SPM® Flow Control Products Catalog

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General Corporate Overview

Corporate Profile

The Weir Group is a well-established global engineering group, focused on delivering engineering solutions to the oil and gas, minerals, and power sectors. Founded in 1871 and headquartered in Scotland, Weir is one of the fastest-growing engineering companies in the FTSE 100, employing more than 13,000 people throughout our global operations.

Weir's Pressure Pumping team is a market leader in well service pumps and high pressure flow control equipment. SPM®'s line of reciprocating plunger pumps is used in various applications including fracturing, cementing, and acidizing. The expanding flow control product line features products used to safely transport fluids at high pressure into the wellbore during various well service applications. Weir also utilizes a global network of strategically located service facilities to provide superior post-sale services to our customers, including pump and fluid end repair, iron inspection and product rental.

Quality, Health, Safety and Environment (QHSE) Systems

Weir's Quality Management System (QMS) is qualified under ISO 9001 and 14001, as well as OHSAS 18001 requirements. Internal audits of SPM®'s manufacturing and service centers are performed semi-annually to verify all policies are being followed and that lean focused continuous improvement drives value for the customer. External audits are performed at a minimum of every three years by a third party certifier.

Commitment to Quality

The Weir Group is committed to managing its activities to safeguard its employees, clients, and the communities within which Weir operates in addition to the environment. Weir global QHSE standards have been disseminated throughout our operations. These standards, based upon a robust risk assessment approach and recognized QHSE management systems, provide a platform for continual improvement.

Commitment to Safety

Global Footprint & Services

Weir prioritizes its ability to provide a rapid response to service needs through its global network of service centers and skilled technicians. Service center teams are located in close proximity to all major shale plays and key production locations around the world to support customers with all repair and maintenance needs.

Commitment to Our Customers

Where You Need Us. When You Need Us.

General Product Operation Notes

SPM® treating iron is available in the following service types:

- Standard Service
  - Low temp or standard temp
  - Alternative seals available for harsh services (chemicals, acids, etc.)
  - Not intended for exposure to H2S.
- H2S (Sour Gas) Service
  - These assemblies are manufactured from tempered alloy (HSLA) steel and are in accordance with NACE MRO175 regarding allowable hardness and alloy concentration. These products are suitable for use with H2S.

WARNING: Exposing standard service components to H2S may result in rapid catastrophic failures, which may lead to **SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.** Due to this risk, it is strongly recommended to only use H2S service components for applications involving any concentration of H2S.

Operating Temperature Range Classification:

Product Classification	Min Temp	Max Temp
Standard Temp	0° C / 32° F	110° C / 230° F
Low Temp	-30° C / -22° F	110° C / 230° F

Note: Temperature ratings are suitable for both standard service and H2S service components.

Maximum Recommended Flow Rate: 42 ft/sec

SPM® flow control products are available in hammer union or patented Safety Iron® end connections. Both end connection types are available in various sizes and pressure ratings. The most common include:

- 2" 1502 hammer union or 15K Safety Iron® end connection
- 3" 1502 hammer union or 15K Safety Iron® end connection
- 4" 1002 hammer union or 10K Safety Iron® end connection
- 4" 1502 hammer union or 15K Safety Iron® end connection

Note: H2S service is de-rated as noted in the chart below.

DE-RATED H2S OPERATING PRESSURE	
End Connection Type	**Max Working Pressure (psi)**
1002 / 10K	7,500
1502 / 15K	10,000
2202	15,000

Each integral union connection is clearly marked with a identification code (e.g. "1502"). This code should be referenced when mating unions. Improper mating can result in failures. All union connections used must match (according to size, pressure rating, etc.). These connections must also match the service of the designated string in which they are installed. (Std, H2S, etc.)

All SPM® threaded components are right hand threaded unless specifically designated otherwise.

Third Party Certifications

CE and DNV certification for most flow control product families is offered. Additional third party certifications, such as ABS or BV, may be available upon request. Contact Weir for specific information.

General Maintenance and Use Notes

General Usage

- Most SPM® products generate, control, or direct pressurized fluids; therefore, it is critical that those who work with these products be thoroughly trained in their proper application and safe handling. It is also critical that these products be used and maintained properly.
- Use of the proper tools is necessary when servicing SPM® treating iron. Service personnel must be knowledgeable and trained in the use and handling of tools for all maintenance. Operating and Maintenance Instruction Manuals should be consulted before operating any product.
- Each treating iron component is clearly marked with a maximum pressure rating. This pressure must not be exceeded.
- A complete visual inspection of flow control products must be made prior to each use. Any leaking seals, broken bolts, leaking hoses, or improperly tightened parts must be replaced prior to use.
- Treating iron connections should be properly cleaned and lightly oiled with white lithium grease before the downstream piping is attached. Any worn, damaged, or missing seals should be replaced.
- Weir recommends that users designate specific treating iron strings by application, and that the designated iron remain in that service application throughout the product's life.
- Every string of iron should be pressure tested to its maximum planned working pressure prior to each use. Do not exceed the max rated pressure for the product.
- Each string, as well as each component, must have regular intervals of maintenance and inspection for safe and proper performance.
- Never tighten or hammer wing unions when flow line is under pressure.
- Welding, brazing, or heating on high pressure components is prohibited.

General Maintenance

- General maintenance will extend the life of flow control products.
  - Grease plug valves and swivel joints before/after every job.
  - Replace worn or damaged seals to help prevent leaks and washouts of seal faces.
  - Clean all seal areas thoroughly.
- Flow lines should be flushed with clean water after each use. Care should be taken to avoid corrosive media from sitting stagnate in treating iron for extended periods of time.
- Each string, as well as each component, must have regular intervals of maintenance and inspection for safe, proper performance. Further information regarding maintenance of product can be found later in this document or in each product family's corresponding operations and maintenance manual.

Inspection - Repair - Testing:

- Any unauthorized alteration of SPM® flow line equipment is prohibited.
- Use only repair methods as outlined by SPM® service literature. Use only the proper SPM® repair tools.
- Only SPM® repair parts should be used for replacement in an SPM® product.
- Weir does not allow weld repair to be attempted on its flow control products. Replacing worn components is a more effective approach.

Recommended Storage

- Flow lines should be flushed with clean water prior to storage for extended periods of time.
- End connections and critical seal and threaded areas should be wiped dry prior to storage.
- It is recommended that a rust inhibitor be applied to critical seal areas and threaded connections prior to storage.
- Thread protectors are recommended to be installed on end connections during general transport and storage.

Product Flow Rates

The following reference chart lists the maximum recommended flow rate by product family. The maximum flow rate is calculated based on internal diameter of the product from the factory and a maximum velocity of 42 feet per second. The published rates are applicable for both standard and H2S service products.

General Maintenance and Use Notes (continued)

Product Family	Size and Pressure	ID (in)	Max Flow Rate (GPM)	Max Flow Rate (BPM)
Pipe (NPS - Hammer Union)	2″ 1502	1.75	315	7.5
	3″ 1502	2.56	672	16
	4″ 1002	3.65	1,369	32.6
Pipe (NPS - Safety Iron®)	2″ 15K	1.75	315	7.5
	3″ 15K	2.56	672	16
Pipe (Integral Pup Joints - Hammer Union)	2″ 1502	1.75	315	7.5
	3″ 1502	2.75	777	18.5
Pipe (Integral Pup Joints - Safety Iron®)	2″ 15K	1.75	315	7.5
	3″ 15K	2.75	777	18.5
	3″ 15K	3.00	924	22
	4″ 15K	4.00	1,646	39.2
Pipe (Integral Crossovers - Hammer Union)	2″ 1502	1.75	315	7.5
	3″ 1502	2.75	777	18.5
	4″ 1002	3.75	1,445	34.4
	4″ 1502	3.75	1,445	34.4
Pipe (Integral Crossovers - Safety Iron®)	2″ 15K	1.75	315	7.5
	2″ 15K	2.00	412	9.8
	3″ 15K	2.50	643	15.3
	3″ 15K	2.75	777	18.5
	4″ 15K	4.00	1,646	39.2

Product Family	Size and Pressure	Max Flow Rate (GPM)	Max Flow Rate (BPM)
Integral Connections (Hammer Union)	2″ 1502	315	7.5
	3″ 1502	643	15.3
	4″ 1002	1,446	34.4
	4″ 1502	1,446	34.4
Integral Connections (Safety Iron®)	2″ 15K	315	7.5
	3″ 15K	643	15.3
	4″ 15K	1,446	34.4
Plug Valve (Hammer Union)	1″ x 2″ 1502	90	2.1
	2″ 1502	174	4.1
	3″ 1502	778	18.5
	4″ 1002	1,446	34.4
	4″ 1502	1,446	34.4
Plug Valve (Safety Iron®)	2″ 15K	315	7.5
	3″ 15K	778	18.5
	4″ 15K	1,446	34.4
Clapper Check Valve (Hammer Union)	2″ 1502	337	8
	3″ 1502	674	16
	4″ 1002	1,446	34.4
	4″ 1502	1,446	34.4

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General Maintenance and Use Notes (continued)

Product Family	Size and Pressure	Max Flow Rate (GPM)	Max Flow Rate (BPM)
Clapper Check Valve (Safety Iron®)	2″ 15K	315	7.5
	3″ 15K	778	18.5
	4″ 15K	1,446	34.4
Dart Check Valve (Hammer Union)	2″ 1502	315	7.5
	3″ 1502	643	15.3
Swivel (Hammer Union)	2″ 1502	315	7.5
	3″ 1502	778	18.5
	4″ 1002	1,446	34.4
	4″ 1502	1,260	30
Swivel (Safety Iron®)	2″ 15K	363	8.6
	3″ 15K	778	18.5
	4″ 15K	1,260	30

Note: Other parts or configurations may be available. Contact Weir for specific details. Product availability and specifications are subject to change at any time, with or without notice.

General Safety Guide

Personal Responsibilities:

- When using SPM® flow control products appropriate Personal Protective Equipment (PPE) is required, including, at a minimum, safety glasses, approved safety shoes, and hard hat. Hammering and lifting must be done with caution.
- Personnel should only hammer on union lugs and not strike the union nut or valve body. Fractures can occur from repeated misuse. Excessive hammering can damage components.
- Proper leg lifting should be used when lifting. Back lifts should be avoided.
- Do not hammer on any SPM® product when pressure is present.

On Location:

- Proper transportation of SPM® products is important. Racks that secure valves and other components, and prevent accidental unloading, are critical. Never transport any SPM® product in a fashion that would allow it to become loose and cause an accident.
- End connections on SPM® products should be cleaned and lightly oiled prior to each use. A visual inspection for damage should also be performed at this time. Union seals should be checked, and replaced when worn or damaged.
- Since SPM® products may be repainted in different colors for various applications, do not use factory color as the primary means of service identification. Operator specific color schemes should be used.
- SPM® product usage should be monitored by a qualified supervisor or foreman. Supervisory personnel must approve proper placement, position, and handling of all equipment in the pumping system. Only specially trained personnel under direct supervisory instruction should be near or operate SPM® flow line equipment while under pressure.
- Prior to applying pressure, valves should be greased in both the opened and closed position. This should be done before each use. If the valve is excessively hard to operate, it should be removed and not used until repairs are made.
- Turning valves under pressure should be avoided due to the inherent risks of **SEVERE BODILY INJURY, DEATH, OR PROPERTY DAMAGE.** It is recommended that remote control actuators be used for this purpose, and that personnel remain outside of the zone of danger. If it is not feasible to use remote control actuators, then only experienced specially trained personnel under direct supervisory instruction should perform this task.
- Do not position any part of your body in the path of exit flow of SPM® flow line equipment.
- It is recommended that a rate in excess of 42 feet per second be avoided. Rates above this will cause rapid wear and erosion.
- After each job flush components with clean water and grease with the proper Weir approved grease. Follow SPM®'s greasing procedure found later in this document.
- Always consult the identification band or plate on the product for the correct cold working pressure rating.

Special Precautions:

- Welding, brazing, or heating on SPM® flow line equipment is prohibited.
- Never alternate a valve's service. Acid service should never be followed by cold temperature service. When acid etching or erosion is present, replace the valve.

⚠ Warning

Working in the oil field, including at frac sites, and using high pressure equipment is inherently dangerous, and can result in **SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.** All information contained in this catalog is general in nature. Weir does not make any representations, warranties or guarantees, express or implied, as to the accuracy or completeness of the information contained in this catalog. Weir is not liable for the user's failure to observe appropriate safety procedures.

Product availability and specifications are subject to change at any time, with or without notice.

Swivels

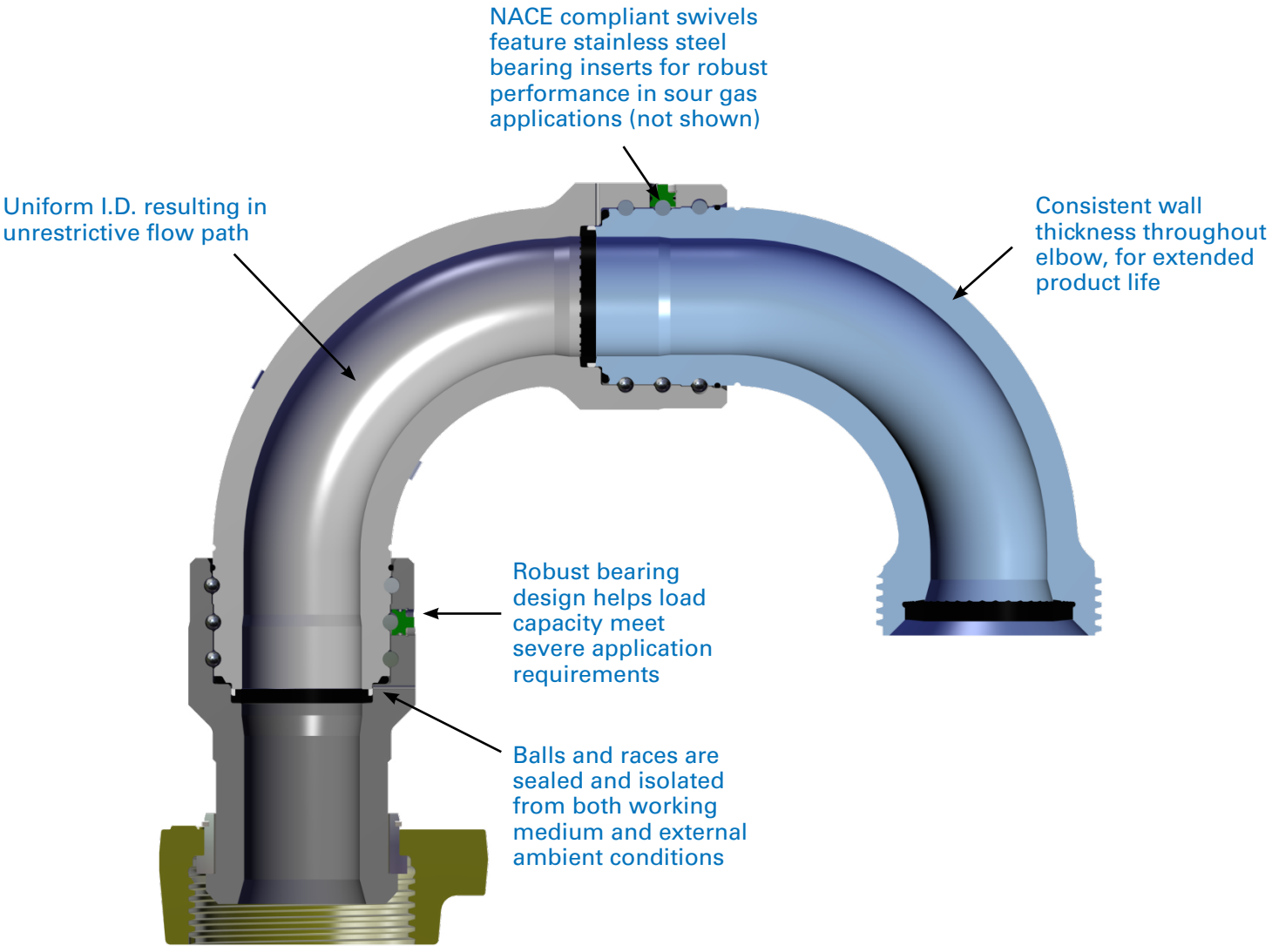
SPM® swivels are available in 2" through 4" sizes and in pressure ratings up to 15,000 psi. All SPM® swivels feature uniform wall thickness throughout for consistent flow of fluids and extended life. Designed for optimized distribution of material for female ball race components, the ball bearing connection of SPM® swivels are robust while providing consistent rotation. The 3" 1502 swivels and 4" 1002 swivels are gauged during manufacturing to enable them to pass a 2.5" and 3.5" frac ball respectively.

SPM® swivels are available in a wide variety of "styles" providing optimal performance in a variety of installations. Rotation of the swivels will vary based on configuration, with options available to provide movement in numerous planes.

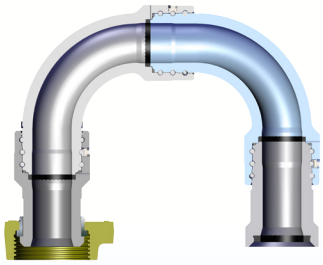
NOTE: Weir's standard swivel offering is not intended for use in applications requiring continuous rotation. Contact Weir Engineering for specific information.

An insufficient number of swivels or improper make-up for a given installation can lead to unacceptable loads on the entire piping system leading to premature failure of seals or accelerated wear on the product. Weir recommends the use of a Style 50 (two articulating joints) or Style 10 (three articulating joints) at each directional change of a string of piping. Fewer articulating joints than featured in the Style 50 swivel may lead to restrictions in some degrees of freedom.

It is recommended that a routine maintenance program be followed for replacement of packing and seals, and that regularly scheduled lubrication is preformed.



SPM® Swivel Configurations



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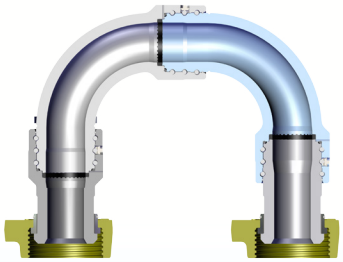

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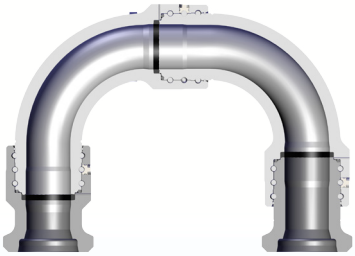

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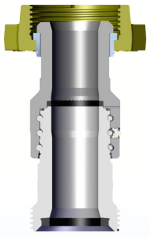

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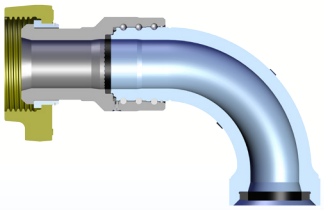

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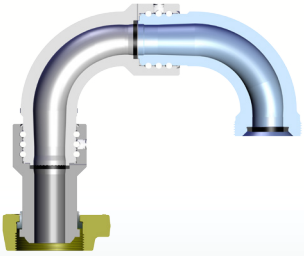

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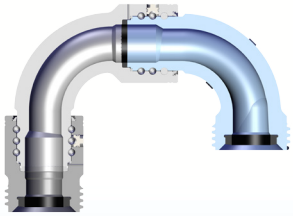

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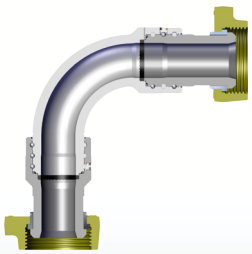

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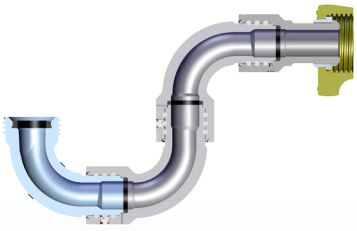

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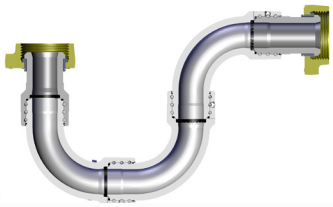

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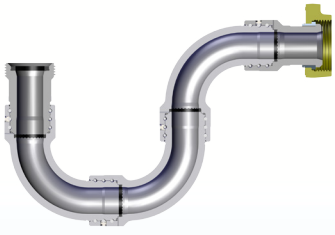

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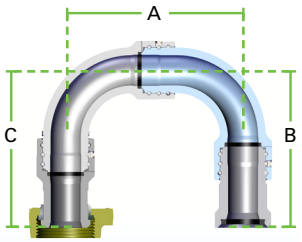
Swivel Specifications



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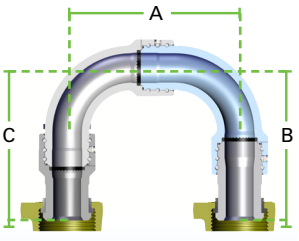

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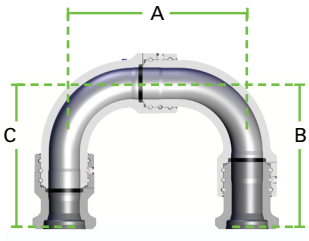
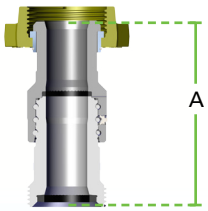


Style 10 - Safety Iron®

STYLE 10 SWIVELS

Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2″	1502M x 1502F	Low	Std.	2A17135	10.69 / 271.5	10.91 / 277.1	10.90 / 276.8	1.69 / 42.9	67 / 29.9	4L17126
2″	1502M x 1502M	Low	Std.	2A17205	10.69 / 271.5	10.91 / 277.1	10.90 / 276.8	1.69 / 42.9	77 / 34.9	4L17126
2″	15K SI x 15K SI	Low	Std.	2A17893	10.69 / 271.5	9.94 / 252.5	9.94 / 252.5	1.69 / 42.9	54 / 24.5	4L17126
2″	1502M x 1502F	Low	H2S	2A17171	10.69 / 271.5	10.91 / 277.1	10.90 / 276.8	1.69 / 42.9	67 / 29.9	4L17193
2″	1502M x 1502M	Low	H2S.	2A17277	10.69 / 271.5	10.91 / 277.1	10.90 / 276.8	1.69 / 42.9	77 / 34.9	4L17193
3″	1502M x 1502F	Low	Std.	2A17920	16.37 / 415.8	14.54 / 369.3	14.49 / 368	2.75 / 69.8	134 / 60.8	4L17660
3″	1502M x 1502M	Low	Std.	2A28766	16.37 / 415.8	14.50 / 368.3	14.49 / 368	2.75 / 69.8	147 / 66.7	4L17660
3″	15K SI x 15K SI	Low	Std.	2A17945	16.37 / 415.8	13.00 / 330.2	13.00 / 330.2	2.75 / 69.8	114 / 51.7	4L17660
3″	1502M x 1502F	Low	H2S	2A17986	16.38 / 416	14.50 / 368.3	14.50 / 368.3	2.75 / 69.8	134 / 60.8	4L17305
3″	1502M x 1502M	Low	H2S	2A17987	16.38 / 416	14.50 / 368.3	14.50 / 368.3	2.75 / 69.8	147 / 66.7	4L17305
4″	1002M x 1002F	Low	Std.	2A17925	18.18 / 461.8	16.19 / 411.2	17.18 / 436.4	3.80 / 96.5	209 / 94.8	4L17721
4″	1002M x 1002M	Low	Std.	2A17929	18.18 / 461.8	16.19 / 411.2	16.19 / 411.2	3.80 / 96.5	219 / 99.3	4L17721
4″	10K SI x 10K SI	Low	Std.	2A29809	18.18 / 461.8	14.50 / 368.3	14.50 / 368.3	3.80 / 96.5	179 / 81.2	4L17721
4″	1502M x 1502F	Low	Std.	2A17765	20.41 / 518.4	20.41 / 518.4	20.40 / 518.2	3.50 / 88.9	326 / 147.9	4L17785
4″	1502M x 1502M	Low	Std.	2A17737	21.20 / 538.5	20.41 / 518.4	20.41 / 518.4	3.50 / 88.9	352 / 159.7	4L17785
4″	15K SI x 15K SI	Low	Std.	2A17894	21.20 / 538.5	16.51 / 419.4	16.51 / 419.4	3.50 / 88.9	282 / 127.9	4L17785

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.



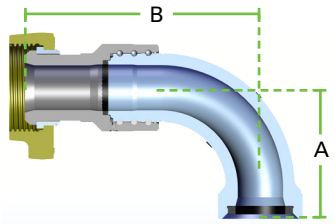
Style 20 - MxF

STYLE 20 SWIVELS

Nominal Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2″	1502M x 1502F	Low	Std.	2A17271	11.12 / 282.4	1.88 / 47.8	31 / 14.1	4L17126
2″	1502M x 1502F	Low	H2S	2A17282	11.12/ 282.4	1.88 / 47.8	31 / 14.1	4L17193
3″	1502M x 1502F	Low	Std.	2A17671	12.62 / 320.5	2.75 / 69.8	55 / 24.9	4L17660
3″	15K SI x 15K SI	Low	Std.	2A29299	9.63 / 244.6	2.75 / 69.8	35 / 15.9	4L17660

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Swivels (continued)

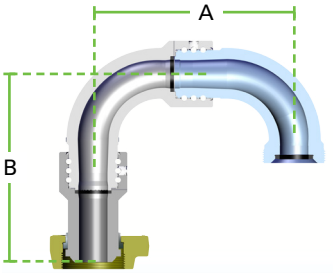


Style 30 - MxF

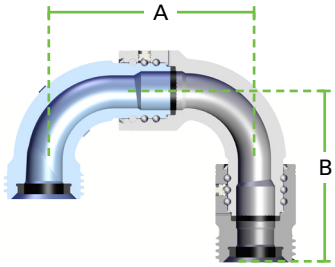
STYLE 30 SWIVELS

Nominal Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2″	1502M x 1502F	Low	Std.	2A17297	5.50 / 139.7	10.90 / 276.9	1.69 / 42.9	38 / 17.2	4L17126
2″	1502M x 1502F	Low	H2S	2A17298	5.50 / 139.7	10.90 / 276.9	1.69 / 42.9	38 / 17.2	4L17193
3″	1502M x 1502F	Low	Std.	2A17947	8.09 / 205.5	14.49 / 368	2.75 / 69.9	71 / 32.2	4L17660

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.



Style 50 - MxF



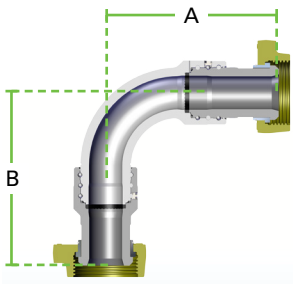
Style 50 - FxF

STYLE 50 SWIVELS

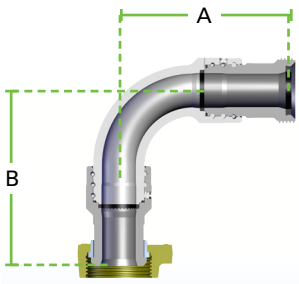
Nominal Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2″	1502M x 1502F	Low	Std.	2A17139	10.81 / 274.6	10.90 / 276.9	1.69 / 42.9	56 / 25.4	4L17126
2″	1502F x 1502F	Low	Std.	2A17213	10.69 / 271.5	8.80 / 223.5	1.69 / 42.9	43 / 19.5	4L17126
2″	1502M x 1502F	Low	H2S	2A17170	10.75 / 273	10.90 / 276.9	1.69 / 42.9	56 / 25.4	4L17193
2″	1502F x 1502F	Low	H2S	2A17279	10.69 / 271.5	8.80 / 223.5	1.69 / 42.9	43 / 19.5	4L17193
3″	1502M x 1502F	Low	Std.	2A17922	16.36 / 415.5	14.50 / 368.3	2.75 / 69.8	111 / 50.3	4L17660
3″	1502F x 1502F	Low	Std.	2A17957	16.38 / 416	14.50 / 368.3	2.75 / 69.8	102 / 46.3	4L17660
3″	1502M x 1502F	Low	H2S	2A17281	16.38 / 416	14.50 / 368.3	2.75 / 69.8	111 / 50.3	4L17305
4″	1002M x 1002F	Low	Std.	2A17926	18.18 / 461.8	16.19 / 411.2	3.75 / 95.3	267 / 121.1	4L17721
4″	1502M x 1502F	Low	Std.	2A17567	20.41 / 518.4	21.20 / 538.5	3.50 / 88.9	266 / 120.7	4L17785

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Swivels (continued)



Style 60 - MxM

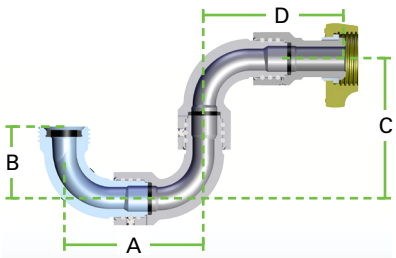


Style 60 - MxF

STYLE 60 SWIVELS

Nominal Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2"	1502M x 1502M	Low	Std.	2A17293	10.91 / 277.1	10.90 / 276.9	1.88 / 47.8	48 / 21.8	4L17126
2"	1502M x 1502F	Low	Std.	2A17494	10.91 / 277.1	10.90 / 276.9	1.88 / 47.8	36 / 16.3	4L17126
3"	1502M x 1502M	Low	Std.	2A17953	14.50 / 368.3	14.50 / 368.3	2.75 / 69.8	107 / 48.5	4L17660
3"	1502M x 1502F	Low	Std.	2A17969	14.50 / 368.3	14.46 / 367.3	2.75 / 69.8	95 / 43.1	4L17660
3"	15K SI x 15K SI	Low	Std.	2A17939	13.00 / 330.2	13.00 / 330.2	2.75 / 69.8	108 / 49	4L17660

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

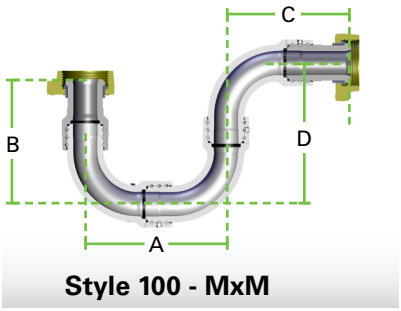


Style 80 - MxF

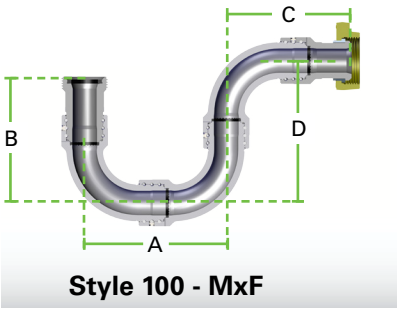
STYLE 80 SWIVELS

Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Dim. D (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2″	1502M x 1502F	Low	Std.	2A17289	10.81 / 274.6	5.56 / 141.2	10.75 / 273.1	10.90 / 276.9	1.69 / 42.9	74 / 33.6	4L17126
3″	1502M x 1502F	Low	Std.	2A17934	16.36 / 415.5	8.09 / 205.5	16.37 / 415.8	14.49 / 368	2.75 / 69.9	151 / 68.5	4L17660

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.



Style 100 - MxM



Style 100 - MxF

STYLE 100 SWIVELS

Size	End Connection	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Dim. D (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2"	1502M x 1502M	Low	Std.	2A17274	10.69 / 271.5	10.91 / 277.1	10.90 / 276.9	10.69 / 271.5	1.69 / 42.9	98 / 44.5	4L17126
2"	1502M x 1502F	Low	Std.	2A17272	10.69 / 271.5	10.91 / 277.1	10.90 / 276.9	10.69 / 271.5	1.69 / 42.9	85 / 38.6	4L17126
2"	1502M x 1502F	Low	H2S	2A17285	10.69 / 271.5	10.91 / 277.1	10.90 / 276.9	10.69 / 271.5	1.69 / 42.9	85 / 38.6	4L17193
3"	1502M x 1502M	Low	Std.	2A17937	16.37 / 415.8	14.50 / 368.3	14.50 / 368.3	16.38 / 416	2.75 / 69.8	186 / 84.4	4L17660
3"	1502M x 1502F	Low	Std.	2A17955	16.34 / 415	14.51 / 368.6	14.46 / 367.3	16.34 / 415	2.75 / 69.8	174 / 78.9	4L17660
3"	15K SI x 15K SI	Low	Std.	2A17979	16.37 / 415.8	13.00 / 330.2	13.00 / 330.2	16.37 / 415.8	2.75 / 69.8	155 / 70.3	4L17660
3"	1502M x 1502F	Low	H2S	2A17982	16.34 / 415	14.51 / 368.6	14.46 / 367.3	16.34 / 415	2.75 / 69.8	174 / 78.9	4L17305

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit: elastomers, swivel balls, ball plugs, plug retainer rings, grease port screw

NOTE: The swivel parts kit contains enough parts to replace the components of one articulating joint.

Recommended Swivel Grease Procedure

APPROVED MATERIALS:

- Chevron Dura-Lith® Grease EP (SPM P/N P17301)

PROCEDURE:

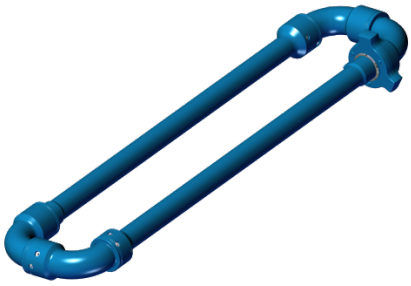
1. Remove lube plug and o-ring.
2. Using a hand-held grease gun and approved grease, apply two strokes of grease.
   a) Do not use high pressure grease gun.
   b) Never grease swivel while under pressure.
3. Rotate swivel elbow 90 degrees.
4. Apply two more strokes.
5. Rotate assembly 90 degrees two more times and apply two strokes of grease each time.
6. Rotate swivel 360 degrees to verify smoothness of rotation.
7. Reinstall lube plug and o-ring.
8. Repeat at all articulating joints of the swivel.

FREQUENCY:

- Swivels should be greased before/after each job.

Hose Loops

SPM® all-steel hoses utilize field-proven SPM® swivel joints for greater flexibility, shock and vibration resistance, and uniform flow. SPM® hoses are designed to easily and conveniently fold up for storage and transportation.



2" 1502 HOSE LOOPS

Length	Style	Connection Type	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
8'7"	C&C	Hammer Union	Low	Standard	2A17581	1.69 / 42.9	142 / 64.4
9'6"	C&C	Hammer Union	Low	Standard	2A17229	1.69 / 42.9	158 / 71.7
9'6"	C&C	Hammer Union	Low	H2S	2A17230	1.69 / 42.9	158 / 71.7

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Plug Valves

SPM® plug valves feature quality components for dependability, minimum weight, and maximum strength. The plug valves act as quarter-turn isolation valves, allowing operators to isolate portions of their flow line or specific pumping units from the entire pumping system in order to address pumping, operational or maintenance requirements. The valves require minimum space, are simple to operate, exhibit a fast response, and add relatively little internal disturbance to the flow. Pressure drop across the valve is low. SPM® plug valves are designed to reduce required operating torque to improve ease of use.

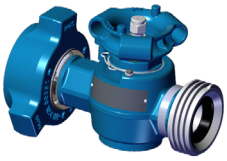
SPM® plug valves are available in sizes ranging from 1" to 4" in working pressures up to 15,000 psi. They feature precision machined and ground components, which aid in proper sealing at a wide range of operating pressures, and plating on critical areas for improved corrosion resistance.

SPM® plug valves are available with wheel (gear), hydraulic, or air actuators for most sizes of plug valves, which further enhances safety in the field. H2S Plug Valves are also available and conform to NACE MR1075-90 for exposure to H2S.

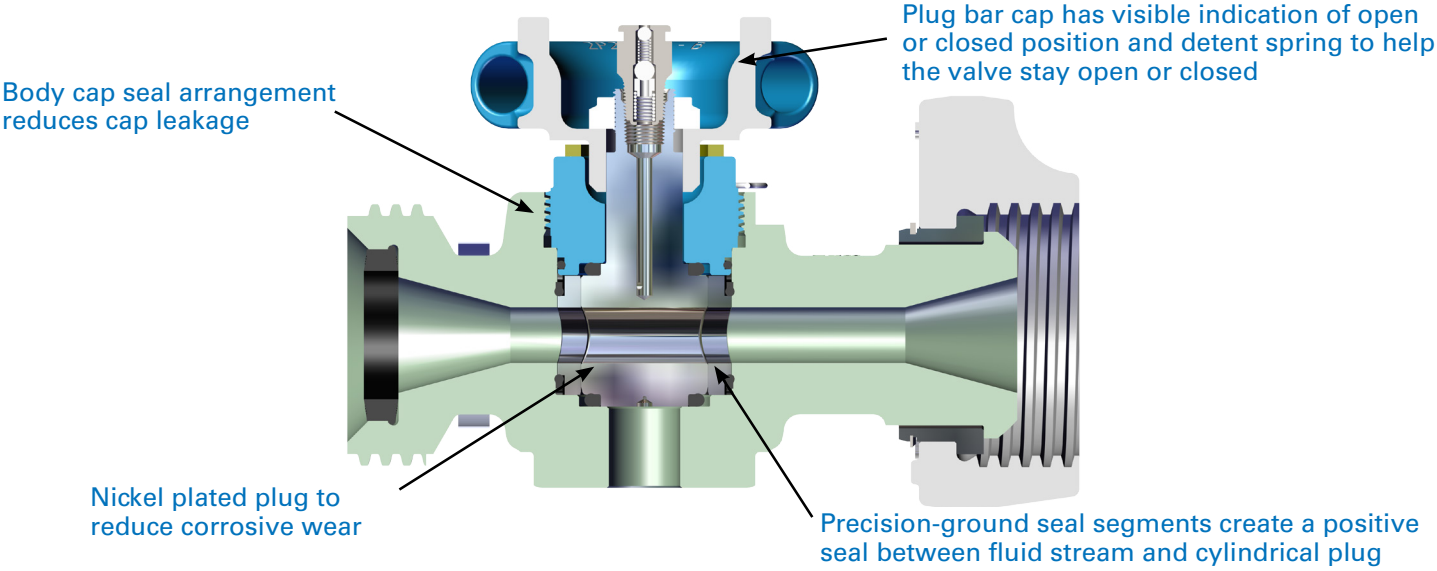
It is imperative that plug valves are routinely greased to promote proper performance and extend life. Operators should follow the greasing procedure outlined later in this document.

WARNING: Turning valves under pressure should be avoided due to the inherent risks of SEVERE BODILY INJURY, DEATH, OR PROPERTY DAMAGE. It is recommended that remote control actuators be used for this purpose. If it is not feasible to use remote control actuators, then only experienced specially trained personnel under direct supervisory instruction should perform this task.

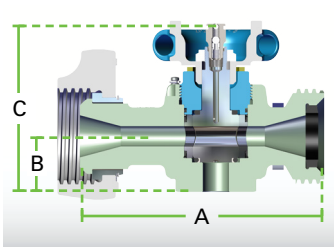
1" x 2"

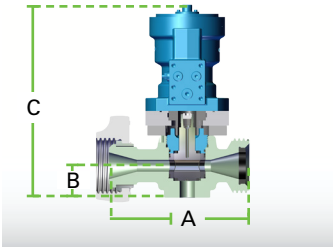


SPM® 1"x 2" plug valves provide reliable operation in a compact design. Suitable for pressures up to 15,000 psi, 1"x 2" plug valves are available in a manual, air, or hydraulic actuated configuration.



1" X 2" PLUG VALVE SPECIFICATIONS





Connection Type	Actuation	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Elastomer Kit	Seal Kit
Hammer Union	Manual	Low	Standard	1A14483	10.56 / 268.2	2.41 / 61.2	7.28 / 184.9	0.88 / 22.4	44 / 20	4L11769	4L20947	4L14203
Hammer Union	Manual	Low	Standard (Acid Service)	1A25038	10.56 / 268.2	2.41 / 61.2	6.29 / 159.8	0.88 / 22.4	41 / 18.6	4L16800	4L20949	4L16783
Hammer Union	Manual	Low	Standard (Torture Style)	1A19748	10.56 / 268.2	2.41 / 61.2	7.28 / 184.9	0.38 / 9.7	45 / 20.4	4L20096	4L20947	4L20094
Safety Iron®	Manual	Low	Standard	2A27975	10.07 / 255.8	2.41 / 61.2	7.28 / 184.9	0.88 / 22.4	32 / 14.5	4L11769	4L20947	4L14203
Hammer Union	Manual	Low	H2S	1A19777	10.56 / 268.2	2.41 / 61.2	7.28 / 184.9	0.88 / 22.4	44 / 20	4L20230	4L20949	4L16783
Hammer Union	Hydraulic	Low	Standard	1A14483HB	10.56 / 268.2	2.41 / 61.2	14.47 / 367.5	0.88 / 22.4	86 / 39	4L11769	4L20947	4L14203
Hammer Union	Hydraulic	Low	H2S	1A19777HB	10.56 / 268.2	2.41 / 61.2	14.47 / 367.5	0.88 / 22.4	86 / 39	4L20230	4L20949	4L16783
Hammer Union	Air	Low	Standard	1A14483A	10.56 / 268.2	2.41 / 61.2	16.8 / 426.7	0.88 / 22.4	64 / 29	4L11769	4L20947	4L14203
Hammer Union	No Actuator	Low	Standard	1A20391	10.56 / 268.2	2.41 / 61.2	6.29 / 159.8	0.88 / 22.4	41 / 18.6	4L11769	4L20947	4L14203

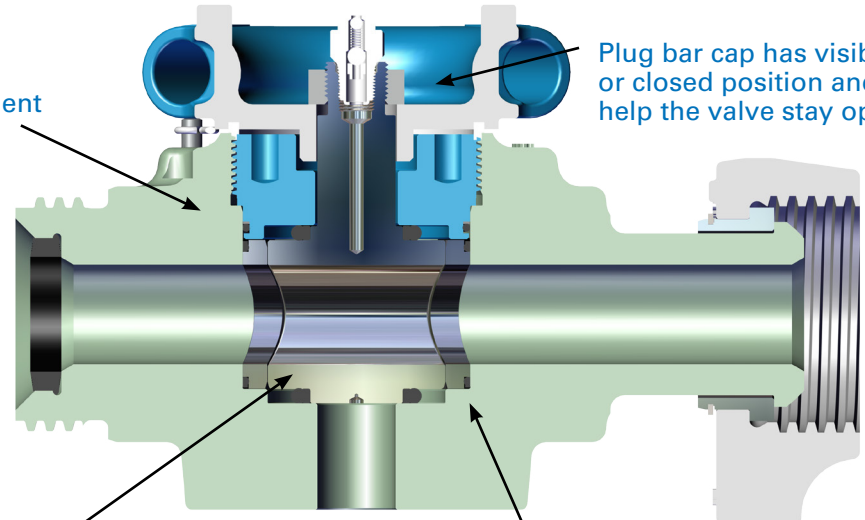
Note: Other parts or configurations may be available. Contact Weir for specific details.

KIT CONTENTS:

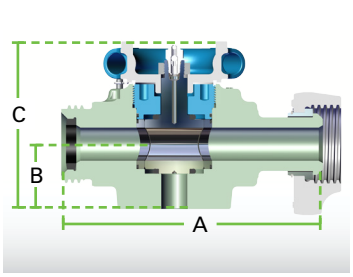
- Parts Kit: plug, seals, side segments, seal segments, grease fitting, backup ring
- Seal Kit: seals, backup rings, grease fitting, seal segment
- Elastomer Kit: seals, backup ring

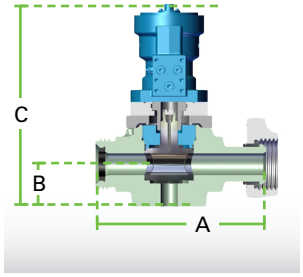
2” Plug Valve (Standard)

SPM® 2” plug valves are rated for pressures up to 15,000 psi. SPM®’s 2” plug valves are available in a manual, air or hydraulic actuated configuration.



2" PLUG VALVE (STANDARD) SPECIFICATIONS





Connection Type	Actuation	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Elastomer Kit	Seal Kit
Hammer Union	Manual	Low	Standard	1A14487	13.88 / 352.6	3.44 / 87.4	8.88 / 225.6	1.75 / 44.5	99 / 44.9	4L11982	4L20948	4L13694
Hammer Union	Manual	Low	Std. (Acid Service)	1A20211	13.88 / 352.6	3.44 / 87.4	8.88 / 225.6	1.75 / 44.5	99 / 44.9	4L16826	4L20950	4L16824
Safety Iron®	Manual	Low	Standard	2A27973	12.25 / 317.5	2.63 / 66.8	8.19 / 208	1.75 / 44.5	79 / 35.8	4L11982	4L20948	4L13694
Hammer Union	Manual	Low	H2S	1A14492	13.88 / 352.6	3.44 / 87.4	8.88 / 225.6	1.75 / 44.5	99 / 44.9	4L20574	4L20950	4L20575
Hammer Union	Hydraulic	Low	Standard	1A14487HB	13.88 / 352.6	3.44 / 87.4	16.4 / 416.6	1.75 / 44.5	142 / 64.4	4L11982	4L20948	4L13694
Hammer Union	Air	Low	Standard	1A14487A	13.88 / 352.6	3.44 / 87.4	19.38 / 492.3	1.75 / 44.5	126 / 57.2	4L11982	4L20948	4L13694
Hammer Union	No Actuator	Low	Standard	1A24017	13.88 / 352.6	3.44 / 87.4	7.89 / 200.4	1.75 / 44.5	93 / 42.2	4L11982	4L20948	4L13694

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit: plug, seals, side segments, seal segments, grease fitting, backup ring
- Seal Kit: seals, backup rings, grease fitting, seal segment
- Elastomer Kit: seals, backup ring

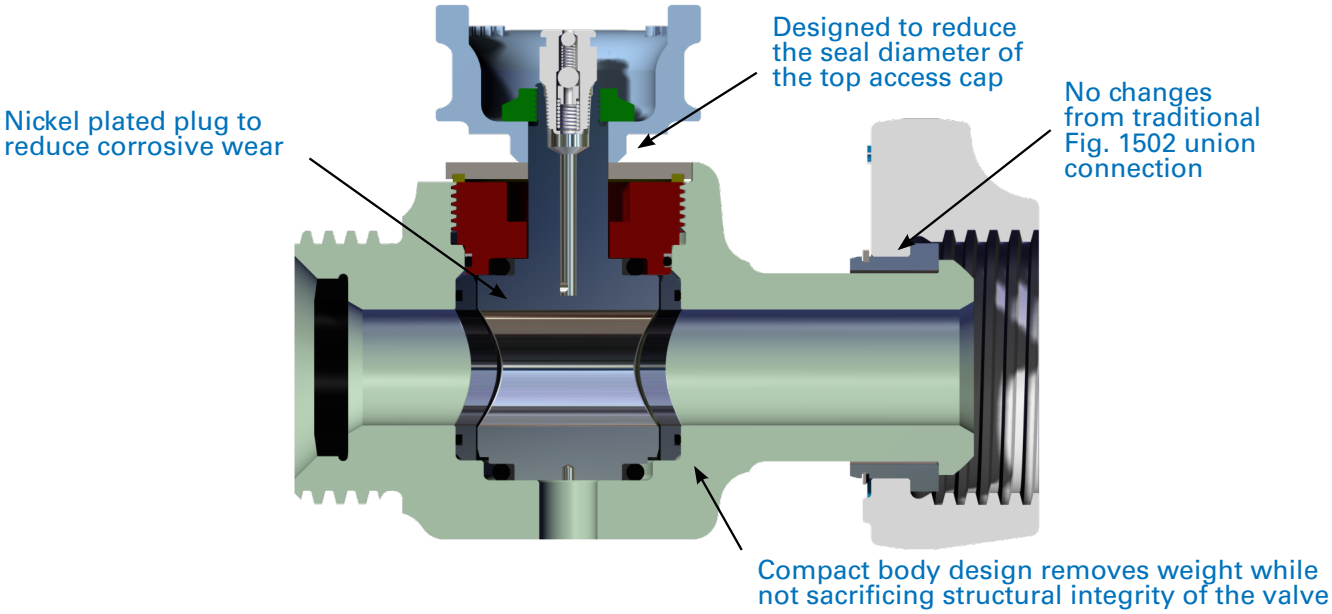
2” Light Weight Plug Valve

The SPM® 2” light weight (LW) plug valve is engineered with safety in mind. The valve is designed to meet HSE lifting requirements in the North Sea while maintaining Weir’s high quality standards. The SPM® 2” LW plug valve is rated for non-shock, cold working pressures up to 15,000 psi.

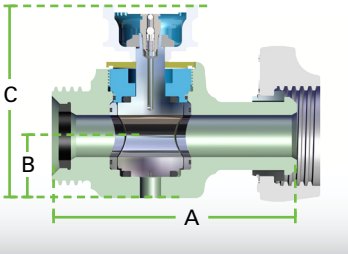
FEATURES AND BENEFITS:

- Compact/Lightweight Design -- Weighs 51 lbs. (23.1 kg)
- Meets HSE requirements for lifting by a single individual*
- Available with DNV Certification
- CE Compliant (97/23/EC)

*HSE compliant products offer a lifting weight of 55 lbs. or less to be lifted and carried by one person.



2” LIGHT WEIGHT PLUG VALVE SPECIFICATIONS



Connection Type	Actuation	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Elastomer Kit	Seal Kit
Hammer Union	Manual	Low	Standard	2A29633	10.25 / 260.4	2.60 / 66	8.08 / 205.2	1.75 / 44.5	51 / 23.1	2A30161	2A30164	2A30162
Hammer Union	Manual	Low	H2S	2A36869	10.25 / 260.4	2.60 / 66	8.08 / 205.2	1.75 / 44.5	51 / 23.1	2A37146	2A37181	2A37180

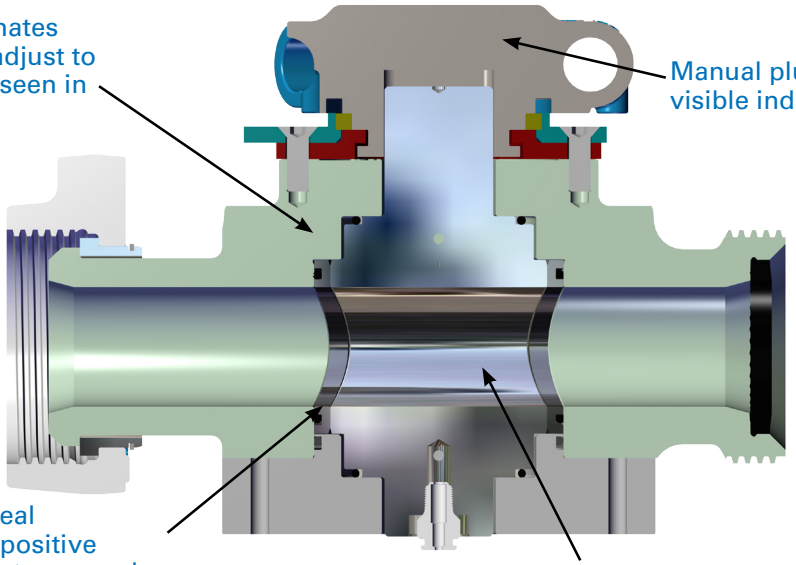
Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

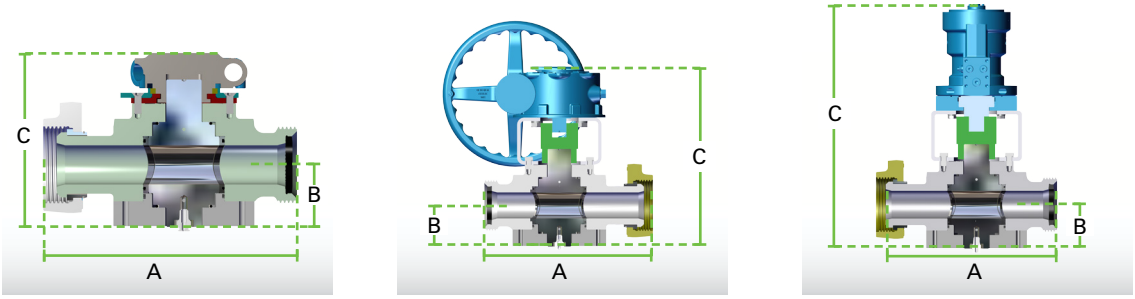
KIT CONTENTS:

- Parts Kit: plug, seals, side segments, seal segments, grease fitting, backup ring
- Seal Kit: seals, backup rings, grease fitting, seal segment
- Elastomer Kit: seals, backup ring

3” and 4” Plug Valve

SPM® 3” & 4” plug valves provide reliable isolation and are available in pressure ratings as high as 15,000 psi. The valves are available in multiple actuator options, including manual in the 3”, as well as wheel (gear) and hydraulic in both sizes.



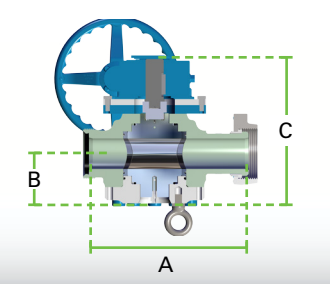


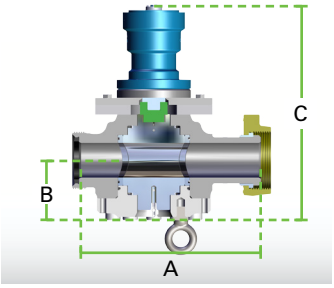
3” 1502 PLUG VALVE SPECIFICATIONS

Connection Type	Actuation	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Elastomer Kit	Seal Kit
Hammer Union	Manual	Low	Standard	2A26611	17.00 / 431.8	4.32 / 109.7	11.83 / 300.5	2.75 / 69.8	229 / 103.9	2A39042	2A30678	2A39044
Safety Iron®	Manual	Low	Standard	2A27943	16.00 / 406.4	4.32 / 109.7	11.82 / 300.2	2.75 / 69.8	215 / 97.5	2A39042	2A30678	2A39044
Hammer Union	Gear	Low	Standard	1A14496	17.00 / 431.8	4.32 / 109.7	19.07 / 484.4	2.75 / 69.8	333 / 151	2A39042	2A30678	2A39044
Hammer Union	Gear - Low Profile	Low	Standard	2A30297	16.00 / 406.4	4.32 / 109.7	16.32 / 414.5	2.75 / 69.8	351 / 159.2	2A39042	2A30678	2A39044
Safety Iron®	Gear	Low	Standard	2A27942	16.00 / 406.4	4.32 / 109.7	19.07 / 484.4	2.75 / 69.8	320 / 145.2	2A39042	2A30678	2A39044
Hammer Union	Gear	Low	H2S	1A19585	17.00 / 431.8	4.32 / 109.7	19.17 / 486.9	2.75 / 69.8	333 / 151	2A39043	2A33788	2A39045
Hammer Union	Hydraulic	Low	Standard	1A14496H	17.00 / 431.8	4.32 / 109.7	24.32 / 617.7	2.75 / 69.8	312 / 141.5	2A39042	2A30678	2A39044
Hammer Union	Hydraulic	Low	H2S	1A19585H	17.00 / 431.8	4.32 / 109.7	24.32 / 617.7	2.75 / 69.8	312 / 141.5	2A39043	2A33788	2A39045
Hammer Union	Air	Low	Standard	1A14496A	17.00 / 431.8	4.32 / 109.7	22.14 / 562.4	2.75 / 69.8	257 / 116.6	2A39042	2A30678	2A39044
Hammer Union	No Actuator	Low	Standard	1A18962	17.00 / 431.8	4.32 / 109.7	10.32 / 262.1	2.75 / 69.8	200 / 90.7	2A39042	2A30678	2A39044
Hammer Union	No Actuator	Low	H2S	1A20933	17.00 / 431.8	4.32 / 109.7	10.32 / 262.1	2.75 / 69.8	200 / 90.7	2A39043	2A33788	2A39045

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Plug Valves (continued)

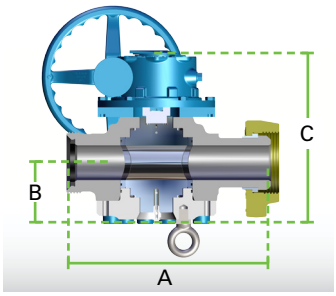


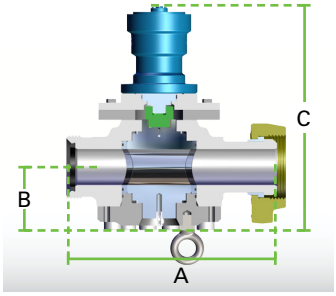


4" 1002 PLUG VALVE SPECIFICATIONS

Connection Type	Actuation	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Elastomer Kit	Seal Kit
Hammer Union	Gear	Low	Standard	2A25182	20.50 / 520.7	5.76 / 146.3	22.71 / 576.8	3.75 / 95.3	495 / 224.5	2A26353	2A26361	2A26358
Safety Iron®	Gear	Low	Standard	2A27872	18.25 / 463.6	5.76 / 146.3	22.50 / 571.5	3.75 / 95.3	474 / 215	2A26353	2A26361	2A26358
Hammer Union	Hydraulic	Low	Standard	2A25182HB	20.50 / 520.7	5.76 / 146.3	27.24 / 691.9	3.75 / 95.3	471 / 213.6	2A26353	2A26361	2A26358
Hammer Union	No Actuator	Low	Standard	2A25154	20.50 / 520.7	5.76 / 146.3	15.31 / 388.9	3.75 / 95.3	341 / 154.7	2A26353	2A26361	2A26358

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.





4" 1502 PLUG VALVE SPECIFICATIONS

Connection Type	Actuation	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Elastomer Kit	Seal Kit
Hammer Union	Gear	Low	Standard	2A25168	22.13 / 562.1	5.76 / 146.3	20.70 / 525.8	3.75 / 95.3	564 / 255.8	2A26354	2A26362	2A26359
Safety Iron®	Gear	Low	Standard	2A28135	19.25 / 489	5.76 / 146.3	22.50 / 571.5	3.75 / 95.3	538 / 244	2A26354	2A26362	2A26359
Hammer Union	Hydraulic	Low	Standard	2A25168HB	22.13 / 562.1	5.76 / 146.3	27.24 / 691.9	3.75 / 95.3	540 / 244.9	2A26354	2A26362	2A26359
Hammer Union	No Actuator	Low	Standard	2A25167	22.13 / 562.1	5.76 / 146.3	15.30 / 388.6	3.75 / 95.3	410 / 186	2A26354	2A26362	2A26359

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit: plug, seals, side segments, seal segments, grease fitting, backup ring
- Seal Kit: seals, backup rings, grease fitting, seal segment
- Elastomer Kit: seals, backup ring

Plug Valve Greasing

SPM® plug valves are rugged, field proven products which provide easy operation and dependable service under severe operating conditions in a variety of applications. The valves are available in sizes ranging from 1" to 4" for use in standard service up to 15,000 psi and H2S service up to 10,000 psi.

In order to maximize the valve's performance and longevity, Weir Engineering has identified a grease compound to be used in conjunction with a specific greasing procedure on all existing plug valve assemblies. Valtex 972 grease (stick) has been identified to notably increase the performance in all sizes of SPM® plug valves. It is the responsibility, though, of the end user to implement the proper maintenance procedures. Failure to follow these requirements can result in reduced valve performance and life.

It is important to note the difference between Valtex 972 "stick" and "bulk" grease. While the bulk Valtex 972 grease bears a similar description, it offers a reduced viscosity to that of the stick grease, resulting in decreased performance and longevity of the valve. Also note that a separate grease, Valtex 1502, should be used to coat certain components during the rebuild process. **Valtex 1502 is not to be used as an operational grease.**

APPROVED MATERIALS:

- Valtex 1502 Assembly Grease
- Valtex 972 Operational Grease or Weir engineering approved grease

Grease Spec	Size	SPM P/N
Valtex 972 – J Stick	8 oz.	P40230
Valtex 972 – V Stick	80 oz.	P32553
Valtex 1502	112 oz.	P36791

- Valtex Grease Guns or Engineering approved grease guns:

Grease Gun	Grese Gun Type	Grease Type / Size	SPM P/N
Valtex QS-5000-C	Air/Hydraulic	Valtex 972 – V Stick	2A39533
Valtex Viper QS-1800	Foot Pump	Valtex 972 – J Stick	P40156
Valtex QS-2000A	Air/Hydraulic	Valtex 972 – J Stick	P136985
Valtex 1000-31	Hand Operated	Valtex 972 – K Stick	P138565
Climax 10516	Hand Operated	Valtex 972 – J Stick	P13335
Climax 1700	Air/Hydraulic	Valtex 972 – J Stick	P23792

Weir recommends operational re-greasing after every six stages or six valve turn operations.

PROCEDURE:

1. Flush valve with clean water to wash away any contaminants in the valve.
2. **FOR RE-WORK ONLY**: Grease with approved SPM® valve grease to displace contaminants from between the valve's internal components. Engineering requires the use of ValTex 1502 (P36791) assembly grease when disassembly and rebuild of the valve is required. Completely coat with grease the O.D. of the plug and seal segments. Reassemble valve using new seal components.

NOTE: The mixing of operational grease types/brands is not recommended. Grease mixing can result in a decrease of valve performance and/or increase the required re-greasing frequency.

3. The valve must be in the open position prior to pumping the grease. Pump the operational grease into the valve using the grease gun.
4. Cycle the valve and grease per the following criteria:
   - i. Pump to 2000 psi
   - ii. Close and open valve
   - iii. Pump to 4000 psi
   - iv. Close and open valve
   - v. Pump to 6000 psi
   - vi. Close and open valve
   - vii. Pump to 6000 psi
   - viii. Close and open valve

NOTE: Air will be heard "popping" during opening and closing. This will allow for a more complete filling of grease in the valve.

5. Visually inspect the inside of the valve to determine if the grease is extruding around the sides of the plug.

WARNING: Use extreme caution when inspecting the interior portion of the valve as the grease could be under high pressure. Failure to do so may lead to **SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.**

Check Valves

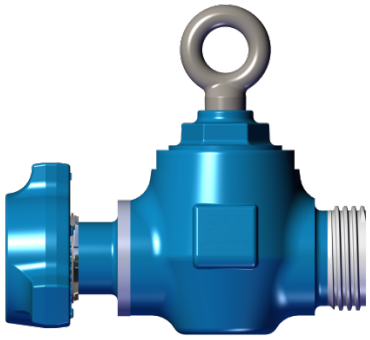
Available in both clapper style and dart style, SPM® check valves are placed in the treating line to allow flow to the well but isolate any back flow to go upstream of the valve. This provides protection for equipment at various locations in the flow line by helping to prevent fluid from traveling backup into the manifold area or into the pumps. Two flow directional configurations are offered, including wing-ahead (standard flow) or thread-ahead (reverse flow) models.

Weir recommends that clapper check valves be used in applications in which fluid being pumped contains solid materials, such as proppant. Dart check valves are recommended only for use in non-abrasive media applications, such as nitrogen pumping.

WARNING: Before assembly into a fluid line, check the direction of flow indicated by the arrow on the body of the valve and make sure the valve is properly oriented in the flow line. Improperly oriented check valves will shut off fluid flow, causing an over pressure event that can result in SERIOUS BODILY INJURY , DEATH, OR PROPERTY DAMAGE.

Clapper Style (SD) Check Valve

SPM® clapper check valves are manufactured in 2", 3", and 4" sizes for operating pressures up to 15,000psi. Check valves with hammer union end connections are available in standard or reverse flow, and should be installed with the flow direction arrow machined on the body aligned with the flow direction of the line. Versions with SPM® Safety Iron® connections are available in only one part number, and only need to have the directional arrow on the body aligned with the flow direction of the treating line. The clapper check valves, unlike the dart style, are designed for fluids that are heavily laden with materials such as proppants, solids, and ball sealers.



The SD check valve utilizes unique design features resulting in improved reliability and performance compared to other check valves currently available to the market.

UTILIZATION OF A THREADED SEAT:

- Self-locking design prevents seat from becoming loose during operation
- Machined from high erosion and high corrosion resistant NACE compliant stainless steel for long life
- Features o-ring for improved sealing performance
- Seat is replaceable and can be removed with special tool, extending operating life of the valve

FULLY COATED CLAPPER

- Clapper fully coated in urethane provides long life and decreased risk of delamination
- Provides consistent, repeatable sealing

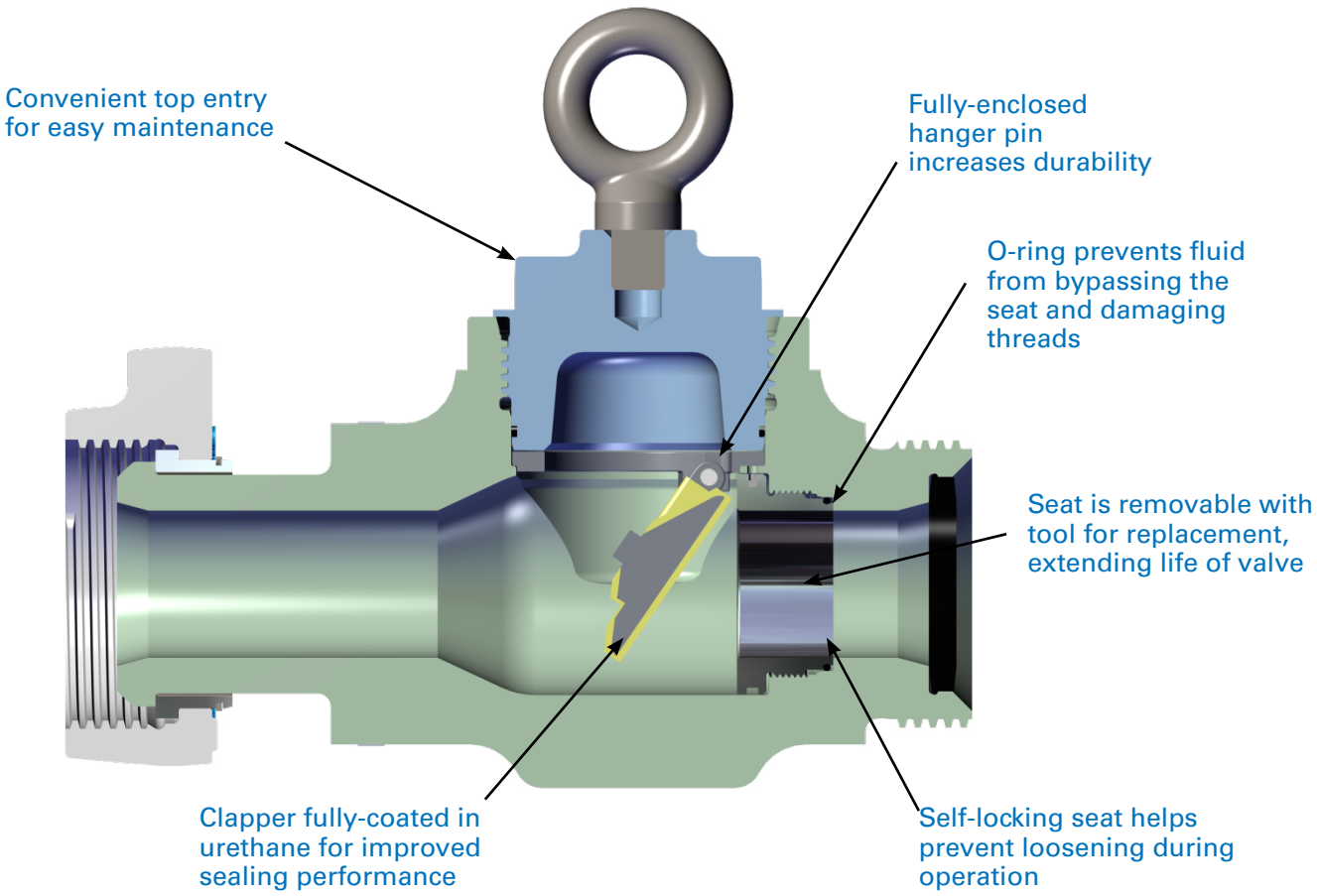
ENHANCED HANGER

- Flat machined into hanger matches flat machined into body preventing rotation during operation
- Fully enclosed hanger pin for fewer loose parts and enhanced durability

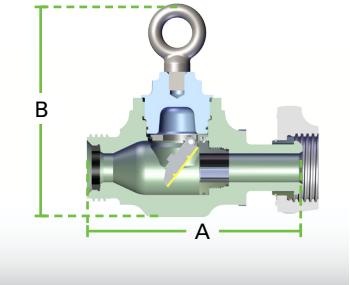
The valve should be mounted in-line in a flat, horizontal position to allow for gravity to close the clapper when there is no flow. The clapper will close by itself, reseat, and seal when sufficient backpressure is encountered. The valve should be mounted such that the bottom plane of the valve (normal to the gravitational direction) does not exceed 22 degrees.

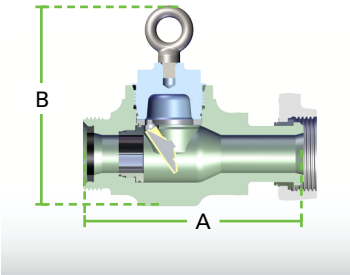
SPM® clapper style check valves are intended to provide quick responding directional fluid control. For complete fluid shut-off, an isolation valve (i.e. a plug valve) should be installed in series with the clapper check valve. Do not attempt to work on or repair any equipment isolated by the clapper check valve while the check valve has pressurized fluid behind it.

WARNING: Before assembly into a treating line, check the direction of flow indicated by the arrow on the body of the valve and make sure the valve is properly oriented in the flow line. Improperly oriented check valves will shut off fluid flow, which may result in an over pressure event that can cause SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.



Clapper Check Valve Specifications

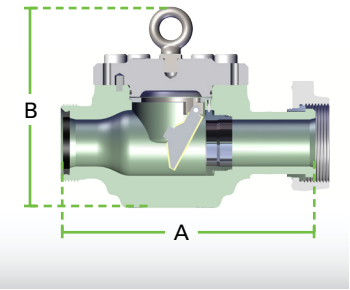




2" AND 3" 1502 SD CLAPPER CHECK VALVE SPECIFICATIONS

Size	Connection Type	Outlet / Branch Configuration	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
2"	FxM (Standard Flow)	Hammer Union	Low	Std.	2A29018	13.13 / 333.5	13.00 / 330.2	1.75 / 44.5	75 / 34	2A29092
2"	MxF (Reverse Flow)	Hammer Union	Low	Std.	2A29024	13.13 / 333.5	13.00 / 330.2	1.75 / 44.5	75 / 34	2A29092
2"	FxM (Standard Flow)	Hammer Union	Low	H2S	2A29022	13.13 / 333.5	13.00 / 330.2	1.75 / 44.5	75 / 34	2A29093
2"	MxF (Reverse Flow)	Hammer Union	Low	H2S	2A29026	13.13 / 333.5	13.00 / 330.2	1.75 / 44.5	75 / 34	2A29093
3"	FxM (Standard Flow)	Hammer Union	Low	Std.	2A28563	16.00 / 406.4	14.60 / 370.8	2.75 / 69.8	125 / 56.7	2A33150
3"	MxF (Reverse Flow)	Hammer Union	Low	Std.	2A28931	16.00 / 406.4	14.60 / 370.8	2.75 / 69.8	125 / 56.7	2A33150
3"	Safety Iron®	Safety Iron®	Low	Std.	2A28756	13.13 / 333.5	14.60 / 370.8	2.75 / 69.8	102 / 46.3	2A33150

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.



4" 1002 AND 4" 1502 SD CLAPPER CHECK VALVE SPECIFICATIONS

Size	Connection Type	Outlet / Branch Configuration	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit
4" 1002	FxM (Standard Flow)	Hammer Union	Low	Std.	2A28744	20.48 / 520.2	16.11 / 409.2	3.75 / 95.3	340 / 154.2	2A33163
4" 1002	MxF (Reverse Flow)	Hammer Union	Low	Std.	2A28949	20.48 / 520.2	16.11 / 409.2	3.75 / 95.3	340 / 154.2	2A33163
4" 10K	Safety Iron®	Safety Iron®	Low	Std.	2A28955	18.25 / 463.6	16.11 / 409.2	3.75 / 95.3	334 / 151.5	2A33163
4" 1502	FxM (Standard Flow)	Hammer Union	Low	Std.	2A28742	22.13 / 562.1	15.16 / 385.1	3.75 / 95.3	393 / 178.3	2A33163
4" 1502	MxF (Reverse Flow)	Hammer Union	Low	Std.	2A28945	22.13 / 562.1	15.16 / 385.1	3.75 / 95.3	393 / 178.3	2A33163
4" 15K	Safety Iron®	Safety Iron®	Low	Std.	2A28959	19.25 / 489	15.16 / 385.1	3.75 / 95.3	368 / 166.9	2A33163

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit: clapper, pins, hanger, seal, backup ring

Legacy Clapper Check Valve Parts Kits

To support legacy clapper style checks valves provided prior to the SD valve, the below kits are still available.

TOP LOAD CHECK VALVE (NON-SD VALVE) KITS

Kit Type	Size	Part Number
Parts Kit	2" 1502	2A26301
Parts Kit (fluoroelastomer)	2" 1502	2A26461
Parts Kit	3" 1502	2A29480
Parts Kit (fluoroelastomer)	3" 1502	2A29481
Parts Kit	4" 1002 & 4" 1502	2A29482

Note: Other parts or configurations may be available. Contact Weir for specific details.

CAST-STYLE CLAPPER CHECK VALVE KITS

Kit Type	Size	Part Number
Parts Kit	2" 1502	4L16449
Parts Kit	3" 1502	4L20821
Parts Kit (fluoroelastomer)	3" 1502	4L16451V
Parts Kit	4" 1002 / 602	4L21128
Parts Kit (fluoroelastomer)	4" 1002 / 602	4L16454

Note: Other parts or configurations may be available. Contact Weir for specific details.

KIT CONTENTS:

- Parts Kit: clapper, pins, hanger, seal, backup ring

Dart Style Check Valve

The SPM® dart style check valve permits fluid to flow towards the well, while impeding back flow from traveling upstream of the check valve. The valve acts as an independent pressure actuated response system, working immediately following a pressure loss and requiring no operator to be present for initiation.

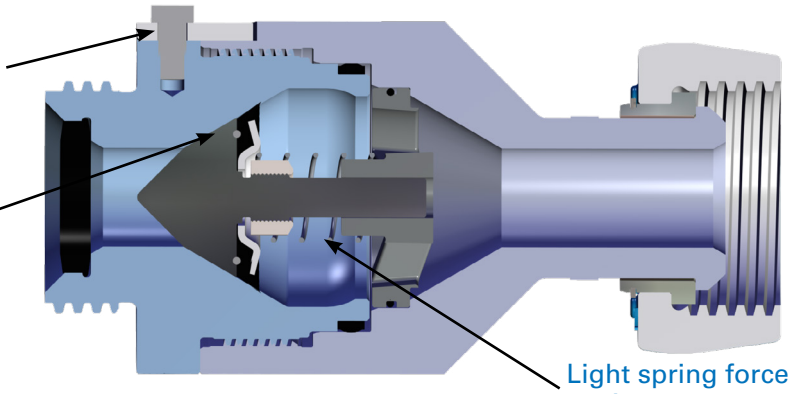
The SPM® dart style valve is constructed of a two-piece body that houses an inline spring loaded dart. When fluid enters from the inlet side, it will overcome the low spring force on the dart. The dart will travel away from the inlet and allow the fluid to flow around towards the outlet. When fluid flow stops, the light spring force closes the dart against its seat, helping to prevent fluid from flowing back through the flow line.

Dart valves are intended for use in services where the fluid media does not contain abrasive materials. For those applications, the clapper check valve will provide enhanced performance and extended life.

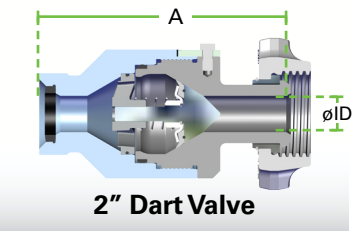
WARNING: Before assembly into a fluid line, check the direction of flow indicated by the arrow on the body of the valve and make sure the valve is properly oriented in the flow line. Improperly oriented check valves will shut off fluid flow, causing an over pressure event that can result in SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.

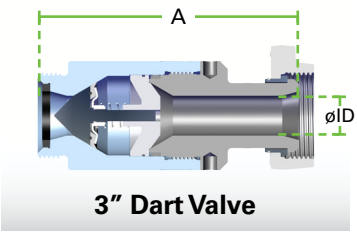
Check Valves (continued)

The SPM® dart style check valve should be installed in a branch where a flow control device is necessary to prevent flow in one direction. For complete fluid shut-off, an isolation valve (such as the SPM® plug valve) should be installed in series with the dart check valve. The SPM® dart valve is not required to be mounted flat to function properly. The internal spring constantly applies light pressure on the dart that prevents any effect gravity might have on the dart's operation.



DART VALVE SPECIFICATIONS





Size	Flow Configuration	Connection Type	Temp	Service Type	Seal Type	Part Number	Dim. A (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)	Parts Kit	Dart Kit	Seal Kit
2"	1502F x 1502M (Standard Flow)	Hammer Union	Low	Std.	Standard	1A19662C	12.06 / 306.3	1.75 / 44.5	63 / 28.6	4L20823C	4L19959	4L20828C
2"	1502M x 1502F (Reverse Flow)	Hammer Union	Low	Std.	Standard	1A19660C	12.23 / 310.6	1.75 / 44.5	63 / 28.6	4L20823C	4L19959	4L20828C
2"	1502F x 1502M (Standard Flow)	Hammer Union	Low	Std.	Metal to Metal	1A23085CLT	12.06 / 306.3	1.75 / 44.5	63 / 28.6	4L23935C	4L19959	4L20828C
2"	1502M x 1502F (Reverse Flow)	Hammer Union	Low	Std.	Metal to Metal	1A24137C	12.23 / 310.6	1.75 / 44.5	63 / 28.6	4L23935C	4L19959	4L20828C
2"	1502F x 1502M (Standard Flow)	Hammer Union	Low	H2S	Standard	1A19467C	12.06 / 306.3	1.75 / 44.5	63 / 28.6	4L20824C	4L18824	4L20829C
2"	1502M x 1502F (Reverse Flow)	Hammer Union	Low	H2S	Standard	1A19485C	12.06 / 306.3	1.75 / 44.5	113 / 51.3	4L20824C	4L18824	4L20829C
3"	1502F x 1502M (Standard Flow)	Hammer Union	Low	Std.	Standard	1A19843C	16.56 / 420.6	2.50 / 63.5	113 / 51.3	4L20825C	4L18821	4L20830C
3"	1502M x 1502F (Reverse Flow)	Hammer Union	Low	Std.	Standard	1A19845C	16.53 / 419.9	2.50 / 63.5	113 / 51.3	4L20825C	4L18821	4L20830C
3"	1502M x 1502F (Reverse Flow)	Hammer Union	Low	Std.	Standard	1A18614C	16.38 / 416	2.50 / 63.5	113 / 51.3	4L20825C	4L18821	4L20830C
3"	Safety Iron®	Safety Iron®	Low	Std.	Standard	2A27904	16.57 / 420.9	2.50 / 63.5	98 / 44.5	4L20826C	4L18818	4L20831C

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit: dart, seals, nut, spring, stop, screw, key
- Dart Kit: dart, seals, spring, nut
- Seal Kit: seals

Relief Valves

In the pressure pumping industry, there is an inherent level of danger surrounding treating lines operating at high pressures. The potential for over pressure events exists, which could result in catastrophic failure of the treating line and result in **SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE**. In order to avoid this type of failure, relief valves are commonly used on pressure pumping sites. Relief valves function by relying on the system's hydraulic pressure to overcome a preset force in the valve, which then expels fluid through an outlet. Weir offers a variety of relief valve styles to help protect against over pressurization.

Weir offers relief valves in two primary types: mechanical spring operated and nitrogen operated. All of these valves are intended for emergency pressure relief for most well service applications. They are designed for operating temperatures from –30°C to +110°C (–22°F to +230°F). They are not suitable for fire protection and they are not intended for continuous flow.

All of these valves are designed for liquid flow. Acceptable media include cement, acidizing fluids, fracturing fluids, and drilling muds. Some of the product is rated for sour gas service–be sure to consult with Weir Engineering for H_2S or other special services.

3" Spring Actuated Relief Valve

3" EXL N2 Back Pressure Relief Valve

Spring Style Relief Valve

SPM® spring actuated relief valves are direct acting, relying on the system's hydraulic pressure to open when the preset force of the spring is exceeded. The 2" valve's operation is a simple balance between the spring loaded keeper which holds the ball in the seat and the inlet liquid pressure acting on the ball. The spring pressure is set by tightening the hex bolt on top which pushes on the keeper, and, in turn, compresses the Belleville springs that forces the keeper on the ball. When the inlet fluid pressure rises and overcomes the set spring pressure, the ball is lifted off its seat thereby discharging fluid through the outlet end. Once the pressure of the inlet fluid falls below the set spring pressure, the ball will be pushed back onto its seat and the fluid can pass downstream.

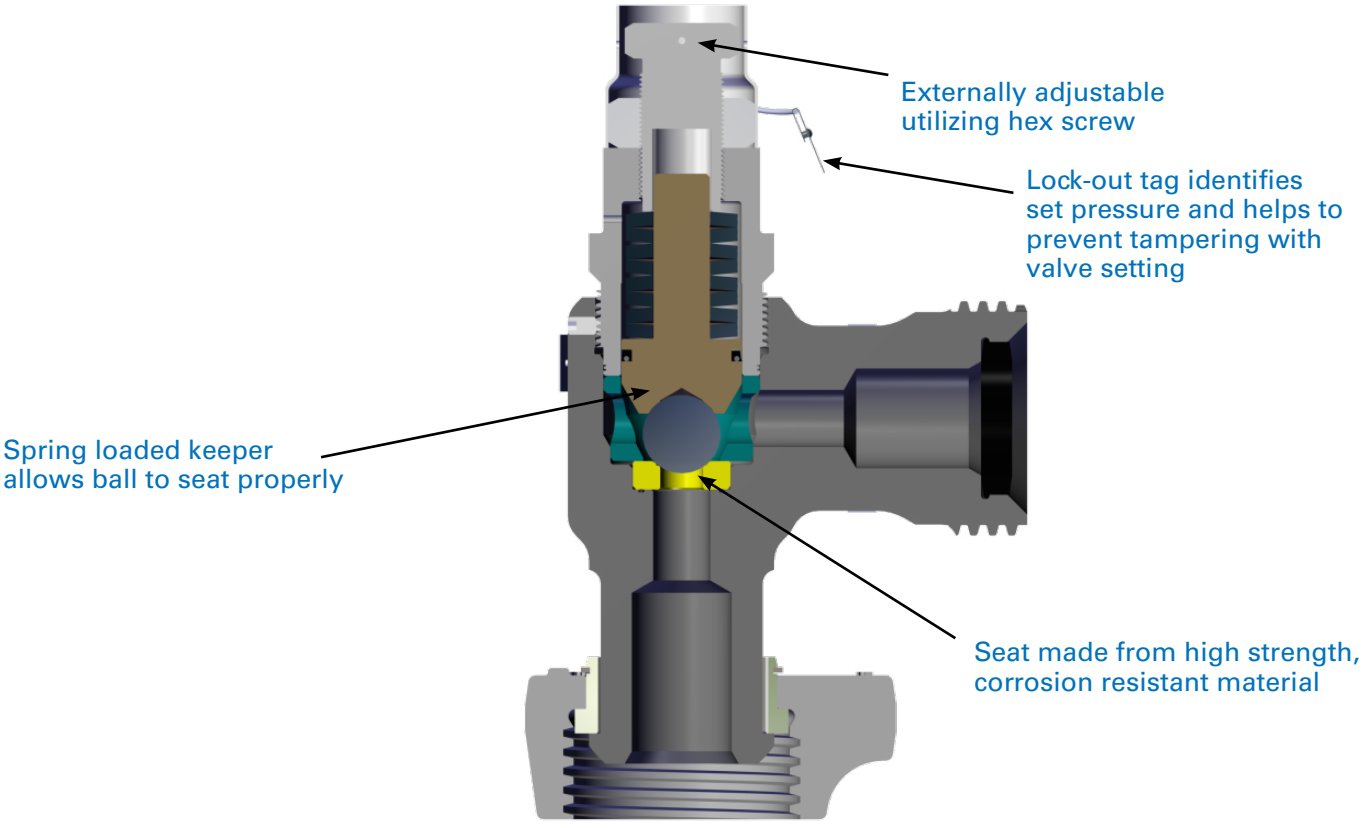
Weir offers multiple relief valve spring configurations, each optimized for a specific pressure range. Using a valve within the rated pressure range will likely achieve greater discharge capacity and improved repeatability. It is recommended that the valve is sized according to the maximum set pressure that may be required. This approach will help prevent the valve from being used at set pressures greater than the recommended value.

APPROXIMATE MAX DISCHARGE RATE FOR RELIEF VALVES:

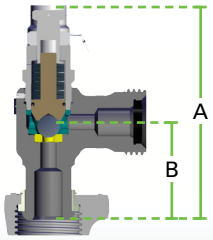
- 2" Spring - 150 GPM Max.
- 3" Spring - 430 GPM Max.

As discharge requirements increase, multiple valves may be preferred, and are permissible. Multiples of either size valve is allowed as long as the valves are all set within 10% of each other.

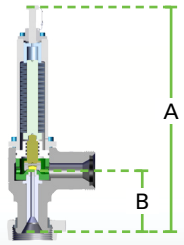
WARNING: This device is intended to discharge to atmospheric pressure when it relieves. It should not have its discharge port blocked or be subject to any back pressure while in the closed position. Failure to comply may lead to SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.



SPRING RELIEF VALVE SPECIFICATIONS



2" Spring Relief Valve



3" Spring Relief Valve

Size	Connection Type	Outlet / Branch Configuration	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Weight (lb / kg)	Parts Kits	Ball, Seat & Seal Kit	Gate, Nozzle & Seal Kit	Seal Kit
2"	Hammer Union	2" LPTL F Outlet	Low	Std.	2A18138	13.01 / 330.5	6.06 / 153.9	41 / 18.6	4L20418	4L18755		4L20423
2"	Hammer Union	2" 1502F Outlet	Low	Std.	2A18192	13.01 / 330.5	6.06 / 153.9	47 / 21.3	4L20418	4L18755		4L20423
2"	Hammer Union	2" 1502F Outlet	Low	H2S	2A18544	13.01 / 330.5	6.06 / 153.9	47 / 21.3	4L18755	4L20417		4L20424
2"	Hammer Union	2" 2002F Outlet	Low	Std.	2A18796	13.06 / 331.7	6.06 / 153.9	46 / 20.9	4L20422	4L19186		4L20426
3"	Hammer Union	3" 1502F Outlet	Low	Std.	2A22356	30.83 / 783.1	8.44 / 214.4	167 / 75.7	4L22486		4L22481	4L22482

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit:
  - 2"- ball, seat, spider, spring, seals, screw, nut
  - 3"- keeper, gate, nozzle, spider, seals
- Ball, Seat & Seal Kit: ball, seat, seal
- Gate, Nozzle & Seal Kit: gate, nozzle, seal
- Seal Kit: seals

Nitrogen Style Relief Valves

Weir will soon offer two styles of Nitrogen relief valves, the SPM® EXL backpressure valve and the SPM® full bore unloading valve. Compact and simple to operate, the valves are direct acting, relying on the system's hydraulic pressure to overcome a preset nitrogen gas force to relieve system pressure.

EXL Backpressure Relief Valve - Coming Soon!

The SPM® EXL backpressure relief valve is the next generation of nitrogen actuated relief valves. With its enhanced internal geometry, unique sealing components, and robust forging, the EXL back pressure relief valve can reduce safety risk for the operator while improving efficiencies through reduced downtime and lower maintenance costs. Unlike full open relief valves, which require a substantial pressure drop before reseating, this valve has the capability to reseat near the sequencing pressure. This, in turn, allows for uninterrupted pumping stages and equates to less downtime and improved production.

DESIGN FEATURES:

- Enhanced internal geometry results in reduced turbulence and sand accumulation in the valve
- Newly designed packing assembly and updated cylinder rod design improve sealing capabilities during normal cycling of the valve
- Threaded body to bonnet configuration incorporates a robust design margin to allow for safe operations in the event of an obstructed discharge port
- Support/transport stand available upon request

The SPM® EXL back pressure relief valve should be installed in a branch on the high-pressure treating line. It is recommended that the valve be placed downstream away from the high pressure pumps. This increased distance will reduce the likelihood of the valve seat experiencing "chatter" as a result of pulsation in the treating line. However, localized protection for pumps on site is permissible. Contact Weir for more information. The valve should be operated in the upright position. This will reduce the tendency for proppants to accumulate around the sealing area and potentially affect the sealing performance.

The approximate flow rate for the EXL relief valve is 2,000 GPM. This value is intended to be referenced for general sizing purposes. The actual discharge capacity is dependent on pressure differential and type of fluid media being discharged. Please contact Weir Engineering for specific information.

NOTE: The valve should be set at a minimum of 1,000 psi above system operating pressure.

WARNING: This device is intended to discharge to atmospheric pressure when it relieves. It should not have its discharge port blocked or be subject to any back pressure while in the closed position. Failure to comply may lead to SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.

Full Bore Unloading Valve

Unlike the EXL relief valve, the SPM® N2 full bore unloading valve operates as a dump valve, remaining open until the pump system is shut down and the valve is reset. It is recommended for those operators who want full system shutdown after an overpressure event has occurred.

By opening fully when sequenced, back pressure drops drastically once it opens. Consequently very large amounts of flow can pass through this valve. It is externally adjustable from a pressure of 1,000 psi to the maximum setting.

Relief Valves (continued)

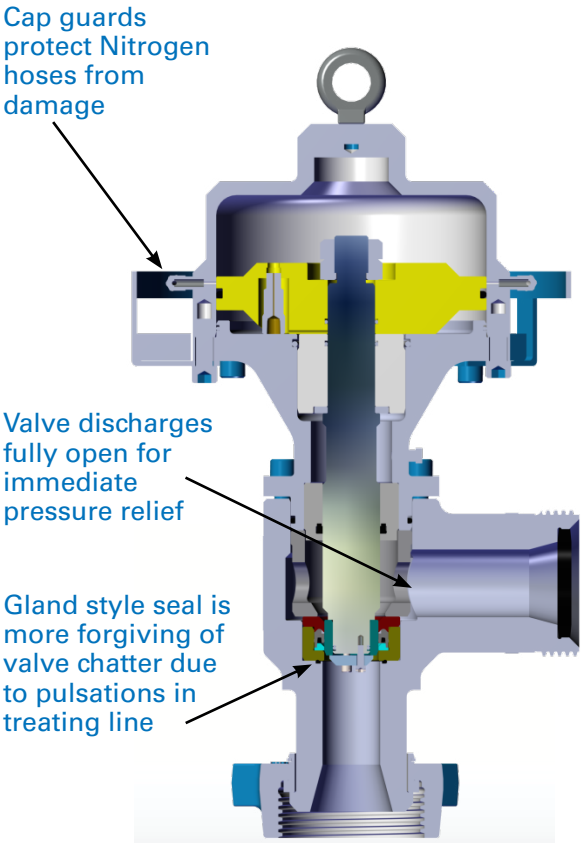
The low-pressure outlet is available with a female union connection. Conforming to conditions of design and performance in API RP520, the SPM® full bore unloading valve is intended for liquid service. The valve is best suited for over pressure protection in a "slick water" medium. However, it also works well in drilling mud applications.

It is recommended that the valve be placed downstream away from the high pressure pumps. This increased distance will reduce the likelihood of the valve seat experiencing "chatter." However, localized protection of pumps is permissible. It is recommended to operate the valve in the upright position. This will reduce the tendency for proppants to accumulate around the sealing area and potentially affect the sealing performance.

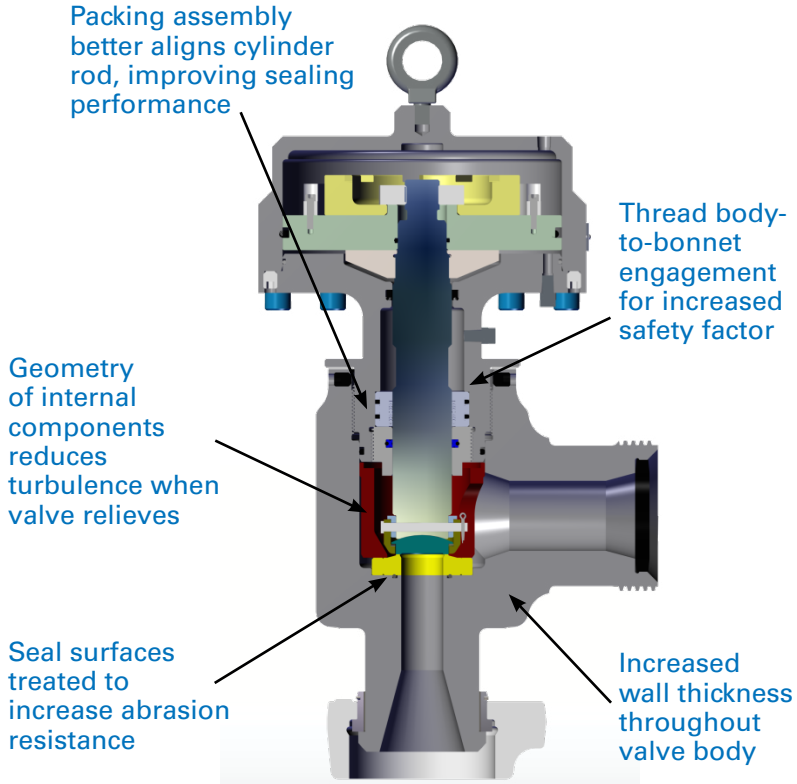
The approximate flow rate for the unloading relief valve is 2,000 GPM. This value is intended to be referenced for general sizing purposes. The actual discharge capacity is dependent on pressure differential and type of fluid media being discharged. Please contact Weir Engineering for specific information.

NOTE: The valve should be set at a minimum of 1,000 psi above system fluid pressure.

WARNING: This device is intended to discharge to atmospheric pressure when it relieves. It should not have its discharge port blocked or be subject to any back pressure while in the closed position. Failure to comply may lead to SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.

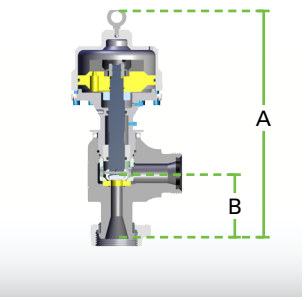


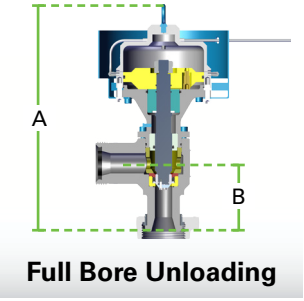
Full Bore Unloading Valve



EXL Back Pressure Relief Valve

NITROGEN RELIEF VALVE SPECIFICATIONS





Full Bore Unloading

Valve Type	Inlet Connection	Outlet / Branch Configuration	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Weight (lb / kg)	Parts Kits	Body Assy*
Nitrogen - Unloading	3" 1502M	3" 1502F	Low	Std.	1A23392	28.22 / 716.8	15.46 / 392.7	250 / 113.4	4L23547	4L24315
Nitrogen - EXL Back Pressure	3" 1502M	3" 1502F	Low	Std.	2A33687	29.21 / 741.9	14.31 / 363.5	231 / 104.8	2A37213	

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.
Note: Replacement body vessel tested before shipment.

KIT CONTENTS:

- Parts Kit (EXL Backpressure): gate, nozzle, bushing, wiper rod, springs, seals and pins
- Parts Kit (Unloading): wear sleeve, nozzle, cartridge, spider, sleeve, seals, backup rings

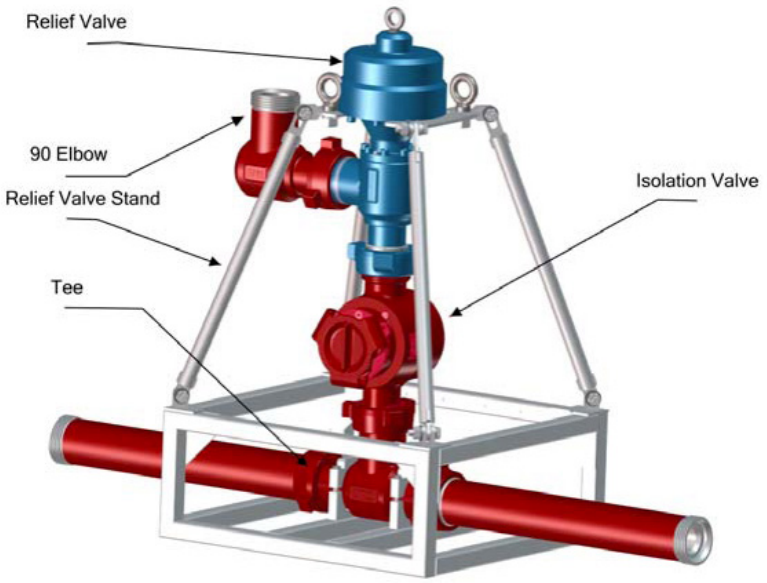
LEGACY BACKPRESSURE N2 VALVE

In order to continue to support the legacy SPM® nitrogen back pressure relief valves offered prior to the EXL valve, the below kit is still available.

Kit Type	Size	Part Number
Valve Assembly	3" 1502	1A23493LT
Parts Kit	3" 1502	4L24315

RELIEF VALVE STAND ASSEMBLIES

Weir recommends that all relief valve and isolation valve assemblies be supported by a self-enclosed portable structure that has been specifically engineered for the valve. Failure to comply with this requirement may expose adjacent union connections to excessive loading, resulting in potential premature failure and line separation, which may cause **SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.** SPM® relief valves are available with a supporting structure to decrease unnecessary loading on adjacent union connections.



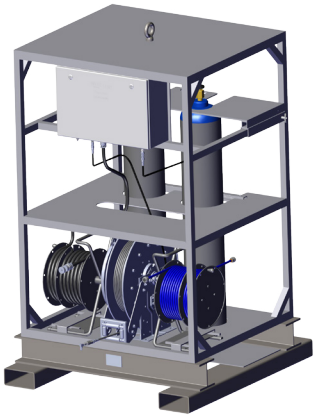
Common Installation Setup

Automated Relief Valve Control (A.R.C.) System

Enhanced relief valve performance through precise electronic calibration.

The SPM® Automated Relief Valve Control System, or A.R.C. System, provides accurate and convenient setting of the SPM® nitrogen relief valve offering. A touch screen panel, positioned away from the flow line, allows the operator to calibrate the system's set pop-off pressure safely and accurately, even while pumping operations are ongoing.

Available through the SPM® rental services of Weir Oil & Gas, the SPM® A.R.C. System may be paired with other SPM® safety products, such as the SPM® Flow Line Safety Restraint System, to provide an offering designed to protect against over pressure events and reduce the area of danger in the instance of a flow line failure.



Regulator Unit and Nitrogen Supply

User Interface

Transducer

SYSTEM BENEFITS:

- Significantly faster to calibrate versus mechanical regulators
- Improved setting accuracy reduces valve chattering, extending useful life of the relief valve
- Ability to recalibrate without full system shut down
- User interface located away from flow line
- Advance notice of low nitrogen pressure

DESIGN FEATURES:

- Warning and Alarm Indicators – the user interface displays visual indicators and has audible alarms for the following events:
  - Nitrogen input low
  - System pressure loss
  - Power loss
- Emergency shut down – at any time the emergency dump valve button can be pressed on the user interface to open the relief valve
- The control box contains three independent backup systems:
  - Power failure – a backup battery will operate the system. Power failure will trigger a flashing warning on the user panel. The backup battery system will provide roughly 30 minutes of operation. The battery system recharges itself after power is restored.
  - Failure of backup battery – control valves will default to open position causing the valve to open.
  - Failure of control valves – valve will open in standard mode at elevated pressure.
- Electronic components are UL listed and intrinsically safe

Ball Injectors

The SPM® Sur-Drop™ ball injector features a "Positive Feed System," resulting in a reliable feed and injection rate. SPM® ball Injectors are designed to support .88" – 1" balls, with a max carrying capacity of 130 balls. The two-piece screw assembly allows for more convenient replacement of the drive stem, without replacing the entire assembly.

Ball Injector Specifications

Size/ Pressure	Type	End Type	Temp	Service Type	Ball Size	Part Number	Weight (lb / kg)	Parts Kit
3" 1502	Remote Actuated - Electric	Male x Female	Std.	Std.	0.88 - 1.00 Diameter	2A28467	480 / 217.7	4L18114
3" 1502	Manual Actuated	Male x Female	Std.	Std.	0.88 - 1.00 Diameter	2A27422	372 / 168.7	4L18114
3" 1502	Manual Actuated	Male x Female	Low	Std.	0.88 - 1.00 Diameter	2A29763	372 / 168.7	4L18114
3" 1502	Manual Actuated	Male	Std.	Std.	0.88 - 1.00 Diameter	2A28452	248 / 112.5	4L18114

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

KIT CONTENTS:

- Parts Kit: screw, seals, bearing, snap rings, pins, backup ring

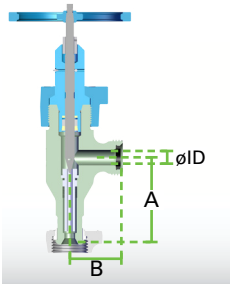
Chokes

SPM® adjustable and positive choke valves provide flow restriction in high pressure applications such as choke manifolds, flow through manifolds, and test manifolds. The SPM® choke valve restricts the flow by reducing the flow area through the valve body to achieve a desired rate. 2" 1502 choke valves have a maximum orifice size of 1" while 3" 1502 choke valves have a maximum orifice size of 2".

Adjustable choke valves use a stem and seat combination to control the flow rate. The desired flow rate is adjusted by turning the hand wheel to achieve a calibrated orifice size and associated flow coefficient. The orifice size is read from an indicator which is calibrated in 1/64" increments and is lined up with a V-notch machined into the top of the bonnet.

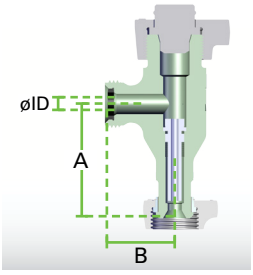
Positive choke valves provide a fixed flow rate through the use of a choke bean. The flow rate is controlled by the choke bean orifice size.

Choke Specifications



ADJUSTABLE CHOKES

End Type	Style	Connection Type	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)
2" 1502F x 2" 1502M	0.75 Seat	Hammer Union	Low	Std.	2A18156-0.75	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	150 / 68
2" 1502F x 2" 1502M	0.75 Seat	Hammer Union	Low	H2S	2A19461-0.75	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	150 / 68
2" 1502M x 2" 1502F	0.75 Seat	Hammer Union	Low	Std.	2A18158-0.75	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	150 / 68
2" 1502F x 2" 1502F	0.75 Seat	Hammer Union	Low	Std.	2A18159-0.75	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	142 / 64.4
2" 1502F x 2" 1502M	1.00 Seat	Hammer Union	Low	Std.	2A18156-1.00	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	150 / 68
2" 1502F x 2" 1502M	1.00 Seat	Hammer Union	Low	H2S	2A19461-1.00	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	150 / 68
2" 1502M x 2" 1502M	1.00 Seat	Hammer Union	Low	Std.	2A18157-1.00	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	148 / 67.1
2" 1502M x 2" 1502F	1.00 Seat	Hammer Union	Low	Std.	2A18158-1.00	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	150 / 68
3" 1502F x 3" 1502M	2.00 Seat	Hammer Union	Low	Std.	2A21253	11.88 / 301.8	8.38 / 212.9	2.50 / 63.5	205 / 93
3" 1502F x 3" 1502M	2.00 Seat	Hammer Union	Low	H2S	2A23122	11.88 / 301.8	8.38 / 212.9	2.50 / 63.5	205 / 93



POSITIVE CHOKES

End Type	Style	Connection Type	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)
2" 1502M x 2" 1502F	w/o Bean	Hammer Union	Low	Std.	2A18160	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	113 / 51.3
2" 1502M x 2" 1502F	0.75 Seat	Hammer Union	Low	Std.	2A18160-0.75	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	113 / 51.3
2" 15K SI x 2" 15K SI	w/o Bean	Safety Iron®	Low	Std.	2A27968	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	109 / 49.4
2" 1502M x 2" 1502F	w/o Bean	Hammer Union	Low	H2S	2A22016	9.91 / 251.7	6.06 / 153.9	1.75 / 44.5	113 / 51.3

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

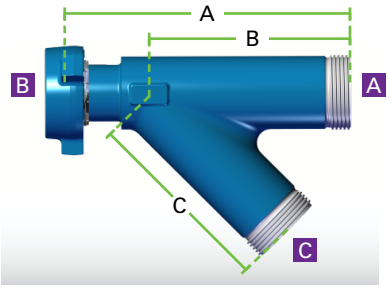
Integral Connections and Pipe

Integrals

Weir manufactures a full line of robust, high-pressure integral union connections in a broad range of configurations and sizes from 2" through 4" and in pressure ratings to 15,000 psi NSCWP. Manufactured from high strength alloy steel forgings, SPM® integral union connections are available in lateral, tee, wye, ell and cross configurations.

Laterals

NOTE: The branch configuration as described below corresponds with the branch labels in this illustration.



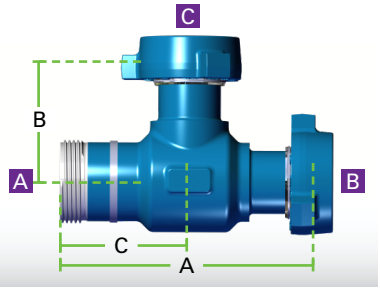
Branch Configuration A	Branch Configuration B	Branch Configuration C	Temp	Service Type	Part Number	Dim. A (in/mm)	Dim. B (in/mm)	Dim. C (in/mm)	Inner Dia. (in / mm)	Weight (lb)
2" 1502F	2" 1502M	2" 1502F	Low	Std.	3L11611	15.75 / 400.1	9.87 / 250.7	9.87 / 250.70	1.75 / 44.5	51
2" 1502M	2" 1502F	2" 1502F	Low	Std.	3L14032	15.75 / 400.1	9.87 / 250.7	9.87 / 250.70	1.75 / 44.5	51
2" 1502M	2" 1502F	2" 1502M	Low	Std.	3A22184	15.75 / 400.1	9.87 / 250.7	9.87 / 250.70	1.75 / 44.5	60
3" 1502F	3" 1502M	3" 1502F	Low	Std.	3L11613	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	2.50 / 63.5	150
3" 1502M	3" 1502F	3" 1502F	Low	Std.	3A20010	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	2.50 / 63.5	150
3" 1502M	3" 1502F	3" 1502M	Low	Std.	3A16949	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	2.50 / 63.5	157
3" 15K SI	3" 15K SI	3" 15K SI	Low	Std.	2A27834	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	2.50 / 63.5	140
4" 1002F	4" 1002M	3" 1502F	Low	Std.	3A21270	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	3.75 x 2.50 / 95.3 x 63.5	131
4" 1002F	4" 1002M	4" 1002F	Low	Std.	3L12998	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	3.75 / 95.3	115
4" 1002M	4" 1002F	4" 1002F	Low	Std.	3L14670	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	3.75 / 95.3	115
4" 1002M	4" 1002F	4" 1002M	Low	Std.	2A26157	21.00 / 533.4	14.50 / 368.3	14.00 / 355.6	3.75 / 95.3	130
4" 1502F	4" 1502M	3" 1502F	Low	Std.	2A26756	23.75 / 603.3	15.88 / 403.4	15.88 / 403.4	3.75 x 2.50 / 95.3 x 63.5	221
4" 1502F	4" 1502M	4" 1502F	Low	Std.	2A21296	23.75 / 603.3	15.88 / 403.4	15.88 / 403.4	3.75 / 95.3	204
4" 15K SI	4" 1502F	3" 1502F	Low	Std.	2A28663	23.75 / 603.3	15.88 / 403.4	15.88 / 403.4	4.00 x 2.75 / 101.6 x 69.9	187
4" 15K SI	4" 15K SI	3" 1502F	Low	Std.	2A29848	23.75 / 603.3	15.88 / 403.4	15.88 / 403.4	4.00 x 2.75 / 101.6 x 69.9	198
4" 15K SI	4" 15K SI	3" 15K SI	Low	Std.	2A29419	23.75 / 603.3	15.88 / 403.4	15.88 / 403.4	4.00 x 3.00 / 101.6 x 76.2	194
4" 15K SI	4" 15K SI	4" 15K SI	Low	Std.	2A28635	23.75 / 603.3	15.88 / 403.4	15.88 / 403.4	4.00 / 101.6	191

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Integral Connections and Pipe (continued)

Tees

NOTE: The branch configuration as described below corresponds with the branch labels in this illustration.



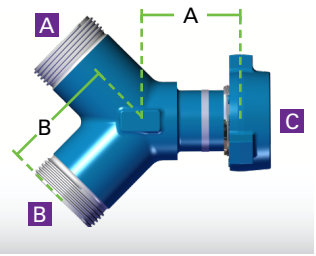
Branch Configuration A	Branch Configuration B	Branch Configuration C	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Dim. C (in / mm)	Horz ID (in / mm)	Vert ID (in / mm)	Weight (lb / kg)
2″ 1502F	2″ 1502F	2″ 1502F	Low	Std.	2A13794	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	35 / 15.9
2″ 1502F	2″ 1502F	2″ 1502M	Low	Std.	3L13150	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	43 / 19.5
2″ 1502F	2″ 1502M	2″ 1502F	Low	H2S	2A16768	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	43 / 19.5
2″ 1502F	2″ 1502M	2″ 1502F	Low	Std.	3L11592	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	44 / 20
2″ 1502F	2″ 1502M	2″ 1502M	Low	Std.	3L13230	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	54 / 24.5
2″ 1502F	2″ 1502M	2″ 1502M	Low	H2S	2A16770	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	54 / 24.5
2″ 1502M	2″ 1502M	2″ 1502F	Low	Std.	3L13229	6.06 / 153.9	12.13 / 308.1	6.06 / 153.9	1.75 / 44.5	1.75 / 44.5	53 / 24
3″ 1502F	3″ 1502M	2″ 1502F	Low	Std.	3L11593	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	2.50 / 63.5	1.75 / 44.5	122 / 55.3
3″ 1502F	3″ 1502M	3″ 1502F	Low	Std.	3L11594	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	2.50 / 63.5	2.50 / 63.5	120 / 54.4
3″ 1502F	3″ 1502M	3″ 1502M	Low	Std.	3L19916	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	2.50 / 63.5	2.50 / 63.5	128 / 58.1
3″ 1502F	3″ 1502M	3″ 1502M	Low	H2S	3L16702	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	2.50 / 63.5	2.50 / 63.5	128 / 58.1
3″ 1502M	3″ 1502M	3″ 1502M	Low	Std.	3L11599	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	2.50 / 63.5	2.50 / 63.5	136 / 61.7
3″ 15K SI	3″ 15K SI	2″ 1502F	Low	Std.	2A27997	8.38 / 212.9	16.75 / 425.5	8.44 / 214.4	2.50 / 63.5	1.75 / 44.5	111 / 50.3
3″ 15K SI	3″ 15K SI	3″ 1502F	Low	Std.	2A27998	8.38 / 212.9	16.75 / 425.5	8.44 / 214.4	2.50 / 63.5	2.50 / 63.5	110 / 49.9
3″ 15K SI	3″ 15K SI	3″ 1502F	Low	Std.	2A28745	8.38 / 212.9	16.75 / 425.5	8.44 / 214.4	3.00 / 76.2	2.75 / 69.8	100 / 43.4
3″ 15K SI	3″ 15K SI	3″ 15K SI	Low	Std.	2A27809	8.38 / 212.9	16.75 / 425.5	8.38 / 212.9	2.50 / 63.5	2.50 / 63.5	109 / 49.4
4″ 1002F	4″ 1002M	3″ 1502F	Low	Std.	3L12827	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	3.75 / 95.3	2.50 / 63.5	108 / 49
4″ 1002F	4″ 1002M	4″ 1002F	Low	Std.	3L12826	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	3.75 / 95.3	3.75 / 95.3	105 / 47.6
4″ 1002F	4″ 1002M	4″ 1002M	Low	Std.	2A28544	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	3.75 / 95.3	3.75 / 95.3	117 / 53.1
4″ 1002M	4″ 1002F	2″ 1502F	Low	Std.	3A19580	8.44 / 214.4	16.88 / 428.8	8.44 / 214.4	3.75 / 95.3	1.75 / 44.5	108 / 49
4″ 10K SI	4″ 10K SI	3″ 1502F	Low	Std.	2A28002	8.38 / 212.9	16.75 / 425.5	8.44 / 214.4	3.75 / 95.3	2.50 / 63.5	93 / 42.2
4″ 1502F	4″ 1502M	2″ 1502F	Low	Std.	2A26065	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	3.75 / 95.3	1.75 / 44.5	218 / 98.9
4″ 1502F	4″ 1502M	3″ 1502F	Low	Std.	2A25853	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	3.75 / 95.3	2.50 / 63.5	214 / 97.1
4″ 1502F	4″ 1502M	3″ 15K SI	Low	Std.	2A28481	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	3.75 / 95.3	2.75 / 69.8	212 / 96.2
4″ 1502F	4″ 1502M	4″ 1502F	Low	Std.	2A25990	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	3.75 / 95.3	3.75 / 95.3	208 / 94
4″ 1502F	4″ 1502M	4″ 1502M	Low	Std.	2A24928	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	3.75 / 95.3	3.75 / 95.3	239 / 108.4
4″ 1502M	4″ 1502M	4″ 1502F	Low	Std.	2A29970	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	3.75 / 95.3	3.75 / 95.3	239 / 108.4
4″ 15K SI	4″ 15K SI	3″ 1502F	Low	Std.	2A28004	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	4.00 / 101.6	2.50 / 63.5	200 / 90.7
4″ 15K SI	4″ 15K SI	3″ 1502M	Low	Std.	2A28667	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	4.00 / 101.6	2.50 / 63.5	202 / 91.6
4″ 15K SI	4″ 15K SI	3″ 15K SI	Low	Std.	2A27811	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	4.00 / 101.6	2.50 / 63.5	197 / 89.4
4″ 15K SI	4″ 15K SI	4″ 15K SI	Low	Std.	2A28140	10.50 / 266.7	21.00 / 533.4	10.50 / 266.7	4.00 / 101.6	4.00 / 101.6	198 / 89.8

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Integral Connections and Pipe (continued)

Wyes

NOTE: The branch configuration as described below corresponds with the branch labels in this illustration.

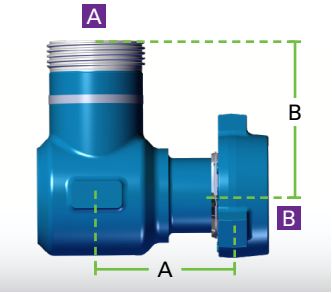


Branch Configuration A	Branch Configuration B	Branch Configuration C	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)
2″ 1502F	2″ 1502F	2″ 1502M	Low	Std.	3L13139	5.25 / 133.4	5.00 / 127	1.75 / 44.5	36 / 16.3
2″ 1502F	2″ 1502F	2″ 1502M	Low	H2S	3A20226	5.25 / 133.4	5.00 / 127	1.75 / 44.5	36 / 16.3
3″ 1502F	3″ 1502F	3″ 1502M	Low	Std.	2L14419	7.75 / 196.9	7.50 / 190.5	2.50 / 63.5	96 / 43.5
4″ 1002F	4″ 1002F	4″ 1002M	Low	Std.	3L13141	7.75 / 196.9	7.47 / 189.7	3.75 / 95.3	82 / 37.2

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Ells

NOTE: The branch configuration as described below corresponds with the branch labels in this illustration.



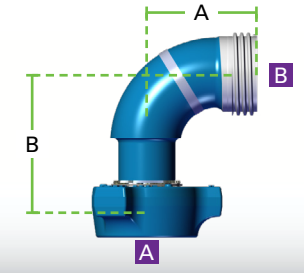
90 DEGREE ELLS

Branch Configuration A	Branch Configuration B	Temp	Service Type	Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)
2″ 1502F	2″ 1502M	Low	Std.	Standard	3L13234	6.06 / 153.9	6.06 / 153.9	1.75 / 44.5	38 / 17.2
2″ 1502F	2″ 1502M	Low	H2S	Standard	2A21068	6.06 / 153.9	6.06 / 153.9	1.75 / 44.5	38 / 17.2
2″ 1502F	2″ 1502M	Low	Std.	Target	2A25338	6.06 / 153.9	6.06 / 153.9	1.75 / 44.5	38 / 17.2
2″ 1502F	2″ 1502M	Low	H2S	Target	2A25339	6.06 / 153.9	6.06 / 153.9	1.75 / 44.5	38 / 17.2
2″ 1502M	2″ 1502F	Low	Std.	45 Degree	3A20075	5.25 / 133.4	5.00 / 127	1.75 / 44.5	32 / 14.5
2″ 1502M	2″ 1502M	Low	Std.	Standard	3L14476	6.06 / 153.9	6.06 / 153.9	1.75 / 44.5	38 / 17.2
3″ 1502F	3″ 1502M	Low	Std.	Standard	3L14591	8.44 / 214.4	8.44 / 214.4	2.50 / 63.5	103 / 46.7
3″ 1502M	3″ 1502F	Low	Std.	45 Degree	1A24627	7.94 / 201.7	7.69 / 195.3	2.50 / 63.5	89 / 40.4
3″ 1502M	3″ 1502F	Low	Std.	Target	2A26013	8.44 / 214.4	8.44 / 214.4	2.50 / 63.5	90 / 40.8
3″ 15K SI	2″ 15K SI	Low	Std.	Standard	2A28724	8.44 / 214.4	8.38 / 212.9	1.88 / 47.8	94 / 42.6
3″ 15K SI	3″ 15K SI	Low	Std.	Standard	2A27838	8.38 / 212.9	8.38 / 212.9	2.50 / 63.5	97 / 44
4″ 1002F	4″ 1002M	Low	Std.	Standard	3L14430	8.44 / 214.4	8.44 / 214.4	3.75 / 95.3	95 / 43.1

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Ells (continued)

NOTE: The branch configuration as described below corresponds with the branch labels in this illustration.



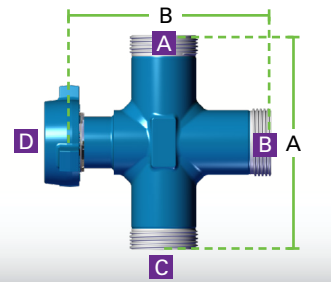
LONG RADIUS ELLS

Branch Configuration A	Branch Configuration B	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)
2″ 1502F	2″ 1502M	Low	Std.	3A20534	5.50 / 139.7	7.16 / 181.9	1.83 / 46.5	32 / 14.5
2″ 1502F	2″ 1502M	Low	H2S	3A20535	5.50 / 139.7	7.16 / 181.9	1.83 / 46.5	32 / 14.5

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Crosses

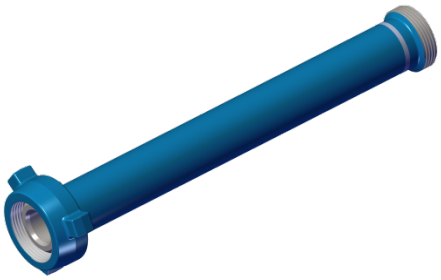
NOTE: The branch configuration as described below corresponds with the branch labels in this illustration.



Branch Configuration A	Branch Configuration B	Branch Configuration C	Branch Configuration D	Temp	Service Type	Part Number	Dim. A (in / mm)	Dim. B (in / mm)	Inner Dia. (in / mm)	Weight (lb / kg)
2″ 1502F	2″ 1502F	2″ 1502M	2″ 1502F	Low	Std.	3L11607	12.13 / 308.1	12.13 / 308.1	1.75 / 44.5	50 / 22.7
2″ 1502F	2″ 1502M	2″ 1502M	2″ 1502M	Low	Std.	1A19904	12.13 / 308.1	12.13 / 308.1	1.75 / 44.5	68 / 30.8
3″ 1502F	3″ 1502F	3″ 1502M	3″ 1502F	Low	Std.	3L11608	16.88 / 428.8	16.88 / 428.8	2.50 / 63.5	139 / 63
3″ 15K SI	3″ 15K SI	3″ 15K SI	2″ 1502F	Low	Std.	2A29497	16.75 / 425.5	16.81 / 427	2.50 x 1.75 / 63.5 x 44.5	128 / 58.1
4″ 1002F	4″ 1002M	4″ 1002M	4″ 1002F	Low	Std.	3A22179	16.88 / 428.8	16.88 / 428.8	3.75 / 95.3	128 / 58.1
4″ 15K SI	4″ 15K SI	4″ 15K SI	4″ 15K SI	Low	Std.	2P32585	16.00 / 406.4	21.00 / 533.4	4.00 / 101.6	309 / 140.2

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

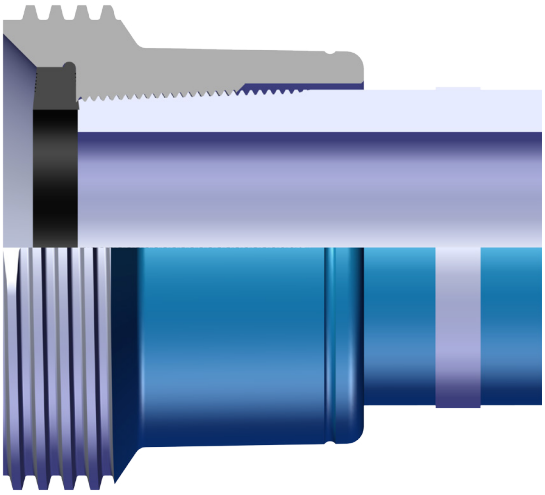
Pipe



Weir offers pipe in both non-pressure seal (NPS) and integral styles. Sizes available may vary by style but Weir provides pipe in many lengths up to 180". Contact Weir for specific non-standard lengths.

NPS Pipe

Weir offers NPS pipe in sizes 2" 1502, 3" 1502, and 4" 1002 configurations. In applications involving strong cyclic loading, though, Weir recommends the use of integral pipe. SPM® NPS pipe includes an identification groove on all non-pressure seal threaded (NPS) subs per API RP-7HU1.



DESIGN SPECIFICATIONS:

- Elastomer seal protects the threads from exposure to the high pressure fluid, allowing for greater working pressure ratings
- Threaded sub incorporates epoxy for a permanent assembly bond
- Threaded tubing is flush with the seal pocket

TOLERANCES:

- Tolerance of the face to face length of NPS pipe:
  - 2" 1502 - +/-.72"
  - 3" 1502 - +/-.72"
  - 4" 1002 - +/-.72"

Integral Connections and Pipe (continued)

2" 1502 NPS PIPE

Style	Length	Connection Type	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
Non-Detachable	24"	Hammer Union	Low	Std.	2A12519	1.75 / 44.5	31 / 14.1
Non-Detachable	36"	Hammer Union	Low	H2S	2A12521	1.75 / 44.5	38 / 17.2
Non-Detachable	48"	Hammer Union	Low	Std.	2A12525	1.75 / 44.5	45 / 20.4
Non-Detachable	60"	Hammer Union	Low	H2S	2A12526	1.75 / 44.5	52 / 23.6
Non-Detachable	72"	Hammer Union	Low	Std.	2A12527	1.75 / 44.5	59 / 26.8
Non-Detachable	96"	Hammer Union	Low	Std.	2A12528	1.75 / 44.5	72 / 32.7
Non-Detachable	120"	Hammer Union	Low	Std.	2A12530	1.75 / 44.5	86 / 39
Detachable - Shoulder	24"	Hammer Union	Low	Std.	2A22811	1.75 / 44.5	31 / 14.1
Detachable - Shoulder	36"	Hammer Union	Low	Std.	2A22766	1.75 / 44.5	38 / 17.2
Detachable - Shoulder	48"	Hammer Union	Low	Std.	2A22812	1.75 / 44.5	45 / 20.4
Detachable - Shoulder	60"	Hammer Union	Low	Std.	2A22813	1.75 / 44.5	52 / 23.6
Detachable - Shoulder	72"	Hammer Union	Low	Std.	2A22814	1.75 / 44.5	59 / 26.8
Detachable - Shoulder	96"	Hammer Union	Low	Std.	2A22815	1.75 / 44.5	73 / 33.1
Detachable - Shoulder	120"	Hammer Union	Low	Std.	2A22816	1.75 / 44.5	86 / 39
Safety Iron®	24"	Safety Iron®	Low	Std.	2A27959	1.75 / 44.5	22 / 10
Safety Iron®	48"	Safety Iron®	Low	Std.	2A27960	1.75 / 44.5	35 / 15.9
Safety Iron®	60"	Safety Iron®	Low	Std.	2A27961	1.75 / 44.5	42 / 19.1

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

3" 1502 NPS PIPE

Style	Length	Connection Type	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
Non-Detachable	24"	Hammer Union	Low	Std.	2A12554	2.56 / 65	57 / 25.9
Non-Detachable	36"	Hammer Union	Low	H2S	2A12556	2.56 / 65	72 / 32.7
Non-Detachable	48"	Hammer Union	Low	Std.	2A12559	2.56 / 65	87 / 39.5
Non-Detachable	60"	Hammer Union	Low	H2S	2A12562	2.56 / 65	103 / 46.7
Non-Detachable	72"	Hammer Union	Low	Std.	2A12563	2.56 / 65	118 / 53.5
Non-Detachable	96"	Hammer Union	Low	Std.	2A12565	2.56 / 65	148 / 67.1
Non-Detachable	120"	Hammer Union	Low	Std.	2A12568	2.56 / 65	178 / 80.7
Detachable - Shoulder	24"	Hammer Union	Low	Std.	2A22820	2.56 / 65	57 / 25.9
Detachable - Shoulder	36"	Hammer Union	Low	Std.	2A22768	2.56 / 65	72 / 32.7
Detachable - Shoulder	48"	Hammer Union	Low	Std.	2A22821	2.56 / 65	87 / 39.5
Detachable - Shoulder	60"	Hammer Union	Low	Std.	2A22822	2.56 / 65	102 / 46.3
Detachable - Shoulder	72"	Hammer Union	Low	Std.	2A22823	2.56 / 65	118 / 53.5
Detachable - Shoulder	96"	Hammer Union	Low	Std.	2A22824	2.56 / 65	148 / 67.1
Detachable - Shoulder	120"	Hammer Union	Low	Std.	2A22825	2.56 / 65	178 / 80.7
Safety Iron®	24"	Safety Iron®	Low	Std.	2A27928	2.56 / 65	46 / 20.9
Safety Iron®	36"	Safety Iron®	Low	Std.	2A27930	2.56 / 65	62 / 28.1
Safety Iron®	48"	Safety Iron®	Low	Std.	2A27931	2.56 / 65	77 / 34.9
Safety Iron®	60"	Safety Iron®	Low	Std.	2A27934	2.56 / 65	92 / 41.7
Safety Iron®	72"	Safety Iron®	Low	Std.	2A27936	2.56 / 65	107 / 48.5
Safety Iron®	96"	Safety Iron®	Low	Std.	2A27938	2.56 / 65	137 / 62.1
Safety Iron®	120"	Safety Iron®	Low	Std.	2A27939	2.56 / 65	168 / 76.2

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

4” 1002 NPS PIPE

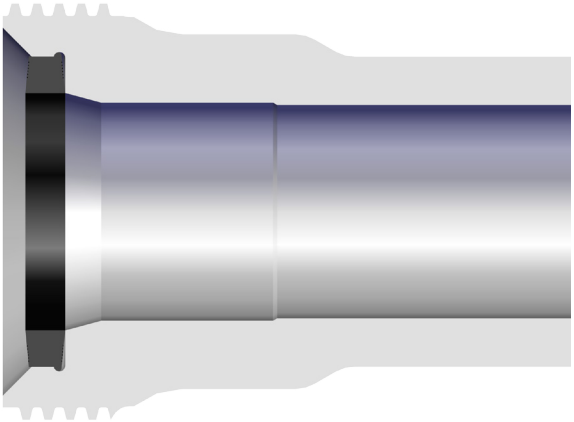
Style	Length	Connection Type	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
Non-Detachable	24"	Hammer Union	Low	Std.	2A28239	3.65 / 92.7	63 / 28.6
Non-Detachable	36"	Hammer Union	Low	H2S	2A28240	3.65 / 92.7	82 / 37.2
Non-Detachable	48"	Hammer Union	Low	Std.	2A28243	3.65 / 92.7	100 / 43.4
Non-Detachable	60"	Hammer Union	Low	H2S	2A28245	3.65 / 92.7	119 / 54
Non-Detachable	72"	Hammer Union	Low	Std.	2A28246	3.65 / 92.7	137 / 62.1
Non-Detachable	96"	Hammer Union	Low	Std.	2A28251	3.65 / 92.7	174 / 78.9
Non-Detachable	120"	Hammer Union	Low	Std.	2A28254	3.65 / 92.7	211 / 95.7
Detachable - Shoulder	24"	Hammer Union	Low	Std.	2A28881	3.65 / 92.7	67 / 30.4
Detachable - Shoulder	36"	Hammer Union	Low	Std.	2A28882	3.65 / 92.7	85 / 38.6
Detachable - Shoulder	48"	Hammer Union	Low	Std.	2A28883	3.65 / 92.7	104 / 47.2
Detachable - Shoulder	72"	Hammer Union	Low	Std.	2A28886	3.65 / 92.7	140 / 63.5
Detachable - Shoulder	96"	Hammer Union	Low	Std.	2A28887	3.65 / 92.7	177 / 80.3
Detachable - Shoulder	120"	Hammer Union	Low	Std.	2A28888	3.65 / 92.7	214 / 97.1
Safety Iron®	24"	Safety Iron®	Low	Std.	2A29648	3.65 / 92.7	54 / 24.5
Safety Iron®	36"	Safety Iron®	Low	Std.	2A29651	3.65 / 92.7	73 / 33.1
Safety Iron®	48"	Safety Iron®	Low	Std.	2A29653	3.65 / 92.7	91 / 41.3
Safety Iron®	60"	Safety Iron®	Low	Std.	2A29654	3.65 / 92.7	110 / 49.9
Safety Iron®	72"	Safety Iron®	Low	Std.	2A29656	3.65 / 92.7	128 / 58.1
Safety Iron®	96"	Safety Iron®	Low	Std.	2A29659	3.65 / 92.7	165 / 74.8
Safety Iron®	120"	Safety Iron®	Low	Std.	2A29660	3.65 / 92.7	202 / 91.6

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Integral Pipe and Crossovers

Weir offers robust integral pipe in sizes 2″ through 4″ in pressure ratings to 15,000 psi NSCWP. Integral pipe is recommended for use in applications where strong cyclic loading is possible. SPM® integral pipe is available in standard length pup joints in 2″ and 3″ 1502 configurations, or custom length long-crossovers in 2″ through 4″ 1502 and 4″ 1002 configurations.

PUP JOINTS



DESIGN SPECIFICATIONS:

- Single piece of forged metal with machined hammer union or Safety Iron® connections (no subs)
- Forged surface on O.D.
- Available in standard lengths only

TOLERANCES:

- Tolerance of the face to face length of integral pup joints:
  - 2″ 1502 - +/-.25″
  - 3″ 1502 - +/-.25″

2″ 1502 PUP JOINTS

Length	Connection Type	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
24"	Hammer Union	Low	Standard	2A38920	1.75 / 44.5	34 / 15.4
36"	Hammer Union	Low	Standard	2A38921	1.75 / 44.5	42 / 19.1
48"	Hammer Union	Low	Standard	2A19448	1.75 / 44.5	50 / 22.7
48"	Safety Iron®	Low	Standard	2A27947	1.75 / 44.5	30 / 13.6
48"	Hammer Union	Low	H2S	2A19453	1.75 / 44.5	50 / 22.7
60"	Hammer Union	Low	Standard	2A20387	1.75 / 44.5	60 / 27.2
60"	Hammer Union	Low	H2S	2A22081	1.75 / 44.5	60 / 27.2
72"	Hammer Union	Low	Standard	2A19859	1.75 / 44.5	71 / 32.2
72"	Hammer Union	Low	H2S	2A19856	1.75 / 44.5	71 / 32.2
90"	Hammer Union	Low	Standard	2A19449	1.75 / 44.5	80 / 36.3
90"	Hammer Union	Low	H2S	2A19454	1.75 / 44.5	80 / 36.3
114"	Hammer Union	Low	Standard	2A19861	1.75 / 44.5	98 / 44.5
114"	Hammer Union	Low	H2S	2A19858	1.75 / 44.5	98 / 44.5

Note: Other parts or configurations may be available. Contact Weir for specific details.

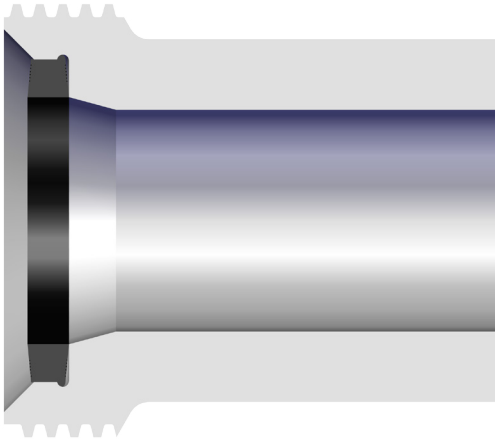
Integral Connections and Pipe (continued)

3″ 1502 PUP JOINTS

Length	Connection Type	End Configuration	Temp	Standard	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
24"	Hammer Union		Low	Standard	2A38935	2.75 / 69.8	69 / 31.3
36"	Hammer Union		Low	Standard	2A38936	2.75 / 69.8	91 / 41.3
48"	Hammer Union		Low	Standard	2A20522	2.75 / 69.8	113 / 51.3
48"	Mix	3″ 15K SI x 3″ 1502F	Low	Standard	2A28216	2.75 / 69.8	100 / 43.4
48"	Mix	3″ 15K SI x 3″ 1502M	Low	Standard	2A28179	2.75 / 69.8	97 / 44
48"	Safety Iron®		Low	Standard	2A27906	2.75 / 69.8	100 / 43.4
48"	Hammer Union		Low	H2S	2A20527	2.75 / 69.8	113 / 51.3
60"	Hammer Union		Low	Standard	2A24677	2.75 / 69.8	136 / 61.7
60"	Safety Iron®		Low	Standard	2A27907	2.75 / 69.8	123 / 55.8
60"	Mix	3″ 15K SI x 3″ 1502M	Low	Standard	2A28180	2.75 / 69.8	136 / 61.7
60"	Hammer Union		Low	H2S	2A22596	2.75 / 69.8	136 / 61.7
72"	Hammer Union		Low	Standard	2A20523	2.75 / 69.8	158 / 71.7
72"	Mix	3″ 15K SI x 3″ 1502M	Low	Standard	2A28181	2.75 / 69.8	158 / 71.7
72"	Mix	3″ 15K SI x 3″ 1502F	Low	Standard	2A28196	2.75 / 69.8	123 / 55.8
72"	Hammer Union		Low	H2S	2A20528	2.75 / 69.8	158 / 71.7
90"	Hammer Union		Low	Standard	2A20524	2.75 / 69.8	191 / 86.6
90"	Safety Iron®		Low	Standard	2A27909	2.75 / 69.8	179 / 81.2
114"	Hammer Union		Low	Standard	2A20526	2.75 / 69.8	237 / 107.5
114"	Hammer Union		Low	H2S	2A20531	2.75 / 69.8	237 / 107.5

Note: Other parts or configurations may be available. Contact Weir for specific details.

INTEGRAL CROSSOVERS:



DESIGN SPECIFICATIONS:

- Single piece of forged metal with machined hammer union or Safety Iron® connections (no subs)
- Machined surface on O.D.
- Custom lengths available

TOLERANCES:

- Tolerance of the face to face length of integral crossovers:

– 2″ 1502 <24″ length: +/-.03″
– 2″ 1502 >24″ length: +/-.06″
– 3″ 1502 <24″ length: +/-.03″
– 3″ 1502 >24″ length: +/-.06″
– 4″ 1002 <24″ length: +/-.03″
– 4″ 1002 >24″ length: +/-.06″
– 4″ 1502 <24″ length: +/-.03″
– 4″ 1502 >24″ length: +/-.06″

SHORT CROSSOVERS (UNDER 24″)

Outlet / Branch Configuration	Length	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
2″ 1502F x 2″ 1502F	7"	Low	Standard	2P10026	1.75 / 44.5	16 / 7.3
2″ 1502M x 2″ 1502F	7"	Low	Standard	3A22139	1.75 / 44.5	22 / 10
2″ 1502M x 2″ 1502M	7"	Low	Standard	3L11571	1.75 / 44.5	32 / 14.5
2″ 1502M x 3″ 1502F	7"	Low	Standard	3A20090	1.75 / 44.5	30 / 13.6
2″ 1502M x 3″ 1502M	7"	Low	Standard	3A20088	1.75 / 44.5	42 / 19.1
3″ 1502M x 2″ 1502F	5.62"	Low	Standard	3A20089	1.75 / 44.5	32 / 14.5
3″ 1502M x 3″ 1502M	7"	Low	Standard	3A20576	2.50 / 63.5	50 / 22.7
3″ 1502M x 4″ 1502F	7"	Low	Standard	2A28957	2.50 / 63.5	40 / 18.1
3″ 15K SI x 2″ 1502F	5"	Low	Standard	2A27785	1.75 / 44.5	15 / 6.8
3″ 15K SI x 2″ 1502M	6"	Low	Standard	2A27788	1.75 / 44.5	25 / 11.3
3″ 15K SI x 3″ 1502F	5"	Low	Standard	2A27901LT	2.50 / 63.5	17 / 7.7
3″ 15K SI x 3″ 1502M	6"	Low	Standard	2A27903LT	2.50 / 63.5	32 / 14.5
3″ 15K SI x 4″ 10K SI	5"	Low	Standard	2A27792	3.00 / 76.2	19 / 8.6
4″ 10K SI x 2″ 1502F	6"	Low	Standard	2A28158	1.75 / 44.5	39 / 17.7
4″ 10K SI x 2″ 1502M	7"	Low	Standard	2A27791	1.75 / 44.5	32 / 14.5
4″ 10K SI x 3″ 1502F	5"	Low	Standard	2A27786	2.50 / 63.5	21 / 9.5
4″ 10K SI x 4″ 1002M	7.25"	Low	Standard	2A27980LT	5.00 / 127	42 / 19.1
4″ 10K SI x 3″ 15K SI	5"	Low	Standard	2P26291	3.00 / 76.2	19 / 8.6
4″ 1502F x 4″ 1502F	7"	Low	Standard	2A33139	3.75 / 95.3	36 / 16.3
4″ 1502M x 4″ 1502F	7.5"	Low	Standard	2A28702	3.75 / 95.3	69 / 31.3
4″ 15K SI x 2″ 1502F	6"	Low	Standard	2P25014	1.75 / 44.5	39 / 17.7
4″ 15K SI x 3″ 1502F	6"	Low	Standard	2A28138	4.00 / 101.6	39 / 17.7
4″ 15K SI x 3″ 1502M	8.5"	Low	Standard	2A28136	2.50 / 63.5	59 / 26.8
4″ 15K SI x 3″ 15K SI	7"	Low	Standard	2A27789	3.00 / 76.2	42 / 19.1
4″ 15K SI x 4″ 1002F	6"	Low	Standard	2A28157	4.00 / 101.6	37 / 16.8
4″ 15K SI x 4″ 1002M	9.25"	Low	Standard	2A28159	3.75 / 95.3	64 / 29
4″ 15K SI x 4″ 10K SI	7"	Low	Standard	2A29687	4.00 / 101.6	40 / 18.1
4″ 15K SI x 4″ 1502F	6"	Low	Standard	2P26197	4.00 / 101.6	39 / 17.7
4″ 15K SI x 4″ 1502M	8.5"	Low	Standard	2A28139	3.75 / 95.3	85 / 38.6
4″ 15K SI x 4″ 15K SI	12"	Low	Standard	2A28330	4.00 / 101.6	80 / 36.3

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SHORT CROSSOVERS (UNDER 24") CONTINUED

Outlet / Branch Configuration	Length	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
2" 1502F x 2" 1502F	7"	Low	H2S	3P18499	1.75 / 44.5	16 / 7.3
2" 1502F x 3" 1502F	7"	Low	H2S	3P19736	1.75 / 44.5	27 / 12.2
2" 1502M x 2" 1502F	5"	Low	H2S	2A26273	1.75 / 44.5	19 / 8.6
2" 1502M x 2" 1502F	7"	Low	H2S	3A19476	1.75 / 44.5	22 / 10
2" 1502M x 2" 1502F	12"	Low	H2S	3A20962	1.75 / 44.5	31 / 14.1
2" 1502M x 2" 1502M	7"	Low	H2S	3A18501	1.75 / 44.5	31 / 14.1
2" 1502M x 3" 1502F	7"	Low	H2S	3A20095	1.75 / 44.5	29 / 13.2
2" 1502M x 3" 1502M	7"	Low	H2S	3A20092	1.75 / 44.5	43 / 19.5
3" 1502F x 3" 1502F	7"	Low	H2S	3P19741	2.50 / 63.5	27 / 12.2
3" 1502M x 2" 1502F	5.62"	Low	H2S	3A20093	1.75 / 44.5	32 / 14.5
3" 1502M x 3" 1502F	7"	Low	H2S	3A21058	2.75 / 69.8	34 / 15.4
3" 1502M x 3" 1502M	7"	Low	H2S	3A20091	2.50 / 63.5	50 / 22.7

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

LONG CROSSOVERS (OVER 24")

Outlet / Branch Configuration	Length	Temp	Service Type	Part Number	Inner Dia. (in / mm)	Weight (lb / kg)
2" 1502M x 2" 1502F	24"	Low	Standard	3A23824	1.75 / 44.5	51 / 23.1
2" 1502M x 2" 1502F	36"	Low	Standard	3A23376	1.75 / 44.5	71 / 32.2
3" 1502F x 3" 1502F	34"	Low	Standard	2A30125	2.50 / 63.5	141 / 64
3" 1502F x 3" 1502F	36"	Low	Standard	2A29618	2.50 / 63.5	149 / 67.6
3" 1502M x 3" 1502F	24"	Low	Standard	2A29010	2.75 / 69.8	82 / 37.2
3" 1502M x 3" 1502F	36"	Low	Standard	2A29011	2.75 / 69.8	116 / 52.6
3" 1502M x 3" 1502F	48"	Low	Standard	2A34098	2.75 / 69.8	149 / 67.6
3" 15K SI x 3" 15K SI	24"	Low	Standard	2A33092	2.50 / 63.5	72 / 32.7
4" 1502M x 4" 1502F	120"	Low	Standard	2A28706	3.75 / 95.3	441 / 200
4" 1502M x 4" 1502F	144"	Low	Standard	2A28969	3.75 / 95.3	520 / 235.9
4" 1502M x 4" 1502F	24"	Low	Standard	2A28375	3.75 / 95.3	123 / 55.8
4" 1502M x 4" 1502F	36"	Low	Standard	2A28704	3.75 / 95.3	163 / 73.9
4" 1502M x 4" 1502F	48"	Low	Standard	2A28705	3.75 / 95.3	203 / 92.1
4" 1502M x 4" 1502F	60"	Low	Standard	2A28709	3.75 / 95.3	242 / 109.8
4" 1502M x 4" 1502F	72"	Low	Standard	2A28630	3.75 / 95.3	282 / 127.9
4" 1502M x 4" 1502F	96"	Low	Standard	2A29028	3.75 / 95.3	361 / 163.7
4" 15K SI x 4" 1502F	48"	Low	Standard	2A29904	3.75 / 95.3	274 / 124.3
4" 15K SI x 4" 1502M	72"	Low	Standard	2A28824	3.75 / 95.3	432 / 196
4" 15K SI x 4" 15K SI	120"	Low	Standard	2A28902	4.00 / 101.6	635 / 288
4" 15K SI x 4" 15K SI	24"	Low	Standard	2A28167	4.00 / 101.6	141 / 64
4" 15K SI x 4" 15K SI	48"	Low	Standard	2A28831	4.00 / 101.6	265 / 120.2
4" 15K SI x 4" 15K SI	60"	Low	Standard	2A28873	4.00 / 101.6	327 / 148.3
4" 15K SI x 4" 15K SI	72"	Low	Standard	2A28689	4.00 / 101.6	388 / 176
4" 15K SI x 4" 15K SI	84"	Low	Standard	2A28961	4.00 / 101.6	450 / 204.1
4" 15K SI x 4" 15K SI	96"	Low	Standard	2A28900	4.00 / 101.6	512 / 232.2
2" 1502M x 2" 1502F	24"	Low	H2S	3A22938	1.75 / 44.5	51 / 23.1
2" 1502M x 2" 1502F	36"	Low	H2S	2A29967	1.75 / 44.5	71 / 32.2

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Hammer Unions

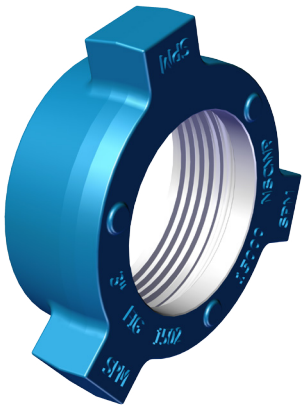
SPM® hammer unions provide pressure-tight, positive sealing and are available for standard service and sour gas service. Hammer unions feature easy identification of size and pressure rating.

Warning - Union Interchangeability - Each union connection is clearly marked with a pressure code (e.g. "1502"). This pressure must not be exceeded. This code should also be used with mating unions. Improper mating can result in failures, and lead to SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE. All mating integral union connections must match (according to size, pressure rating, etc). These connections must also match the service of the designated string they are installed in.

Warning - Replacement of Component Parts – It is critical that SPM® hammer union component parts, particularly retainer segments and rings, be replaced only with SPM® parts of the same size and pressure rating. Do not mix retainer segments and rings from other manufacturers within SPM® union connections.

HAMMER UNIONS

Figure Number	Service Type	Nominal Pipe Size (inches / mm)		
		2 / 50.8	3 / 76.2	4 / 101.6
200	Standard	3P12004	2P12009	2P11765
206	Standard	3P12004	2P12009	2P11765
1002	Standard			Detachable - 2P10963 NonDetach. - 2P10965
1502	Standard	3P10228	2P10257	2P11729
1502	H2S	2P13710	2P14370	
2002	Standard	2P14202	2P19422	
2202	H2S	2P14714	2P19342	



Note: Other parts or configurations may be available. Contact Weir for specific details.

UNION ASSEMBLIES

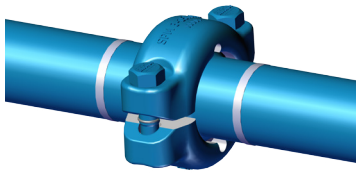
Figure Number	Service Type	Connection Type	Nominal Pipe Size (inches / mm)		
			2 / 50.8	3 / 76.2	4 / 101.6
200	Standard	Pressure Seal	3A12006		2A11831
206	Standard	Buttweld SCH 40		2A12024	2A12029
206	Standard	Pressure Seal	3A12008	2A12014	2A11637
1002	Standard	Pressure Seal			2A10964
1502	Standard	Buttweld SCH XXH	Detachable - 2A10224 NonDetach. - 2A12265	2A12267	
1502	Standard	Pressure Seal	2A10223	2A10252	
1502	H2S	Buttweld SCH XXH	Detachable - 2A14925	2A14621	

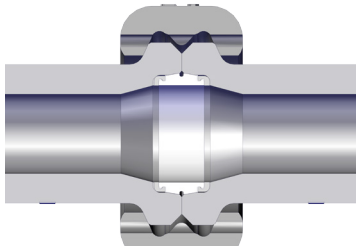
Note: Other parts or configurations may be available. Contact Weir for specific details.

Safety Iron®

US PATENT NO. 7,204,525

Safety Iron® is a clamp connecting flow line system developed to provide a more robust connection than the traditional hammer union connections. The product consists of a seal ring utilizing a soft seal and a metal-to-metal seal, an upper clamp with "captive" bolts, and a lower threaded clamp. The metal seal ring and rubber seals freely slip into the tapered flange end. Sealing is accomplished by the end crush on the rubber seal and tapered metal contact from the clamp force. The result is a superior performing connection that is designed for flow line applications with greater load stresses.





FEATURES:

- Greater vibration fatigue resistance compared to traditional hammer union alternatives.
- Large sweeping radii in high pressure components for increased strength at connections.
- Robust wall thickness to reduce the risk of failure in high risk areas.

Assembly Specifications

Weir recommends the use of a pneumatic impact wrench for primary assembly of all Safety Iron® connection. This wrench must be chosen to suit the torque requirements listed below and should have a minimum drive of 1/2". However, a 3/4" drive impact wrench is recommended for the larger 4" 15K Safety Iron® connection. If required, an adaptor can be incorporated to allow the use of larger size impact sockets.

SAFETY IRON® CONNECTION TORQUE VALUES

Size	Pressure Rating (psi)	Torque (ft-lbs)
2"	15K	180 +/- 50 ft lbs
3"	15K	350 +/- 50 ft lbs
4"	10K	350 +/- 50 ft lbs
4"	15K	700 +/- 50 ft lbs

Weir recommends the use of a manual adjustable torque wrench to verify the proper torque has been applied. Also, while the iron is unpressurized, a visual inspection of the flow line should be performed to verify that all bolts are properly tightened. This can be achieved by performing a quick inspection of the line by feeling the underside of each clamp to verify the bolt is within 1/4" of the opening in the bottom threaded clamp.

SAFETY IRON® 2" 15K END CONNECTION

Type	Style	Temp	Part Number	Weight (lb / kg)
Clamp Assembly		Low	2A25919	16 / 7.3
Seal Kit	Buna	Low	2A39288	0.8 / 0.36
Seal Kit	Fluoroelastomer	Low	2A39289	0.8 / 0.36

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

SAFETY IRON® 3" 15K END CONNECTION

Type	Style	Temp	Part Number	Weight (lb / kg)
Clamp Assembly		Low	2A25917	26 / 11.8
Seal Kit	Buna	Low	2A39290	1.3 / 0.6
Seal Kit	Fluoroelastomer	Low	2A39291	1.3 / 0.6

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

SAFETY IRON® 4" 10K END CONNECTION

Type	Style	Temp	Part Number	Weight (lb / kg)
Clamp Assembly		Low	2A25927	27 / 12.2
Seal Kit	Buna	Low	2A39294	1.8 / 0.8
Seal Kit	Fluoroelastomer	Low	2A39295	1.8 / 0.8

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

SAFETY IRON® 4" 15K END CONNECTION

Type	Style	Temp	Part Number	Weight (lb / kg)
Clamp Assembly		Low	2A25402	65 / 29.5
Seal Kit	Buna	Low	2A39298	2.9 / 1.3
Seal Kit	Fluoroelastomer	Low	2A39296	2.9 / 1.3

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

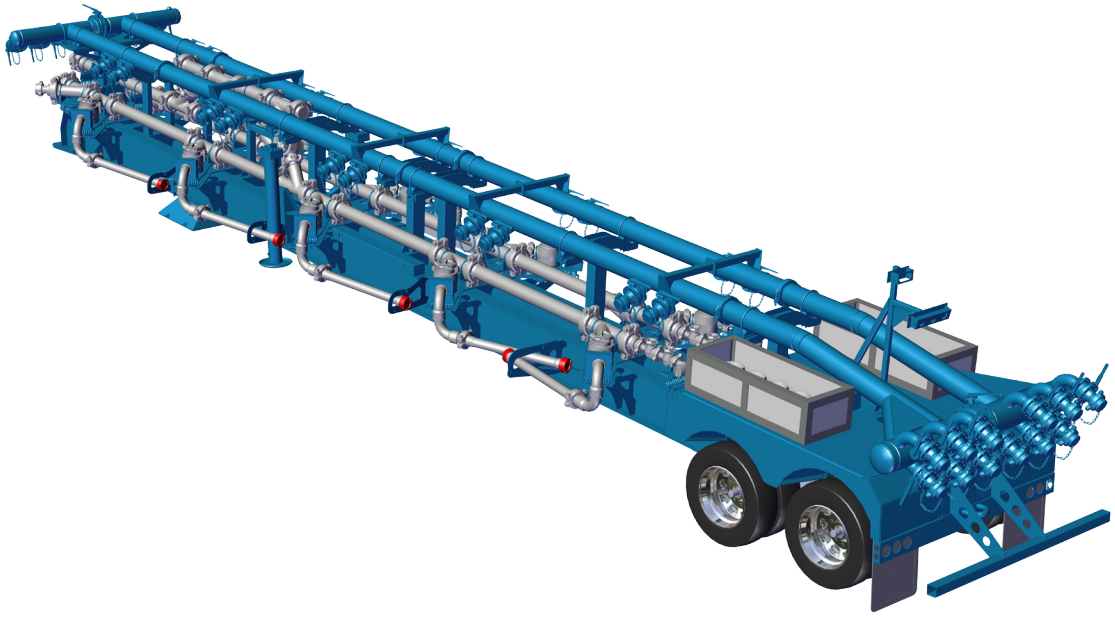
KIT DEFINITIONS:

- Clamp Assembly: clamp halves, bolts, retainer rings
- Seal Kit: hard seal ring, soft seals

Manifold Trailers

The SPM® manifold trailer provides the market with the uniquely designed Safety Iron® manifold system that is suited for stimulation operations, where vibration and side load have proven to be detrimental to the existing hammer union trailer models currently on the market.

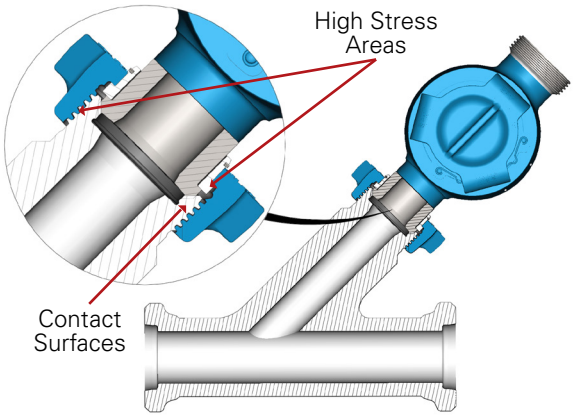
Safety Iron® connections provide a more reliable seal with increased vibration fatigue resistance when compared to traditional hammer union connections. Once properly assembled, Safety Iron® connections provide a connection that is less susceptible to leaking during operation. This means less downtime and more efficient operation for its users.



BENEFITS OF SAFETY IRON® CONNECTIONS OVER HAMMER UNIONS IN MANIFOLD TRAILER APPLICATIONS:

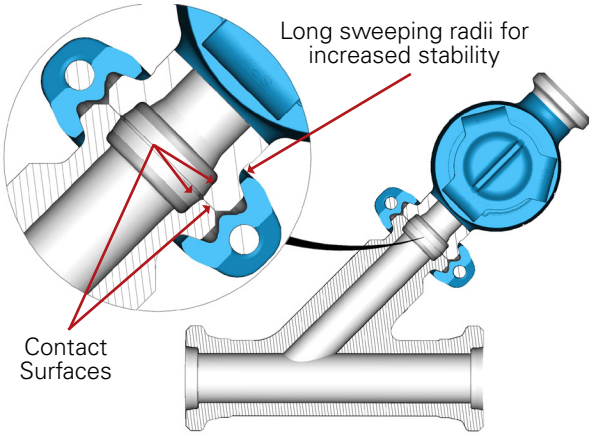
- Safety Iron® connections feature a greater I.D. than like-sized traditional hammer union iron, resulting in greater flow rate potential and reduced velocity at equivalent rates, resulting in longer lasting iron.
- Safety Iron® connections have a more robust design at critical areas of the connections versus hammer unions:

Traditional Hammer Union Connection



Hammer union connections feature only one contact seal surface, limiting the integrity of the connection. Hammer unions, with their thinner wall section at vital points and higher stress areas due to the jagged grooves and the threads, are more susceptible to damage as a result of vibration or side loading in harsh operating environments.

Safety Iron® Connection



Safety Iron® connections have a greater surface contact area for a much more stable connection compared to hammer union seals. Safety Iron® flanges are also more robust with larger sweeping radii for reduced stress, additional strength and vibration resistance.

Assembly Specifications

TRAILER FRAME

All standard SPM® manifold trailers with Safety Iron® connections utilize a dual-axle frame. Experience has shown dual-axle frames are better suited to handle the trailer weight requirements while providing a more durable base, resulting in extended life. Some competitor trailers feature a single axle and I-beam structural design that are more susceptible to damage and require more frequent repair.

FLOW LINE MOUNTING

SPM® manifold trailers with Safety Iron® connections feature flexible mounts, including coil springs (high pressure) and rubber anti-vibration clamps (low pressure), greatly reducing the chance of fatigue cracks in integral components due to the vibration caused during transport and operation. SPM® treating iron is mounted on wings designed to provide even weight distribution across adjacent stations with a robust design that is better suited for high vibration environments.

TRAILER SUSPENSION

SPM® manifold trailers with Safety Iron® manifold connections are available with air-ride suspensions.

LANDING GEAR

SPM® manifold trailers come standard with 5" landing gear systems. Experience has shown that the 5" landing gears are better suited for the loads seen on most manifold trailers, compared to 4" offerings. Most trailers utilize electric-over-hydraulic systems; a self-contained hydraulic power unit is installed and driven off of an electric DC motor. This motor is powered by a 12V battery mounted on the trailer. Customers also have the option for a hydraulic wet kit.

Manifold Skid

The SPM™ 8-station manifold skid with Safety Iron® connections provides users with a manifold system utilizing many of the design features of SPM® manifold trailers in a more compact footprint for use in regions where transport of larger manifold trailers is challenging. The manifold skid can be transported and loaded/unloaded from a flatbed trailer utilizing a winch. The modular design of the skid, coupled with the high pressure iron mounted above the low pressure manifold greatly enhances the serviceability of the high pressure system during maintenance cycles. The lower profile of the high pressure iron also increases safety for the user as actuating the isolation valves can be achieved more efficiently.

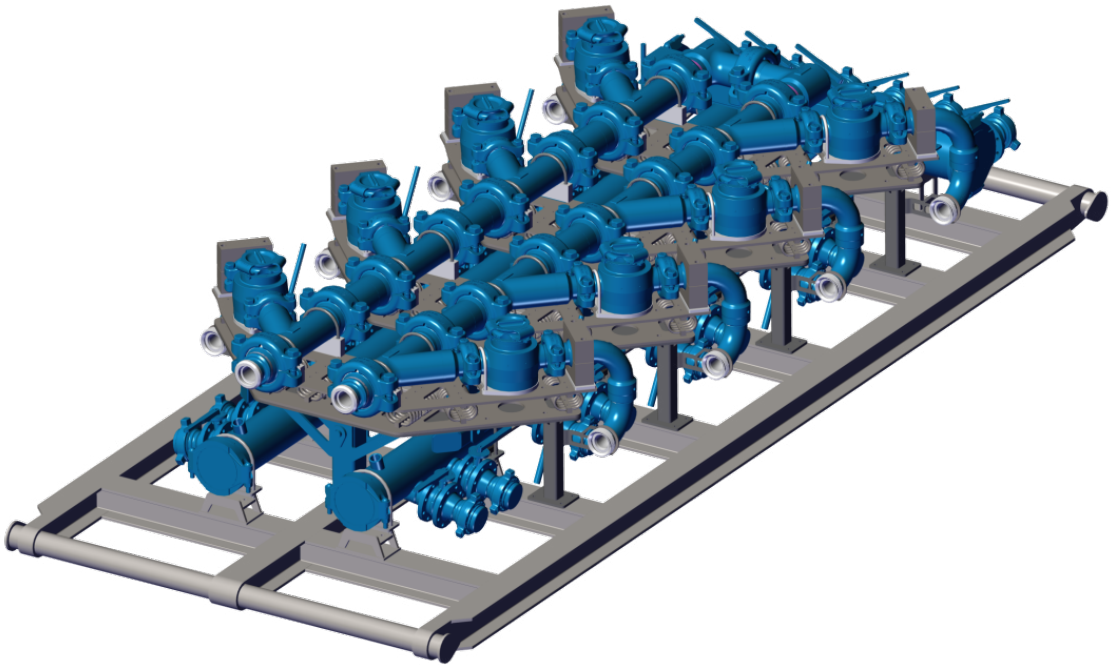
FEATURES:

- Skid engineered for improved carrying capacity, flexibility, and ease of transport
- Designed for domestic and international transportation requirements
- High pressure system utilizing coiled cable suspension provides vibration resistance to reduce risk of cracked integrals
- Modular high pressure system allowing easy removal and serviceability
- High pressure Safety Iron® manifold rated for pressures up to 15,000 psi standard service and flow rating of 75 BPM

General Dimensions:

- Overall width: Approx. 95.00″
- Overall length: Approx. 233.25″
- Weight: Approx. 17,500 lbs

PATENT PENDING DESIGN



Flow Line Safety Restraint (FSR) System

The SPM® Flow Line Safety Restraint (FSR) system is designed to reduce the area of danger around high-pressure flow line disengagements. Suitable for use on both onshore and offshore applications, operators and service companies have relied on the FSR System to enhance safety during pumping operations.

US PATENT 6,481,457

UK PATENT 2,370,869

WHY USE THE FSR SYSTEM

The SPM® FSR system is intended to help contain high-pressure piping and components in case of flow line rupture during the pumping process. The destructive force of an unrestrained flow line rupture, regardless of the cause, can be devastating and catastrophic to both people and equipment. Metal components that were previously subjected to up to 15,000 psi of internal pressure are instantly forced to relieve that pressure and could become airborne and flail, resulting in **SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE.** Installation of the FSR System can help operators and well service providers deliver enhanced safety at the well site.

HOW THE FSR SYSTEM WORKS

The SPM® FSR system utilizes interlocking synthetic loops that are strung the length of the flow line (spine), and attached to critical points of the flow line through smaller loops (ribs). This assembly is then anchored to a substantial structural tie-down, such as the pumping unit or offshore rig structure. Ribs and spines of the system transmit separation forces to the anchor point and restricts flow line movement and helps dissipate energy. In one instance, a customer utilized the FSR System on a well site in west Texas that experienced a line failure while pumping energized fluid at approximately 5,000 psi. The wellhead and the entire flow line were effectively restrained by the system. The customer believes the FSR prevented a nearby active well from being struck and saved an estimated three lives.

PROVEN PERFORMANCE

The SPM® FSR system has been used in both onshore and offshore applications around the world since 2000 to increase safety during pumping operations. It has been tested and honored by the industry for its innovation and performance.

- "Best Mechanical Engineering Innovation Award" from the American Society of Mechanical Engineers in 2002
- Approved by several major E&P companies for use during pumping operations
- Accepted by WorkSafeBC (the Workers' Compensation Board of British Columbia) as in compliance with a government mandate that flow line piping systems be anchored and restrained during well testing or stimulation operations

SIZE AND PRESSURE RATINGS

Nominal Iron Size	LIGHT DUTY Pressure (psi)	MEDIUM DUTY Pressure (psi)	HEAVY DUTY Pressure (psi)
2"	15,000	20,000	20,000
3"	7,500	15,000	15,000
4"	5,000	10,000	15,000

Note: These load ratings are valid for gas and liquids in both energized and non-energized services.

DUTY RATING AND COLOR CODES

	LIGHT DUTY	MEDIUM DUTY	HEAVY DUTY
FSR Ribs	Yellow	Red	Orange
FSR Spines	White	Blue	Gray

Flow Line Safety Restraint (FSR) System (continued)

FSR SYSTEM COMPONENT PARTS

Spines – Main restraint member running the length of the flow line

- Light Duty – rated at 90,000 lbf minimum breaking strength
- Medium Duty – rated at 124,000 lbf minimum breaking strength
- Heavy Duty – rated at 210,000 lbf minimum breaking strength

Ribs – Transverse members attaching the spine to the flow line at critical locations

- Light Duty – rated at 50,000 lbf minimum breaking strength; double looped for 100,000 lbf
- Medium Duty – rated at 64,000 lbf minimum breaking strength; double looped for 128,000 lbf
- Heavy Duty – rated at 105,000 lbf minimum breaking strength; double looped for 210,000 lbf

Anchor Line – Supplement line used to anchor system and prevent shifting

- Light Duty – rated at 90,000 lbf minimum breaking strength
- Medium Duty – rated at 124,000 lbf minimum breaking strength
- Heavy Duty – rated at 210,000 lbf minimum breaking strength

Anchor Crossover – Components installed within the flow line at critical locations where the main line can be anchored.

SPM® Rental Program

Weir maintains a fleet of rental FSR system units at its strategically located service centers around the globe for onsite delivery. The rental fleet undergoes rigorous inspection per Weir engineering specification. Each component features identification and inspection badges that indicate its compliance with regulations. Rental storage trailers are also available to store and organize the FSR system and make transport of component parts safe and convenient. Weir technicians will deliver the unit to a site as requested and provide onsite installation services.

The FSR system has performed successfully in flow line disengagements on many occasions. It has become an industry standard in temporary flow line restraints to enhance safety during pumping operations. Call Weir today for specific information about the Flow Line Safety Restraint System.

Other Safety Products

Safety Hammer®

The Safety Hammer® union assembly device promotes a safer work environment by reducing the dangers associated with assembling hammer union connections using a sledgehammer. The Safety Hammer® device is composed of two main parts: a high strength alloy steel adaptor and pneumatic hammer. The steel adaptor can be changed out as needed to fit different union sizes. In order for the Safety Hammer® device to function as intended, Weir recommends 29 SCFM per device, with an air pressure of 90 psi and 1/2" air supply hose size. The Safety Hammer® device will make up and break down the hammer union depending on its orientation.

To use the Safety Hammer® device, simply hand-tighten the hammer union connection until the wing nut ceases to rotate. Slide the Safety Hammer® adapter over the wing nut so that it bears against one of the three lugs. Orient so that the impact tool striking the wing nut lug will tighten the connection. Apply a turning force to the gooseneck handle until the wing nut ceases to rotate. Squeeze the trigger and continue to apply a slight turning force to the gooseneck handle. The hammer union will be quickly tightened.

SAFETY HAMMER ASSEMBLIES AND SPARES

Type	Size	Cage Fig. Rating	Part Number	Weight (lbs / kg)
Complete Assembly	2"	1502	2A26689	31 / 14.1
Complete Assembly	3"	1502	2A26699	35 / 15.9
Complete Assembly	4"	200 & 206	2A26886	35 / 15.9
Complete Assembly	4"	602 & 1002	2A26709	35 / 15.9
Pneumatic Hammer			2A26730	18 / 8.2
Hammer Tool			2P27058	1 / .5
Cage	2"	1502	2P26690	7 / 3.2
Cage	3"	200 / 206	2P26887	8 / 3.6
Cage	3"	1502	2P26700	8 / 3.6
Cage	4"	1002	2P26710	8 / 3.6

Note: Other parts or configurations may be available. Contact Weir for specific details.
Note: Listed weights are approximate.

Inspection Services

Weir offers reliable flow control inspection and rebuild services through its extensive global network of service centers, mobile inspection units and customer embedded facilities. Qualified technicians perform inspections on both SPM® and competitor flow control product according to customer requirements. Rugged handheld computers guide technicians through all processes outlined by the customer, which are maintained in SPM®'s A.M.P. database, and record the results of the inspection.

Below lists the processes that are generally performed for each of the designated inspection levels. Weir is able to amend its offering to meet the needs of its customers as required.

LEVEL 1 INSPECTION:

1. Iron is cleaned and visually inspected for signs of cracking or erosion.
2. An ultra-sonic wall thickness test is performed per customer or OEM specifications.
3. Male subs, wing nuts, female (threaded) union ends, and swivel ball races are cleaned and tested with appropriate gauge kits as necessary.
4. Union connections have their seal rings replaced and wing nuts are ground to remove any burrs.
5. Swivels and plug valves are greased.
6. Iron is pressure tested to 100% of rated working pressure per customer or OEM specifications.
7. Iron is banded and data is logged into SPM® Asset Management Program.

Notes:

- All iron is inventoried and serial numbers are input into SPM®'s Asset Management Program prior to work beginning.
- Results of each test throughout the entire inspection process are logged into the SPM® Asset Management Program.
- Customer is provided with an inspection report that details the results of each process.

LEVEL 2 INSPECTION:

In addition to the tasks performed in Level 1 inspections, SPM® performs these steps:

1. Iron is fully disassembled and thoroughly cleaned. Grease is removed using solvent where needed.
2. Elastomer parts are replaced. Other internal components are inspected and replaced as necessary.

LEVEL 3 INSPECTION:

In addition to the tasks performed in Level 2 inspections, a magnetic particle inspection is performed on the iron prior to a pressure test.

OTHER OPTIONS:

Within the iron inspection process, Weir offers additional services that can be performed at customer request.

Asset Management Program (A.M.P.)

Weir's Asset Management Program (A.M.P.) is the ultimate tool for users to manage their treating iron assets. With detailed inspection history, access to critical material information, and intelligent reporting to assist in planning and inventory control, A.M.P. provides users with a wealth of data to assist in managing their frac fleet.

Weir also utilizes A.M.P. to provide inspection services to satisfy customer requirements. Weir inspection processes integrate customer inspection specifications and permission based controls into rugged hand-held computers that direct technicians both in the shop and at remote locations.

ASSET MANAGEMENT:

- Real-time customer access to detailed asset information through a secure internet-based portal, including equipment status, inspection history and material certifications
- Permissions based structure allows customers to configure asset attributes along a wide array of categories

REPORTING:

- An intuitive reporting structure allows users to customize reports based on a wide variety of asset characteristics or by operating business unit.
- Permissions based structure allows customers to manage their own user profiles through designated administrators.

INSPECTION MANAGEMENT:

- Customer inspection criteria can be loaded into the system, dictating how inspections are performed.
- Rugged hand-held computers utilized by technicians in Weir service centers manage data between inspection tools, such as UT meters, and A.M.P.

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