X	1
O-Chloronaphthalene	X	X	X	-	-	-	1	2	1	1	1	-	1
Chlorosulfonic Acid	2	X	X	X	-	-	1	X	1	-	-	-	-
Chlorotoluene	X	X	X	X	X	X	1	-	1	1	1	X	1
Chlorox, Bleach	2	2	-	1	2	-	1	1	X	X	2	X	X
Chromic Acid, 5%	X	X	-	-	-	-	1	X	X	X	2	X	X
Chromic Acid, 10%	X	X	X	1	2	X	1	X	X	X	2	X	X

*Use Gates fuel hose or contact Denver Product Applications Department.
**Nitrile 150°F or less, no constant contact.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers: A	C	C_2	J			Z	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
	Trade Names: Neoprene	Nitrile	Nitrile/PVC	CPE	Hypalon	Urethane (cover rating only)	PTFE	Nylon					
Chromic Acid, 25%	X	X	X	1	2	X	1	X	X	X	2	X	X
Chromic Acid, 50%	X	X	X	1	2	X	1	X	X	X	2	1	X
Chromic Acid, 100%	-	-	-	-	-	X	1	-	X	X	2	-	X
Circo Light Process Oil	1	1	-	-	-	-	1	-	1	1	1	1	-
Citgo FR Fluids	-	X	-	X	-	2	1	-	1	1	1	-	1
Citgo Glycol FR-20XD	-	1	-	-	-	2	1	-	1	1	1	-	1
Citgo Sentry (Under 100°F)	2	2	1	-	X	2	1	-	1	1	1	-	1
Citgo Tractor Hydraulic Fluid	-	1	-	-	-	2	1	-	1	1	1	-	1
Citric Acid, 5%	-	2	-	-	-	-	1	1	X	1	1	1	X
Citric Acid, 5% @150°F	-	2	-	-	-	-	1	X	X	X	1	2	X
Citric Acid, 15%	1	2	-	-	-	-	1	1	X	X	1	-	1
Citric Acid, 15% Boiling	1	2	-	-	-	-	1	X	X	2	1	X	X
Citric Acid, Concentrated Boiling	1	X	1	-	1	2	1	X	X	X	1	X	X
Coal Gas	1	X	-	1	-	1	1	-	-	-	-	-	-
Coal Tars	X	2	X	2	2	-	1	X	1	1	1	1	1
Cod Liver Oil	1	1	1	-	-	-	1	-	1	1	1	1	1
Coke Oven Gas (Under 100°F)	X	2	X	-	2	-	1	-	1	1	1	1	1
Condor 1000,1002,1004, 1006,1008	-	2	-	-	-	-	-	-	-	-	-	-	-
Condor 1008,1010,1012, 1014,1016	-	2	-	-	-	-	-	-	-	-	-	-	-
Convelex 10	X	X	-	-	-	-	-	-	-	-	-	-	-
Copper Arsenate, Cupric Arsenate	-	-	-	-	2	-	1	-	1	1	1	-	-
Copper Chloride, 1%	1	1	-	-	-	-	1	X	X	X	1	-	X
Copper Chloride, 5%	1	1	-	-	-	-	1	X	X	X	1	-	-
Copper Chloride, Cupric Chloride	2	2	2	2	2	1	1	2	X	X	1	-	X
Copper Cyanide, Cupric Cyanide	2	2	2	-	2	-	1	X	1	1	1	-	X
Copper Nitrate, 1% & 5%	1	1	-	-	-	-	1	1	X	1	1	X	X
Copper Nitrate, Cupric Nitrate	1	1	1	1	1	-	1	-	1	1	1	1	-
Copper Sulfate, Cupric Sulfate	1	1	1	1	1	1	1	1	X	1	1	X	X
Copper Sulfate, 10%	1	1	-	-	-	-	1	-	X	2	2	X	-
Copper Sulfate, 50%	1	1	-	-	-	-	1	-	-	2	2	-	-
Corn Oil	X	2	2	2	X	X	1	-	1	1	1	-	1
Corn Syrup	2	2	-	2	-	-	1	-	1	1	1	1	-
Cottonseed Oil	2	2	1	2	2	X	1	2	1	1	1	1	1
Creosote, Wood Or Coal Tar (Under 100°F)	X	2	X	-	X	X	1	X	2	1	1	1	X
Cresol, Cresylic Acid (Under 100°F)	X	X	X	1	X	-	1	X	2	1	1	2	-
Cyesylic Acid	X	X	-	-	-	-	1	X	1	1	1	1	-
Crude Petroleum Oil (Under 100°F)	X	X	2	2	2	2	1	-	X	X	2	1	-
Cutting Oil, Water Soluble	X	1	-	-	-	-	1	-	1	1	1	-	1
Cutting Oil, Sulfur Base	X	1	-	-	-	-	1	-	1	1	1	1	1
Cutting Oil	2	1	2	1	X	-	1	-	1	1	1	1	1
Cyclohexane	X	2	-	1	X	1	1	1	1	1	1	1	1
Cyclohexanone	X	X	X	2	X	1	1	1	-	1	1	2	-
Cymene	X	X	X	X	X	-	1	-	1	1	1	1	1
D													
Dasco FR150, FR200, FR200B, FR310	-	1	-	-	-	-	1	1	1	1	1	1	1
Dasco IFR	-	1	-	-	-	-	1	1	1	1	1	1	1
DC200, DC510, DC550, DC560	-	1	-	-	-	-	-	1	-	1	1	1	1
Decalin	X	2	-	2	X	-	1	1	-	-	-	-	1
Dectol R&O Oils	X	1	-	-	-	2	-	-	-	-	-	-	-
Denatured Alcohol	1	1	1	1	-	-	1	1	1	1	1	1	1
Developing Fluids, Photo	1	1	-	1	-	-	-	-	X	X	2	-	-
Developing Solutions, Hypos	2	-	-	1	2	-	1	-	-	1	1	-	-
Diacetone	X	X	X	1	X	-	1	1	1	1	1	1	1
Diacetone Alcohol	-	X	-	1	-	-	1	1	1	1	1	1	1
Dibenzel Ether	X	X	-	2	-	-	1	-	1	1	1	1	1
Dibutyl Ether	X	X	-	1	-	-	1	-	1	1	1	1	1
Dibutyl Phthalate (Under 120°F)	X	X	X	2	X	2	1	-	1	1	1	1	1
Dibutyl Sebacate	X	X	X	2	-	-	1	-	-	-	-	-	1
Dichlorobenzene	X	X	X	X	X	X	1	1	-	1	1	-	1
Dichloroethane	X	X	X	X	-	-	1	X	-	X	X	X	X
Diesel, Biodiesel**	-	-	-	-	-	-	1	1	-	1	1	-	-
Diesel Oil, Fuel ASTM #2	②	1	②	2	X	1	1	1	1	1	1	1	1
Diester Lubricant MIL-I-7808	X	2	-	-	-	-	1	-	1	1	1	1	-
Diester Synthetic Lubricants	X	2	-	-	-	-	1	-	1	1	1	1	-
Diethylamine (Under 120°F)	2	2	-	2	X	-	1	1	1	1	1	1	1
Diethylene Glycol	1	1	1	1	1	1	1	1	1	1	1	1	1
Diethy Ether	X	X	-	1	-	-	1	-	1	1	1	1	1
Diethyl Phthalate	-	X	-	2	-	-	1	-	-	1	1	-	1
Diethyl Sebacate	X	X	X	2	-	-	1	-	-	1	1	-	1
Diisobutylene	X	2	-	1	X	-	1	-	2	1	1	2	1
Diisobutyl Ketone	X	X	X	2	X	-	1	1	1	1	1	1	1
Diisopropyl Ketone	X	X	X	2	X	-	1	1	-	1	1	-	1
Dimethyl Aniline	X	X	X	2	X	-	1	-	-	-	-	-	1
Dimethyl Formamide (Under 120°F)	X	X	X	-	-	-	1	-	1	1	1	1	-
Dimethyl Phthalate	X	X	X	1	X	-	1	-	-	-	-	-	1
Dioctyl Phthalate	X	X	X	2	X	-	1	-	1	1	1	1	1
Dioctyl Sebacate	X	X	X	X	X	-	1	-	1	1	1	1	-
Dioxane	X	X	X	2	-	-	1	1	1	1	1	1	1
Dipentene	X	X	-	2	-	-	1	-	1	1	1	1	1
Dirco Oils	-	1	-	-	-	-	1	1	1	1	1	1	1
Dispersing Oil #10	X	X	-	-	-	-	1	-	1	1	1	1	-
Dowtherm A	X	X	X	2	X	X	1	-	1	1	1	1	1
Dowtherm E	X	X	-	2	-	-	1	-	1	1	1	1	1
DP47, 200 Flow - DOW	-	1	-	-	-	-	1	1	1	1	1	1	1
Duro FR-HD	-	1	-	-	-	X	1	1	1	1	1	1	1
Duro Oils	-	1	-	-	-	-	1	1	1	1	1	1	1
E													
Elco 28-EPLubricant	X	1	-	-	-	-	-	-	1	1	1	1	-
Enamels	-	-	-	-	-	-	1	1	-	-	-	-	1
Energol HL68	-	1	-	-	-	-	-	-	1	1	1	1	1
Energol HLPC 68	-	1	-	-	-	-	-	-	1	1	1	1	1
EPHydraulic Oils, Chevron	-	1	-	-	-	-	-	-	1	1	1	1	1
Epichlorohydrin (Under 120°F)	X	X	-	-	-	-	1	-	1	2	1	1	-
Esam-6 Fluid	2	-	-	-	-	-	-	-	-	-	-	-	-
Ethanol	1	1	-	1	-	X	1	1	X	1	1	-	1
Ethanolamine, Aminoethanol	2	2	-	1	X	X	1	1	1	1	1	1	1
Ethers (Under 120°F)	X	2	X	1	2	2	1	1	1	1	1	1	1
Ethyl Acetate	X	X	X	2	X	2	1	1	1	1	1	2	2
Ethyl Acetoacetate	X	X	X	1	X	X	1	-	1	1	1	1	1
Ethyl Acrylate	X	X	X	2	X	X	1	-	1	1	1	1	-
Ethyl Alcohol	1	1	1	1	-	-	1	1	1	1	1	1	2
Ethyl Amine, Monoethylamine	X	X	X	1	X	X	1	-	2	1	1	2	1
Ethyl Benzene	X	X	X	2	X	1	1	-	1	1	1	1	1
Ethyl Bromide, Di	X	X	X	2	X	-	1	-	1	1	1	1	1
Ethyl Butyrate	X	X	X	-	-	-	1	-	-	1	1	1	-
Ethyl Cellulose	-	-	-	1	-	-	1	-	1	1	1	-	1
Ethyl Chloride	X	X	X	-	-	X	1	-	2	1	1	1	2
Ethyl Ether		X	X	X	-	-	1	-	2	1	1	1	1
Ethyl Mercaptan	X	X	X	-	X	X	1	-	2	-	-	-	-
Ethyl Oxalate	X	X	-	1	X	X	1	-	-	-	-	-	-
Ethyl Pentachlorobenzene	-	X	-	X	-	1	1	-	2	1	1	-	1
Ethyl Silicate	1	1	1	1	-	1	1	1	1	1	1	1	1
Ethylene Chloride	X	X	X	X	-	1	1	X	2	1	1	-	2
Ethylene Chlorohydrin, Under 100°F	X	X	X	-	-	X	1	X	1	1	2	X	-
Ethylene Diamine (Under 100°F)	2	2	2	1	X	X	1	-	-	-	-	-	1
Ethylene Dichloride	X	X	-	2	-	1	1	1	-	1	1	X	-
Ethylene Glycol	1	1	1	1	1	1	1	1	2	1	1	1	1

**Nitrile 150°F or less, no constant contact.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers (Trade Names) A	C	C_2	J			Z	Couplings & Adapters				
	Neoprene	Nitrile	Nitrile/PVC	CPE	Hypalon	Urethane (cover rating only)	PTFE	Nylon	Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
F													
Factovis 52	-	1	-	-	-	-	-	-	1	1	1	1	1
Fatty Acids	2	2	2	2	X	1	1	1	2	1	1	1	2
Ferric Chloride	-	-	-	1	2	-	1	1	X	X	X	X	X
Ferric Chloride, 1%	1	1	-	-	-	-	1	1	X	2	2	X	X
Ferric Chloride, 1% Boiling	-	2	-	-	-	-	1	1	X	X	X	X	X
Ferric Chloride, 5% Still	2	1	-	-	-	-	1	1	X	X	X	X	X
Ferric Chloride, 5% Agitated or Aerated	2	2	-	-	-	-	1	1	X	X	X	X	X
Ferric Chloride, 10%	2	1	-	-	-	-	1	1	X	X	X	X	X
Ferric Sulfate	2	2	2	1	2	-	1	1	X	1	1	X	X
Ferrous Chloride	1	1	-	1	2	-	1	-	X	1	2	-	2
Ferrous Nitrate	2	2	2	-	2	-	1	-	-	1	1	-	-
Ferrous Sulfate, Copper Gas	2	2	2	1	2	-	1	-	X	1	1	1	2
Ferrous Sulfate, 10%	1	1	-	-	-	-	1	1	X	2	2	X	-
Ferrous Sulfate, Saturated	1	-	-	-	-	-	1	1	-	2	2	X	-
Fire Resistant Hydraulic Fluid, Texaco	-	1	-	-	-	-	1	-	1	1	1	1	1
Firtec 290, MF	-	-	-	-	-	-	1	-	-	-	-	-	-
Fixing Solution, Photo	2	-	-	-	2	-	1	-	-	1	1	-	-
Fluoboric Acid	1	1	-	1	-	-	1	-	1	-	1	X	-
Fluoboric Acid, 65%	2	-	-	1	2	X	1	-	-	1	1	-	-
Fluosilicic Acid	2	1	-	-	-	-	1	-	X	X	X	X	1
Fluosilicic Acid, 50%	2	X	X	1	2	X	1	X	-	-	-	1	-
Formaldehyde	1	X	-	1	-	-	1	2	1	1	1	1	X
Formaldehyde, 37%	2	2	-	1	2	2	1	-	-	1	1	1	1
Formaldehyde, Hot	-	-	-	-	-	-	1	1	X	2	1	2	1
Formic Acid (Under 120°F)	1	X	1	1	2	X	1	2	X	2	1	1	2
Formic Acid, Dilute Hot	1	X	-	1	-	-	1	X	X	2	1	2	X
Freon 12 (Under 100°F)	Use Freon Hose Only								2	1	1	1	1
Freon 114	Use Freon Hose Only								1	1	1	1	-
Fruit Juices						-	-	1	1	X	1	1	-
Fuel Oil	②	1	①	1	X	2	1	1	2	2	2	1	2
Fumaric Acid	2	X	-	-	-	X	1	-	1	1	1	-	-
Furan, Furfuran	X	X	X	1	-	-	1	-	1	1	1	1	1
Furan Resin	X	X	-	-	-	-	1	-	-	-	1	-	-
Furfural Alcohol, Ant Oil	2	X	X	1	2	-	1	1	2	1	1	1	1
Fusel Oil, Grain Oil	X	X	-	-	-	-	1	-	-	-	-	-	-
Fyrguard 150, 200	-	1	-	-	-	-	1	-	1	1	1	1	1
Fyrquel A60, 90, 100, 150, 220, 300, 500	X	X	-	-	-	-	1	-	1	-	-	1	-
Fyrquel 1000, 15R&O, 220R&O, 550R&O	X	X	-	-	-	-	1	-	1	-	-	1	-
G													
Gallic Acid (Under 100°F)	X	X	X	1	-	X	1	2	X	1	1	X	-
Gas, Natural	-	-	-	X	-	-	1	-	1	1	1	-	2
Gasohol	2	*	*	-	X	-	1	-	2	1	1	1	1
Gasoline, Aviation	X	-	2	-	-	-	1	-	-	1	1	1	1
Gasoline, Meter	X	*	-	-	-	-	1	X	1	1	1	1	X
Gasoline, Premium	②	*	*	-	X	X	1	-	2	1	1	1	1
Gasoline, Sour	X	X	-	-	-	-	1	-	2	1	1	X	-
Gasoline, Standard	①	*	*	2	X	X	1	-	2	1	1	1	1
Gasoline, Unleaded Under 50% Aromatics	X	*	X	-	X	X	1	-	2	1	1	1	1
Gelatin	1	1	-	-	-	-	1	1	X	1	1	1	-
Glauber's Salt	2	X	-	-	-	-	1	-	1	1	1	-	-
Glucose	1	1	1	-	1	1	1	1	1	1	1	1	1
Glue (Under 120°F)	2	2	2	-	1	1	1	2	2	1	1	2	X
Glycerine, Glycerol	1	1	1	1	1	1	1	1	2	1	1	1	2
Glycol FR Fluids	-	1	-	-	-	-	1	-	1	1	1	1	1
Glycols (Under 120°F)	1	1	1	1	1	1	1	1	2	1	1	1	1
Grease, Ester Base	-	-	-	-	-	-	1	1	1	1	1	1	1
Grease, Petroleum Base	2	1	2	-	2	1	1	1	1	1	1	1	1
Grease, Silicone Base	-	-	-	-	-	-	1	1	1	1	1	1	1
Green Sulfate Liquor, Under 100°F	2	2	1	2	1	-	1	-	1	1	1	-	-
Gulf FR Fluid G-200	-	1	-	-	-	X	1	-	1	1	1	1	1
Gulf FR Fluid P37, P40, P43, P45, P47	-	X	-	-	-	X	1	-	-	-	-	-	-
H													
Halowax Oil	X	X	X	-	X	-	1	-	-	-	-	-	-
Heptachlor, In Petroleum	-	2	X	-	-	-	1	-	-	-	-	-	-
Heptane (Under 100°F)	②	1	②	1	X	1	1	1	1	1	1	1	1
N-Hexaldehyde	2	X	2	-	-	-	1	-	1	1	1	1	1
Hexane (Under 120°F)	②	1	②	2	1	1	1	1	1	1	1	1	1
Hexene	②	2	-	1	-	-	1	-	1	1	1	-	1
Hexyl Alcohol	1	2	1	1	-	-	1	-	1	1	1	1	2
High Viscosity Lubricant, U4	2	1	-	-	-	-	1	-	-	-	-	-	-
High Viscosity Lubricant, H2	2	1	-	-	-	-	1	-	-	-	-	-	-
Hilo MS #1	X	X	-	-	-	-	-	-	-	-	-	-	-
Houghto-Safe 1010,1055 (Phos. Ester)	X	X	X	1	X	-	1	-	1	1	1	1	1
Houghto-Safe 1115,1120, 1130 (Phos. Ester)	X	X	X	1	X	-	1	-	1	1	1	1	1
Houghto-Safe 271,416,520, 616 (Water/Glycol)	2	1	1	-	-	2	1	-	1	1	1	1	1
Houghto-Safe 620, 625, 640, 525 (Water/Glycol)	1	1	1	-	-	2	1	-	1	1	1	1	1
Houghto-Safe 5046, 5046W (Water/Oil Emulsion)	2	1	-	-	-	-	1	-	1	1	1	1	1
Hy-Chock Oil	-	1	-	-	-	-	1	1	1	1	1	-	-
Hydrafluid 760, Texaco and Houghton	-	1	-	-	-	-	1	1	1	1	1	-	1
Hydrafluid AZR&O, A, B, AA, C	-	1	-	-	-	-	1	1	1	1	1	-	1
Hydrasol A	-	1	-	-	-	-	1	1	1	1	1	-	-
Hydraulic Fluid, Phosphate Ester Base	X	X	X	1	-	X	1	1	1	1	1	-	-
Hydraulic Fluid, Std. Petroleum Oils	2	1	2	1	2	2	1	1	1	1	1	1	1
Hydraulic Fluid, Water Glycol Base	1	1	1	-	-	1	1	1	1	1	1	1	1
Hydraulic Fluid HF - 18, HF - 20	-	1	-	-	-	2	1	1	1	1	1	1	1
Hydraulic Fluid HF - 31	-	-	-	-	-	-	1	1	1	1	1	1	1
Hydraulic Oils, Petroleum	2	1	-	-	-	-	1	1	1	1	1	1	1
Hydraulic Oils, Synthetic	-	X	-	-	-	-	1	-	1	1	1	1	1
Hydraulic Safety Fluid 200 & 300, Texaco	-	1	-	-	-	1	1	-	1	1	1	1	1
Hydrazine	X	X	X	-	-	2	1	-	-	-	-	-	-
Hydro-Drive Oil, Houghton	-	1	-	-	-	2	1	-	-	-	-	-	-
Hydrobromic Acid	X	X	-	-	-	-	1	X	1	1	1	X	-
Hydrobromic Acid, 37%	X	X	X	1	2	X	1	X	1	1	1	X	-
Hydrochloric Acid	2	X	-	-	-	-	1	X	X	X	X	X	X
Hydrochloric Acid, 3 Molar	2	X	-	-	-	-	1	X	X	X	X	X	X
Hydrochloric Acid, Concentrated	X	X	-	-	-	-	1	X	X	X	X	X	X
Hydrochloric Acid, 15%	X	X	X	1	2	X	1	X	X	X	X	X	X
Hydrochloric Acid, 37%	X	-	X	1	2	X	1	X	X	X	X	X	X
Hydrocyanic Acid, 20% Under 100°F	X	X	X	-	2	X	1	1	X	1	1	1	X
Hydrocyanic Acid, 98%	-	-	-	-	-	-	1	-	-	-	-	-	-
Hydrofluoric Acid, 10%	2	2	X	1	1	X	1	X	X	X	X	X	X
Hydrofluoric Acid, 20% (Under 120°F)	2	X	X	1	2	X	1	X	X	X	X	X	X
Hydrofluoric Acid, 48% (Under 120°F)	2	X	X	1	2	X	1	X	X	X	X	X	X
Hydrofluoric Acid, 70%	-	X	X	-	2	X	1	X	X	X	X	X	X
Hydrofluoric Acid, Concentrated	X	X	X	1	2	X	1	X	X	X	X	X	X
Hydrofluoric Acid, Anhydrous	-	X	-	-	-	-	1	-	-	-	-	-	-
Hydrofluosilicic	X	X	X	X	-	-	1	X	X	X	X	X	1
Hydrogen	1	1	-	1	-	-	1	-	X	X	X	1	-

○Cover stock rating only; Rating for tube stock "X"
*Use Gates fuel hose or contact Denver Product Applications Department.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers: A Neoprene	A Nitrile	C Nitrile/PVC	C_2 CPE	J Hypalon	J Urethane (cover rating only)	Z PTFE	Z Nylon	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
Hydrogen Chloride Gas	-	-	-	1	-	-	1	-	-	1	1	-	-
Hydrogen Cyanide Gas	-	-	-	-	-	-	-	-	-	-	-	1	-
Hydrogen Fluoride (Under 100°F)	-	X	-	-	-	-	1	-	2	2	1	-	-
Hydrogen Peroxide, Dilute	1	2	-	-	-	-	1	1	1	-	1	-	X
Hydrogen Peroxide, 10%	X	1	X	1	2	X	1	X	X	2	1	1	X
Hydrogen Peroxide, 30%	X	2	X	1	2	X	1	X	X	2	1	1	X
Hydrogen Peroxide, 70%	X	X	X	1	-	X	1	X	X	2	1	1	X
Hydrogen Peroxide, 90%	X	X	-	-	-	-	1	-	X	2	1	-	X
Hydrogen Sulfide	2	X	-	-	-	-	1	1	2	2	1	-	X
Hydrogen Sulfide Aqueous Solution	2	X	-	-	-	-	1	-	X	-	-	X	-
Hydrogen Sulfide, Gas	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrolube, Water Glycol	2	1	-	-	-	X	1	-	1	1	1	-	1
Hydrolubric Oil, Houghton	-	2	-	-	-	2	1	1	-	-	-	-	-
Hydroquinone	X	-	-	-	X	-	1	-	-	1	1	2	-
Hykil No.6 (33%); Water (67%)	-	2	-	-	-	-	1	-	1	-	-	-	-
Hypochlorous Acid (Under 120°F)	X	X	X	-	2	-	1	1	2	2	2	X	-
Hypoid Grease (Parapoid 10-C)	-	1	-	-	-	-	1	-	-	-	-	-	-
I													
Imol, Imol S150, S220, S300, S500	-	1	-	-	-	2	1	1	1	1	1	1	-
Industron 53	-	1	-	-	-	-	1	-	-	-	-	-	-
Ink (Printers)	1	1	-	-	-	-	1	1	2	2	1	-	2
Ink Oil	-	2	-	-	-	-	1	-	1	1	1	-	1
Insulating Oil (Transformer)	2	1	2	-	X	-	1	-	1	1	1	-	1
Isobutyl Alcohol	2	2	2	1	-	-	1	1	1	1	1	1	2
Iodine (Under 100°F)	X	X	-	1	2	X	1	1	2	2	2	X	-
Iodine, In Alcohol	2	-	-	-	-	X	1	-	-	-	-	X	-
Iodine Pentafluoride	X	X	-	-	-	-	1	-	X	2	2	X	-
Isooctane	1	1	2	2	1	2	1	1	1	1	1	2	1
Isooctyl Thioglucolate	-	-	-	-	-	-	1	1	-	-	-	-	-
Isobutane - WET	X	X	-	-	-	X	1	X	X	1	1	2	1
Isopropyl Acetate	X	X	X	-	X	2	1	1	2	2	1	X	1
Isopropyl Alcohol (Isopropanol)	2	2	2	1	2	2	1	1	1	1	1	1	2
Isopropyl Ether	X	X	X	-	-	-	1	1	1	1	1	1	1
J													
Fuel JP-3 (Under 100°F)	②	1	②	-	X	2	1	1	1	1	1	2	1
Jet Fuel JP-4 (Under 100°F)	②	1	②	-	X	-	1	1	1	1	1	2	1
Jet Fuel JP-5	X	1	X	-	X	-	1	1	2	1	1	2	1
Jet Fuel JP-6	X	1	X	-	X	-	1	1	2	1	1	2	1
Jet Fuel JP-x	2	1	X	-	X	-	1	1	2	1	1	2	1
K													
Kerosene	X	1	②	1	X	-	1	1	1	1	1	1	1
Ketchup	1	1	-	-	-	-	1	1	-	1	1	-	-
Ketones	X	X	X	-	X	X	1	1	1	1	1	2	1
L													
Lacquer Solvents	X	X	X	-	X	2	1	1	X	2	1	1	1
Lacquers	X	X	X	-	X	-	1	1	X	X	1	1	1
Lactic Acid	1	X	X	-	1	X	1	-	X	2	1	X	2
Lactic Acid (5%)	2	1	-	-	-	-	1	1	X	2	1	1	X
Lactic Acid (5% Boiling)	X	X	-	-	-	-	1	-	X	2	1	2	X
Lactic Acid (10% Boiling)	X	X	-	-	-	-	1	-	X	2	1	X	X
Lactol	2	2	2	-	-	-	1	-	1	1	1	1	1
Lard	2	1	-	1	-	-	1	1	1	1	1	1	X
Lasso (Ag Spray)	-	-	-	-	-	-	1	1	-	1	1	-	-
Latex	1	1	-	-	X	-	1	1	1	1	1	1	1
Lead Acetate	X	X	-	1	2	1	1	-	2	2	2	X	1
Lead Arsenate	2	2	-	-	-	-	1	-	1	1	1	-	-
Lead Nitrate	2	2	-	-	1	1	1	-	1	2	2	-	-
Lead Sulfate	1	1	-	1	2	-	1	-	1	1	1	-	-
Lead, Tetraethyl (Under 100°F)	X	2	X	-	X	-	1	2	-	-	-	-	-
Lead, Tetramethyl	X	2	X	-	X	1	1	-	-	-	-	-	-
Lecithin	2	X	-	-	-	-	1	-	-	1	1	-	-
Ligroin (Petroleum Ether, Under 120°F)	X	1	-	-	X	-	1	-	2	1	1	X	-
Lime (Chlorinated, Free Chlorine 20%)	-	1	-	1	-	1	-	-	-	-	2	-	-
Lime Bleach (Under 100°F)	X	2	X	-	X	-	-	-	X	2	1	-	-
Lime Sulphur	1	X	-	-	-	-	2	1	2	1	1	X	X
Lime Sulfur (Under 135°F)	1	X	X	-	2	-	2	1	2	1	1	X	X
Lindane (Ag Spray)	-	-	-	-	-	-	1	1	-	1	1	-	-
Linoleic Acid	X	2	X	-	-	-	1	-	X	2	1	1	-
Linseed Oil	X	1	-	-	-	-	1	1	1	1	1	2	2
Linseed Oil (Boiled)	2	2	1	1	1	1	1	-	2	1	1	1	2
Lubricating Oil (SAE 10, 20, 30, 40, 50)	2	2	-	-	-	-	1	1	1	1	1	1	1
Lubricating Oils (Diester, Under 135°F)	X	2	X	-	-	X	1	1	1	1	1	1	1
M													
Machine Oil (Under 135°F)	1	1	2	-	2	-	1	1	1	1	1	1	1
Magnesium Carbonate	1	1	1	-	1	1	1	-	2	2	2	1	-
Magnesium Chloride	1	1	1	1	1	1	1	1	X	2	1	X	2
Magnesium Hydroxide	2	2	2	1	1	X	1	-	1	1	1	X	X
Magnesium Nitrate	2	2	2	-	1	-	1	-	2	2	2	X	1
Magnesium Sulfate	2	2	2	1	1	1	1	1	2	2	2	2	2
Malathion (Ag Spray Dilute)	-	2	-	-	-	-	1	1	1	1	1	-	1
Maleic Acid	2	X	-	-	-	-	1	-	2	2	1	-	-
Malic Acid	-	-	-	-	-	-	1	-	2	2	1	-	-
Manganese Salts	-	1	1	-	1	-	1	-	-	-	-	-	-
Maxmul (Penzoil Hydraulic Fluid)	2	1	2	-	-	-	1	-	1	-	1	-	-
Mercuric Chloride	1	2	2	1	1	2	1	X	X	1	1	X	X
Mercuric Cyanide	1	2	2	-	1	-	-	-	2	2	2	X	-
Mercurous Nitrate (Under 120°F)	1	2	2	-	1	-	1	-	1	1	1	X	-
Mercury	1	2	2	1	1	2	1	1	1	1	1	X	X
Mesityl Oxide	X	X	X	2	X	X	1	-	1	1	1	1	1
Methane	2	1	-	-	-	-	1	-	-	1	1	-	-
Methoxychlor (Insecticide)	-	-	-	-	-	-	1	X	1	1	1	-	-
Methyl Acetate	X	X	X	1	X	-	1	-	1	1	1	1	1
Methyl Acrylate	X	X	X	-	X	-	1	-	1	1	1	1	1
Methyl Alcohol	1	1	1	1	-	-	1	1	1	1	1	1	2
Methyl Amine (25% Aqueous Solution)	2	X	-	-	-	-	1	-	1	1	1	1	-
Methyl Amine (60%)	2	2	-	-	-	-	1	2	1	1	1	1	2
Methyl Amine (99%)	X	X	-	-	-	-	1	-	1	1	1	1	X
Methyl Bromide	X	X	X	-	X	X	1	1	1	1	1	X	1
Methyl Butyl Ketone (MBK)	X	X	X	2	X	-	1	-	1	1	1	1	1
Methyl Cellosolve (Under 100°F)	2	X	-	1	X	-	1	-	2	2	2	2	1
Methyl Chloride	X	X	X	X	X	-	1	1	1	1	1	-	1
Methyl Ethyl Ketone (MEK)	X	X	X	2	X	X	1	1	1	1	1	2	1
Methyl Formate	2	X	X	-	X	-	1	-	2	1	1	1	1
Methyl Isobutyl Ketone (MIBK, 100°F)	X	X	X	2	X	X	1	1	1	1	1	1	1
Methyl Isopropyl Ketone	X	X	X	2	X	X	1	1	1	1	1	1	1
Methyl Methacrylate	X	X	X	2	2	-	1	-	2	2	2	-	-
Methyl Salicylate	2	2	2	-	-	-	1	-	1	1	1	1	1
Methyl Sulfate (Dimethyl, Under 100°F)	X	X	X	-	X	1	1	1	1	1	1	-	-
Methylene Chloride	X	X	X	X	X	-	1	X	1	1	1	X	1
Methylene Dichloride	X	X	X	-	-	-	1	1	1	1	1	X	1
Mineral Oil (Under 120°F)	1	1	1	1	1	1	1	1	1	1	1	2	1
Mineral Spirits	-	1	2	-	X	-	1	-	1	1	1	2	1

◯Cover stock rating only; Rating for tube stock "X"
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Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers (Trade Names) A: Neoprene	A: Nitrile	C: Nitrile/PVC	C_2: CPE	J: Hypalon	J: Urethane (Cover rating only)	Z: PTFE	Z: Nylon	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
Mobile Therm 603	-	1	-	-	-	-	1	-	1	1	1	1	1
Molasses (Under 120°F)	2	2	2	-	1	1	1	-	2	1	1	2	X
Monochlorobenzene	X	X	X	X	X	X	1	-	1	1	1	X	1
Monoethanolamine	X	2	-	1	X	-	1	-	1	1	1	2	1
Morpholine (Pure Additive)	-	-	-	-	-	-	1	-	-	1	1	-	-
Motor Oils (Under 135°F)	2	1	2	1	2	2	1	1	1	1	1	1	1
Mould Oil	-	-	-	-	-	-	1	-	1	1	1	-	-
Muriatic Acid (Hydrochloric)	X	X	X	1	2	X	1	X	X	X	X	X	X
Mustard	1	2	1	-	1	-	1	-	X	1	1	2	-
N													
Naphtha (Low Aromatic Content)	X	2	X	1	X	-	1	1	2	1	1	1	1
Naphthalene (Tar Camphor)	X	X	X	1	X	-	1	1	1	1	1	1	1
Naphthalene	X	X	X	-	X	-	1	-	1	1	1	-	1
Naphthenic Acid	-	2	-	-	-	-	1	-	-	2	1	-	-
Natural Gas	-	-	-	-	-	-	1	-	1	1	1	-	2
Nickel Acetate	-	-	-	-	-	-	1	-	1	1	1	1	1
Nickel Chloride	2	2	2	1	2	-	1	1	1	1	1	1	1
Nickel Nitrate	2	2	2	1	2	-	1	1	2	2	2	X	-
Nickel Plating Solution	-	2	-	-	2	X	1	-	-	1	1	-	-
Nickel Salts	2	-	1	-	-	-	1	-	-	-	-	-	-
Nicotine Salts	-	-	-	-	-	1	1	-	1	X	2	-	-
Nitric Acid	X	X	-	-	-	-	1	-	X	1	1	-	X
Nitric Acid, 3 Molar	X	X	-	-	-	-	1	-	X	1	1	-	X
Nitric Acid, Concentrated (Boiling)	X	X	-	-	-	-	1	X	X	2	2	X	X
Nitric Acid, Inhibited Red Fuming (IRFNA)	X	X	-	-	-	-	1	-	X	1	1	1	X
Nitric Acid, Red Fuming (RNFA)	X	X	X	-	X	X	1	X	X	2	2	2	X
Nitric Acid, 5% To 10%	X	X	X	1	2	X	1	X	X	2	2	1	X
Nitric Acid, 20%	X	X	X	1	2	X	1	X	X	2	2	X	X
Nitric Acid, 50% (Boiling)	X	X	X	X	X	X	1	X	X	2	2	X	X
Nitric Acid, 65% (Boiling)	X	X	X	X	X	X	1	X	X	2	2	X	X
Nitric Acid & Hydrochloric Acid	-	X	-	-	-	-	1	-	X	X	X	X	-
Nitrobenzene (Under 100°F)	X	X	X	2	X	X	1	2	1	1	1	1	1
Nitroethane	X	X	X	1	2	-	1	-	1	1	1	1	1
Nitrogen	1	1	2	1	1	1	1	1	1	1	1	1	1
Nitrogen Oxide Up To 50% (Under 100°F)	1	1	2	1	1	-	1	1	1	1	1	-	X
Nitromethane	X	X	X	-	-	-	1	1	1	1	1	1	1
Nitropropane	X	X	X	-	-	-	1	1	1	1	1	1	1
Nyvac 20 (WG), 30 (WG)	-	1	-	-	-	-	1	-	1	1	1	1	1
Nyvac FR Fluid	-	1	-	-	-	-	1	-	1	1	1	1	1
Nyvac FR200 Fluid	-	1	-	-	-	-	1	-	1	1	1	1	1
N-Octane	X	2	-	1	X	-	-	-	1	1	1	-	1
O													
Octyl Alcohol	2	2	2	1	-	-	1	1	1	1	1	-	2
Oils, Crude	X	2	-	-	-	-	1	-	1	-	-	-	-
Oil (SAE, Under 100°F)	1	1	1	1	2	1	1	1	1	1	1	1	1
Oleic Acid (Under 120°F)	2	2	2	1	2	1	1	-	2	2	1	1	2
Oleum	X	X	X	X	X	-	1	X	-	-	1	-	-
Olive Oil	X	2	2	2	X	-	1	-	2	1	1	1	2
OS 45 Type III (OS45)	1	2	-	-	-	-	1	-	-	-	-	-	-
OS 45 Type IV (OS45-1)	1	2	-	-	-	-	1	-	-	-	-	-	-
OS 70	1	2	-	-	-	-	1	-	-	-	-	-	-
Oxalic Acid (5%, Hot And Cold)	2	2	-	-	-	-	1	2	X	2	1	1	X
Oxalic Acid (10%)	2	2	-	-	-	-	1	2	X	2	1	1	X
Oxalic Acid (10% Boiling)	X	X	-	-	-	-	1	-	X	X	X	X	X
Oxalic Acid	X	X	X	1	2	X	1	X	X	2	1	2	X
Oxygen, Gaseous	-	-	-	-	-	-	1	-	1	1	1	1	1
Ozone (Dry)	2	X	2	1	2	1	1	2	1	1	1	1	1
Ozone (Wet)	-	X	-	-	-	-	1	-	X	2	1	2	-
P													
Paint	X	-	-	-	X	X	1	2	-	1	1	1	1
Paint Solvents (Oil Base)	X	X	-	-	X	X	1	2	-	1	1	1	1
Paints (Oil Base)	-	1	-	-	1	-	1	1	-	-	-	-	-
Paint Thinner, Duco	2	1	-	-	-	-	1	1	2	2	1	2	X
Palmetic Acid	2	2	2	1	X	1	1	1	2	2	1	1	X
Palm Oil	2	1	2	-	2	-	1	-	1	1	1	1	1
Paraffin (Petroleum)	2	1	2	1	X	-	1	1	2	1	1	1	1
Paraformaldehyde	2	2	2	-	2	2	1	-	1	1	1	1	-
Peanut Oil (Less Than 100°F)	2	1	2	-	-	-	1	-	1	1	1	1	1
Pentasol	2	2	2	-	2	-	1	1	1	1	1	1	1
Perchloric Acid	X	X	-	-	2	X	1	X	X	2	1	X	-
Perchloroethylene (Tetrachloroethylene)	X	X	X	2	X	-	1	2	1	1	1	X	X
Petroleum Ether	X	2	-	1	-	-	1	-	2	1	1	-	1
Petroleum Oil (Crude)	2	1	-	-	-	-	1	-	-	-	-	-	-
Petroleum Oil (Below 250°F)	2	1	-	-	-	-	1	-	-	-	-	-	-
Petroleum Oil (Above 250°F)	X	X	-	-	-	-	1	-	-	-	-	-	-
Petroleum Oils (Under 100°F)	2	1	2	-	2	2	1	-	1	1	1	1	1
Petroleum Oils (Refined)	2	1	2	-	2	2	1	1	1	1	1	1	1
Petroleum Oils (Sour)	2	2	-	-	X	2	1	-	2	1	1	1	X
Phenol (Carbolic Acid)	X	X	X	1	X	X	1	X	2	1	1	1	X
Phenol (70/30 Water)	X	X	-	-	-	-	1	-	-	1	1	1	-
Phenol (85/15 Water)	X	X	-	-	-	-	1	-	-	1	1	1	-
Phorone (Diisopropylidene Acetone)	X	X	-	-	X	X	1	-	1	1	1	-	1
Phosphate Esters (Concentrated)	X	X	-	X	X	X	1	2	-	-	-	-	-
Phosphate Esters (3 Molar)	X	X	-	2	2	X	1	2	-	-	-	-	-
Phosphate Esters (Dilute)	X	X	-	1	1	X	1	2	-	-	-	-	-
Phosphoric Acid	2	2	-	-	-	-	1	-	-	-	2	-	-
Phosphoric Acid (3 Molar)	X	X	-	-	-	-	1	-	-	-	-	-	-
Phosphoric Acid (Concentrated)	X	X	-	-	-	-	1	-	-	-	-	-	-
Phosphoric Acid (1%)	2	-	-	-	-	-	1	-	-	1	1	-	X
Phosphoric Acid (5%)	2	X	-	-	-	-	1	-	-	1	1	-	X
Phosphoric Acid (10%)	2	X	-	-	-	-	1	-	X	-	1	X	X
Phosphoric Acid (10% Hot)	2	X	-	-	-	-	1	-	X	-	1	X	X
Phosphoric Acid (50%)	2	2	2	1	1	X	1	X	X	2	1	X	2
Phosphoric Acid (50% Hot)	2	X	-	-	-	-	1	-	X	X	2	X	X
Phosphoric Acid (85%)	2	X	-	1	1	X	1	X	X	2	2	X	X
Phosphoric Acid (85% Hot)	2	X	-	-	-	-	1	-	X	X	X	X	X
Phosphoric Acid (Aerated)	-	-	-	-	-	-	1	-	X	-	2	-	-
Phosphoric Acid Air Free	-	-	-	-	-	-	1	-	X	-	-	X	-
Photographic Developers	1	1	-	-	-	-	1	-	X	1	1	-	-
Photographic, Emulsions	-	-	-	-	-	-	1	-	-	-	-	-	-
Photographic, Fixing Solutions	2	-	-	-	2	-	1	-	-	1	1	-	-
Phthalic Acid	-	-	-	-	-	-	-	-	2	2	1	2	-
Picric Acid (Water Solution 100°F)	2	2	2	-	2	-	1	X	X	1	1	X	X
Pinene	X	2	-	2	-	-	1	-	1	1	1	1	1
Pine Oil	X	2	-	2	X	-	1	1	1	1	1	1	-
Piperazine Hydrochloride Solution (34%)	-	2	-	-	-	-	1	-	-	-	-	-	-
Pitch	2	1	-	-	2	2	1	1	-	-	-	-	-
Plating Solutions (Chrome)	X	X	-	-	-	X	1	X	-	X	X	-	-
Plating Solutions (Other)	-	1	-	-	-	-	1	-	-	-	-	-	-
Polyester Resin	-	-	-	-	-	-	-	2	-	-	-	-	-
Polyurethane Foam (Under 125°F)	-	-	-	-	-	-	1	-	-	-	-	-	-
Potassium Acetate	2	2	-	1	2	X	1	-	2	1	1	X	-
Potassium Bicarbonate	1	1	-	-	1	-	1	1	1	2	2	1	-
Potassium Bisulfite	-	1	-	-	-	-	1	1	-	-	-	-	-
Potassium Bromate	-	-	-	-	-	-	1	-	-	-	-	-	-
Potassium Bromide	1	1	-	-	1	2	1	1	X	X	2	X	-
Potassium Carbonate (Potash)	1	1	1	1	1	2	1	1	2	1	1	X	X

○Cover stock rating only; Rating for tube stock "X" *Use Gates fuel hose or contact Denver Product Applications Department.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers (Trade Names) A	C	C_2	J			Z	Couplings & Adapters				
	Neoprene	Nitrile	Nitrile/PVC	CPE	Hypalon	Urethane (Cover rating only)	PTFE	Nylon	Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
Potassium Chlorate	1	1	-	-	-	2	1	1	2	2	2	2	-
Potassium Chloride (1% To 5%)	1	1	-	1	-	2	1	1	1	2	2	X	X
Potassium Chloride (Boiling)	-	-	-	-	-	-	1	-	-	2	2	-	X
Potassium Cyanide	1	1	-	1	-	-	1	1	2	1	1	X	X
Potassium Dichromate	1	1	-	1	-	-	1	2	1	2	2	2	-
Potassium Ferrocyanide	-	-	-	-	-	-	1	-	2	1	1	2	-
Potassium Fluoride	-	-	-	-	-	-	1	-	-	-	-	-	-
Potassium Hydroxide	2	2	-	-	-	-	1	-	1	1	1	-	-
Potassium Hydroxide (5%)	1	1	-	-	-	-	1	1	2	2	2	X	X
Potassium Hydroxide (27% Boiling)	-	-	-	-	-	-	1	-	2	2	1	X	X
Potassium Hydroxide (30%, Caustic Potash)	-	-	-	1	-	-	1	-	-	-	-	-	-
Potassium Hydroxide (50% Boiling)	-	-	-	-	-	-	1	-	2	2	2	X	X
Potassium Hydroxide (70%)	-	X	-	-	-	-	1	-	-	-	-	X	X
Potassium Hydroxide (70% Hot)	-	-	-	-	-	-	1	-	X	-	-	X	X
Potassium Iodide	1	1	-	-	1	-	1	1	1	2	2	-	-
Potassium Nitrate	1	1	-	1	-	1	1	1	1	1	2	2	2
Potassium Nitrate (1% To 5%)	1	1	-	-	-	-	1	-	1	1	1	1	2
Potassium Permanganate	1	2	-	-	-	-	1	2	1	2	2	2	-
Potassium Permanganate (5%)	1	1	-	-	-	-	1	1	1	1	1	1	-
Potassium Persulfate	-	-	-	-	-	-	1	-	-	-	-	-	-
Potassium Phosphate	1	-	-	-	1	-	1	-	X	2	2	X	-
Potassium Sulfate	1	1	-	1	-	1	1	1	1	2	2	1	-
Potassium Sulfate - 1% & 5%	1	1	-	-	-	-	1	1	1	1	1	1	X
Potassium Sulfide	1	1	-	-	-	-	1	-	2	2	2	-	-
Potassium Sulfite	1	1	-	1	-	-	1	-	1	1	1	1	-
Potassium Thiosulfate	1	-	-	-	1	-	1	-	-	-	-	-	-
Primatol A, S, P (Ag Spray)	-	-	-	-	-	-	1	-	-	-	-	-	-
Propane Gas	X	X	-	-	-	X	1	-	1	1	1	-	1
Propionic Acid	X	X	-	-	-	-	1	-	1	-	2	2	-
Propyl Acetate	X	X	-	2	-	-	1	-	1	-	-	-	-
Propyl Alcohol	1	1	2	1	-	X	1	1	1	1	1	-	2
Propylene (Liquid Or Gas, Ambient)	X	X	-	1	-	-	1	2	1	1	1	1	-
Propylene Dichloride	-	-	-	-	-	-	1	-	1	2	1	X	-
Propylene Glycol	1	1	-	1	1	1	1	2	1	1	1	-	-
Propylene Oxide	X	X	-	-	-	-	-	-	2	1	1	2	-
Purina Insecticide	X	X	-	-	-	-	1	2	1	1	1	1	2
Puropale RX Oils	-	1	-	-	-	2	1	1	1	1	1	1	1
Pyranol, Transformer Oil	2	1	-	-	-	-	1	-	1	1	1	1	-
Pydraul	X	X	-	-	-	-	1	-	-	-	-	-	-
Pydraul 10E, 29E-LT, 30E, 60, 65E, 115E	X	X	-	2	-	-	1	-	1	1	1	1	1
Pydraul 135	-	X	-	2	-	-	1	2	1	1	1	-	-
Pydraul 150	X	X	X	2	X	2	1	2	1	1	1	1	1
Pydraul 280	X	X	X	2	X	2	1	2	1	1	1	-	-
Pydraul 312	X	X	X	2	-	2	1	1	1	1	1	-	-
Pydraul 50E	-	-	-	2	-	2	1	1	1	1	1	-	-
Pydraul 540	X	X	X	2	X	X	1	X	1	1	1	-	-
Pydraul 625	X	X	X	2	X	2	1	2	1	1	1	-	-
Pydraul A-200	X	X	X	2	X	X	1	2	1	1	1	-	-
Pydraul F-9	X	X	X	2	X	2	1	1	1	1	1	-	-
Pyridine (50%)	X	X	-	-	X	1	1	-	1	1	1	1	1
Pyrogard 160, 230, 630	-	-	-	-	-	-	1	-	1	1	1	-	-
Pyrogard 51, 53, 55	-	X	-	-	-	-	1	-	1	1	1	-	-
Pyrogard C, D	-	1	-	-	-	2	1	1	1	1	1	1	1
Q													
Quench Oil	2	2	-	-	-	-	1	-	-	1	1	1	-
Quintolubric 822	2	1	-	-	-	-	1	-	1	1	1	1	1
R													
Ramrod (Ag Spray)	-	-	-	-	-	-	1	1	1	1	1	1	1
Rando Oils	-	1	-	-	-	2	1	1	1	1	1	1	1
Rape Seed Oil	2	X	-	-	X	-	1	2	1	1	1	1	1
Red Oil (Comm. Oleic Acid, MIL-H-5606)	2	2	2	1	2	-	1	1	2	2	1	1	2
Refined Wax (Petroleum)	2	1	2	-	-	2	1	1	1	1	1	-	1
Regal Oils R&O	-	1	-	-	-	2	1	1	1	1	1	1	1
Richfield Weed Killer	X	2	-	-	X	-	1	-	-	-	-	-	-
Round Up	2	2	-	-	-	-	1	1	2	1	1	1	1
Rubilene Oils	-	1	-	-	-	2	1	1	-	-	-	-	-
S													
Salicylic Acid	1	X	-	-	-	-	1	1	1	1	1	2	-
Salt Water (Sea Water)	2	2	2	-	2	1	1	1	2	1	1	X	2
Santosafe W-G15, W-G20, W-G30	-	1	-	-	-	2	1	1	1	1	1	1	1
Santo Safe 300	X	X	-	-	-	-	1	-	1	1	1	1	-
Sevin	-	-	-	-	-	-	1	1	-	-	-	-	-
Sewage	2	2	2	1	2	-	1	1	X	1	1	2	1
SFR Fluid B (Shell)	-	X	-	-	-	-	1	-	-	-	-	-	-
SFR Fluid C (Shell)	-	X	-	-	-	-	1	-	-	-	-	-	-
Shellac	2	1	-	-	-	-	1	1	1	1	1	1	-
Shellac (Bleached)	2	1	-	-	-	-	1	1	1	1	1	1	2
Shellac (Orange)	2	1	-	-	-	-	1	1	1	1	1	1	2
Silicone Greases	2	2	2	-	2	-	1	1	1	1	1	1	1
Silicone Oils	2	2	2	-	2	-	1	1	1	1	1	1	1
Silver Cyanide	1	-	-	-	-	-	1	-	1	1	1	X	-
Silver Nitrate	1	1	1	1	1	-	1	1	2	1	1	1	2
Skydrol 500A& 7000	X	X	X	2	X	-	1	1	1	1	1	1	-
Soap Oil	X	X	-	-	X	-	1	-	1	1	1	-	-
Soap Solutions	2	1	2	1	1	1	1	1	1	1	1	1	1
Soda Ash (Sodium Carbonate)	1	1	1	1	1	1	1	1	1	1	1	X	2
Soda Water	-	-	-	-	-	1	1	1	-	-	-	-	-
Sodium Acetate	X	X	X	1	X	2	1	1	1	1	1	1	1
Sodium Benzoate	-	-	-	-	-	1	1	-	-	-	-	-	-
Sodium Bicarbonate	1	1	1	1	1	1	1	1	2	1	1	2	2
Sodium Bisulfate (Niter Cake)	1	1	1	1	1	1	1	1	X	2	1	X	X
Sodium Bisulfite	1	1	1	1	1	1	1	1	2	1	1	2	-
Sodium Borate	1	1	1	1	1	1	1	1	1	1	1	-	-
Sodium Carbonate	1	1	1	1	1	1	1	1	2	2	2	X	2
Sodium Chlorate	2	1	-	-	1	1	1	1	2	2	2	X	-
Sodium Chloride	1	1	1	1	1	1	1	1	2	2	1	X	X
Sodium Chloride - 2%	1	1	-	-	-	-	1	1	2	2	1	X	X
Sodium Chloride - 5%	1	1	-	-	-	-	1	1	-	2	1	X	X
Sodium Chloride - 5% @ 150°F	1	1	-	-	-	-	1	1	-	2	1	-	X
Sodium Chloride Saturated	1	1	-	-	-	-	1	1	-	1	1	X	-
Sodium Chloride Saturated (Boiling)	-	-	-	-	-	-	1	-	-	2	1	X	-
Sodium Chloride Slurry	-	-	-	-	-	-	1	-	-	-	-	-	-
Sodium Cyanide	1	1	1	1	1	1	1	1	2	1	1	X	X
Sodium Dichromate	2	1	-	1	2	1	1	1	-	-	-	-	-
Sodium Ferricyanide	-	-	-	-	-	-	1	-	2	2	2	-	-
Sodium Ferrocyanide	-	-	-	-	-	-	1	-	-	-	-	-	-
Sodium Fluoride	-	1	-	-	-	-	1	-	2	2	2	-	-
Sodium Fluoride (5%)	-	1	-	-	-	-	1	1	2	2	2	-	-
Sodium Fluoride (70%)	-	-	-	-	-	-	1	-	-	-	2	-	-
Sodium Hydrosulfide	1	X	-	-	-	-	1	-	-	-	-	-	-
Sodium Hydrosulfite	-	-	-	-	-	-	1	-	-	-	-	-	-
Sodium Hydroxide	2	2	-	-	-	-	1	-	2	-	-	-	X
Sodium Hydroxide (3 Molar)	2	2	-	-	-	-	1	-	-	-	-	-	X
Sodium Hydroxide (10%)	-	-	-	1	-	-	1	-	-	-	-	-	-

○Cover stock rating only; Rating for tube stock "X"
*Use Gates fuel hose or contact Denver Product Applications Department.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers *Trade Names* A: Neoprene	A: Nitrile	C: Nitrile/PVC	C_2: CPE	J: Hypalon	J: Urethane (cover rating only)	Z: PTFE	Z: Nylon	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
Sodium Hydroxide (20% Cold)	1	2	-	-	-	-	1	1	1	1	1	X	X
Sodium Hydroxide (20% Hot)	1	X	-	-	-	-	1	-	2	1	1	X	X
Sodium Hydroxide (40%)	1	2	2	1	1	-	1	2	2	1	1	X	X
Sodium Hydroxide (50% Cold)	2	X	X	1	1	-	1	2	2	2	2	X	X
Sodium Hydroxide (50% Hot)	-	-	-	1	2	-	1	X	X	2	2	X	X
Sodium Hydroxide (60%)	2	X	X	1	2	-	1	X	X	2	2	X	X
Sodium Hydroxide (70% Cold)	1	2	-	-	-	-	1	-	-	-	2	X	X
Sodium Hydroxide (70% Hot)	-	-	-	-	-	-	1	-	-	-	-	-	-
Sodium Hydroxide (80% Hot)	1	X	-	-	-	-	1	-	X	X	X	X	X
Sodium Hypochlorite	1	X	-	-	-	-	1	-	X	X	X	X	-
Sodium Hypochlorite, 5%	-	X	X	1	1	X	1	1	X	X	2	X	X
Sodium Hypochlorite, 20%	X	X	X	1	1	X	1	2	X	X	2	X	X
Sodium Hyposulfate	X	-	-	-	-	-	1	-	X	1	1	X	-
Sodium Metaphosphate	2	2	2	1	2	-	1	1	X	1	1	1	X
Sodium Nitrate	X	X	-	1	2	1	1	1	1	2	2	2	2
Sodium Perborate	X	X	-	-	X	-	1	2	X	1	1	1	X
Sodium Peroxide (Sodium Dioxide)	1	2	1	2	1	-	1	X	X	1	1	1	X
Sodium Phosphate	X	1	-	1	-	1	1	1	2	1	1	X	X
Sodium Phosphate (Mono)	1	1	-	-	-	-	1	-	-	-	-	-	-
Sodium Phosphate (Dibasic)	2	1	-	-	-	-	1	-	-	-	-	-	-
Sodium Phosphate (Tribasic)	2	1	-	-	-	-	1	-	2	2	2	-	-
Sodium Silicate	1	1	-	1	1	2	1	1	1	1	1	-	1
Sodium Silicate (Hot)	1	1	-	-	-	-	1	-	2	2	2	X	X
Sodium Sulfate	1	1	-	1	1	1	1	1	2	1	1	-	2
Sodium Sulfide	1	1	-	1	1	1	1	1	X	X	2	X	X
Soium Sulfide, Saturated	1	1	-	-	-	-	1	1	2	2	1	X	X
Sodium Sulfite	2	2	2	1	2	1	1	2	1	1	1	-	X
Sodium Sulfite, 5%	1	1	-	-	-	-	1	-	1	1	1	1	-
Sodium Sulfite, 10% @ 150°F	1	1	-	-	-	-	1	-	2	2	2	2	-
Sodium Thiosulfate (HPO, Antichior)	1	1	1	1	1	1	1	1	X	1	1	2	X
Sodium Tripolyphosphate (STPP)	-	-	-	-	-	-	1	-	-	1	1	X	X
Solnus Oils	-	1	-	-	-	2	1	1	1	1	1	1	1
Sour Crude Oil	-	-	-	-	-	-	1	-	-	-	-	-	-
Soybean Oil	2	2	2	-	2	-	1	1	1	1	1	1	-
Spent Acid	-	-	-	-	2	-	1	-	-	1	1	-	-
Stannic Chloride	X	2	2	1	X	-	1	X	X	X	X	X	X
Stannic Chloride, 50%	X	1	-	-	-	-	1	-	X	X	X	X	-
Stannous Chloride (Under 150°F)	1	1	-	1	1	-	1	X	-	X	2	X	-
Stannous Chloride, 15%	1	1	-	-	-	-	1	-	X	X	-	X	-
Starch	2	2	-	-	1	1	1	1	X	1	1	1	-
Steam	USE STEAM HOSE				-	2	1	-	1	1	1	-	2
Stearic Acid	2	2	2	1	2	1	1	1	X	2	1	X	X
Stearin	-	-	-	-	-	1	1	2	-	-	-	-	-
Stoddard Solvent	2	2	X	1	-	X	1	1	2	1	1	1	1
Styrene (Vinyl Benzene)	X	X	-	-	-	-	1	1	1	1	1	1	1
Styrene (Monomer)	-	X	-	2	-	-	1	2	2	X	2	X	2
Sucrose Solutions	1	1	1	-	1	-	1	-	1	1	1	-	-
Sulfamic Acid (10%, Under 170°F)	-	-	-	1	2	-	1	-	-	-	-	-	-
Sulfate Black Liquor	1	1	-	-	-	-	1	1	2	2	2	X	-
Sulfate Green Liquor	1	1	-	-	-	-	1	1	2	2	2	X	-
Sulfur	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur (Molten)	X	X	-	-	-	-	-	-	-	-	-	-	-
Sulfur Chloride	X	X	X	-	2	-	1	2	X	X	2	X	X
Sulfur Dioxide (Moist)	2	X	-	-	2	-	1	1	-	2	1	1	X
Sulfur Dioxide (Dry)	X	X	X	-	2	-	1	X	2	1	1	1	1
Sulfur Dioxide (Liquid)	2	X	-	-	2	-	1	-	-	-	-	-	-
Sulfur Hexaflouride (Gas)	1	2	-	-	2	-	1	X	-	-	-	-	-
Sulfur Trioxide (Dry)	X	X	X	X	X	-	1	1	2	2	2	2	X
Sulfuric Acid, 85%	X	X	-	-	-	-	1	-	X	2	1	X	-
Sulfuric Acid, 3 Molar	X	X	-	-	-	-	1	-	-	-	-	-	-
Sulfuric Acid, Aerated, No Velocity	-	-	-	-	-	-	1	-	2	2	2	X	-
Sulfuric Acid, Air Free No Velocity	-	-	-	-	-	-	1	-	X	X	2	X	-
Sulfuric Acid, Concentrated	X	X	-	-	-	-	1	-	-	1	1	-	-
Sulfuric Acid, Fuming, Oleum	X	-	-	-	-	-	1	-	2	1	1	2	-
Sulfuric Acid (10%)	1	2	2	1	1	-	1	X	-	X	X	2	X
Sulfuric Acid (30%)	1	-	-	1	1	-	1	X	X	X	2	X	X
Sulfuric Acid (50%)	2	X	X	1	1	-	1	X	X	X	2	X	X
Sulfuric Acid (75%)	X	X	X	-	2	-	1	X	X	X	2	X	X
Sulfuric Acid (93%)	X	X	X	-	X	-	1	X	2	X	2	X	X
Sulfuric Acid (98%)	X	X	X	X	X	-	1	X	2	X	2	X	X
Sulfurous Acid	2	2	-	-	-	-	1	X	X	X	2	2	-
Sulfurous Acid (10%)	-	X	-	1	1	-	1	-	-	X	2	1	X
Sulfurous Acid (75%)	X	X	X	1	1	-	1	X	X	X	2	X	X
Sun R&O Oils	-	1	-	-	-	2	1	1	1	1	1	1	1
Sunsafe (Fire Resist. Hydr. Fluid)	2	1	-	-	-	2	1	1	1	1	1	1	-
Suntac HPOils	-	1	-	-	-	2	1	1	1	-	1	1	-
Suntac WR Oils	-	1	-	-	-	2	1	1	1	-	1	1	-
Sunvis Oils 700, 800, 900	-	1	-	-	-	2	1	1	1	1	1	-	-
Super Hydraulic Oils (Conoco)	-	1	-	-	-	2	1	1	1	1	1	1	-
Sutan Plus, Herbicide	X	X	X	1	-	-	-	1	1	1	1	1	-
Sutazine Plus, Herbicide	X	X	-	1	-	-	-	1	X	1	1	1	-
Synthetic Oil (Citgo)	-	-	-	-	-	2	-	1	1	1	1	-	-
Syrup	2	1	2	-	-	-	1	1	-	1	1	1	-
T													
Tall Oil (Under 150°F)	2	2	2	-	X	-	1	-	2	X	2	X	-
Tallow	2	2	2	-	-	-	1	1	2	2	2	1	2
Tannic Acid (10%)	2	X	-	1	2	-	1	X	2	1	1	2	X
Tar And Tar Oil	2	-	-	-	-	2	1	1	1	1	1	1	2
Tar (Bituminous, Under 100°F)	2	2	2	X	-	-	1	-	1	1	1	1	2
Tartaric Acid	2	2	2	1	1	-	1	1	X	2	2	2	X
Tellus Oils	-	1	-	-	-	2	1	1	1	1	1	1	1
Tenol Oils	-	1	-	-	-	2	1	1	1	1	1	-	-
Tergitol	-	-	-	-	-	-	1	-	2	1	1	-	2
Terpineol	X	2	-	1	2	-	1	2	-	-	-	-	-
Terresstic	-	1	-	-	-	-	-	1	1	1	1	-	-
Tetraethyl Lead	2	2	-	-	-	-	1	2	-	-	-	-	-
Tetraethyl Lead Blend	X	2	-	-	-	-	1	-	-	-	-	-	-
Tetrahydrofuran (THF)	X	X	-	-	X	2	1	1	2	-	-	-	-
Tetralin	X	X	-	-	X	-	1	2	1	1	1	1	-
Thiopen	X	X	-	-	-	-	1	-	-	-	-	-	-
Titanium Tetrachloride	X	X	X	-	-	-	1	-	1	2	2	X	X
Toluene (Toluol)	X	X	X	X	X	-	1	1	1	1	1	1	1
Toluene Diisocyanate (Under 150°F)	X	-	-	-	-	-	1	-	1	1	1	-	-
Transformer Oil (Askarel Types)	X	X	X	1	X	-	1	-	1	1	1	1	-
Transformer Oil (Petroleum Type)	2	1	2	1	X	2	1	1	1	1	1	1	1
Transmission Fluid, Type A	2	1	2	1	2	-	1	2	1	1	1	1	1
Tributoxyethyl Phosphate	X	X	X	X	X	-	1	2	1	-	-	X	-
Tributyl Phosphate	X	X	X	2	X	-	1	-	1	-	-	X	-
Trichloroethylene	X	X	X	2	X	-	1	2	X	2	1	X	1
Trichloromonofluoroethane (Freon 17)	Use Freon Hose						1	1	1	1	X	-	
Trichlorotrifluoroethane (Freon 113)	Use Freon Hose						1	1	1	1	X	-	
Tricresyl Phosphate	X	X	X	1	X	-	1	1	1	2	2	X	-
Triethanolamine (TEA)	2	2	-	1	2	-	1	1	1	1	1	1	1
Tripolyphosphate (STPP)	X	1	-	-	-	-	1	-	-	2	1	X	-
Tung Oil	2	2	-	-	2	-	1	1	1	1	1	1	1
Turpentine	X	2	-	2	X	1	1	1	X	1	1	1	2
Type I Fuel (MIL-S-3136) ASTM Fuel A	2	1	-	-	-	-	1	-	1	1	1	1	-
Type II Fuel (MIL-S-3136)	X	2	-	-	-	-	1	-	1	1	1	1	-

○ Cover stock rating only; Rating for tube stock "X" *Use Gates fuel hose or contact Denver Product Applications Department.

Chemical Resistance Table

Rating Scale:
1 Excellent
2 Good resistance
X Not recommended
– Testing recommended

Chemical Name	Gates Hose Polymers *Trade Names* A: Neoprene	C: Nitrile	C_2: Nitrile/PVC	J: CPE	J: Hypalon	J: Urethane (cover rating only)	Z: PTFE	Z: Nylon	Couplings & Adapters: Carbon Steel	Stainless Steel 304	Stainless Steel 316	Aluminum	Brass
Type III Fuel (MIL-3136) ASTM Fuel B	X	1	-	-	-	-	1	-	1	1	1	1	-
U													
Ucon Hydrolube Types 150CP, 200CP	-	1	-	-	-	2	1	1	1	1	1	1	1
Ucon Hydrolube Types 275CP, 300CP, 550CP	-	-	-	-	-	-	1	-	-	-	-	-	-
Ucon M1	-	1	-	-	-	2	1	1	1	1	1	1	1
Union ATF Dexron	-	1	-	-	-	2	1	1	1	1	1	-	-
Union ATF Type F	-	1	-	-	-	2	1	1	1	1	1	1	1
Union C-2 Fluid	-	1	-	-	-	2	1	1	1	1	1	-	-
Union C-POil	-	1	-	-	-	2	1	1	1	1	1	1	1
Union Hydraulic Oil AW	-	1	-	-	-	2	1	1	1	1	1	1	1
Union Hydraulic Tractor Fluid	-	1	-	-	-	2	1	1	1	1	1	1	1
Urea Solution	1	2	-	1	1	2	1	1	1	1	1	2	-
V													
Varnish	X	X	X	-	X	-	1	1	2	1	1	1	2
Vegetable Oils	2	1	2	1	-	2	1	1	1	1	1	1	2
Vegetable Oil (Hot)	-	-	-	-	-	-	1	1	2	2	2	1	2
Versilube	1	1	-	-	-	-	1	-	1	1	1	1	-
Versilube F-50, F-44	2	2	2	-	2	2	1	1	1	1	1	1	1
Vinegar	2	X	X	2	X	-	1	1	X	2	1	X	X
Vinyl Acetate	X	X	X	1	X	-	1	-	2	1	2	1	2
Vinyl Chloride (Chloroethylene, Monomer)	X	X	X	X	X	-	1	-	2	1	1	2	X
Vitrea Oils	X	X	X	-	-	2	1	1	1	1	1	-	-

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W													
Water	1	1	1	1	1	1	1	1	2	1	1	1	1
Water, Acid Mine	2	X	-	-	-	-	1	1	X	2	2	X	X
Water, Brine	2	2	-	-	1	1	1	1	X	2	2	-	-
Water Deionized, (Demineralized)	-	-	-	-	-	-	1	-	-	-	-	-	-
Water, Distilled	2	1	-	-	1	1	1	1	X	1	1	1	1
Water, Fresh	1	1	-	-	-	-	1	1	X	1	1	1	X
Water In Oil Emulsions	-	-	-	-	-	2	1	1	-	-	-	-	-
Water, Potable (FDA Tube Only)					Use FDA Hose Only			-	-	-	-	-	--
Water, Salt	2	1	-	-	-	-	1	1	X	2	2	X	X
White & Bagley No. 2190 Cutting Oil	2	1	-	-	-	-	1	-	-	-	-	-.	-
Wines	2	1	1	1	1	-	1	1	2	2	2	1	-
Wood Oil	2	1	-	1	2	1	1	1	1	1	1	1	-
X													
Xylene	X	X	-	X	-	2	1	X	2	2	2	-	-
Z													
Zeric	-	1	-	-	-	2	1	2	-	-	-	-	-
Zinc Acetate	2	X	-	-	X	-	1	2	1	1	1	1	1
Zinc Chloride Solutions	1	1	1	1	1	-	1	1	X	2	1	X	X
Zinc Chromate	-	-	-	1	1	-	1	-	-	1	1	-	-
Zinc Hydrate	-	-	-	-	-	2	1	-	-	-	-	-	-
Zinc Sulfate Solutions	2	2	2	1	2	-	1	2	X	2	1	X	X

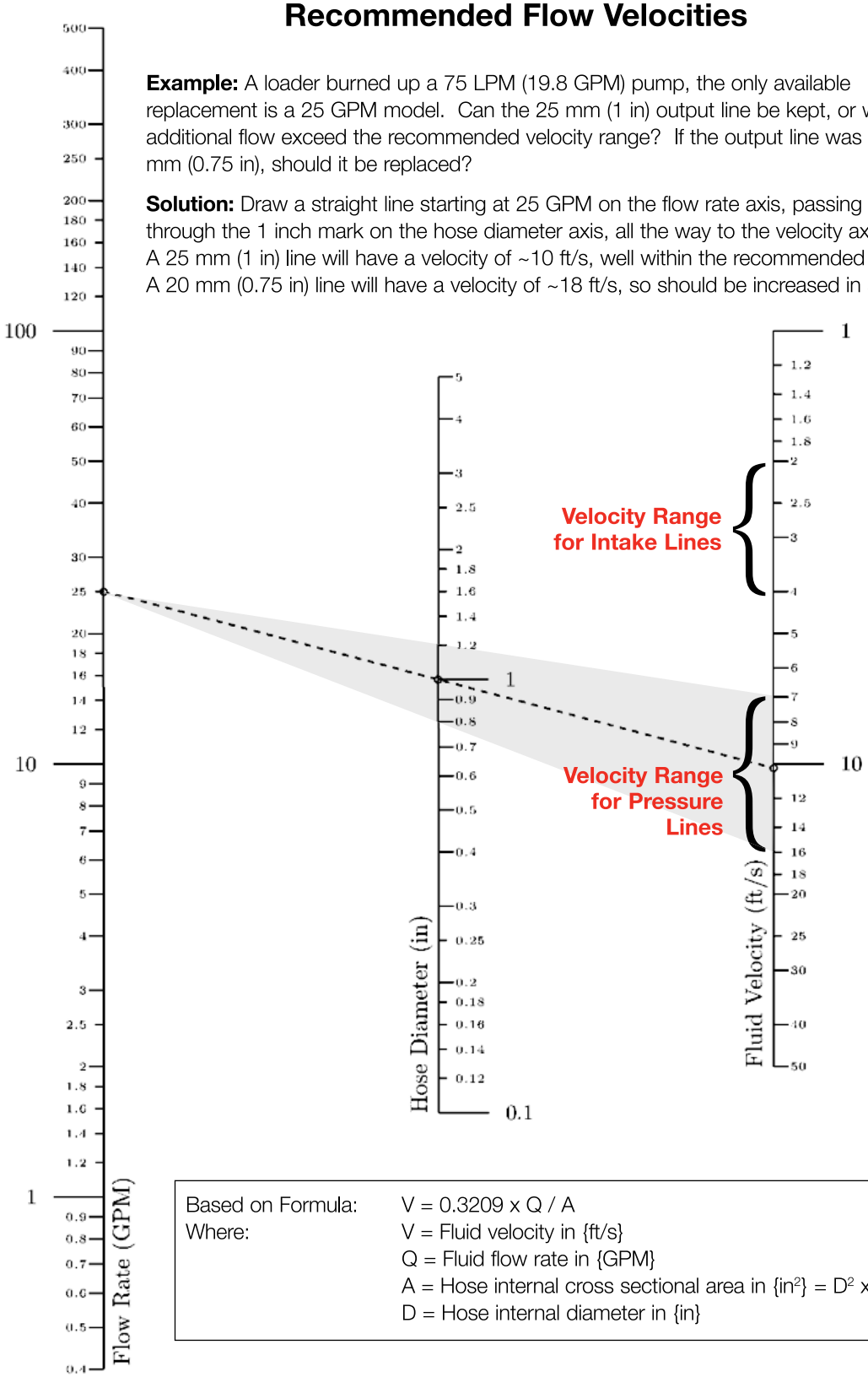
○Cover stock rating only; Rating for tube stock "X"
*Use Gates fuel hose or contact Denver Product Applications Department.

Nomographic Chart

Flow Capacity of Hose Assemblies at Recommended Flow Velocities

Example: A loader burned up a 75 LPM (19.8 GPM) pump, the only available replacement is a 25 GPM model. Can the 25 mm (1 in) output line be kept, or will the additional flow exceed the recommended velocity range? If the output line was 20 mm (0.75 in), should it be replaced?

Solution: Draw a straight line starting at 25 GPM on the flow rate axis, passing through the 1 inch mark on the hose diameter axis, all the way to the velocity axis. A 25 mm (1 in) line will have a velocity of ~10 ft/s, well within the recommended range. A 20 mm (0.75 in) line will have a velocity of ~18 ft/s, so should be increased in size.



Based on Formula:	V = 0.3209 x Q / A
Where:	V = Fluid velocity in {ft/s}
	Q = Fluid flow rate in {GPM}
	A = Hose internal cross sectional area in {in^2} = $D^2 \times \pi / 4$
	D = Hose internal diameter in {in}

Properties of C14 PTFE Tube

Tensile Strength, 73°F (23°C)		1500-3000 Lb./Sq. In.
Elongation, 73°F (23°C)		100-200%
Stiffness, 73°F (23°C)		60,000 Lb/Sq. In.
Impact Strength	@70°F (21°C)	2.0 Ft.-Lb./In.
	@73°F (23°C)	3.5 Ft.-Lb./In.
	@170°F (77°C)	6.0 Ft.-Lb./In.
Hardness, Durometer		D55-D70 Shore D
Compressive Stress at		
1% Deformation	@73°F (23°C)	600 Lb./Sq.In.
1% Offset	@73°F (23°C)	1000 Lb./Sq.In.
Deformation Under Load, 24 Hrs. @ 122°F (50°C)		
1200 Lb./Sq.In.		4-8%
2000 Lb./Sq.In.		25%
Heat-Distortion Temperature @66 Lb./Sq. In.		250°F (121°C)
Coefficient of Linear Thermal Expansion per °F; 77-140°F (25-60°C)		5.5×10^{-5}
Thermal Conductivity 0.18 In.		1.7 B.T.U./Hr./Sq.Ft./°F/In.
Specific Heat		0.25 B.T.U./Lb./°F
Water Absorption		0.0%
Flammability		Nonflammable
Specific Gravity		2.1-2.3

Electrostatic Discharge

Most applications of PTFE hose do not require the use of a conductive inner tube. Under certain applications, the potential for Static Discharge must be considered. Be aware that static electricity can be a hazard. Under those conditions where static discharge can occur, the use of conductive Gates C14CT hose is recommended. The following should serve to increase your knowledge and understanding of this phenomenon and how to avoid its occurrence:

When two different materials contact each other, electrons from one material can move across its boundary and associate with the other. These electrons align themselves with the material contacted. If the two materials are good conductors of electricity, the positive and negative electrons flow back and forth between them, keeping them in balance. If one or both are insulators, the flow will not occur. A charge will then build up on the surface of one of the materials. When the charge exceeds the electric strength of the material, electric breakdown results.

In applying this to PTFE hose, we have to consider fluids and gases that are poor conductors of electricity and the flow rates of those fluids and gases. In order for a liquid or gas to be a poor electrical conductor, it will generally satisfy one or both of the following conditions:

1. Be nonpolar; that is, an imbalance between protons and electrons, and/or
2. Contain a nonmixable component or a suspended solid; such as water in kerosene.

So when a liquid contacts a PTFE tube that isn't a good conductor (white PTFE innercore), the result is phase separation and the electric charge starts to build. The rate at which static electricity builds up now becomes a function of the fluid flow rate. When the electric strength of the PTFE tube is exceeded, the electric charge will **puncture the tube wall and ground itself on the stainless steel braid of the hose.**

In hydraulics, high pressures generally mean high velocities. Historically, fluids were filtered upstream of the hoses using metallic filter elements. The metallic element helped to ground the charge. But, today, most filtration is done with paper-type and glass-fiber filter elements that have a tendency to inject an electrostatic charge into the fluid they are filtering.

Steam and fuels are two specific areas of concern. **No hoses in this catalog can or should be used in steam applications. Contact Gates Product Application for proper hose recommendation.**

Fuels (i.e., gasoline and white spirits, hydrazine, benzene, diesel oils, etc.) are, for the most part, "nonconductive" liquids. These fluids usually are transferred at
fairly low velocities, but there still is a potential for an electrostatic discharge due to external factors, such as humidity and, to some extent, temperature. You should take all of these factors into account even at fluid velocities at or below 1 meter per second.

When using PTFE hose, you can offset the potential hazard of electrostatic discharge by using a conductive Gates C14CT hose. Carbon is added to the PTFE inner tube wall during manufacture. The carbon layer directs the electrostatic charge down the inner diameter of the hose to the metal end fittings. This prevents the charge from building up on the inner tube wall.

So, it's important to examine any application where nonconductive fluids are used and any of the above conditions exist. This section is not meant to cover all conditions or situations when they involve fuels, steam or other media which may cause electrostatic buildup or potential discharge. If you need help on any individual application, contact Hose/Connector Product Application, Denver.

Following is a list of some of the chemicals that meet at least one of the criteria necessary to create electrostatic discharge:

- Cyclohexane
- Decalin
- Diacetone
- Dibutyl Ether
- Dibutyl Phthalate
- Dibutyl Sebacate
- Dimethyl Phthalate
- Dioctyl Phthalate
- Dipentene
- Fuel Oil
- Gasoline
- Hexane
- Hexene
- Hydrazine
- Kerosene
- Lacquers
- Lacquer Solvents
- Naphtha
- Naphthalene
- Octane
- Paint
- Petroleum
- Pinene
- Silicone Oils
- Skydrol 500 & 700
- Steam
- Toluene
- Transformer Oil
- Turpentine
- Varnish
- Versilube

General Industry Practice has identified the above fluids as requiring a conductive hose—Gates C14CT.

Effusion/Corrosion for PTFE Hose and Hose Assemblies

What is Effusion?

It is the process where chemical molecules move through the PTFE wall and escape from a hose or hose assembly. It is sometimes called permeation. The rate at which effusion occurs depends upon temperature, pressure, wall thickness and the hose material.

The fact that effusion occurs isn't the problem. This process will happen with most all media in most hose material.

The basic issues are:

1. At what rate will effusion occur?
2. How hazardous are the media?
3. In what kind of environment does effusion take place; closed room, outside, etc.?

General media concerns regarding the potential effects of effusion:

- Media where corrosion is not of concern, but effusion may displace the air we breathe, thus becoming a hazard to personnel.

  Some of the chemicals in this category are:

  - Carbon Dioxide
  - Nitrogen
  - Steam
  - Oxygen
  - Helium
  - Neon
  - Argon
  - Xenon
  - Krypton

- Media that can effuse in their "vapor phase"; i.e., their boiling point is below approximately +52°C (+125°F) at atmospheric pressure. These media can form chemicals that can corrode the braid and/or cause injury to personnel.

  Some of these include:

  - Acetaldehyde (Flammable, toxic)
  - Benzene (Flammable, toxic)
  - Liquid Butane (Flammable)
  - Carbon Disulfide (Flammable, toxic)
  - Diethyl Ether (Flammable, narcotic)
  - Ethyl Mercaptan (Flammable, toxic)
  - Hydrochloric Acid (Corrosive, toxic)
  - Lacquer Solvents (Flammable)
  - Methyl Bromide (Flammable, toxic, corrosive)
  - Methylene Chloride (Toxic)
  - Methyl Formate (Flammable, toxic)
  - Liquid Propane (Flammable)
  - Sulphur Trioxide (Corrosive, toxic)
  - Liquid Chlorine (Corrosive, toxic)

- Media with the potential to effuse and cause corrosion of the braid reinforcement and fitting materials. These chemicals are all gases while at atmospheric pressure and a temperature of +13°C (+56°F) or lower.

  Some of these chemicals are:

  - Acetylene (Flammable)
  - Butadiene (Flammable)
  - Butane Gas (Flammable)
  - Carbon Monoxide (Toxic, flammable)
  - Chlorine (Toxic, corrosive)
  - Chlorine Trifluoride (Toxic, corrosive)
  - Ethyl Chloride (Toxic, corrosive)
  - Hydrogen (Flammable)
  - Hydrogen Chloride (Corrosive, toxic)
  - Hydrogen Sulfide (Flammable, toxic)
  - Hydrocyanic Acid (Flammable, toxic)
  - Hydrogen Cyanide (Flammable, toxic)
  - Coke Oven Gas (Flammable, toxic)
  - Natural Gas (Flammable, toxic)
  - Propane Gas (Flammable)
  - Sulfur Dioxide (Corrosive)
  - Vinyl Chloride Monomer (Toxic, corrosive)

It is important that hose assemblies used in these applications are installed in well-vented areas to avoid potential problems for personnel and/or equipment.

Hydraulic System Pressure Drop

What is pressure drop?

Friction is defined as the resistance an object encounters in moving over another. Solids, liquids, and gasses all exhibit friction in their motion. In hose and piping systems the result of this friction is pressure drop and heat generation that may be accurately estimated with engineering models.

Why does pressure drop matter?

If there is excessive pressure drop in a system pumps will have to work harder, use more energy, and the working fluid will increase in temperature. Depending on the source of the additional pressure loss it could: raise the whole system pressure, increasing wear and introducing potentially dangers over pressure conditions; render some tools or equipment functions inoperable, because of inadequate operation pressure; or create damaging cavitation and loss of net positive suction head (NPSH).

What affects pressure drop?

The factors which contribute pressure loss may be broken down into two general categories: mechanical components and fluid properties. Mechanical components such as valves, flow meters, quick disconnects, adapters, couplings, tubing, hose, etc., all contribute to pressure loss. The amount of pressure loss in mechanical components is impacted by criteria such as cross sectional area, internal surface roughness, length, bends, and geometric complexity. Fluid properties such as density, viscosity, heat capacity and bulk modulus will also contribute to pressure loss. Fluid properties are impacted by temperature, pressure, contamination, air entrainment, and time.

While all of these components contribute to pressure loss, fluid velocity has the most impact. Fluid velocity is a direct product of flow rate and cross sectional area.

What can be done to reduce pressure drop?

- Check system pressure drop when non-identical replacement parts are required or there is ongoing system problems.
- Use straight adapters and bent couplings whenever possible.
- Replace worn parts and old fluids.
- Lower the fluid velocity.

How can I calculate pressure drop for a hose assembly?

With some basic system information reliable pressure drop approximations may be readily calculated. First determine the applicable mechanical components and fluid for the analysis (doing 1 hose assembly at a time is recommended), then enter those values into the Gates online pressure drop calculator.

Hose assembly information: Inside Diameter, Length, Couplings, Adapters

Fluid information: Density, Viscosity, and Heat Capacity (these may be estimated with fluid type and temperature)

Go to http://www.gates.com/pressuredrop to calculate the pressure loss from the system information.

Pressure Conversions

Metric to PSI

(1 kPa = .145 psi)

Kilo Pascals (kPa)	Mega Pascals (MPa)	Bar (Bar)	Pounds per Square Inch (psi)
100	0.1	1	14.5
200	0.2	2	29.0
300	0.3	3	43.5
400	0.4	4	58.0
500	0.5	5	72.5
600	0.6	6	87.0
700	0.7	7	101.5
800	0.8	8	116.0
900	0.9	9	130.5
1,000	1.0	10	145.0
2,000	2.0	20	290.1
3,000	3.0	30	435.1
4,000	4.0	40	580.2
5,000	5.0	50	725.2
6,000	6.0	60	870.2
7,000	7.0	70	1,015.3
8,000	8.0	80	1,160.3
9,000	9.0	90	1,305.3
10,000	10	100	1,450
20,000	20	200	2,901
30,000	30	300	4,351
40,000	40	400	5,802
50,000	50	500	7,252
60,000	60	600	8,702
70,000	70	700	10,153
80,000	80	800	11,603
90,000	90	900	13,053
100,000	100	1000	14,504
200,000	200	2000	29,008
300,000	300	3000	43,511

PSI to Metric

(1 psi = 6.89 kPa)

Pounds per Square Inch (psi)	Kilo Pascals (kPa)	Mega Pascals (MPa)	Bar (Bar)
10	68.9	0.07	0.7
20	137.9	0.14	1.4
30	206.8	0.21	2.1
40	275.8	0.28	2.8
50	344.7	0.34	3.4
60	413.7	0.41	4.1
70	482.6	0.48	4.8
80	551.6	0.55	5.5
90	620.5	0.62	6.2
100	689	0.7	6.9
200	1,379	1.4	13.8
300	2,068	2.1	20.7
400	2,758	2.8	27.6
500	3,447	3.4	34.5
600	4,137	4.1	41.4
700	4,826	4.8	48.3
800	5,516	5.5	55.2
900	6,205	6.2	62.1
1,000	6,895	6.9	68.9
2,000	13,790	13.8	137.9
3,000	20,684	20.7	206.8
4,000	27,579	27.6	275.8
5,000	34,474	34.5	344.7
6,000	41,369	41.4	413.7
7,000	48,263	48.3	482.6
8,000	55,158	55.2	551.6
9,000	62,053	62.1	620.5
10,000	68,948	68.9	689
20,000	137,895	137.9	1,379
30,000	206,843	206.8	2,068
40,000	275,790	275.8	2,758

Examples

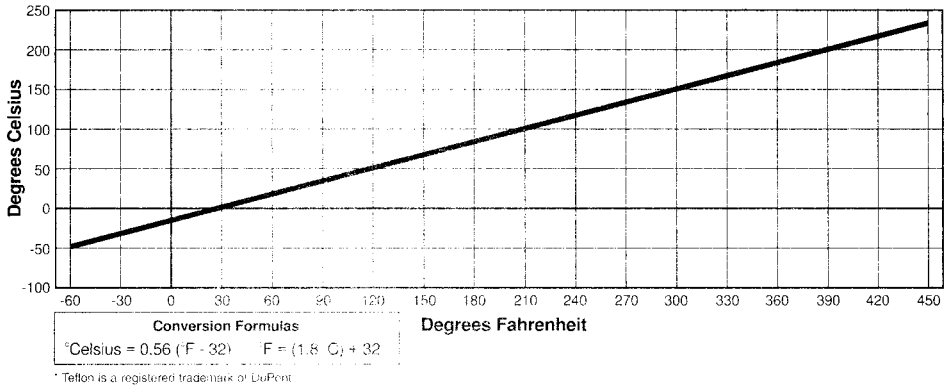
(A) Convert 3,429 psi to the equivalent pressure in Bar.

	3,000 psi	=	206.8	Bar
+	400 psi	=	27.6	Bar
+	20 psi	=	1.4	Bar
+	9 psi	=	.62	Bar
	3429 psi	=	236.42	Bar

(B) Convert 3,429 psi to the equivalent pressure in MPa.

	3,000 psi	=	20.680	MPa
+	400 psi	=	2.760	MPa
+	20 psi	=	.140	MPa
+	9 psi	=	.062	MPa
	3,429 psi	=	23.642	MPa

Fahrenheit-Celsius Conversion



* Teflon is a registered trademark of DuPont

Fahrenheit-Celsius Conversion

Look up a temperature reading in the middle column (shaded). If it's in degrees Centigrade, read the Fahrenheit equivalent in the right-hand column. If it's in degrees Fahrenheit, read the Centigrade equivalent In the left-hand column.

C	F\C	F
-68	-90	-130
-62	-80	-112
-57	-70	-94
-51	-60	-76
-46	-50	-58
-40	-40	-40
-34	-30	-22
-29	-20	-4
-23	-10	14
-17.8	0	32
-17.2	1	33.8
-16.7	2	35.6
-16.1	3	37.4
-15.6	4	39.2
-15.0	5	41.0
-14.4	6	42.8
-13.9	7	44.6
-13.3	8	46.4
-12.8	9	48.2
-12.2	10	50.0
-11.7	11	51.8
-11.1	12	53.6
-10.6	13	55.4
-10.0	14	57.2
-9.4	15	59.0
-8.9	16	60.8
-8.3	17	62.6
-7.8	18	64.4
-7.2	19	66.2
-6.7	20	68.0
-6.1	21	69.8
-5.6	22	71.6
-5.0	23	73.4
-4.4	24	75.2
-3.9	25	77.0
-3.3	26	78.8
-2.8	27	80.6
-2.2	28	82.4
-1.7	29	84.2
-1.1	30	86.0
-.6	31	87.8
0	32	89.6
.6	33	91.4
1.1	34	93.2
1.7	35	95.0
2.2	36	96.8
2.8	37	98.6
3.3	38	100.4
3.9	39	102.2
4.4	40	104.0

C	F\C	F
5.0	41	105.8
5.6	42	107.6
6.1	43	109.4
6.7	44	111.2
7.2	45	113.0
7.8	46	114.8
8.3	47	116.6
8.9	48	118.4
9.4	49	120.2
10.0	50	122.0
10.6	51	123.8
11.1	52	125.6
11.7	53	127.4
12.2	54	129.2
12.8	55	131.0
13.3	56	132.8
13.9	57	134.6
14.4	58	136.4
15.0	59	138.2
15.6	60	140.0
16.1	61	141.8
16.7	62	143.6
17.2	63	145.4
17.8	64	147.2
18.3	65	149.0
18.9	66	150.8
19.4	67	152.6
20.0	68	154.4
20.6	69	156.2
21.1	70	158.0
21.7	71	159.8
22.2	72	161.6
22.8	73	163.4
23.3	74	165.2
23.9	75	167.0
24.4	76	168.8
25.0	77	170.6
25.6	78	172.4
26.1	79	174.2
26.7	80	176.0
27.2	81	177.8
27.8	82	179.6
28.3	83	181.6
28.9	84	183.2
29.4	85	185.0
30.0	86	186.8
30.6	87	188.6
31.1	88	190.4
31.7	89	192.2
32.2	90	194.0
32.8	91	195.8

C	F\C	F
33.3	92	197.6
33.9	93	199.4
34.4	94	201.2
35.0	95	203.0
35.6	96	204.8
36.1	97	206.6
36.7	98	208.4
37.2	99	210.2
37.8	100	212.0
43	110	230
49	120	248
54	130	266
60	140	284
66	150	302
71	160	320
77	170	338
82	180	356
88	190	374
93	200	392
99	210	410
100	212	413.6
104	220	428
110	230	446
116	240	464
121	250	482
127	260	500
132	270	518
138	280	536
143	290	554
149	300	572
154	310	590
160	320	608
166	330	626
170	338	640
171	340	644
177	350	662
182	360	680
186	366	691
188	370	698
193	380	716
198	388	730
199	390	734
204	400	752
208	406	763
210	410	770
216	420	788
221	430	806
227	440	824
232	450	842

Decimal and Millimeter Equivalents of Fractions

Inches		
Fractions	Decimals	Millimeters
1/64	.015625	.397
1/32	.03125	.794
3/64	.046875	1.191
1/16	.0625	1.588
5/64	.078125	1.984
3/32	.09375	2.381
7/64	.109375	2.778
1/8	.125	3.175
9/64	.140625	3.572
5/32	.15625	3.969
11/64	.171875	4.366
3/16	.1875	4.763
13/64	.203125	5.159
7/32	.21875	5.556
15/64	.234375	5.953
1/4	.250	6.350
17/64	.265625	6.747
9/32	.28125	7.144
19/64	.296875	7.541
5/16	.3125	7.938

Inches		
Fractions	Decimals	Millimeters
23/64	.359375	9.128
3/8	.375	9.525
25/64	.390625	9.922
13/32	.40625	10.319
27/64	.421875	10.716
7/16	.4375	11.113
29/64	.453125	11.509
15/32	.46875	11.906
31/64	.484375	12.303
1/2	.500	12.700
33/64	.515625	13.097
17/32	.53125	13.494
35/64	.546875	13.891
9/16	.5625	14.288
37/64	.578125	14.684
19/32	.59375	15.081
39/64	.609375	15.478
5/8	.625	15.875
41/64	.640625	16.272
21/32	.65625	16.669

Inches		
Fractions	Decimals	Millimeters
11/16	.6875	17.463
45/64	.703125	17.859
23/32	.71875	18.256
47/64	.734375	18.653
3/4	.750	19.050
49/64	.765625	19.447
25/32	.78125	19.844
51/64	.796875	20.241
13/16	.8125	20.638
53/64	.828125	21.034
27/32	.84375	21.431
55/64	.859375	21.828
7/8	.875	22.225
57/64	.890625	22.622
29/32	.90625	23.019
59/64	.921875	23.416
15/16	.9375	23.813
61/64	.953125	24.209
31/32	.96875	24.606
63/64	.984375	25.003
1	1.000	25.400

Metric (SI) — U.S. Units for Fluid Power Use

(The following conversions are based on information taken from ASTM, American Society for Testing and Materials, Handbook E380-72.)

Quantity	Customary U.S. Unit	SI Unit	Conversion from U.S. to SI Units	Conversion from SI to U.S. Units
Area	Square Inch (in^2)	Square Metre (m^2)	(in^2) x (6.4516 x 10 -4) = (m^2)	(m^2) x 1550.003 = (in^2)
Force	Pound (lb_f)	Newton (N)	(lbf) x 4.4482 = (N)	(N) x (2.2481 $x10^{-1}$) = (lb_f)
Frequency	Cycles/Second (cps)	Hertz (H_z)	1 (cps) = 1(H_z)	1(Hz) = 1(cps)
Length	Inch (in)	Metre (m)	(in) x (2.540 $x\ 10^{-2}$) = (m)	(m) x 39.370 = (in)
Mass	Pound (lb_m)	Kilogram (kg)	(lbm) x .4536 = (kg)	(kg) x 2.2046 = (lb_m)
Power	Electric Horsepower (HP)	Watt (W)	(HP) x (7.460 $x\ 10^2$) = (W)	(W) x (1.3405 $x\ 10^{-3}$) = (HP)
Pressure	Pounds/Sq In (psi)	Newtons/Sq Metre (N/m^2)	(psi) x (6.8948 $x\ 10^3$) = (N/m^2)	(N/m^2) x (1.4504 $x\ 10^{-4}$) = (psi)
	(psi) (psi) (Bar)	Mega Pascal (MPa) Bar (Bar) (N/m^2)	(Non-Preferred Conversions) (psi)/145 = MPa psi/14.5 = Bar (Bar) x 100,000 = (N/m^2)	 (MPa) x 145 = (psi) (Bar) x (1.4504 $x\ 10^1$) = (psi) (N/m^2) x (1.00 $x\ 10^{-5}$) = (Bar)
Temperature	Degrees Fahrenheit (°F)	Degrees Celsius (°C)	(°Celsius) = 0.556(°F-32)	(1.8°C) + 32 = °F
Torque	Pound-Inch (lb_f-in)	Newton-Metres (N-m)	(lb_f-in) x (1.1298 $x\ 10^{-1}$) = (N-m)	(N-m) x 8.8507 = (lb_f-in)
Volume	US Gallon (Gal)	Cubic Metre (m^3)	(Gal) x (3.7854 $x\ 10^{-3}$) = (m^3)	(m^3) x (2.6417 $x\ 10^2$) = (Gal)
		Litre (l)	(Non-Preferred Conversions) (Gal) x 3.7854 = (l)	(l) x (2.6417 $x\ 10^{-1}$) = (Gal)
Work	Foot-Pound (ft-lb_f)	Joule (J)	(ft-lb_f) x 1.3558 = (J)	(J) x (7.3756 $x\ 10^{-1}$) = (ft-lb_f)

Tightening and Torque Recommendations for Hydraulic Couplings

1. Determine the correct torque value for your coupling using the manufacturers' recommendations. The minimum torque values are adequate for sealing in most applications; never exceed the maximum torque recommendations. Only use manufacturer specified torque values; do not use SAE recommendations.
2. Calculated the correct torque wrench setting. Wrench Setting = Desired Torque * L / LA (see Figure 1)
3. Ensure that the seal face and threads are clean and in good condition. O-rings should be lubricated with light oil, but threads should be completely dry unless making a tapered pipe thread connection (interference seal).
4. If the assembly has a male connector on one end, install the male connector first.
5. Hand tighten the connection by bringing seal face in contact and rotating the nut by hand until it stops, approximately 0.3-1 ft-lb.
6. Mark the coupling nut and backup hex with a line for flats method of torque verification.
7. Apply a wrench to the backup hex to prevent the coupling and hose from moving while tightening the nut with a torque wrench. Failure to retain the backup hex during installation can cause hose twisting and will result in additional clamp load force that can cause seal face damage.
8. While keeping the backup hex secure apply the torque wrench to the fitting nut and pull until the proper torque is achieved. The coupling nut must be in motion when the final torque is achieved, otherwise the nut must be loosened and retightened until the torque is attained while the nut is in motion.
9. If a torque wrench cannot fit into the coupling area or if it is unavailable, flats method may be used to ensure that JIC couplings are properly tightened, as shown in figure 2. Checking flats is also a good method of ensuring that critical connections have been properly tightened.

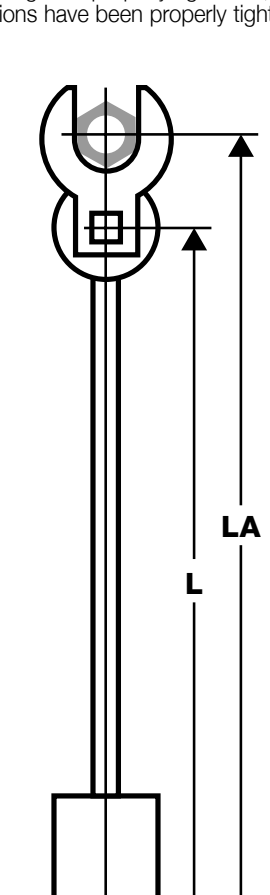


Figure 1 - Torque wrench adjustment when using a crowfoot wrench. Torque Wrench Setting = Desired Torque * L / LA

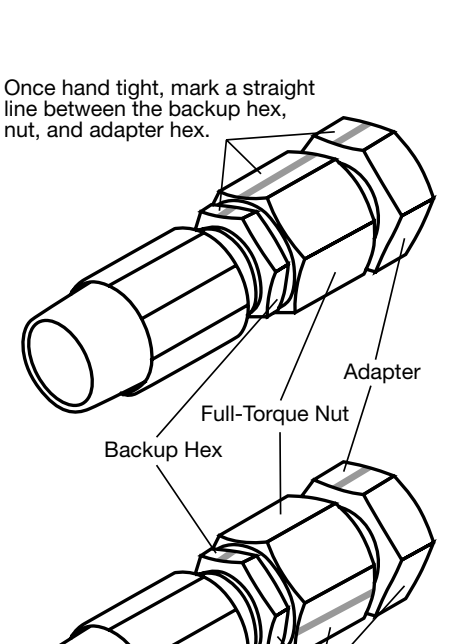


Figure 2 – Flats method of verifying coupling torque.