

# FMC Chiksan<sup>®</sup> and Weco<sup>®</sup> Field-Proven Sour Gas Products

*The solution for your demanding sour gas equipment requirements*

*Technology*

*Performance*

*Reliability*

*Service*



**FMC** EnergySystems

# Important Information About Sour Gas

**H**ydrogen sulfide ( $H_2S$ ) is found in many oil and gas formations.  $H_2S$  is highly toxic, colorless, and heavier than air. It has a characteristic foul odor of rotten eggs. Gas containing  $H_2S$  is commonly referred to as sour gas.

Many oilfield injuries and fatalities can be traced to sour gas. Prolonged exposure to low concentrations of sour gas will dull the sense of smell and cause eye and respiratory irritation. In moderate concentrations, loss of balance and reasoning ability will occur. At high concentrations,  $H_2S$  deadens the sense of smell, preventing detection of the deadly gas and paralyzing the lung muscles. This lethal situation has resulted in many deaths.

Pressure-containing components are vulnerable to sulfide stress cracking (SSC) when exposed to sour environments and can lead to various modes of material failure depending on additional environmental conditions. Material damage can occur in a relatively short time frame and can lead to catastrophic failure of the equipment.

To prevent material failure and the potential release of highly toxic gases, it is necessary to design metallic components to resist SSC. Guidelines for controlling SSC have been established by the National Association of Corrosion Engineers (NACE). These guidelines are published in NACE Standard MR-01-75. Additional guidelines are published by the American Petroleum Institute (API) in API RP-14E.

Sour gas equipment should be specified when there is a possibility that operating conditions will fall within the parameters established by NACE Standard MR-01-75. These parameters include concentration of  $H_2S$ , operating pressure, and gas/oil ratio of contained fluids.

In today's competitive business environment, oil and gas producers are keenly aware of the need for safe operations and are demanding higher accountability from their suppliers. Many major producers now specify the exclusive use of sour gas service products.

# FMC Sour Gas Equipment

**FMC** has been supplying reliable, field-proven sour gas equipment since 1970. Today, FMC is pursuing its commitment to you through improved designs, new materials, higher pressure ratings, and a rigorous new product research and development effort.

## All Chiksan and Weco sour gas products meet or exceed NACE and API requirements

FMC began providing quality sour gas equipment long before the National Association of Corrosion Engineers (NACE) Standard MR-01-75 was written. Today, all Chiksan and Weco brand products for sour gas service meet or exceed NACE Standard MR-01-75 and the American Petroleum Institute's (API) Standard RP-14E.

## Quality assurance second to none

Before any Chiksan or Weco product for sour gas service reaches you, it goes through FMC's total quality assurance program. This rigid quality program approved by leading independent inspection organizations insures that all FMC sour gas products are manufactured and processed to the highest industry standards. The result: You get quality sour gas equipment that provides long life and dependable service every time.

## Simple, positive identification

For positive identification, all Chiksan and Weco sour gas products are stamped "Sour Gas" using low-stress dot stamping. FMC sour gas equipment is also painted with an olive green, zinc-chromate primer that is unique to sour gas products.

## Widest selection in the oilfield

FMC offers you the most complete line of sour gas swivel joints, wing unions, and plug valves in the world. Other FMC products for sour gas service include Chiksan cementing and circulating hoses, Weco pup joints, fittings and adapters, Weco pressure relief valves, Weco check valves, and manifold assemblies.

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# Weco® Wing Unions

Weco wing unions are the most complete line of sour gas pipe connections available, ranging in size from 2- to 6-inches with cold working pressures to 15,000 psi. All Weco unions are color coded with an olive green, zinc-chromatic primer for quick identification. Materials meet NACE MR-01-75, ASTM and AISI standards.

## Features & Benefits

### Positive sealing designs

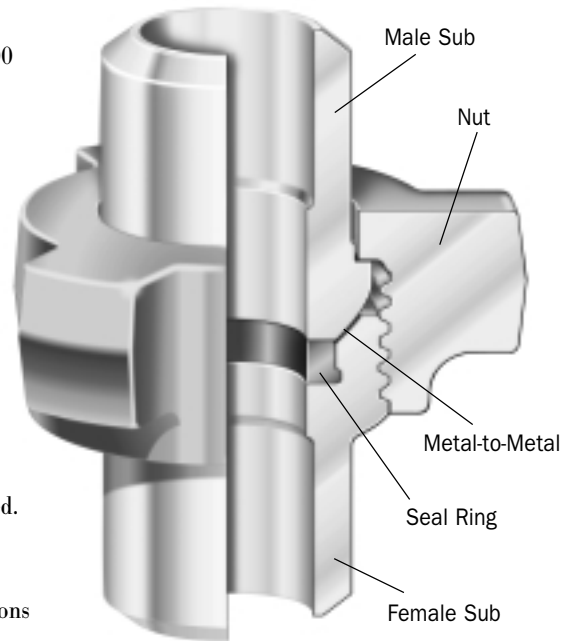
Weco wing union seals vary according to pressure and application. All provide positive, pressure-tight sealing.

### Fast make-up and break-out

Three-lug nuts and rugged self-locking Acme threads provide fast make-up and break-out regardless of position or space restrictions. No special tools are required.

### End connections

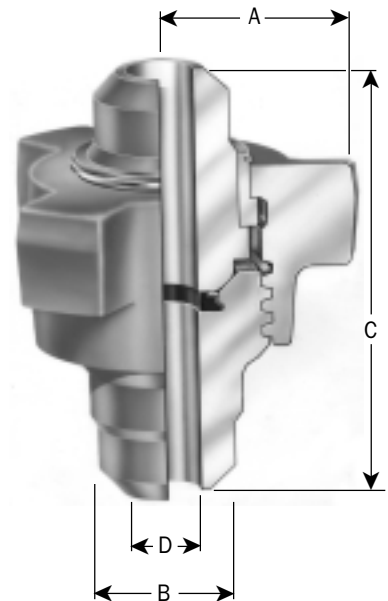
Weco wing unions are shown with butt-weld connections. For other end connections consult factory.



Weco Wing Union 1502

**Figure 2202 Butt Weld**  
**15,000 psi (1034 bar) CWP; 22,500 psi (1551 bar) Test**

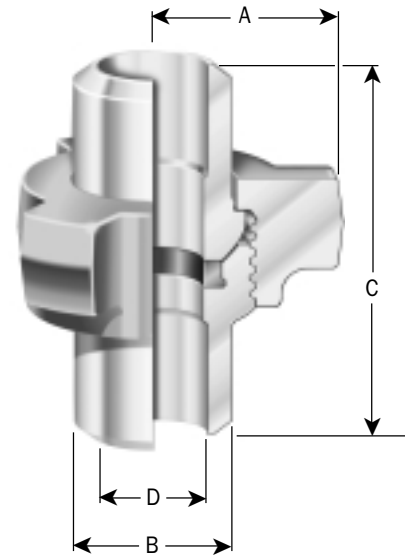
Description		2 inch (50mm)	3 inch (80mm)
Complete union	Part No.	3235746	3252159
	lbs (kg)	26 (11.6)	97 (44.0)
	Price	CF	CF
Nut, detachable	Part No.	3233306	3256281
	lbs (kg)	10 (4.5)	42 (19.1)
	Price	CF	CF
Retainer segments (3 required)	Part No.	3233309	3251602
	lbs (kg)	1 (.5)	2 (.9)
	Price each	CF	CF
Retainer ring	Part No.	3226859	3245922
	Price	CF	CF
Male sub	Part No.	3235747	3252157
	lbs (kg)	6 (2.7)	25 (11.4)
	Price	CF	CF
Female sub	Part No.	3235748	3252158
	lbs (kg)	7 (3.2)	21 (9.5)
	Price	CF	CF
Viton seal ring	Part No.	3233069	3251671
	Price	CF	CF
A	Clearance radius, in. (mm)	3.75 (95.3)	6.25 (158.8)
B	Outside diameter, in. (mm)	2.88 (73.2)	4.81 (122.2)
C	End-to-end, in. (mm)	8.81 (123.8)	10.50 (266.7)
D	Inside diameter, in. (mm)	1.30 (33)	3.00 (76.2)



# Weco® Wing Unions

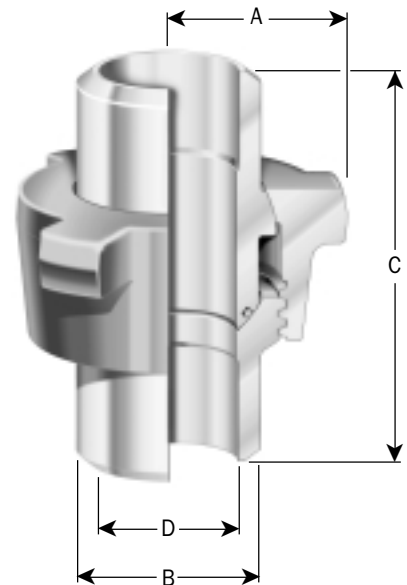
**Figure 1502 Butt Weld (Schedule XXH)**  
**10,000 psi (690 bar) CWP; 15,000 psi (1034 bar) Test**

Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)
Complete union	Part No.	3248700	3235505	3256881
	lbs (kg)	22 (10)	28 (12.7)	61 (27.7)
	Price	CF	CF	CF
Nut	Part No.	3237953	3237773	3251673
	lbs (kg)	10 (4.6)	13 (5.9)	22 (10)
	Price	CF	CF	CF
Male sub	Part No.	3248701	3235536	3256879
	lbs (kg)	6 (2.7)	7 (3.2)	21 (9.5)
	Price	CF	CF	CF
Female sub	Part No.	3248702	3237771	3256880
	lbs (kg)	6 (2.7)	8 (3.6)	18 (8.2)
	Price	CF	CF	CF
Viton seal ring	Part No.	3232434	3232646	3251672
	Price	CF	CF	CF
A	Clearance radius, in. (mm)	3.91 (99.3)	4.50 (114.3)	6.00 (152.4)
B	Outside diameter, in. (mm)	2.38 (60.5)	3.50 (88.9)	4.50 (114.3)
C	End-to-end, in. (mm)	6.25 (158.8)	5.25 (133.4)	8.50 (216)
D	Inside diameter, in. (mm)	1.50 (38.1)	2.30 (58.4)	3.15 (80)



**Figure 1003 Butt Weld with Misaligning Union (Schedule XXH)**  
**3" 7,500 psi (517 bar) CWP; 11,250 psi (776 bar) Test**  
**4" 5,000 psi (345 bar) CWP; 7,500 psi (517 bar) Test**

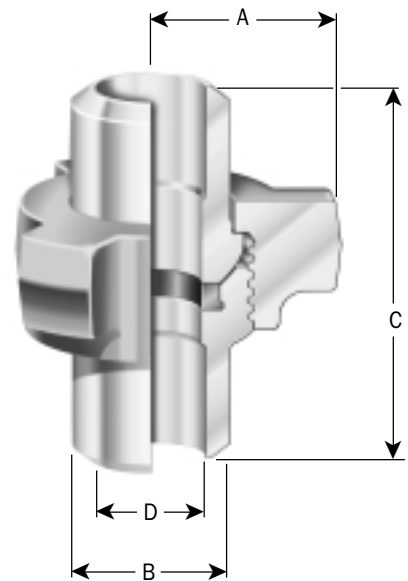
Description		3 inch (80mm)	4 inch (100mm)
Complete union	Part No.	3257227	3261476
	lbs (kg)	48 (21.8)	82 (37.2)
	Price	CF	CF
Nut	Part No.	3257232	3261479
	lbs (kg)	22 (10)	39 (17.7)
	Price	CF	CF
Male sub	Part No.	3267225	3261478
	lbs (kg)	16 (7.3)	26 (11.8)
	Price	CF	CF
Female sub	Part No.	3257226	3261477
	lbs (kg)	10 (4.6)	17 (7.7)
	Price	CF	CF
Viton "O" ring	Part No.	3231057	3233034
	Price	CF	CF
A	Clearance radius, in. (mm)	4.88 (124)	5.75 (146.1)
B	Outside diameter, in. (mm)	3.50 (88.9)	4.50 (114.3)
C	End-to-end, in. (mm)	9.12 (231.7)	10.93 (277.6)
D	Inside diameter, in. (mm)	2.30 (58.4)	3.15 (80)



# Weco® Wing Unions

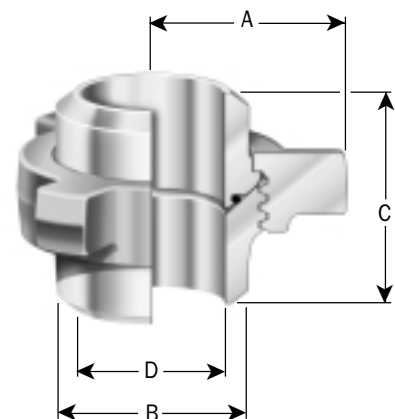
**Figure 1002 Butt Weld (Schedule XXH)**  
**7,500 psi (517 bar) CWP; 11,250 psi (776 bar) Test**

Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)
Complete union	Part No.	3253694	3240428	3254936
	lbs (kg)	15 (6.8)	22 (10.4)	33 (14.9)
	Price	CF	CF	CF
Nut	Part No.	3253693	3240914	3241596
	lbs (kg)	7 (3.2)	10 (4.5)	13 (5.9)
	Price	CF	CF	CF
Male sub	Part No.	3253267	3241605	3254938
	lbs (kg)	4 (1.8)	6 (2.7)	10 (4.5)
	Price	CF	CF	CF
Female sub	Part No.	3253268	3248183	3254937
	lbs (kg)	4 (1.8)	7 (3.2)	10 (4.5)
	Price	CF	CF	CF
Viton seal ring	Part No.	3232434	3232646	3232654
	Price	CF	CF	CF
A	Clearance radius, in. (mm)	3.81 (96.8)	4.31 (109.5)	4.88 (124)
B	Outside diameter, in. (mm)	2.38 (60.5)	3.50 (88.9)	4.50 (114.3)
C	End-to-end, in. (mm)	5.20 (132.1)	5.44 (138.2)	5.91 (150.11)
D	Inside diameter, in. (mm)	1.50 (38.1)	2.30 (58.4)	3.15 (80)



**Figure 1002 Butt Weld (Schedule see below)**  
**5,000 psi (345 bar) CWP; 7,500 psi (517 bar) Test**

Description		5 inch (125mm)	6 inch (150mm)
Schedule		XXH	160
Complete union	Part No.	P508629	P508519
	lbs (kg)	57 (25.9)	83 (37.7)
	Price	CF	CF
Nut	Part No.	P508666	P508518
	lbs (kg)	26 (11.8)	37 (16.8)
	Price	CF	CF
Male sub	Part No.	3257700	P508283
	lbs (kg)	15 (6.8)	20 (9.1)
	Price	CF	CF
Female sub	Part No.	3257701	P508284
	lbs (kg)	16 (7.3)	26 (11.8)
	Price	CF	CF
Viton "O" ring	Part No.	3232387	3255971
	Price	CF	CF
A	Clearance radius, in. (mm)	6.16 (156.5)	7.00 (177.8)
B	Outside diameter, in. (mm)	5.56 (141.2)	6.63 (168.4)
C	End-to-end, in. (mm)	6.09 (154.7)	6.23 (158.2)
D	Inside diameter, in. (mm)	4.06 (103.1)	5.19 (131.8)



# Weco® Wing Unions

**Figure 602 Butt Weld with A350 LF2 Steel Subs (Schedule XXH)**

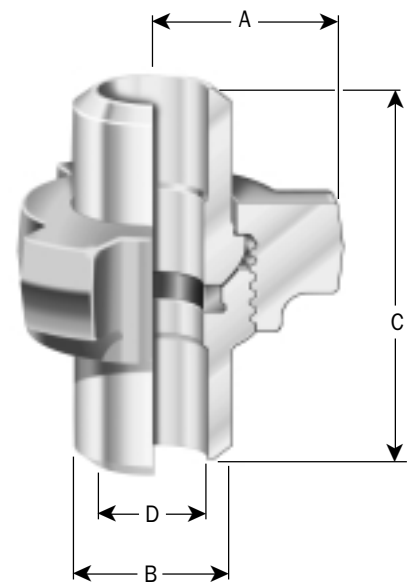
Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)
Maximum CWP rating of assy, psi (bar) <sup>1</sup>		6000 (414)	5000 (345)	4125 (284)
Complete union	Part No.	P509453	P509454	P509455
	lbs (kg)	16 (7.3)	25 (11.3)	31 (14.1)
	Price	CF	CF	CF
Nut	Part No.	P508207	P508214	P508222
	lbs (kg)	7 (3.2)	10 (4.5)	11 (5.0)
	Price	CF	CF	CF
Male sub	Part No.	P508210	P508217	P508225
	lbs (kg)	4 (1.8)	6 (2.7)	9 (4.1)
	Price	CF	CF	CF
Female sub w/seal ring	Part No.	P509426	P509427	P509428
	lbs (kg)	5 (2.3)	9 (4.1)	11 (5.0)
	Price	CF	CF	CF
Viton seal ring <sup>2</sup>	Part No.	3232434	3232646	3232654
	Price	CF	CF	CF
A	Clearance radius, in. (mm)	3.63 (92.2)	4.50 (114.3)	5.19 (131.8)
B	Outside diameter, in. (mm)	2.38 (66.8)	3.50 (88.9)	4.50 (114.3)
C	End-to-end, in. (mm)	5.06 (128.5)	5.21 (132.3)	5.67 (144)
D	Inside diameter, in. (mm)	1.50 (38.1)	2.30 (58.4)	3.15 (80)

1. Nut to be marked with pressure rating at fabrication. CWP dependent upon pipe specification.
2. Included with female sub listed above.

**Figure 602 Butt Weld with A350 LF2 Steel Subs (Schedule 160)**

Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)
Maximum CWP rating of assy, psi (bar) <sup>1</sup>		5610 (387)	5000 (345)	4125 (284)
Complete union	Part No.	P509450	P509451	P509452
	lbs (kg)	16 (7.3)	25 (11.3)	31 (14.1)
	Price	CF	CF	CF
Nut	Part No.	P508207	P508214	P508222
	lbs (kg)	7 (3.2)	10 (4.5)	11 (5.0)
	Price	CF	CF	CF
Male sub	Part No.	P508209	P508216	P508224
	lbs (kg)	4 (1.8)	6 (2.7)	9 (4.1)
	Price	CF	CF	CF
Female sub w/seal ring	Part No.	P509423	P509424	P509425
	lbs (kg)	5 (2.3)	9 (4.1)	11 (5.0)
	Price	CF	CF	CF
Viton seal ring <sup>2</sup>	Part No.	3232434	3232646	3232654
	Price	CF	CF	CF
A	Clearance radius, in. (mm)	3.63 (92.2)	4.50 (114.3)	5.19 (131.8)
B	Outside diameter, in. (mm)	2.38 (60.5)	3.50 (88.9)	4.50 (114.3)
C	End-to-end, in. (mm)	5.06 (128.5)	5.21 (132.3)	5.67 (144)
D	Inside diameter, in. (mm)	1.69 (42.9)	2.62 (66.5)	3.44 (87.4)

1. Nut to be marked with pressure rating at fabrication. CWP dependent upon pipe specification.
2. Included with female sub listed above.



# Weco® Wing Unions

**Figure 602 Butt Weld with A350 LF2 Steel Subs (Schedule 80)**

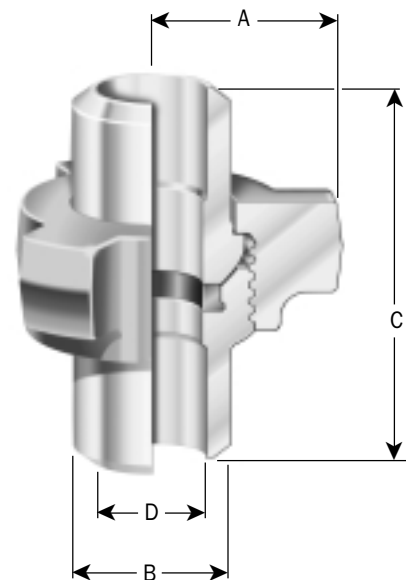
Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)
Maximum CWP rating of assy, psi (bar) <sup>1</sup>		2990 (203)	3090 (210)	2755 (187)
Complete union	Part No.	P509447	P509448	P509449
	lbs (kg)	14 (6.4)	23 (10.4)	29 (18.1)
	Price	CF	CF	CF
Nut	Part No.	P508207	P508214	P508222
	lbs (kg)	7 (3.2)	10 (4.5)	11 (5.0)
	Price	CF	CF	CF
Male sub	Part No.	P508208	P508215	P508223
	lbs (kg)	3 (1.4)	5 (2.3)	8 (3.6)
	Price	CF	CF	CF
Female sub w/seal ring	Part No.	P509412	P509414	P509415
	lbs (kg)	4 (1.8)	8 (3.6)	10 (4.5)
	Price	CF	CF	CF
Viton seal ring <sup>2</sup>	Part No.	3232434	3232646	3232654
	Price	CF	CF	CF
A	Clearance radius, in. (mm)	3.63 (92.2)	4.50 (114.3)	5.19 (131.8)
B	Outside diameter, in. (mm)	2.38 (60.5)	3.50 (88.9)	4.50 (114.3)
C	End-to-end, in. (mm)	5.06 (128.5)	5.21 (132.3)	5.67 (144)
D	Inside diameter, in. (mm)	1.94 (49.3)	2.90 (73.7)	3.83 (97.3)

1. Nut to be marked with pressure rating at fabrication. CWP dependent upon pipe specification.
2. Included with female sub listed above.

**Figure 602 Butt Weld with A350 LF2 Steel Subs (Schedule 40)**

Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)
Maximum CWP rating of assy, psi (bar) <sup>1</sup>		1725 (117)	1950 (133)	1700 (116)
Complete union	Part No.	P509444	P509445	P509446
	lbs (kg)	14 (6.4)	23 (10.4)	29 (13.1)
	Price	CF	CF	CF
Nut	Part No.	P508207	P508214	P508222
	lbs (kg)	7 (3.2)	10 (4.5)	11 (5.0)
	Price	CF	CF	CF
Male sub	Part No.	P509462	P509463	P509464
	lbs (kg)	3 (1.4)	5 (2.3)	8 (3.6)
	Price	CF	CF	CF
Female sub w/seal ring	Part No.	P509465	P509466	P509467
	lbs (kg)	4 (1.8)	8 (3.6)	10 (4.5)
	Price	CF	CF	CF
Viton seal ring <sup>2</sup>	Part No.	3232434	3232646	3232654
	Price	CF	CF	CF
A	Clearance radius, in. (mm)	3.63 (92.2)	4.50 (114.3)	5.19 (132)
B	Outside diameter, in. (mm)	2.38 (60.5)	5.06 (128.5)	2.07 (52.6)
C	End-to-end, in. (mm)	3.50 (88.9)	5.21 (132.3)	3.07 (78)
D	Inside diameter, in. (mm)	4.50 (114.3)	5.67 (144)	4.03 (102.4)

1. Nut to be marked with pressure rating at fabrication. CWP dependent upon pipe specification.
2. Included with female sub listed above.





# Weco® Wing Unions

**Figure 206 Butt Weld with A350 LF2 Steel Subs (Schedule 80)**

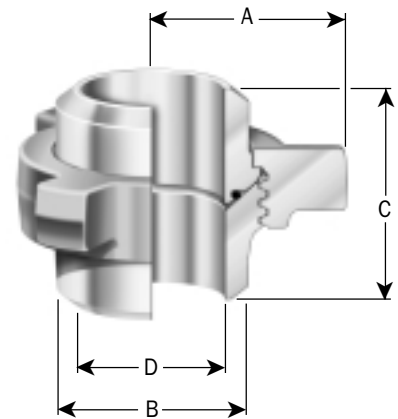
Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)	6 inch (150mm)
Maximum CWP rating of assy, psi (bar) <sup>1</sup>		2000 (138)	2000 (138)	2000 (138)	2000 (138)
Complete union	Part No.	P509432	P509433	P509440	P509441
	lbs (kg)	4 (1.8)	16 (7.8)	22 (10.0)	46 (20.9)
	Price	CF	CF	CF	CF
Nut	Part No.	P508070	P508073	P508076	3212866
	lbs (kg)	2 (.9)	6 (2.7)	7 (3.2)	15 (6.8)
	Price	CF	CF	CF	CF
Male sub w/"O" ring	Part No.	P509408	P509409	P509410	P509411
	lbs (kg)	1 (.5)	5 (2.3)	7 (3.2)	15 (6.8)
	Price	CF	CF	CF	CF
Female sub	Part No.	P508072	P508075	P508078	3237328
	lbs (kg)	1 (.5)	5 (2.3)	8 (3.6)	16 (7.3)
	Price	CF	CF	CF	CF
Viton "O" ring <sup>2</sup>	Part No.	3231045	3231049	3259648	3232388
	Price	CF	CF	CF	CF
A	Clearance radius, in. (mm)	3.00 (76.2)	4.00 (102)	4.69 (119)	6.25 (158.8)
B	Outside diameter, in. (mm)	2.38 (60.5)	3.50 (88.9)	4.50 (114.3)	6.63 (168.4)
C	End-to-end, in. (mm)	3.26 (82.8)	4.66 (118.4)	4.98 (126.5)	6.26 (159)
D	Inside diameter, in. (mm)	1.94 (49.3)	2.90 (73.7)	3.83 (97.3)	5.76 (146.3)

1. Nut to be marked with pressure rating at fabrication. CWP dependent upon pipe specification.
2. Included with male sub listed above.

**Figure 206 Butt Weld with A350 LF2 Steel Subs (Schedule 40)**

Description		2 inch (50mm)	3 inch (80mm)	4 inch (100mm)	6 inch (150mm)
Maximum CWP rating of assy, psi (bar) <sup>1</sup>		1725 (119)	1950 (134)	1700 (117)	1450 (100)
Complete union	Part No.	P509429	P509430	P509431	P509442
	lbs (kg)	4 (1.8)	14 (6.4)	20 (9.1)	44 (20)
	Price	CF	CF	CF	CF
Nut	Part No.	P508070	P508073	P508076	3212866
	lbs (kg)	2 (.9)	6 (2.7)	7 (3.2)	15 (6.8)
	Price	CF	CF	CF	CF
Male sub w/"O" ring	Part No.	P509456	P509457	P509458	P509422
	lbs (kg)	1 (.5)	4 (1.8)	6 (2.7)	14 (6.4)
	Price	CF	CF	CF	CF
Female sub	Part No.	P509459	P509460	P509461	3206887
	lbs (kg)	1 (.5)	4 (1.8)	7 (3.2)	15 (6.8)
	Price	CF	CF	CF	CF
Viton "O" ring <sup>2</sup>	Part No.	3231045	3231049	3259648	3232388
	Price	CF	CF	CF	CF
A	Clearance radius, in. (mm)	3.00 (76)	4.00 (102)	4.69 (119)	6.25 (159)
B	Outside diameter, in. (mm)	2.38 (60.5)	3.50 (88.9)	4.50 (114.3)	6.63 (168.4)
C	End-to-end, in. (mm)	3.26 (82.8)	4.66 (118.4)	4.98 (126.5)	6.26 (159)
D	Inside diameter, in. (mm)	2.07 (52.6)	3.07 (78)	4.03 (102.4)	6.07 (154.2)

1. Nut to be marked with pressure rating at fabrication. CWP dependent upon pipe specification.
2. Included with male sub listed above.



# Weco® Plug Valves

Weco sour gas plug valves are reliable, quarter-turn valves designed for services to 15,000 psi cold working pressure. These rugged valves range in size from 1 to 3 inches and come with integral Weco wing union ends. The union ends add considerable strength to the connection, reduce turbulence, and minimize corrosion and stress concentration sites. Weco sour gas plug valves are available with manual, handwheel, and hydraulic actuators.

## Complete in-line maintenance

Weco sour gas plug valves can be rebuilt in-line using standard tools. Repair kits are available. FMC uses special sour gas resistant O-rings and seals in all Weco plug valves and repair kits for sour gas service. Only genuine FMC replacement parts are recommended for use in FMC plug valves.

## Model DR Plug Valves

### Floating segments insure positive seal

Dual seal segments float slightly to offset possible micro-expansion of the valve body and to insure a positive seal in sour gas applications.

### Easy operation under pressure

The cylindrical plug fits between a set of precision machined seal and side segments for ultra low operating torque under pressure.

## Model ULT Plug Valves

### Exclusive patented seal design extends service life

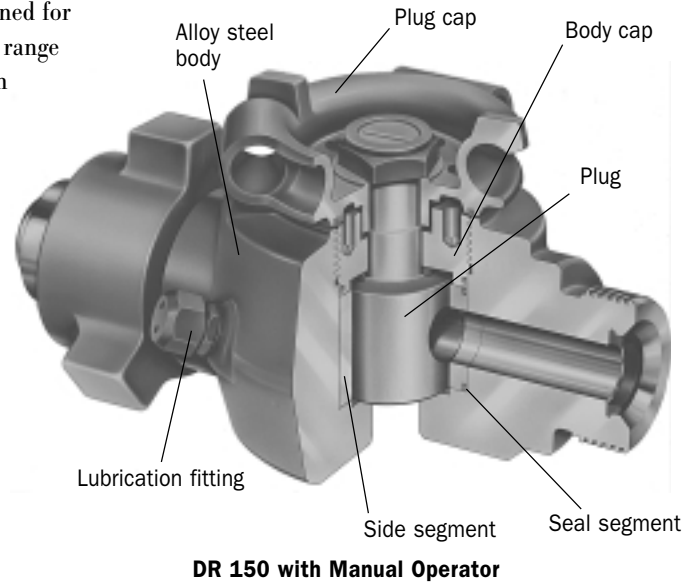
Seal design forces line fluid between the plug/seal interface when the valve is closed to eliminate body erosion and limit wear to replaceable components, extending service life 3 to 5 times over other plug valves while reducing maintenance costs.

### Two-piece floating plug/stem

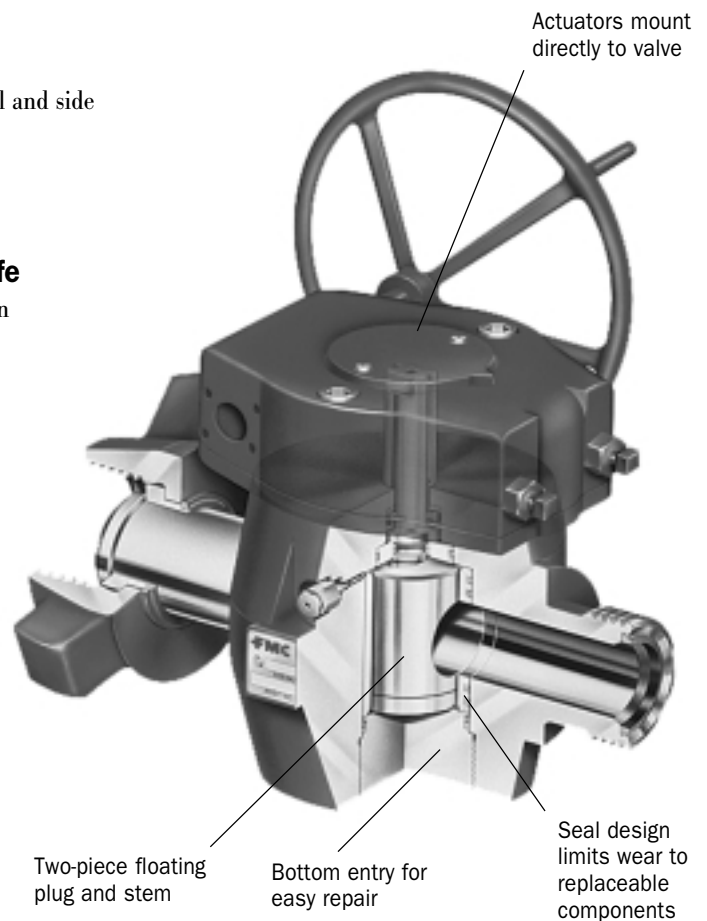
FMC's proprietary floating plug and stem uniformly distribute load against the downstream seat to improve sealing and reduce operating torque.

### Bottom entry for fast, easy repair

The Model ULT valve features bottom entry design for ease of inspection and repair without removal of operator or actuator.

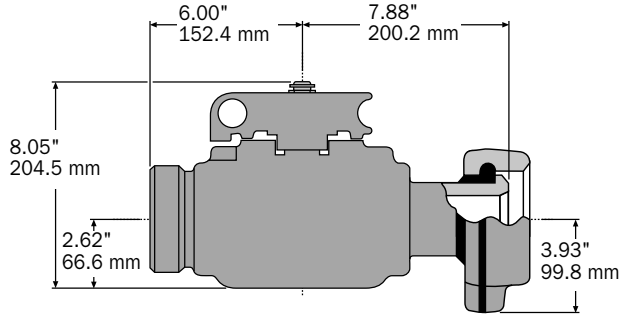


DR 150 with Manual Operator

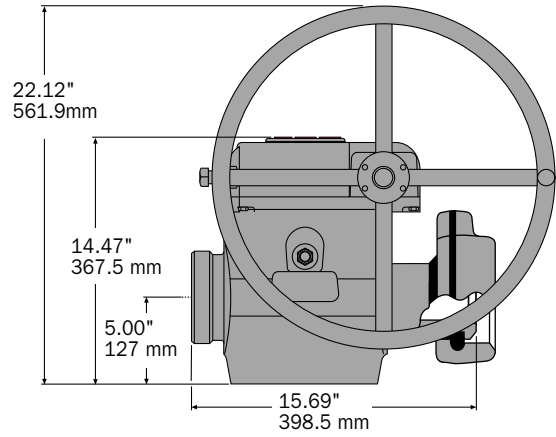


ULT 150 with Handwheel Operator

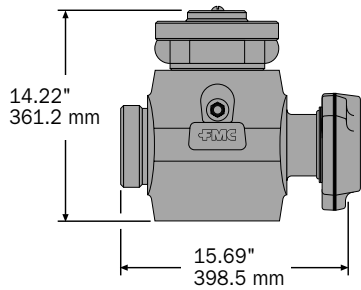
# Weco® Plug Valves



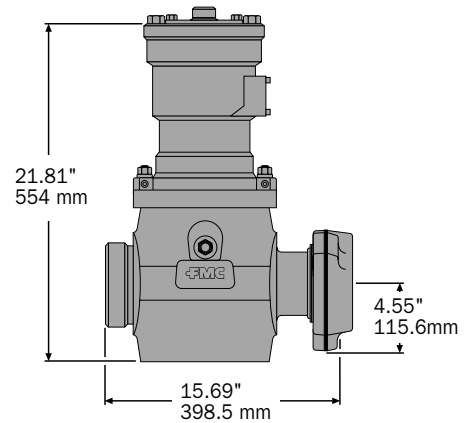
**2-inch DR 150 with Manual Operator**



**3-inch ULT 150 with Handwheel Operator**



**ULT 150 with Manual Operator**



**ULT 150 with Hydraulic Actuator**

## Sour Gas Weco Plug Valve Reference Chart

Model	Sizes in. (mm)	End Connection*	CWP psi (bar)	Test psi (bar)	Part No.	Weight lbs (kg)	Price
DR 150 Manual Operator	1 (25)	Weco 1502	10,000 (690)	15,000 (1034)	3252285	37 (17)	CF
	1x2 (25x50)	Weco 1502	10,000 (690)	15,000 (1034)	3258139	43 (20)	CF
	2 (50)	Weco 1502	10,000 (690)	15,000 (1034)	3248705	88 (40)	CF
ULT 150 Manual Operator	3 (80)	Weco 1502	10,000 (690)	15,000 (1034)	P501010	241 (109)	CF
ULT 150 Handwheel Operator	3 (80)	Weco 1502	10,000 (690)	15,000 (1034)	3265257	292 (132)	CF
ULT 150 Hydraulic Actuator	3 (80)	Weco 1502	10,000 (690)	15,000 (1034)	3267427	340 (154)	CF
DR 200 Manual Operator	2 (50)	Weco 2202	15,000 (1034)	22,500 (1551)	3234183	83 (38)	CF

NOTE: DR 150 and 200 plug valves can be furnished with hydraulic actuators. Consult factory for price.  
 \* Other end connections are available. Consult factory.

# Chiksan® Swivel Joints

Chiksan swivel joints are available in 2- to 4-inch sizes and can handle cold working pressures up to 15,000 psi in sour gas service.

## Features & Benefits

### Streamlined bore minimizes flow restrictions

Smooth, round bore design minimizes turbulence and pressure drop. Longsweep® swivel joints have extra-long radius elbows for even better flow characteristics.

### Patented, Snap-in ball races

Because sour gas service requires specially heat-treated steel, Chiksan sour gas swivel joints use patented field replaceable snap-in ball races for extra strength, high load-bearing capacity, and low operating torque.

### Dual seal design isolates races and bearings

Fluoroelastomer or hydrogenated nitrile packing, with stainless steel anti-extrusion ring, and secondary O-ring seal are used to isolate the races and bearings from line fluid.

### Leak detection port

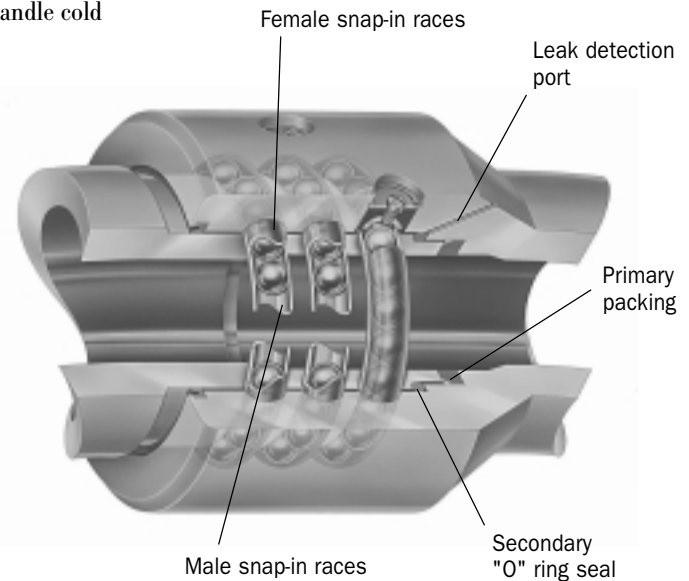
Chiksan sour gas swivel joints have a leak-detection port between the primary packing and the secondary O-ring seal. If leakage past the primary packing should occur, it is forced through the port, signaling the need for packing replacement.

### Integral Weco wing union ends

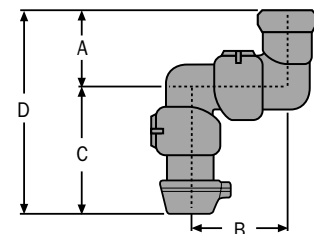
Chiksan sour gas swivel joints come with integral Weco wing union end connections, eliminating welding and minimizing turbulence.

### Field repairable

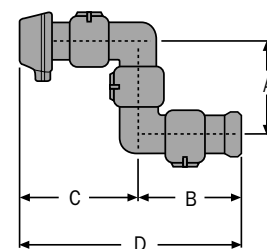
Only occasional light greasing is required to keep Chiksan swivel joints on the job. If packing, bearings, snap-in races, or ball plugs should need replacing, easy-to-use field repair kits are available.



Chiksan Longsweep Swivel Joint



High Pressure Swivel Joint - Style 50



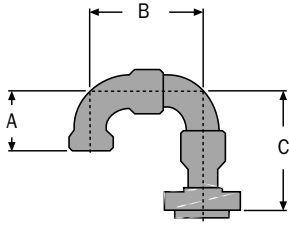
High Pressure Swivel Joint - Style 10

## Sour Gas High Pressure Series Swivel Joint Reference Chart

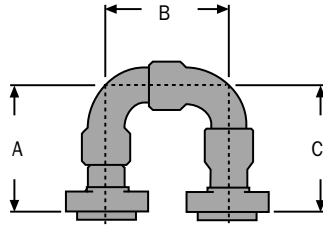
Fluoroelastomer packing

Model	Sizes in. (mm)	End Connection	CWP psi (bar)	Dimensions, in. (mm)				Part No.	Weight lbs (kg)	Price
				A	B	C	D			
Style 50	2 (50)	Weco 602	6,000 (414)	5.30 (134.6)	6.60 (167.6)	9.50 (241.3)	14.80 (251)	6100749	43 (19.4)	CF
Style 10 MxF	2 (50)	Weco 602	6,000 (414)	6.60 (167.6)	9.50 (241.3)	12.50 (317.5)	22.00 (558.8)	6100750	52 (23.4)	CF

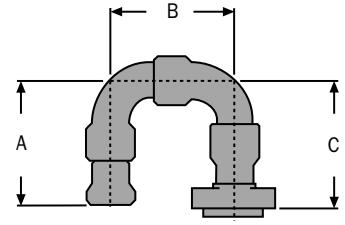
# Chiksan® Swivel Joints



Longsweep Swivel Joint - Style 50



Longsweep Swivel Joint - Style 10 MxM



Longsweep Swivel Joint - Style 10 MxF

## Sour Gas Longsweep® Series Swivel Joint Reference Chart Fluoroelastomer packing

Model	Sizes in. (mm)	End Connection	CWP psi (bar)	Dimensions, in. (mm)			Part No.	Weight lbs (kg)	Price
				A	B	C			
Style 50	3 (80)	Weco 602	6,000 (414)	7.94 (202)	16.38 (416)	14.50 (368)	3263609	103 (46.3)	CF
Style 10 MxF	3 (80)	Weco 602	6,000 (414)	14.50 (368)	16.38 (416)	14.50 (368)	3263612	128 (58.1)	CF

## Sour Gas Longsweep® Series Swivel Joint Reference Chart Fluoroelastomer packing

Model	Sizes in. (mm)	End Connection	CWP psi (bar)	Dimensions, in. (mm)			Part No.	Weight lbs (kg)	Price
				A	B	C			
Style 50	2 (50)	Weco 1502	10,000 (690)	5.50 (140)	10.69 (271)	10.88 (276)	3143916	52 (23.4)	CF
Style 10 MxF	2 (50)	Weco 1502	10,000 (690)	10.88 (276)	10.69 (271)	10.88 (276)	3143917	66 (29.7)	CF
Style 10 MxM	2 (50)	Weco 1502	10,000 (690)	14.50 (276)	10.69 (271)	10.88 (276)	3144341	76 (34.5)	CF
Style 50	3 (80)	Weco 1502	10,000 (690)	7.94 (202)	16.38 (416)	14.50 (368)	3144942	106 (48.1)	CF
Style 10 MxF	3 (80)	Weco 1502	10,000 (690)	14.50 (368)	16.38 (416)	14.50 (368)	3144945	131 (59.4)	CF
Style 10 MxM	3 (80)	Weco 1502	10,000 (690)	14.50 (368)	16.38 (416)	14.50 (368)	3144944	142 (64.4)	CF
Style 50	4 (100)	Weco 1502	10,000 (690)	9.69 (246)	21.19 (538)	20.38 (518)	3267436	248 (112.5)	CF

## Sour Gas Longsweep® Series Swivel Joint Reference Chart Fluoroelastomer packing

Model	Sizes in. (mm)	End Connection	CWP psi (bar)	Dimensions, in. (mm)			Part No.	Weight lbs (kg)	Price
				A	B	C			
Style 50	2 (50)	Weco 2202	15,000 (1034)	5.50 (140)	10.69 (271)	10.88 (276)	3144650	63 (28.6)	CF
Style 10 MxF	2 (50)	Weco 2202	15,000 (1034)	10.88 (276)	10.69 (271)	10.88 (276)	3144651	77 (35)	CF
Style 10 MxM	2 (50)	Weco 2202	15,000 (1034)	14.50 (276)	10.69 (271)	10.88 (276)	3144654	86 (39)	CF
Style 50	3 (80)	Weco 2202	15,000 (1034)	7.94 (202)	16.38 (416)	14.50 (368)	3145814	308 (139.7)	CF
Style 10 MxF	3 (80)	Weco 2202	15,000 (1034)	14.50 (368)	16.38 (416)	14.50 (368)	6100783	381 (172.8)	CF

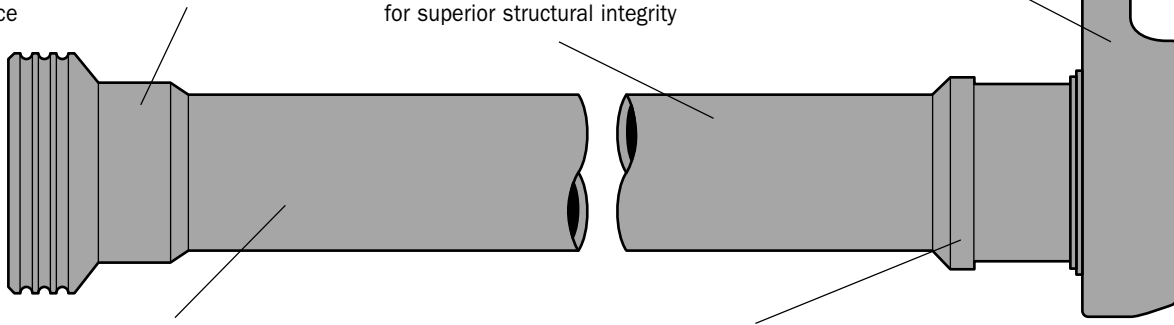
# Weco® Pup Joints

FMC's lightweight, one-piece pup joints feature integral Weco wing union end connections. Available in lengths to 10 feet, Weco alloy-steel pup joints efficiently handle sour gas fluids at cold working pressures up to 15,000 psi.

Fully traceable; available with Charpy impact values for cold temperature service

One-piece construction eliminates all welds and threads; allows uniform heat treating for superior structural integrity

Weco wing union nut detaches for field repair



Uninterrupted bore for greater flow capacity and improved flow characteristics

The patented specially machined shoulder prevents nut from sliding down pup when held vertical

## Sour Gas Pup Joint Reference Chart Fluoroelastomer Seals

Size, in. (mm)	End Connection	CWP psi (bar)	Part No.	Weight lbs (kg)	Price
2 x 48 (50 x 1219.2)	Weco 1502	10,000 (690)	3268784	46 (20.9)	CF
2 x 60 (50 x 1524)	Weco 1502	10,000 (690)	3268785	52 (23.4)	CF
2 x 72 (50 x 1828.8)	Weco 1502	10,000 (690)	3268786	58 (26.4)	CF
2 x 96 (50 x 2438.4)	Weco 1502	10,000 (690)	3268788	73 (33.2)	CF
2 x 120 (50 x 3048)	Weco 1502	10,000 (690)	3268790	87 (39.5)	CF
3 x 72 (80 x 1828.8)	Weco 1502	10,000 (690)	6101791	167 (75.8)	CF
3 x 120 (80 x 3048)	Weco 1502	10,000 (690)	6102151	267 (121.1)	CF

## Sour Gas Pup Joint Reference Chart Fluoroelastomer Seals

Size, in. (mm)	End Connection	CWP psi (bar)	Part No.	Weight lbs (kg)	Price
2 x 60 (50 x 1524)	Weco 2202	15,000 (1034)	P504891	66 (29.9)	CF
2 x 120 (50 x 3048)	Weco 2202	15,000 (1034)	P504892	119 (54)	CF

NOTE: Other sizes and union end configurations are available. Consult factory for prices.

# Chiksan® Cementing & Circulating Hoses

Chiksan Cementing and Circulating Hoses can handle sour gas fluids at cold working pressures up to 15,000 psi. These rugged, all-steel hoses are available in sizes and configurations to meet all your sour gas needs. All materials meet NACE MR-01-75, ASTM or AISI standards.

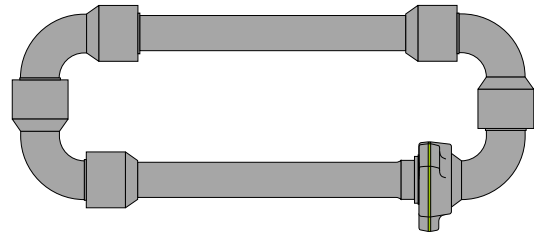
## Features & Benefits

### Chiksan swivel joints

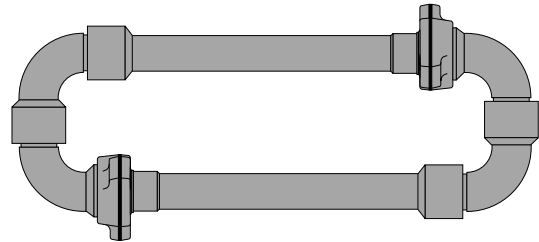
FMC all steel hoses feature Chiksan sour gas swivel joints which provide flexibility, absorb shock and vibration, and maximize flow characteristics.

### Weco wing union connections

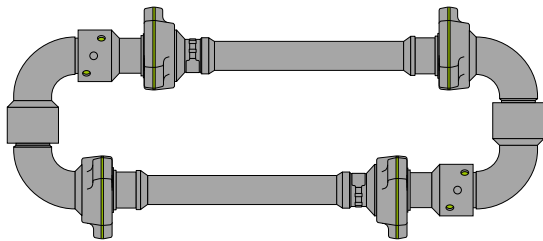
Weco sour gas wing union end connections insure fast, pressure-tight make-up and break-out without threading, welding, or special connections.



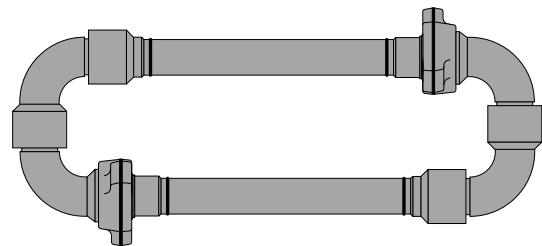
LSG-10 Longsweep (1 Style 50 and 1 Style 10) Integral



LSG-10 Longsweep (2 Style 50) Integral



LSG-10 Longsweep (2 Style 50 or Style 10) Integral



LSG-15 Longsweep (2 Style 50) Welded

## Sour Gas Longsweep® Series Cementing & Circulating Hoses Reference Chart

10,000 psi (690 bar) CWP; 15,000 psi (1034 bar) Test

Size	Swivel Joint Style	End Connection	Quantity of Wing Unions	Part No.	Weight lbs (kg)	Price
2" x 10' (50mm x 3.05m)	50 & 10	Weco 1502	1	6102809	147 (66.7)	CF
2" x 12' (50mm x 3.66m)	50 & 10	Weco 1502	1	3263264	170 (77.1)	CF
2" x 12' (50mm x 3.66m)	(2) 50	Weco 1502	2	3263332	179 (81.2)	CF
2" x 12' (50mm x 3.66m)	(2) 50	Weco 1502	4	P503247	207 (94)	CF
3" x 12' (80mm x 3.66m)	(2) 50	Weco 1502	4	3263610	454 (206)	CF

## Sour Gas Longsweep® Series Cementing & Circulating Hoses Reference Chart

15,000 psi (1034 bar) CWP; 22,500 psi (1551 bar) Test

Size	Swivel Joint Style	End Connection	Quantity of Wing Unions	Part No.	Weight lbs (kg)	Price
2" x 12' (50mm x 3.66m)	(2) 50	Weco 2202	2	6101403	228 (103.4)	CF

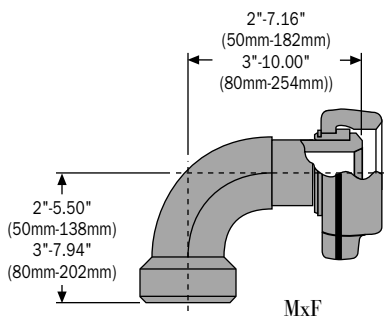
NOTE: Other sizes and configurations are available. Consult factory for prices.

# Weco® Adapters & Integral Fittings

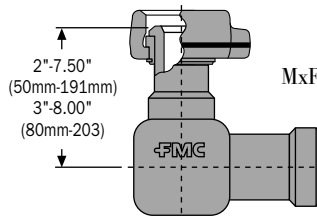
Weco adapters and integral fittings are ideal for handling sour gas fluids at cold working pressures up to 15,000 psi. These proven products feature high-quality forged construction with integral Weco wing union end connections for a high-strength, high-integrity connection every time. Tees, elbows, crosses, wyes, and laterals can be combined to suit virtually any installation.



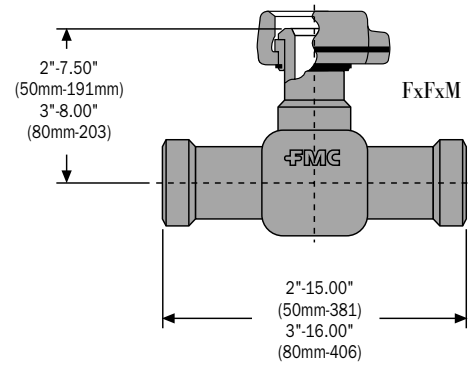
**Female x Female Adapter**



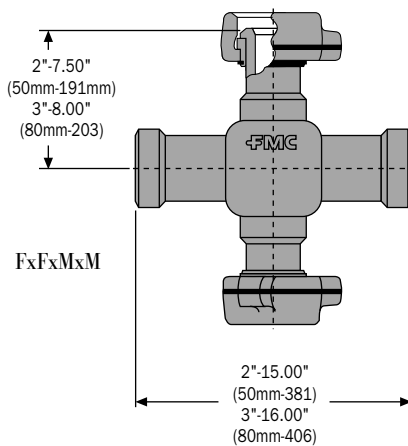
**Male x Female Adapter**



**Male x Male Adapter**

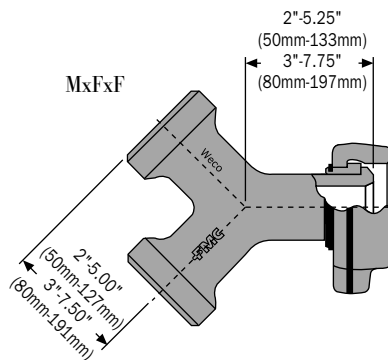


**Longsweep Elbow**



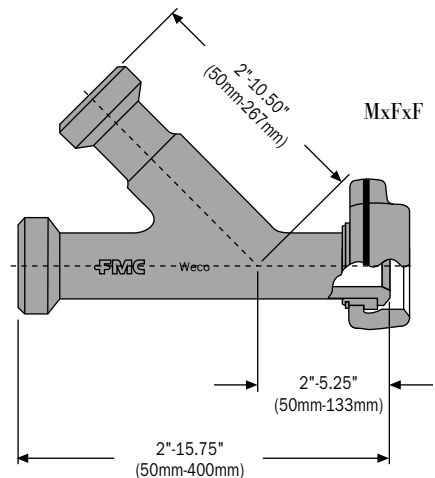
**Cross**

**Block Elbow**



**Wye**

**Tee**



**45° Lateral**



# Weco® Adapters & Integral Fittings

## Sour Gas Weco Adapter Assemblies Reference Chart

Size, in. (mm)	Configuration	End Connection	CWP psi (bar)	Part No.	Weight lbs (kg)	Price
2" (50mm)	MxM	Weco 1502	10,000 (690)	3259883	17 (7.7)	CF
2" (50mm)	MxF	Weco 1502	10,000 (690)	3265207	22 (10)	CF
2" (50mm)	FxF	Weco 1502	10,000 (690)	3259885	11 (409)	CF
2" x 3" (50mm x 80mm)	MxM	Weco 1502	10,000 (690)	3263208	38 (17)	CF
2" x 3" (50mm x 80mm)	MxF	Weco 1502	10,000 (690)	3257182	23 (10.4)	CF
2" x 3" (50mm x 80mm)	FxM	Weco 1502	10,000 (690)	3258468	31 (14)	CF
2" x 3" (50mm x 80mm)	FxF	Weco 1502	10,000 (690)	P501843	19 (8.6)	CF
3" (80mm)	MxM	Weco 1502	10,000 (690)	3259027	41 (18.6)	CF
3" (50mm)	FxF	Weco 1502	10,000 (690)	3259171	14 (6.4)	CF

NOTE: Other sizes and configurations available. Consult factory for prices.

## Sour Gas Weco Integral Fittings Reference Chart

Fluoroelastomer or Hydrogenated Nitrile Seals Available (Specify at time of order)

Fitting Type	Size in. (mm)	Configuration	End Connection	CWP psi (bar)	Part No.	Weight lbs (kg)	Price
Longsweep Elbow	2 (50)	MxF	Weco 1502	10,000 (690)	3260438	27 (12.3)	CF
Longsweep Elbow	3 (80)	MxF	Weco 1502	10,000 (690)	3262406	50 (23)	CF
Lateral	2 (50)	FxMxF	Weco 1502	10,000 (690)	P500724	54 (24.4)	CF
Lateral	2 (50)	MxFxF	Weco 1502	10,000 (690)	3261421	54 (24.4)	CF
Wye	2 (50)	MxFxF	Weco 1502	10,000 (690)	3248668	27 (12.3)	CF
Wye	2 (50)	MxFxF	Weco 2202	15,000 (1034)	3261015	28 (12.6)	CF
Cross	2 (50)	FxFxFxM	Weco 1502	10,000 (690)	3260888	65 (29.4)	CF
Cross	2 (50)	FxFxMxM	Weco 1502	10,000 (690)	3259191	67 (30.2)	CF
Cross	2 (50)	MxFxFxF	Weco 2202	15,000 (1034)	P501752	75 (34)	CF
Cross	2 (50)	MxFxMxM	Weco 2202	15,000 (1034)	P501753	81 (36.7)	CF
Cross	3 (80)	FxFxMxF	Weco 1502	10,000 (690)	3265042	188 (85.3)	CF
Tee	2 (50)	FxFxF	Weco 1502	10,000 (690)	3260359	50 (23)	CF
Tee	2 (50)	FxFxM	Weco 1502	10,000 (690)	3259575	57 (25.7)	CF
Tee	2 (50)	FxMxF	Weco 1502	10,000 (690)	3259188	57 (25.7)	CF
Tee	2 (50)	FxMxM	Weco 1502	10,000 (690)	3263209	64 (29)	CF
Tee	2 (50)	MxMxF	Weco 1502	10,000 (690)	3265075	64 (29)	CF
Tee	2 (50)	MxMxM	Weco 1502	10,000 (690)	3263266	73 (33.2)	CF
Tee	2 (50)	FxMxF	Weco 2202	15,000 (1034)	3259218	57 (25.7)	CF
Tee	2 (50)	FxMxM	Weco 2202	15,000 (1034)	3259225	71 (32.2)	CF
Tee	3 (80)	FxFxM	Weco 1502	10,000 (690)	3265044	168 (76.2)	CF
Tee	3 (80)	FxMxF	Weco 1502	10,000 (690)	P505146	112 (50.8)	CF
Tee	3 (80)	MxFxM	Weco 1502	10,000 (690)	P500322	137 (62.1)	CF
Tee	3 (80)	MxMxF	Weco 1502	10,000 (690)	3263553	137 (62.1)	CF
Elbow	2 (50)	FxF	Weco 1502	10,000 (690)	3269540	41 (18.6)	CF
Elbow	2 (50)	MxF	Weco 1502	10,000 (690)	3260360	51 (23.1)	CF
Elbow	2 (50)	FxM	Weco 2202	15,000 (1034)	3264680	53 (23.8)	CF
Elbow	3 (80)	MxF	Weco 1502	10,000 (690)	3262076	148 (67.1)	CF

NOTE: Other sizes and configurations available. Consult factory for prices.

# Weco® Pressure Relief Valves

Weco Pressure Relief Valves for sour gas service are the automatic way to relieve pressure at preset system limits. These rugged, compact valves are available for cold working pressures up to 10,000 psi. The pressure relief valve comes in a 2-inch size with integral Weco wing union ends.

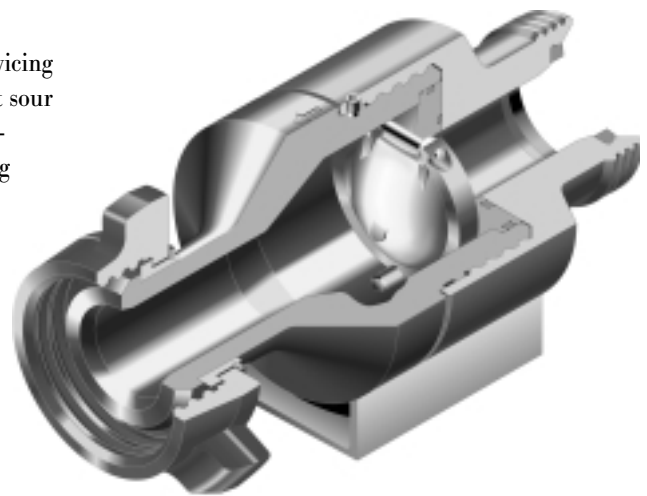


**Sour Gas Weco Pressure Relief Valve Reference Chart**  
Fluoroelastomer Seals

Size	Configuration	End Connection	CWP psi (bar)	Part No.	Weight lbs (kg)	Price
2-inch (50mm)	MxF	Weco 1502	10,000 (690)	P500374	60 (27.2)	CF

# Weco® Swing Check Valves

FMC's patented flowline check valves are used to isolate well servicing equipment from high pressure fluids. These rugged valves seal against sour gas fluids up to 10,000 psi. They are available with or without a downstream vent (consult factory), and are available with integral Weco wing union ends. Consult factory for dimensions.



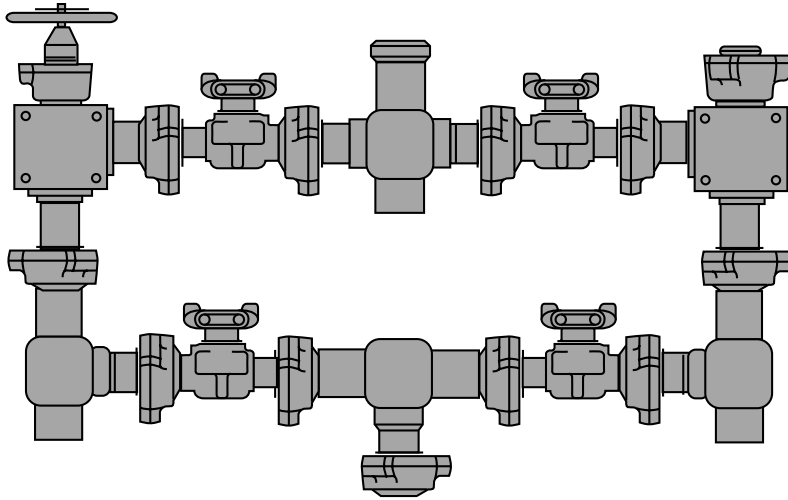
**Sour Gas Weco Swing Check Valves Reference Chart**  
Fluoroelastomer Seals

Size	Configuration	End Connection	CWP psi (bar)	Part No.	Weight lbs (kg)	Price
2-inch (50mm)	MxF	Weco 1502	10,000 (690)	3269175	84 (38.1)	CF
2-inch (50mm) reverse flow	FxM	Weco 1502	10,000 (690)	3269176	84 (38.1)	CF
3-inch (80mm)	MxF	Weco 1502	10,000 (690)	P502934	122 (55.3)	CF

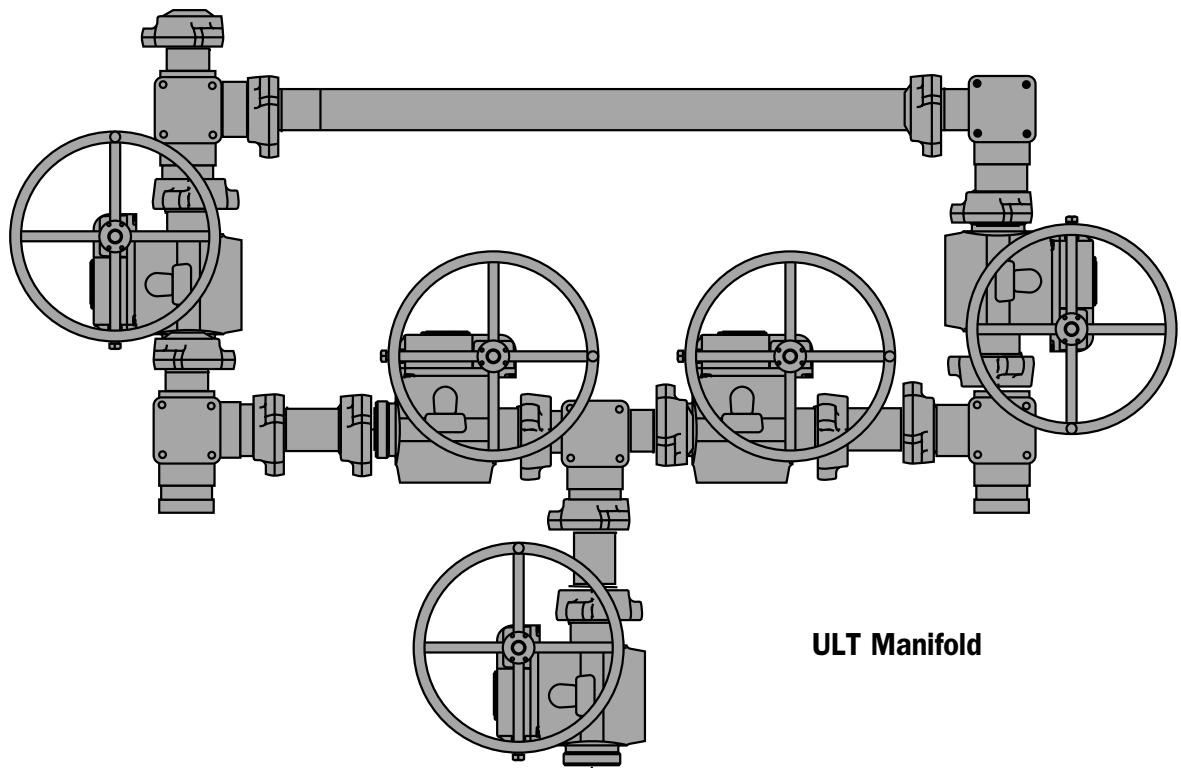
# FMC Manifolds

FMC offers manifolds in materials, sizes, pressures, and temperature ratings for a complete range of sour gas oilfield applications. These rugged manifolds feature proven Chiksan and Weco fluid control sour gas components for unsurpassed reliability, fast make-up and break-out, and improved safety.

Unlimited manifold designs using FMC's advanced ULT and DR Plug Valves are available. Manifold assemblies are available with various configurations and pressure ratings. Consult factory for prices.



**DR Manifold**



**ULT Manifold**

# Warnings & Safety Instructions

**FMC** can not anticipate all of the situations a user may encounter while installing and using FMC products. Therefore, the user of FMC products **MUST** know and follow all applicable industry specifications on the safe installation and use of these products. Refer to FMC product catalogs, product brochures and installation, operating and maintenance manuals for additional product safety information or contact FMC at 800/772-8582.

## Warnings

### **FAILURE TO FOLLOW THESE WARNINGS COULD RESULT IN SERIOUS INJURY OR DEATH!**

1. Do not mix or assemble components, parts or end connections with different pressure ratings. Mismatched parts may fail under pressure.
2. Do not use or substitute non FMC components or parts in FMC products and assemblies.
3. Do not strike, tighten or loosen pressurized components or connections.
4. Do not exceed the rated working pressure of the product.
5. Complete and proper make-up of components and connections is required to attain rated working pressure.
6. Do not use severely worn, eroded or corroded products. Contact FMC for more information on how to identify the limits of erosion and corrosion.
7. Follow safe practices when using products in overhead applications. Products not properly secured could fall.
8. Select only appropriate product and

materials for the intended service:

- Do not expose standard service products to sour gas fluids. (Refer to NACE MR-0175.) Do not interchange sour gas components with standard service components.
  - Use appropriate safety precautions when working with ferrous products in below freezing temperatures. Freezing temperatures lower the impact strength of ferrous materials.
9. Follow manufacturers instructions and Material Safety Data Sheet directions when using solvents.
  10. Make certain that personnel and facilities are protected from residual hazardous fluids before disassembly of any product.
  11. If any leakage is detected from FMC products, take them from service immediately to prevent potential damage and personal injury.

### **SAFETY INSTRUCTIONS**

The applications of FMC products are in working environments where general personnel safety procedures and policies **MUST** be followed. Always use appropriate protective equipment in high pressure, extreme temperature or severe service applications.

## How to Order

**FMC** Fluid Control is committed to being your most valued supplier. We are dedicated to answering your inquiries and processing your orders in the shortest length of time. Your help in this process by supplying as much relevant information as possible will greatly improve our ability to meet or exceed your expectations. When ordering standard items for known applications, all that is required is the part numbers provided in this price list together with a brief description. When ordering or inquiring about non-standard items or about items to be used in new applications, some information regarding the product and application will be required, such as:

1. size, pressure rating, product model and style
2. type of fluid(s) to be handled
3. the operating temperature
4. type of end connections to be mated with
5. special material requirements
6. special documentation requirements
7. other application mechanical loads or movement

When ordering replacement parts for non-standard items, please provide us with the following information:

1. size, pressure rating, product model (part number if available) and style
2. type of fluid(s) that are handled
3. the operating temperature
4. any relevant service or performance history

# Terms & Conditions

1. Payments are to be made in U.S. funds unless otherwise specified; Payment terms: Net 30 days. Prices invoiced will be those in effect at time of shipment. All prices apply F.O.B. point of manufacture. Seller reserves the right to place a service charge on past due accounts at the highest rate permitted by law.

2. A. Seller warrants products of its manufacture for a period of one (1) year from date of shipment, to the extent that Seller will at its option repair or replace, F.O.B. point of manufacture, any such products if by reason of faulty material or workmanship they prove defective under normal use and service; provided, however, that Seller does not in any manner whatsoever warrant seals or packing materials in equipment handling special or corrosive fluids or operating at unusual temperatures or pressures. Except to the extent of the descriptions contained hereon, or as specified on Seller's Order Acknowledgement. Seller makes NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NOR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.

B. If in Seller's opinion repair or replacement will not remedy a claimed product deficiency, or if a product of Seller's manufacture does not comply with the description or specification set forth on Seller's Order Acknowledgment, Seller's liability shall be limited to repayment of any amounts paid on the purchase price, cancellation of the order and acceptance of the product F.O.B. point of manufacture, however, if the product has been in use for a period in excess of 30 days, Seller reserves the right to make a reasonable depreciation charge for such use.

C. Products not of Seller's manufacture and special plating, coatings, or heat treatment applied to Seller's products are guaranteed only to the extent of guarantees provided by suppliers of such products, platings, coatings, or treatments.

D. Seller does not recommend and will not assume any responsibility for rebuilding, repairing special plating, coating, welding, or heat treating done outside Seller's plant by or at the request of the Buyer.

E. Seller expressly disclaims consequential damages arising in connection with the installation, use, operation, repair, replacement or service of any products furnished, or from any breach of the foregoing warranty.

3. THE SELLER SHALL NOT IN ANY EVENT BE LIABLE FOR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT, INCLUDING WITHOUT LIMITATION BREACH OF ANY OBLIGATION IMPOSED ON THE SELLER UNDER OR IN CONNECTION WITH THIS AGREEMENT. CONSEQUENTIAL DAMAGES FOR PURPOSES OF THIS AGREEMENT SHALL INCLUDE WITHOUT LIMITATION LOSS OF USE, INCOME OR PROFIT, OR LOSSES SUSTAINED AS THE RESULT OF INJURY (INCLUDING DEATH) TO ANY PERSON, OR LOSS OF OR DAMAGE TO PROPERTY (INCLUDING WITHOUT LIMITATION PROPERTY HANDLED OR PROCESSED BY THE USE OF THE PRODUCT).

4. Seller shall not be liable to Buyer for any loss or damage suffered by the Buyer, directly or indirectly, as a result of Seller's failure to perform, or delay in

performing, any obligation hereunder, where such failure or delay is caused by fires, floods, labor troubles (including, without limitation, strikes, slowdowns and lockouts), war, civil disturbances, Government regulations, interruptions of or delay in transportation, material shortages, power failures, accidents, acts of God, or other causes of like or different character beyond Seller's control.

5. All published dimensions, weight, temperature and pressure ratings are approximate. If critical, consult factory.

6. The risk of loss or destruction of, or damages to, the product shall be on the Buyer from and after delivery of the product to the Buyer or carrier, whichever first occurs.

7. Buyer shall pay the amount of any Federal, State, County, or Municipal sales, use, compensating, intangibles, gross income or like tax applicable to this transaction which is now in effect or may hereafter become effective, but not including taxes payable upon Seller's net income.

8. No material will be accepted for credit when returned without written permission from Seller's home office. All material accepted for credit is subject to Seller's normal restocking charge. No material will be accepted for credit after one year from date of shipment.

9. Products incorporating variations from catalog items are considered special and are not subject to cancellation without charge. Specials may be shipped 10% over or under quantities ordered and may not be returned for credit.

10. The purchase of the product does not entitle the Buyer to employ the same with any patented process owned by the Seller or others, except where the Buyer is expressly authorized to use such process.

11. A. Except in the case of articles, materials and designs furnished or specified by the Buyer, the Seller, at his own expense shall defend any suit brought against the Buyer on the ground that the use of the product for the intended purpose or purposes, as furnished by the Seller, infringes any United States patent in effect on the purchase date, and shall pay the amount of any judgement that may be awarded against the Buyer in any such suit, provided and upon condition that the Buyer shall have made all payment due under this Agreement and shall (a) promptly deliver to the Seller all infringement notices and other papers received by or served upon the Buyer, (b) permit the Seller to take complete charge of the defense of such suit and compromise the same, if deemed advisable by the Seller, and (c) assist in every reasonable way in the conduct of such defense.

B. In the event that the Buyer shall be enjoined by a court of competent jurisdiction, from which no appeal can be taken, from selling or using the product for the intended purpose or purposes on the ground that such sale or use of the product infringes any such United States patent, or if it is established to the Seller's satisfaction, upon due investigation, that sale or use of the product infringes any such United States patent, the Seller, at its option, may either (a) procure for the

Buyer a license to sell and/or use the product; (b) modify the product so as to make it noninfringing without seriously impairing its performance; (c) replace the product with a product that is substantially equal but noninfringing; or (d) accept the return of the product from the Buyer, in which event the Seller shall refund to the Buyer the purchase price less depreciation at the rate of 15 percent per year (measured from the date Seller shipped the product). The foregoing sets forth the Seller's entire liability to the Buyer for patent infringement based on the possession, use or sale of the product by the Buyer; it being understood and agreed that the aforesaid obligations of the Seller do not extend to, and are not applicable in the case of, any patent infringement claims directed to a method or a process.

C. The Buyer agrees to defend and indemnify the Seller against any claims or liabilities for, or by reason of, any alleged patent infringement arising from the manufacture or sale of all or any part of the product which is manufactured in accordance with the specifications furnished by the Buyer.

12. Title to the products supplied hereunder this order, and to any and all additions and accessories thereto and substitutions therefore, shall remain with Seller as a security interest until Buyer has completed payment of the purchase price, plus accrued interest, if any.

13. It is understood that Seller has relied upon data furnished by and on behalf of Buyer with respect to the safety aspects of the products supplied hereunder and/or representations by or on behalf of Buyer that such products will not be applied or used by Buyer or its customers in such a way as to detract materially from their safety in use, including, without limitation, in the manufacture of a product of which such products will be a part, and that it is Buyer's responsibility to assure that such products, when installed and put in use, will be in compliance with safety requirements fixed by applicable law and will be otherwise legally adequate to safeguard against injuries to persons or property. BUYER HEREBY AGREES TO INDEMNIFY, HOLD HARMLESS AND DEFEND SELLER, AND ITS DIRECTORS, OFFICERS, EMPLOYEES AND AGENTS AGAINST ANY AND ALL LOSSES, COST, DAMAGES, CLAIMS, LIABILITIES OR EXPENSES, INCLUDING, BUT NOT LIMITED TO, REASONABLE ATTORNEY'S FEES, ARISING OUT OF ANY INJURY TO ANY PERSON OR DAMAGE TO ANY PROPERTY CAUSED BY THE INADEQUACY IN THE PRODUCTS SUPPLIED HEREUNDER OF THE SAFETY FEATURES, DEVICES OR CHARACTERISTICS SPECIFIED HEREIN, OR IN THE INSTALLATION, USE OR OPERATION OF SUCH PRODUCTS, EXCEPT CLAIMS SOLELY FOR REPAIR OR REPLACEMENT OF DEFECTIVE PARTS COVERED BY THE WARRANTY SET FORTH IN PARAGRAPH 3 HEREOF.

14. No effect shall be given to any provision in any acceptance or purchase form of the Buyer which is in conflict with or in addition to the terms hereof.

15. Should any part or provision of this quotation be held unenforceable or in conflict with the law of any jurisdiction, the validity of the remaining parts or provisions shall not be affected by such holding.

# **FMC** EnergySystems

## **FMC Corporation**

### **Fluid Control Division**

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