FMC Technologies

Flowline Products and Services

World Proven Chiksan® and Weco® Equipment

Flowline Products and Services

FMC Technologies is the world's leading supplier of flowline products and services to the oilfield industry and is the standard against which all others are measured. From the original Chiksan® and Weco® products to the revolutionary equipment designs and integrated services of today, FMC's fluid control family of products and services enables customers to achieve maximum life and value from their flowline systems throughout a complete range of applications.

The success of FMC's fluid control technology stems from a strong tradition of anticipating and responding to customer needs in every way possible. By focusing on the delivery of top products and services, FMC Technologies is helping its customers face tomorrow's technical and economic challenges today.

Flowline Products and Services

Health, Safety & Environment

As a leading oilfield equipment and services provider, FMC Technologies stresses overall health, safety, and environment (HSE) in all of its operations and processes. With a proven record of outstanding HSE performance, FMC is a strong advocate of HSE training that goes beyond the basic legal requirements. The goal is to ensure that all field and office personnel are competent to carry out HSE critical duties, having received the appropriate training required by law, company policy, and clients. HSE policy covers all key elements of the business, including company safety policy statements, product safety, risk assessment, monitoring, auditing, and review.

Manufacturing Leader

FMC's fluid control manufacturing facility is located in Stephenville, Texas. The plant was constructed in 1980 and expanded in 1984, 1987, and 1996. The facility

occupies a 44-acre site and comprises 220,000 square feet of manufacturing capacity and 48,000 square feet of customer service, production support, and engineering offices. It utilizes the latest in computer numerical controlled (CNC) machining centers, production planning systems, computer aided design/computer aided manufacturing (CAD/CAM) systems, and the latest technology in order and distribution operating systems. The Stephenville facility produces a wide range of flowline equipment for distribution worldwide.

Experienced, Knowledgeable, Productive People

FMC's global fluid control team is structured around top flowline professionals – individuals who understand your business and are dedicated to meeting your needs. The management, engineering, and sales support staff are among the most experienced in the oil and gas industry. Their knowledge and industry expertise show up in the quality of products and services delivered to you.

CHIKSAN

WECO

Flowline Products and Services

Unsurpassed Quality

FMC's fluid control quality system has been surveyed and approved by DNV and meets ISO 9001 and European Pressure Equipment Directive 97/23/CE. Most products are supplied with the CE marking. Chiksan and Weco products also can be supplied with both type and case approval from DNV, Lloyds, ABS, GGTN, and others. Products for sour gas service meet NACE MR-01-75 and API RP-14-E. Complete material certification and traceability are also available.

Research and Development

To meet the evolving needs of its customers, FMC continually invests in flowline research and development. This industry-leading effort has resulted in a host of new products and refinements to existing products. All new products are subjected to exhaustive laboratory and field tests to ensure their reliability and integrity before they are released to the marketplace. Research and development capabilities include exhaustive laboratory and field testing, destructive and nondestructive testing, three-dimensional finite element analysis, computational fluid dynamics, and the flowline industry's only high-velocity flow loop.

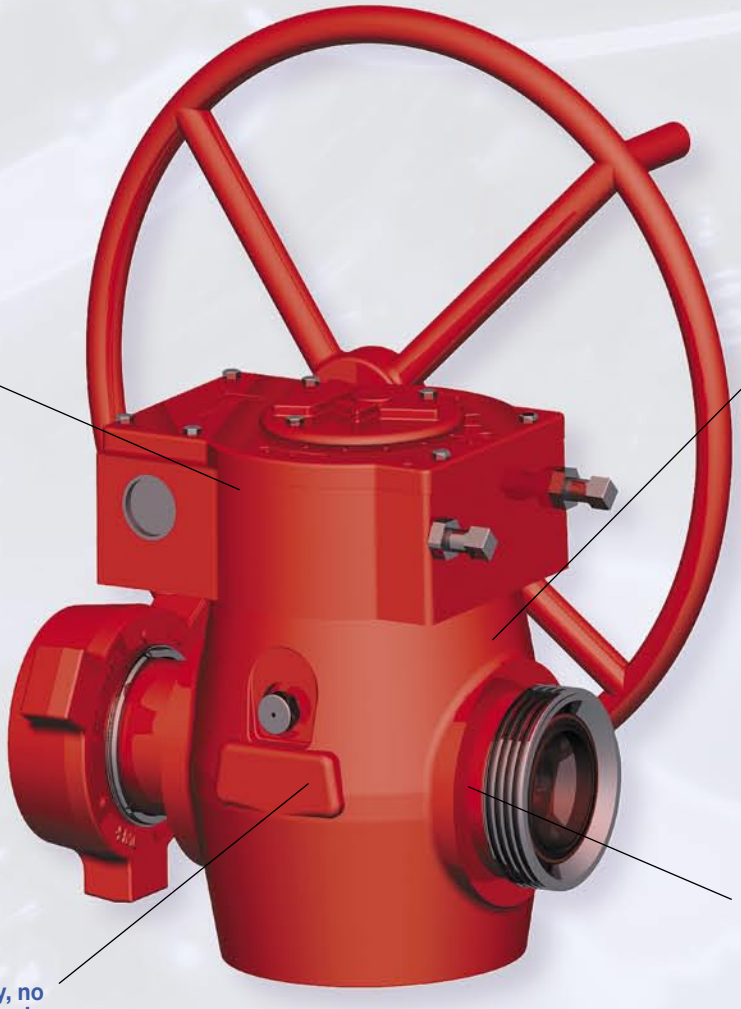
Worldwide Distribution

Chiksan and Weco products are distributed from more than 60 locations worldwide. FMC fluid control facilities stock many flowline products in the specific sizes, pressures, and materials common in the various regions. From a replacement seal for a Chiksan swivel joint to a platform full of well servicing equipment, FMC Technologies delivers.

Integrated Services

To satisfy the total flowline requirements of its customers, FMC Technologies has consolidated its industry-leading after-sales capabilities into a comprehensive Integrated Services program. Integrated Services is helping customers worldwide realize the maximum value from their flowline assets to guarantee that the right products are shipped to the job site in top working condition. This total solutions approach includes the InteServ tracking and management system, mobile inspection and repair, strategically located service centers, and genuine Chiksan and Weco spare parts.

Weco® Plug Valves



Choice of operators, actuators
Gear operators, pneumatic actuators, and hydraulic actuators are available.

Body erosion virtually eliminated
Fluid is forced between the plug/seal interface, limiting wear to replaceable parts.

Ultimate sealability, no adjustments required
Floating plug improves sealability and reduces plug wear.

Low torque operation at all pressures
Cylindrical plug fits between seal and side segments, reducing plug drag on the valve body.

Weco ULT and DR plug valves are premium, quarter-turn valves designed for a wide range of standard and sour gas drilling, production, and well-servicing applications. These rugged valves are offered in single and dual-body designs in pressures to 20,000 psi. They range in size from 1 to 4-inches and come with threaded, Weco wing union, flanged, and clamp hub ends. Consult factory for configurations. Like all pressure containing products, Weco plug valves require special handling (see inside back cover for Warnings and Cautions).

ULT Plug Valves

The benefits of FMC's ULT plug valves are a direct result of its unique design features. Combined, these features have redefined the standards for plug valve operating principles and performance.

Ultimate Sealability

The key to the ULT plug valve's unprecedented seal integrity is its proprietary floating plug and dual-seal design. When the valve is closed, the dual segment seal provides a redundant seal on the downstream side of the valve. In 3-inch and larger sizes, the ULT plug valve also employs a two-piece plug and stem design. When these valves are closed, line fluid pressure in the body is equalized around the plug resulting in ultimate sealing and low operating torque.

Ultimate Valve Body Life

In addition to improved bi-directional seal performance, the ULT plug valve dramatically extends service life. When a traditional plug valve is closed, high-pressure fluids are forced between the upstream body and seal segment interface. This flow path can erode the valve body, potentially ruining the valve. When a ULT plug valve is closed, the only available flow path is between the seal segment and plug interface. This flow path eliminates body erosion and limits any potential wear to replaceable components.

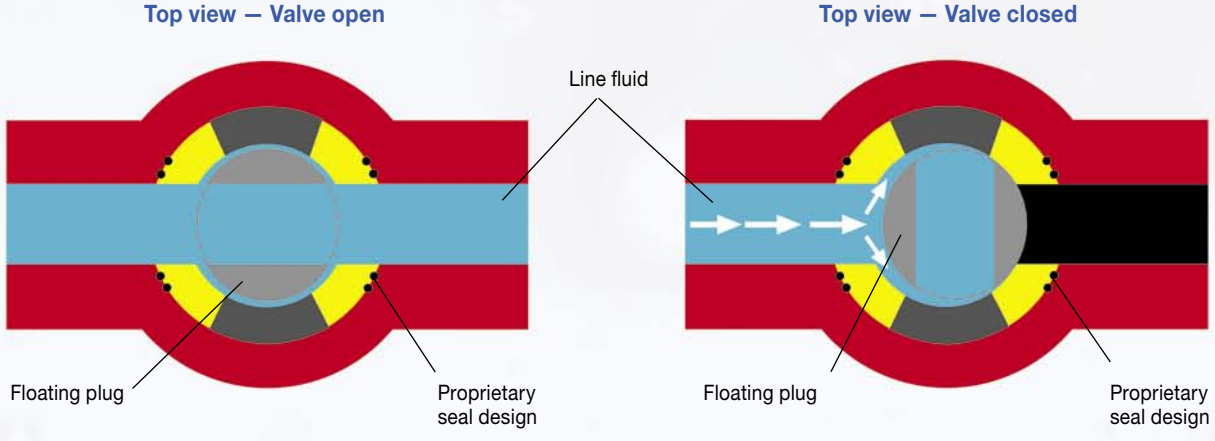
Ultimate Seal Life

In addition to improved valve body life, two other frequent operating problems associated with high-pressure plug valves – both of which cause premature damage to seals and increased valve operating torque – are solved by the ULT plug valve. Traditional plug valve designs can sometimes seal on the upstream side of the valve, resulting in extrusion damage to the upstream segment seal. Traditional plug valves can also trap body pressure after line pressure is removed from the valve, resulting in extrusion damage to both upstream and downstream segment seals. The dual-seal design of the ULT plug valve, by forcing flow between the plug and segment interface, eliminates both of these problems.

Ultimate Life Cycle Cost Savings

Superior sealability, increased life of valve body, and elimination of premature seal damage result in significant savings in life cycle costs of the ULT plug valve over traditional plug valves. Qualification tests have proven that the ULT plug valve extends service life 3 to 5 times over other plug valves while reducing maintenance costs. In smaller sizes, ULT parts kits may be used in existing DR plug valve bodies to extend the life of these valves.

OPERATING PRINCIPAL



Weco® Plug Valves

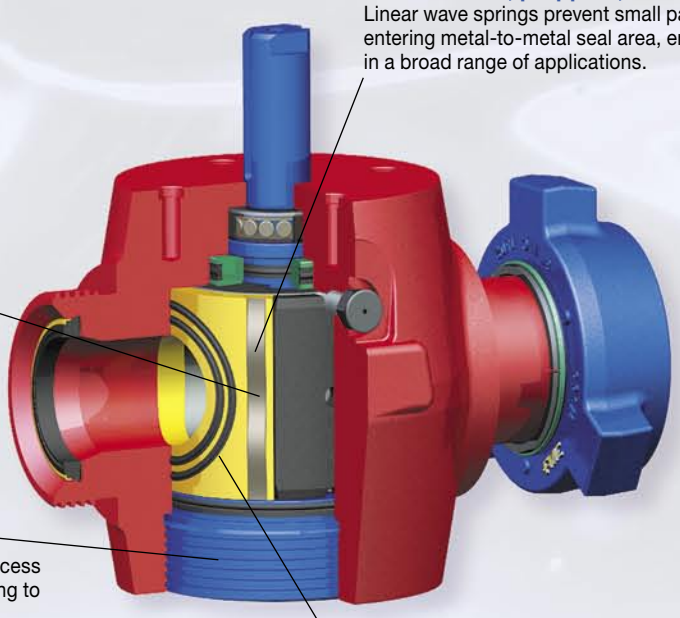
ULT Plug Valves (3-inch and larger)

Up to 20,000 psi cold working pressure

Recommended service
Slick water, sand, proppant/gel, and cement

Handles sand, proppant, and cement
Linear wave springs prevent small particles from entering metal-to-metal seal area, enabling use in a broad range of applications.

Two-piece floating plug/stem
Proprietary floating plug and stem uniformly distribute load against the downstream seat to improve sealability and reduce plug wear.



Fast, simple field repair
Bottom entry design provides access to all valve internals without having to remove the operator or actuator.

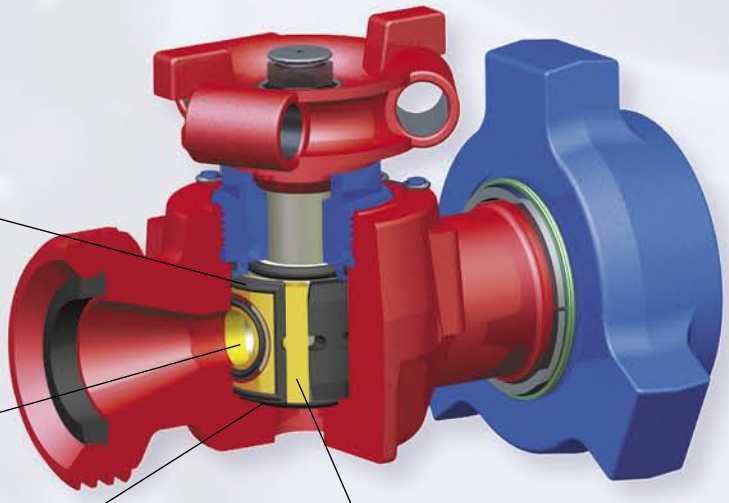
Eliminates body washout, extends body life
Dual seals direct flow between the seal segment and plug to provide long, trouble-free service life.

ULT Plug Valves (below 3-inch)

Up to 20,000 psi cold working pressure

Recommended service
Slick water, sand, proppant/gel, and cement

Eliminates body washout, extends body life
Dual seals direct flow between the seal segment and plug to provide long, trouble-free service life.



Fast assembly
Integral stem and plug provide fast, sure assembly without adjustments.

Interchangeable design
Internal components interchange with Weco DR valve components, potentially extending the life of those valve bodies.

Eliminates corrosion in segment sealing area
Dual segment seals greatly reduce erosive fluid flow between the seal segments and the plug valve body to improve sealing capabilities and extend service life.

See specifications tables (pages PV1A and PV2A) for sizes, dimensions, weights, materials, and part numbers.

Specialty ULT Plug Valves

The ULT plug valve's proven, proprietary design technology enables customers to take advantage of a wide range of configurations for a host of specialty applications. Options include single and dual body designs; drill pipe, Weco union, or flanged end connections; and side outlets. Consult factory for specific applications.

ULT Dual Body Plug Valves

(Drill Pipe Connections)

ULT Dual Body Plug Valves

(Weco Union x Flanged End Connections)

ULT Flanged Plug Valves

(Flanged End Connections)

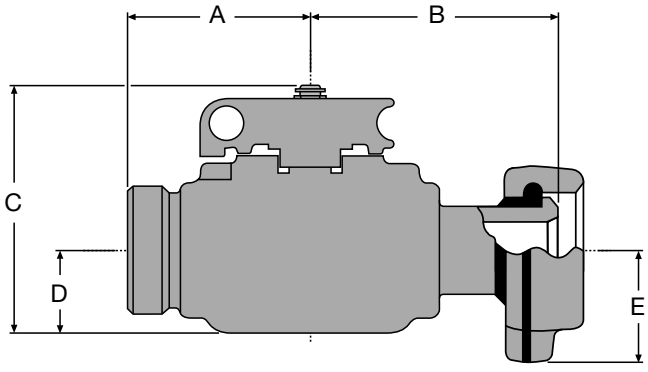
See Specifications Tables (page PV1A) for sizes, dimensions, weights, materials, and part numbers.

Weco® Plug Valve Specifications

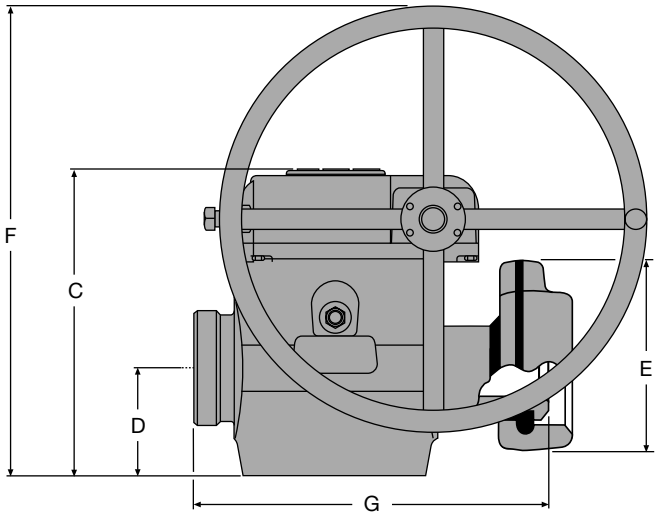
Plug Valves

Model	Nominal Size, in.	Part No.	Weco End Connection*	Service	CWP psi (bar)	Weight lb (kg)
ULT 150	1	P516114	1502	Standard	15,000 (1034)	37 (16.8)
	1	P524578	1002	Sour	10,000 (690)	37 (16.8)
	1x2	P516108	1502	Standard	15,000 (1034)	43 (19.5)
	1x2 (.38 bore)	P516146	1502	Standard	15,000 (1034)	58 (26.3)
	1x2	P516208	1002	Sour	10,000 (690)	37 (16.8)
DR 150	2	3247527	1502	Standard	15,000 (1034)	93 (42.2)
	2	3248705	1002	Sour	10,000 (690)	93 (42.2)
DR 200	2	3223008	2002	Standard	20,000 (1380)	83 (37.6)
	2	3234183	2202	Sour	15,000 (1034)	83 (37.6)
ULT 150 (Manual)	3	3265904	1502	Standard	15,000 (1034)	238 (108)
ULT 100 (Manual)	3	P501010	1002	Sour	10,000 (690)	241 (109)
ULT 150 (Hydraulic)	3	3265123	1502	Standard	15,000 (1034)	337 (153)
ULT 100 (Hydraulic)	3	3267427	1002	Sour	10,000 (690)	340 (154)
ULT 150 (Handwheel)	3	3265122	1502	Standard	15,000 (1034)	288 (131)
ULT 100 (Handwheel)	3	3265257	1002	Sour	10,000 (690)	288 (131)
ULT 200 (Hydraulic)	3	P519087	2002	Standard	20,000 (1380)	754 (342)
ULT 200 (Handwheel)	3	P519453	2002	Standard	20,000 (1380)	634 (288)
ULT 200 (Handwheel)	3	P522233	2202	Sour	15,000 (1034)	640 (290)
ULT 100 (Hydraulic)	4	P518352	1002	Standard	10,000 (690)	738 (335)
ULT 100 (Handwheel)	4	P518356	1002	Standard	10,000 (690)	660 (299)
ULT 150 (Hydraulic)	4	P516015	1502	Standard	15,000 (1034)	774 (351)
ULT 150 (Handwheel)	4	P519749	1502	Standard	15,000 (1034)	660 (299)

Note: 1", 1x2" ULT 150, DR150 and DR200 plug valves can be furnished with hydraulic actuators.
* Other end connections are available. Consult factory.



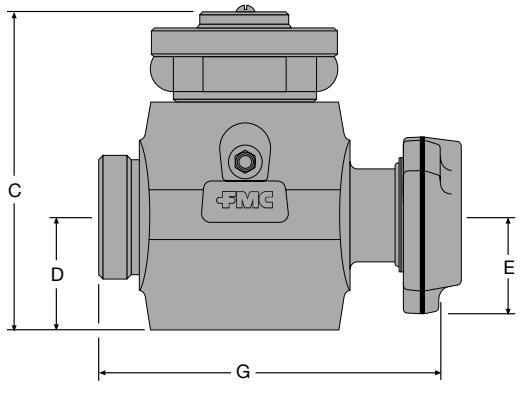
DR 150 with Manual Operator



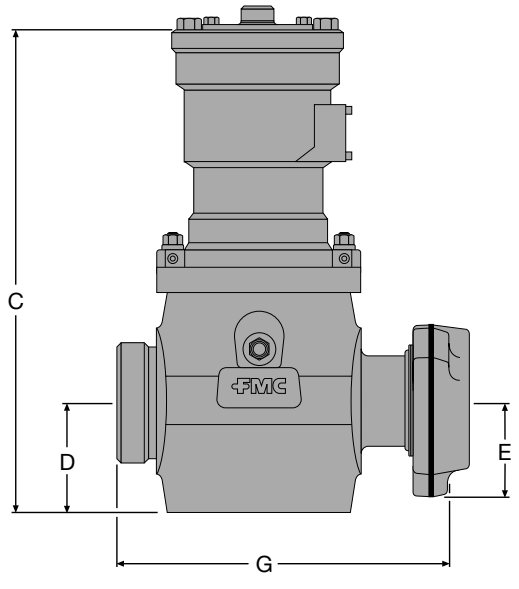
ULT 150 with Handwheel Operator

Weco® Plug Valve Specifications

Model	Nominal Size, in.	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G in. (mm)
ULT 150	1	4.69 (119)	5.88 (149)	6.59 (167)	1.75 (45)	2.88 (73)	—	—
	1	4.69 (119)	5.88 (149)	6.59 (167)	1.75 (45)	2.88 (73)	—	—
	1x2	4.69 (119)	5.88 (149)	6.59 (167)	1.75 (45)	3.93 (100)	—	—
	1x2 (.38 bore)	4.69 (119)	5.88 (149)	6.59 (167)	1.75 (45)	3.93 (100)	—	—
	1x2	4.69 (119)	5.88 (149)	6.59 (167)	1.75 (45)	3.93 (100)	—	—
DR 150	2	6 (152)	7.88 (200)	8.05 (205)	2.62 (67)	3.93 (100)	—	—
	2	6 (152)	7.88 (200)	8.05 (205)	2.62 (67)	3.93 (100)	—	—
DR 200	2	6.06 (154)	9.19 (233)	8.05 (205)	2.62 (67)	3.76 (96)	—	—
	2	6.06 (154)	9.19 (233)	8.05 (205)	2.62 (67)	3.76 (96)	—	—
ULT 150 (Manual)	3	—	—	14.27 (363)	5 (127)	4.55 (116)	—	15.69 (399)
ULT 100 (Manual)	3	—	—	14.27 (363)	5 (127)	4.55 (116)	—	15.69 (399)
ULT 150 (Hydraulic)	3	—	—	21.81 (554)	5 (127)	4.55 (116)	—	15.69 (399)
ULT 100 (Hydraulic)	3	—	—	21.81 (554)	5 (127)	4.55 (116)	—	15.69 (399)
ULT 150 (Handwheel)	3	—	—	14.47 (368)	5 (127)	4.55 (116)	22.12 (562)	15.69 (399)
ULT 100 (Handwheel)	3	—	—	14.47 (368)	5 (127)	4.55 (116)	22.12 (562)	15.69 (399)
ULT 200 (Hydraulic)	3	—	—	29.63 (753)	6.26 (159)	6 (152)	—	22.08 (561)
ULT 200 (Handwheel)	3	—	—	17.62 (448)	6.26 (159)	6 (152)	36.88 (937)	22.08 (561)
ULT 200 (Handwheel)	3	—	—	17.62 (448)	6.26 (159)	6 (152)	36.88 (937)	22.08 (561)
ULT 100 (Hydraulic)	4	—	—	28.49 (724)	7.00 (118)	4.94 (126)	—	22.85 (580)
ULT 100 (Handwheel)	4	—	—	19.1 (485)	7.00 (118)	4.94 (126)	38.36 (974)	22.85 (580)
ULT 150 (Hydraulic)	4	—	—	28.49 (724)	7.00 (118)	6.14 (156)	—	22.85 (580)
ULT 150 (Handwheel)	4	—	—	19.1 (485)	7.00 (118)	6.14 (156)	38.29 (973)	22.85 (580)



ULT 150 with Manual Operator



ULT 150 with Hydraulic Actuator

Typical Weco® and Chiksan® Equipment Recommended Temperature Ranges

(Consult factory for specific values)

Elastomer Selection	Product Line and Materials of Construction					Temperature Ranges
	Wing Unions, Swivel Joints		Wing Unions, Swivel Joints, Plug Valves, Check Valves, Fittings, Pup Joints, Adapters		Butterfly Valves	
	Ductile Iron	Carbon Steel	Alloy Steel Standard Service	Alloy Steel Sour Gas Service		
No Seal (Wing Union)	X					20°F (-7°C) to 300°F (149°C)
No Seal (Wing Union)		X				0°F (-18°C) to 300°F (149°C)
Nitrile	X					20°F (-7°C) to 240°F (116°C)
Nitrile		X				0°F (-18°C) to 240°F (116°C)
Nitrile			X			-20°F (-29°C) to 240°F (116°C)
Winterized Nitrile				X		-50°F (-46°C) to 240°F (116°C)
HNBR	X					20°F (-7°C) to 300°F (149°C)
HNBR		X	X	X		10°F (-12°C) to 300°F (149°C)
Viton®	X	X	X	X		20°F (-7°C) to 300°F (149°C)
Natural Rubber Seat					X	-20°F (-29°C) to 150°F(66°C)
Nitrile Seat					X	-20°F (-29°C) to 200°F (93°C)
EPDM, Hypalon, or PTFE Seat					X	-20°F (-29°C) to 250°F (121°C)
Silicone Rubber Seat					X	-20°F (-29°C) to 300°F (149°C)
Fluoroelestomer Seat					X	-10°F (-23°C) to 300°F (149°C)
Neoprene Seat					X	0°F (-18°C) to 200°F (93°C)

Warnings and Cautions

FMC Technologies cannot 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 and practices on the safe installation and use of these products. For additional safety information, refer to FMC Technologies product catalogs, product brochures, and installation, operating, and maintenance manuals, which can be accessed at www.fmctechnologies/fluidcontrol.com, or contact FMC Technologies at 800-772-8582.

⚠ WARNING

Failure to follow these safety warnings could result in death, serious personal injury, and/or severe property damage.

- Never mix or assemble components, parts, or end connections with different pressure ratings. Mismatched conditions, including but not limited to that of a 2” Figure 1502 male sub end connected to a 2” Figure 602 female sub, may fail under pressure resulting in death, serious personal injury, or severe property damage.
- Never use or substitute non FMC components or parts in FMC products or assemblies.
- Never modify or repair FMC products in a manner not specifically directed in instructions published by FMC Technologies.
- Never strike, tighten, loosen, or attempt repairs on pressurized components or connections.
- Never exceed the rated working pressure of the product.
- Complete and proper make-up of components and connections is required to attain rated working pressure. Always apply essential care, attention, handling, and inspection to threaded components before, during and after make-up.
- Never use severely worn, eroded, or corroded products. Contact FMC Technologies for more information on how to identify the limits of erosion and corrosion.
- Never strike wing union nuts having severely flattened and extruded ears. This condition can result in flying debris leading to serious personal injury and must immediately be addressed by either grinding off extruded material or removing the nut from service.
- Always follow safe practices when using products in overhead applications. Products not properly secured could fall.
  - Never exceed the load rating of lifting devices on products or lifting equipment.
  - Use of FMC products in suspension applications can result in over-stress conditions leading to catastrophic failure.
  - If externally applied loads are anticipated, consult factory.
- Always follow safe practices when manually lifting and carrying products.
- Always select only appropriate product and materials for the intended service:
  - Never expose standard service products to sour gas fluids (Refer to NACE MR-01-75). Do not interchange sour gas with standard service components.
  - Always use appropriate safety precautions when working with ferrous products in below freezing temperatures. Freezing temperatures lower the impact strength of ferrous materials.
- Always follow manufacturer’s instructions and Material Safety Data Sheet directions when using solvents.
- Always make certain that personnel and facilities are protected from residual hazardous fluids before disassembly of any product.
- Whenever leakage is detected from FMC Technologies products, remove them from service immediately to prevent death, serious personal injury, and/or property damage.

SAFETY INSTRUCTIONS: The applications of FMC products are in working environments and systems which must be properly designed and controlled. Safety procedures and policies MUST be clearly established by the user and followed. Always use appropriate protective equipment.

FMC Technologies, Inc.
1803 Gears Road
Houston, Texas 77067
Tel +1-281-260-2121
Fax +1-281-260-2122

FMC Technologies, Inc.
2825 West Washington
Stephenville, Texas 76401
Toll Free 1-800-772-8582 (U.S.)
Tel +1-254-968-2181
Fax +1-254-968-5709

www.fmctechnologies.com/fluidcontrol