



Group 0 Flowline Equipment



FLUID CONTROL[®]

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Symbol Key:



Available for rental

Fluid Control AS offers a wide range of equipment for hire suitable for both Standard and Sour Gas service, with a comprehensive range of sizes and fittings.

We offer custom rental contracts for both long and short term on all types of equipment.

FEATURES OF THE PROGRAM:

- Monthly reports on rental equipment highlighting all product on rental, length of time on rental, and charges to date by part number for all product rented.
- Material traceability and certification detailing working pressure, service, description and design temperature.
- Daily rates, monthly rates or annual rates.
- 24-hour / 7-day a week service.
- Pickup and delivery service available.
- Quick response to customer emergency requirements.
- Fully certified iron packages available to health, safety, and environmental requirements.
- Large inventories or individual items.

All items with the  symbol and that are highlighted in the tables are currently available for rental. Other sizes and models may be made available for rental upon request.

Example:

Valve Model	NSCWP* (PSI)	End Connection	Size					
			1"	1" x 2"	1 1/2"	2"	3"	4"
SP100TF	10,000	Threaded				x		
SP150TF	15,000	Threaded			x	x		
SP150TMF	15,000	Threaded		x				
SP150WU	15,000	Fig. 1502	x	x	x	x	x	x

Please see our services section at the beginning of the catalogue and contact us at post@fluidcontrol.no to receive more information about our rental program.

Flow Control Reference Guide

The following recommendations for SPM flow control products are intended to be a guide to maximize efficiency, extended product life, and create a safer work environment.

- Treating or discharge iron is produced for the following services:
 - Standard Service
 - H2S / Sour Gas Service
 - Low Temp Service
- SPM® recommends that you designate specific strings of iron for the following applications, and that the designated iron remain in that service application throughout the product's life:
 - Energized Fluids
 - Acids
 - Sour Gas
 - Low Temperature Applications
- **FLOW RATES ABOVE 42 FEET PER SECOND ARE NOT RECOMMENDED.**
- Every string of iron should be pressurized to its maximum planned working pressure prior to each use.
- Pressure seal line pipe threads are not recommended for pulsating service above 10,000 psi or where side loading or erosion are suspected. (Integral or Non-Pressure seal threads are recommended.)
- Most flow control products are certified for the following temperature rating:
 - Minimum: -30° C
 - Maximum: 110° C
- Personnel must not be around pressure vessel products while pressure is present or being applied.
- Each string, as well as each component, must have regular intervals of maintenance and inspection for safe, proper performance.
- Never tighten or hammer wing unions when pressure is apparent.
- Welding, brazing or heating on high pressure components is prohibited.
- General maintenance will extend the life of flow control products.
 - Grease plug valves and swivel joints after every job.
 - Replace seals to help prevent leaks and washouts of seal faces.
 - Clean all seal areas thoroughly.
 - Flush all products with water after each job.



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HAMMER UNIONS

Hammer unions are available in a wide range of sizes and in working pressures to 20,000 psi. Pressure seal, non-pressure seal, and welded styles are offered in various sizes and pressures. All SPM hammer unions provide pressure-tight, positive sealing and are available for standard service and sour gas models. SPM hammer unions for sour gas service are specially heat-treated for controlled hardness and utilize fluorocarbon elastomer seal rings.

Figure #	Standard Service PSI Rating		Sour Gas PSI Rating		Nominal Pipe Size (Inches)											
	CWP	Test	CWP	Test	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"	10"	12"
50	500	750	500	750							x	x				
100	1000	1500	1000	1500				x	x	x	x	x	x	x		
200	2000	3000	2000	3000	x	x	x	x	x	x	x	x	x	x		
206	2000	3000	2000	3000	x	x	x	x	x	x	x	x	x	x	x	
207	2000	3000	2000	3000						x	x		x	x	x	
211	2000	3000	2000	3000	x	x	x	x	x	x	x					
400	4000	6000	2500	3750				x	x	x	x					
400	2500	3750	2500	3750								x	x	x	x	x
402	4000	6000	2500	3750				x								
600	6000	9000	-		x		x	x	x	x	x					
602	6000	9000	6000	9000	x	x	x	x	x	x	x					
1002	10000	15000	7500	11250	x	x	x	x	x	x	x					
1002	7500	11250	5000	7500								x	x			
1003	10000	15000	7500	11250				x		x						
1003	7500	11250	5000	7500							x	x				
1004	10000	15000	7500	11250								x	x			
1502	15000	22500	10000	15000	x		x	x	x	x	x	x	x			
2002	20000	30000	-					x		x	x	x	x			
2202	-		15000	22500				x	x	x	x	x	x			



Figure 50
RED NUT - RED SUB

An economical union with precision machined metal-to-metal sealing surfaces plus o-ring seal for air, water, oil or gas service to 1,000 psi NSCWP*.



Figure 100
BLACK NUT YELLOW SUBS

An economical union with precision machined metal-to-metal sealing surfaces for air, water, oil or gas service to 1,000 psi NSCWP*.



Figure 200
BLUE NUT GREY SUBS

A precision metal-to-metal sealing surface between male and female subs for air, water, oil, gas and mud service to 2,000 psi NSCWP*.



Figure 206
BLACK NUT YELLOW SUBS

A precision metal-to-metal seal plus O-ring seal for air, water, gas, oil, and mud service to 2,000 psi NSCWP*.

R HAMMER UNIONS



Figure 207
BLUE CAP - RED SUB

Interchangeable Fig. 206 sub with blanking cap and O-ring seal to assure no-leak closure of manifolds and lines to 2,000 psi NSCWP*.



Figure 211
BLACK NUT - BLUE SUBS

A precision O-ring seal plus seal ring and insulation ring to provide a 35 millionohms resistance across the union. Ideal for production systems with electrolytic corrosion and service up to 2,000 psi NSCWP*.



Figure 400
BLACK NUT RED SUBS

Features a precision ball and cone sealing surface for sure metal-to-metal seal for air, water, oil, gas and mud service to 4,000 psi NSCWP*.



Figure 402
BLACK NUT BLACK SUBS

A resilient lip-type seal for air, water, oil or mud service to 4,000 psi NSCWP*.



Figure 600
BLACK NUT - GREY SUBS

Features a rustproof bronze seat seal. Ideal for steam services, boiler connections, manifold and line connections service up to 6,000 psi NSCWP*.



Figure 602
BLACK NUT ORANGE SUBS

A replaceable lip-type seal ring minimizes fluid flow turbulence and gives pressure seal for air, water, oil, gas and mud service to 6,000 psi NSCWP*.



Figure 1002
RED NUT BLUE SUBS

A resilient lip-type seal protects ball and cone seal against abrasion in air, water, oil, gas and mud service to 10,000 psi NSCWP*.



Figure 1003
BLACK NUT GREY SUBS

A precision metal-to-metal seal plus O-ring seal which allows for misalignment and provides a positive seal with up to 7 1/2° pipe misalignment. Ideal for air, water, gas, oil and mud service to 10,000 psi NSCWP*. 7,500 psi CWP for 4" and 5" sizes.



Figure 1004
RED NUT - RED SUB

A resilient lip-type seal protects ball and cone seal against abrasion in air, water, oil, gas and mud service to 10,000 psi NSCWP*. 7,500 psi CWP for 5" and 6" sizes



Figure 1502
BLUE NUT RED SUBS

For manifold and truck mountings or installations encountering high pressures including air, water, oil, gas and mud service to 15,000 psi NSCWP*.



Figure 2002
WHITE NUT WHITE SUBS

For cementing, fracturing, acidizing, testing and choke-and-kill lines where extreme pressures are encountered to 20,000 psi NSCWP*



Figure 2202
GREEN NUT GREEN SUBS

Especially for sour gas service; with heat-treated components, fluoroelastomer seal rings. For service to 15,000 psi NSCWP*.

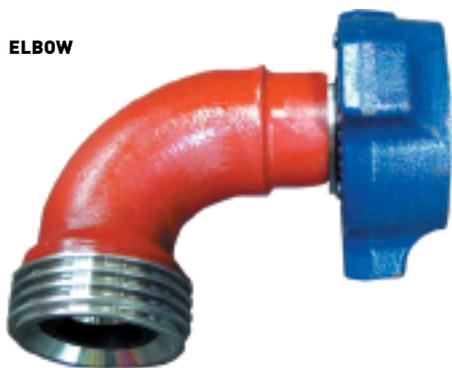
*Non-Shock Cold Working Pressure

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HAMMER UNIONS Connections and Unions

SPM® manufactures a quality line of high-pressure integral union connections in a broad range of configurations and sizes from 1" through 4" and in pressure ratings to 20,000 psi NSCWP*. Manufactured from high strength alloy steel forgings, SPM® integrals feature a lightweight design not found in competitors' products. All SPM® integral union connections are subjected to controlled heat-treat processes.

ELBOW



TEE



WYE



CROSS



**45 AND 90
DEGREE
LATERALS**



Size	Fig. 1002 10,000 psi*	Fig. 1502 15,000 psi*	Fig. 1502 10,000 psi* H2S	Fig. 2202 15,000 psi* H2S	All Female (Thread)	All Male (Wing)	Combination Styles and Sizes
1"		x			x	x	x
1 1/2"		x		x	x	x	x
2"		x	x	x	x	x	x
3"		x	x	x	x	x	x
4"	x	x	x		x	x	x

*Non-Shock Cold Working Pressure

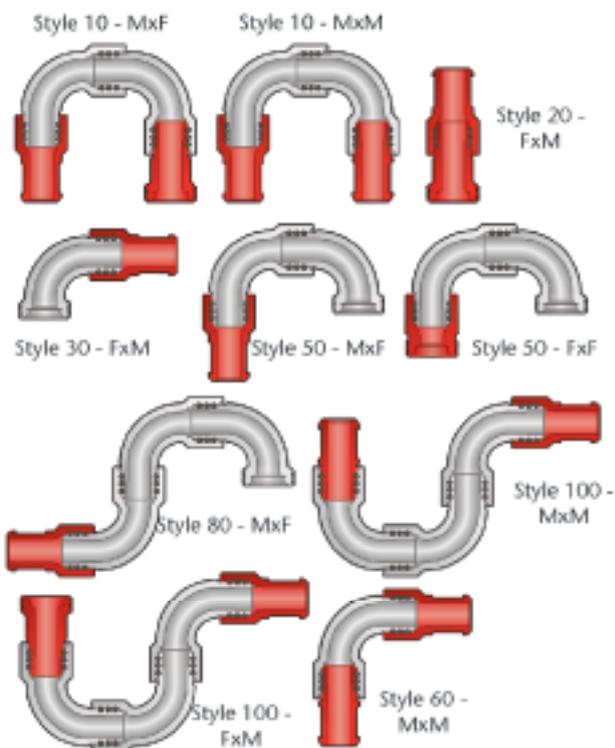
R Swivel Joints

SPM's 3" Fig. 1502 and 4" Fig. 1002 Long Radius Swivel Joints are designed to extend the life of a swivel while maintaining uniform flow.

FEATURES INCLUDE:

- Additional erosion material under critical ball race locations:
 - 3" Fig. 1502 - over 13% more
 - 4" Fig. 1002 - over 22% more
- More stable assembly with better load distribution in 3" Fig. 1502 series, featuring longer ball race life.
- Better distribution of material for more robust female ball race components in 3" Fig. 1502 and 4" Fig. 1002 models.
- No danger for any mismatches.
- Available in traditional hammer union styles or in SPM's patented Safety Iron® connections.

All SPM® swivel joints feature uniform wall thickness throughout for longer and more uniform flow of fluids (including slurries and abrasives), elastomeric packing for service to 225°F, instream packing that is designed not to enter stream regardless of velocity, and improved lubrication.



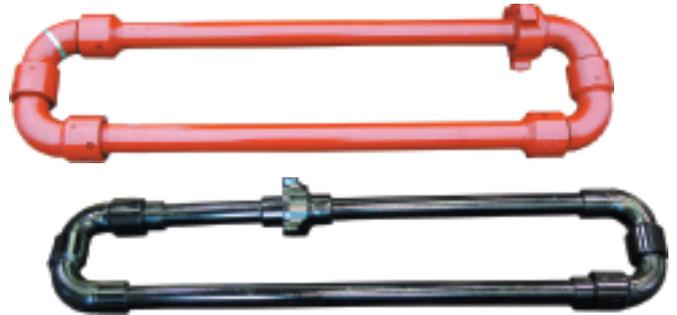
	Pressure Rating		Size			
	2"	2" H2S	3"	3" H2S	3" x 2"	4"
Style 10 Fig. 1502 MxF	x	x	x	x		x
Style 10 Fig. 1502 MxM	x	x	x	x		x
Style 20 Fig. 1502 MxF	x		x	x		
Style 30 Fig. 1502 MxF	x		x	x		
Style 50 Fig. 1502 MxF	x	x	x	x	x	x
Style 60 Fig. 1502 MxF	x	x	x	x		
Style 80 Fig. 1502 MxF	x	x	x	x		
Style 100 Fig. 1502 MxF	x	x	x	x	x	
Style 100 Fig. 1502 MxM	x	x	x	x	x	
Style 10 Fig. 1002 MxF						x
Style 10 Fig. 1002 MxM						x
Style 50 Fig. 1002 MxF						x

SPM® all-steel hose loops are used for a variety of high pressure well service applications including discharge lines, water lines, cementing and circulating lines, well test lines and temporary flow lines.

SPM® all-steel hoses utilize field-proven SPM® swivel joints for greater flexibility, shock and vibration resistance, and more uniform flow. Also utilized are SPM® wing union end connections for fast, pressure-tight make-up and break-out.

These rugged hoses handle a full range of fluids to cold working pressures up to 15,000 psi and come in sizes and configurations to meet any need. Hoses for sour gas service are available at cold working pressure up to 10,000 psi. SPM® hoses are designed to easily and conveniently fold up for storage and transportation.

R Steel Hose Loops and Pipe



Weir SPM Model	Color Code	Method of Construction	NSCWP* (PSI)	Size (In.)	
				2	3
Long Radius Swivel Joints	Olive Green [†]	x	10,000	x	x
	Red	x	15,000	x	x

*Non-Shock Cold Working Pressure

[†] Sour Gas Service



R Flow Line Piping

Size (In.)	Type of Service	NSCWP* (PSI)	End Connection
2	Standard	15,000	Fig. 1502 Union
2	Sour Gas	10,000	Fig. 1502 Union
3	Standard	15,000	Fig. 1502 Union
3	Sour Gas	10,000	Fig. 1502 Union
4	Standard	15,000	Fig. 1502 Union

*Non-Shock Cold Working Pressure

SPM® all-steel, one piece flow line piping, with wing union end connections, eliminates the need for welds or threads for an uninterrupted bore and greater flow. Piping is available in lengths to 10 feet to handle fluids at cold working pressures to 15,000 psi. They are used on high-pressure discharge lines, auxiliary flow lines, choke-and-kill lines and for abrasive applications.

R PLUG VALVES

1", 1" X 2", 1½", AND 2" PLUG VALVES

SPM® high pressure plug valves are durable, field-proven units that provide dependable service for applications such as cementing, fracturing, acidizing, coiled tubing, and sand control. Available in 1", 1" X 2", 1½" and 2" sizes and in pressure ratings to 15,000 psi NSCWP*, SPM® plug valves feature quality components throughout for greater dependability, minimum weight, and maximum strength. Plug valves are available in standard service and sour gas service models. Special models are available to 20,000 psi.

3" AND 4" PLUG VALVES

SPM® three-inch and four-inch plug valves are available in pressure ratings to 20,000 psi NSCWP*. Features include a flanged body for easier maintenance, integral inlets and outlets, hand crank, locked-open and shut gear drive standard. Standard service and sour gas service models are available.

REMOTE OPERATION

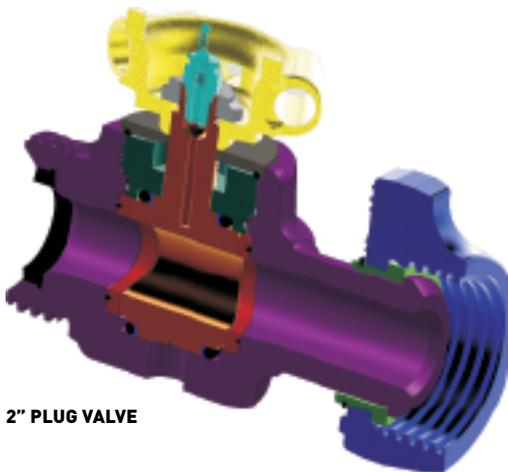
Hydraulic and pneumatic actuators are available for all sizes of plug valves, which enhances safety in the field.



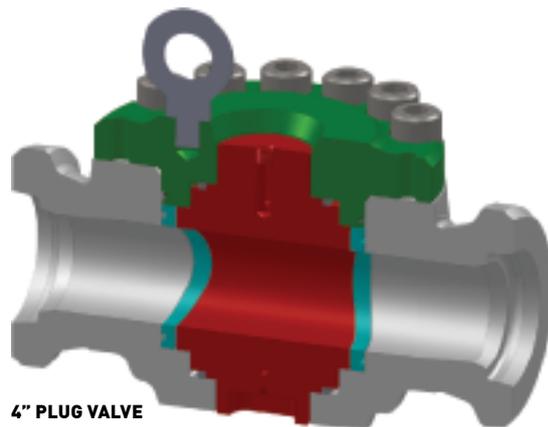
REPAIR AND SEAL KITS

SPM® repair kits and seal kits contain all the parts necessary to rebuild valves in the field or in the shop. SPM® seal kits contain all items in the standard repair kit, except the plug. Individual components and elastomer kits are also available.

FLUID CONTROL DOES MAINTENANCE, RECERTIFICATION AND REPAIR OF VALVES. FOR MORE DETAILS AND INFORMATION ABOUT OUR VARIOUS SERVICES CHECK OUT OUR SERVICES SECTION AT THE FRONT OF THE CATALOGUE.



2" PLUG VALVE



4" PLUG VALVE

Valve Model	NSCWP* (PSI)	End Connection	Size					
			1"	1" x 2"	1 1/2"	2"	3"	4"
SP100TF	10,000	Threaded				x		
SP150TF	15,000	Threaded			x	x		
SP150TM	15,000	Threaded		x				
SP150TMF	15,000	Threaded		x				
SP150WU	15,000	Fig. 1502	x	x	x	x	x	x

Special models are available in 20,000 psi.

*Non-Shock Cold Working Pressure

PLUG VALVE Light Weight Plug Valve

SPM®'s 2" Light Weight Plug Valve is engineered with safety in mind. The valve is designed to meet HSE lifting requirements in the North Sea while maintaining SPM®'s high quality standards. The Light Weight Plug Valve is available with DNV certification.

- Compact/Lightweight Design
- Meets HSE requirements*
- Weighs 51 lbs (23.1 kg)
- Easy Assembly/ Disassembly
- Available with DNV Certification
- CE Compliant (97/23/EC)

*HSE compliant products offer a safe lifting weight of 55 lbs or less to be lifted and carried by 1 person.

The 2" LW Plug Valve is rated for non-shock cold working pressures up to 15,000 PSI. Like other SPM® high pressure plug valves, the 2" LW Plug valve is able to provide dependable service for applications such as:

- Acidizing
- Cementing
- Coil Tubing
- Fracturing
- Sand Control
- Well Kill



CHOKO TEES

Adjustable and positive choke tees are primarily used in choke manifolds, flow thru manifolds and test manifolds. Various forged-body configurations are available in 2-inch and 3-inch sizes, each rated at 15,000 psi NSCWP*. Choke tees are also available in sour gas configuration.

*Non-Shock Cold Working Pressure



R CHECK VALVES

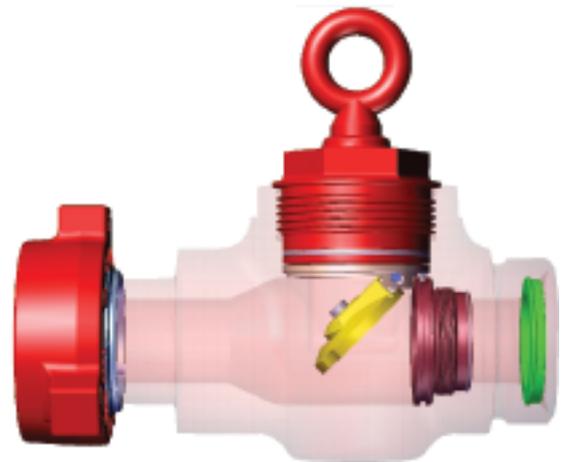
SPM® check valves are made of high strength steel and are precision manufactured to exact tolerances for clapper styles in 2" through 4" sizes, dart styles in 1" through 3" sizes, and CO2/nitrogen styles in 2" and 3" sizes. The clapper design features either a standard coating or superior abrasion and acid resistant coating to give longer operating life in corrosive applications.

The rugged valves operate at working pressures from 6,000 to 20,000 psi in well service applications such as acidizing, cementing, fracturing, and energized fluids. SPM®'s check valves are manufactured from solid forgings to maximize strength and increase abrasion resistance.



R CHECK VALVE SD Clapper Style

SPM®'s new Severe Duty Check Valve is designed specifically to provide longer life and reliable operation in severe service environments. Ideal for the harsh pumping operations seen in the Haynesville shale play, the SD Check Valve utilizes unique design features resulting in improved reliability and performance compared to other check valves currently available to the market.



Valve Size	Inlet	Outlet	Upstream / Downstream	NSCWP* (PSI)
2" 1502	Male	Female	Reverse Flow	15,000
2" 1502	Female	Male	Standard Flow	15,000
2" 2002	Female	Male	Standard Flow	20,000
3" 1502	Male	Female	Reverse Flow	15,000
3" 1502	Female	Male	Standard Flow	15,000
3" 1502 Sour Gas	Male	Female	Reverse Flow	10,000
3" 1502 Sour Gas	Female	Male	Standard Flow	10,000
3" 2002	Female	Male	Standard Flow	20,000
4" 1002	Female	Male	Standard Flow	10,000
4" 1002	Male	Female	Reverse Flow	10,000
4" 1502	Male	Female	Reverse Flow	15,000
4" 1502	Female	Male	Standard Flow	15,000

*Non-Shock Cold Working Pressure

Available in Standard Flow (Wing Ahead) and Reverse Flow (Thread Ahead)

FEATURES & BENEFITS

Utilization of a Threaded Seat:

- Self-locking design prevents seat from becoming loose due to high vibration of flow line
- Machined from high erosion and high corrosion resistant NACE compliant stainless steel for longer life
- Features o-ring for excellent sealing performance
- Fully coated clapper provided in most sizes

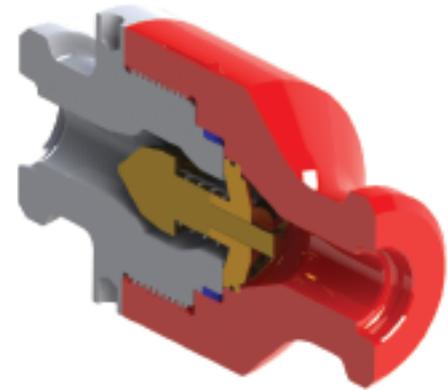
Enhanced Hanger:

- Flat machined into hanger matches flat machined into body preventing rotation during operation
- Removes hanger pin from assembly requiring fewer component parts



CHECK VALVE Dart Style

The 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, preventing fluid from flowing back through the flow line. The SPM® Dart Style Check Valve is available for standard service, CO₂/Nitrogen compatible and for sour gas (H₂S) environments.



**AVAILABLE IN STANDARD FLOW (WING AHEAD)
AND REVERSE FLOW (THREAD AHEAD)**

Valve Size	Inlet	Outlet	Upstream / Downstream	NSCWP* (PSI)	Service
1" 1502	Female	Male	Reverse Flow	15,000	Standard
1" 1502	Female	Male	Standard Flow	15,000	Standard
1 1/2" 2002	Male	Female	Reverse Flow	15,000	Standard
1 1/2" 1502	Female	Male	Standard Flow	15,000	Standard
2" 1502	Male	Female	Reverse Flow	15,000	Standard
2" 1502	Female	Male	Standard Flow	15,000	Standard
3" 1502	Male	Female	Reverse Flow	15,000	Standard
3" 1502	Female	Male	Standard Flow	15,000	Standard
2" 1502	Male	Female	Reverse Flow H ₂ S	10,000	H ₂ S
2" 1502	Female	Male	Standard Flow H ₂ S	10,000	H ₂ S
3" 1502	Male	Female	Reverse Flow H ₂ S	10,000	H ₂ S
3" 1502	Female	Male	Standard Flow H ₂ S	10,000	H ₂ S

*Non-Shock Cold Working Pressure



RELIEF VALVES Spring

SPM® Emergency Relief Valves provide over-pressure protection for reciprocating pumps, treating lines, pressure vessels and other equipment operating under a variety of pressure and flow conditions. The valves are compact, simple to operate and rely on the system's pressure to open when a preset pressure is exceeded, and automatically snap shut when the pressure drops.

The valves are externally adjustable, and unlike shear relief valves, which use common nails to trigger the valve, SPM®'s Emergency Relief Valves utilize an internal spring, nitrogen, or rig air to activate opening and closing. Valves are available in 2", 3" and 4" models.

SPRING

SPM® Spring Actuated Emergency Relief Valves provide over pressure protection for pumps, flow lines, pressure vessels and other equipment operating under a variety of pressures and flow conditions. SPM®'s Spring Actuated Emergency Relief Valves are field-tested products that have long been providing reliable over-pressure protection for well service providers.

The valves are externally adjustable to operate from low pressure/ medium flows. Unlike shear relief valves, which use common nails to trigger the valve, SPM®'s Emergency Relief Valves utilize an internal spring to activate opening and closing. 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.

Size	Description	Design Style
		Spring
2"	1502 M Inlet, Line Pipe Thread Outlet	x
	1502 M Inlet, 1502 F Outlet	x
	1502 M Inlet, 1502 F Outlet Sour Gas	x
	2002 M Inlet, 2002 F Outlet	x
	2202 M Inlet, 2202 F Outlet Sour Gas	x
3"	1502 M Inlet, 1502 F Outlet	x



**3" SPRING ACTUATED
RELIEF VALVE**

NOTE:

Approximate flow rate for relief valves:

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

As flow requirements increase, then multiple valves may be preferred, and are permissible. You may find that two of the 2" valves are a better economic combination than one 3" valve. Multiples of either valve are allowed as long as the valves are all set within 10% of each other.

Example:

If a customer requires a flow of 400 GPM, he may choose to use three 2" spring operated valves or one 3" spring operated valve.

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RELIEF VALVES Emergency Back Pressure

SPM®'s Emergency Back Pressure Relief Valve provides over-pressure protection for reciprocating pumps, treating lines, pressure vessels, and other equipment operating under high-pressure, high-flow conditions. Compact and simple to operate, the valve is direct acting, relying on the system's hydraulic pressure to overcome a preset nitrogen gas force to relieve. It is externally adjustable from zero pressure to maximum setting.

Unlike Shear Relief Valves, which use common nails to trigger the release, the SPM® valve will reseal once the system pressure reduces. And unlike many "High-Lift" Valves, which require a substantial drop in pressure before they will reseal, the SPM® valve exhibits little blow down and will reseal at or near the "cracking pressure".

NOTE:

Approximate flow rate for relief valves:

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

As flow requirements increase, then multiple valves may be preferred, and are permissible. You may find that two of the 2" valves are a better economic combination than one 3" valve. Multiples of either valve are allowed as long as the valves are all set within 10% of each other.

Example:

If a customer requires a flow of 400 GPM, he may choose to use three 2" spring operated valves or one 3" spring operated valve.



Size	Description	Design Style Spring
3"	1502 M Inlet, 1502 F Outlet	x
	1002 M Inlet, 1002 F Outlet	x
4"	1502 M Inlet, 1502 F Outlet	x

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RELIEF VALVES Full Bore Unloading Valve

SPM® Full Bore Unloading Valves for drilling applications provide over-pressure protection for mud pumps operating under a variety of pressure and flow conditions. The valves are compact, simple to operate and rely on the system's pressure to open when a preset pressure is exceeded and automatically snap shut when the pressure drops.

The valves are externally adjustable, and unlike shear relief valves which use common nails to trigger the valve, Weir SPM®'s Full Bore Unloading Valve utilizes nitrogen or rig air (properly filtered) to activate opening and closing. This model is available in 3" and 4" sizes. Operating pressures range from 5,000 psi to 20,000 psi. Standard service and sour gas models are available.





RELIEF VALVES N2 Relief Valve Status Indicator System

SPM® now offers a Status Indicator System as an option to be included in all new 3" and 4" Emergency Back Pressure & Unloading Relief Valves. The product operation concept is simple. At any given time when the valve piston lifts greater than 0.030", the system will remotely indicate that the valve has opened. In the instance that the valve piston has dropped below 0.030" the system will then remotely indicate that the valve has closed.

The SPM® Status Indicator System can interface with existing customermanaged data monitoring and logging systems allowing for accurate control and trouble shooting of over pressure events on a frac site. The Data Van Interface directly integrates the Status Indicator System into the data van's data acquisition system. A 200 ft weather resistant cable can be purchased separately for transferring data. Contact Weir SPM®'s Flow Engineering team for more detailed information about interfacing data.



REMOTE CONTROL PANEL For Nitrogen Relief Valve Operation

The Remote Control Panel offers increased safety during high pressure pumping operations at a safe distance.

To maximize safety, SPM®'s Remote Control panel should be utilized along with the Full Bore Emergency Unloading Valve and the Emergency Back Pressure Relief Valve. The Remote Control Panel regulates the flow of rig air or nitrogen to the relief valve and allows the operator to change pressure relief settings with the flow line. The Remote Control Panel is also engraved with a quick reference Chart for easy adjustment.



SUR-DROP® BALL INJECTORS

SPM® Sur-Drop® High-Pressure Ball Injector features the "Positive Feed System", resulting in a reliable feed and injection rate. New design revisions have enhanced operating performance, made maintenance more convenient, and greatly reduced lead time for faster response to customer needs.

NEW DESIGN UPGRADES:

- Improved manufacturing processes allow for more precise machined parts.
- Increased flexibility in operation by consolidating ball cartridge sizes.
 - ~ 5/8" & 3/4" ~ 7/8" & 1" ~ 1-1/8" & 1-1/4"
- Increased convenience in maintenance.
 - ~ Two-piece screw assembly allows for more convenient replacement of drive stem, without replacing entire assembly.
- Easy manual loading eliminates use of awkward tools.



SAFETY LIFTING CLAMPS™

The Safety Lifting Clamp™ is a simple to use tool to safely lift long lengths of pipe on site by ensuring the lift occurs at the center of gravity of the pipe, making movement easier, more consistent and most importantly safe.

Safety Lifting Clamps™ are tested to meet ASME B30.20-2010 standards and compliant with NACE MR00175. SPM® offers 4 different assemblies to fit pipe ranging from 3.50" to 6.50" outside diameter.



CEMENT HEADS

Utilizing superior field-tested welding techniques, SPM[®] cement heads provide high-pressure performance in a variety of designs to meet the needs of the industry. Featuring single or double plug head designs, easy-to-attach landing joints, and reliable plug pin performance, SPM[®] cement heads perform with consistency and reliability in the field.

Single and Double Head designs are available in the following sizes:

2.875"
 3.50"
 4.50"
 5.0" - 5.5"
 7.0" - 7.63"
 8.63" - 9.63"
 10.75" - 11.75"
 13.375"
 16.0"
 18.63" - 20.0"



Cement Head Manifolds
 also available

FRAC HEADS

SPM^{®s} customizable frac heads allow customers to design their ideal frac head for reliable and consistent performance on their frac sites.

SPM frac heads are manufactured from hardened steel and feature field-proven durable welds at the branches. Available in two styles, the "Goat Head" Style and "Inlet" Style, SPM[®] customizes frac head orders to customer specifications through the use of a Frac Head Request Form.

Through the utilization of the Frac Head Request Form, customers may customize their purchase through the following design options:

- Pressure Rating
- Top Connection Type
- Minimum Through-Bore Width
- Number of Side Connections
- Side Connection Branch Angle
- Side Connection Branch, Type, and Pressure Rating
- Bottom Connection Type



SAFETY IRON®

Safety Iron® is a clamp connecting flow line system developed to replace traditional wing nut 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 seal 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 compared to traditional hammer union connections, and a safer work environment by allowing the user to "throw away the hammer."

**Available in 1½" through 4" in pressure ratings up to 20,000 psi.
U.S. Patent No. 7,204,525**

BENEFITS OF SAFETY IRON® VS. TRADITIONAL HAMMER UNION

CONNECTIONS:

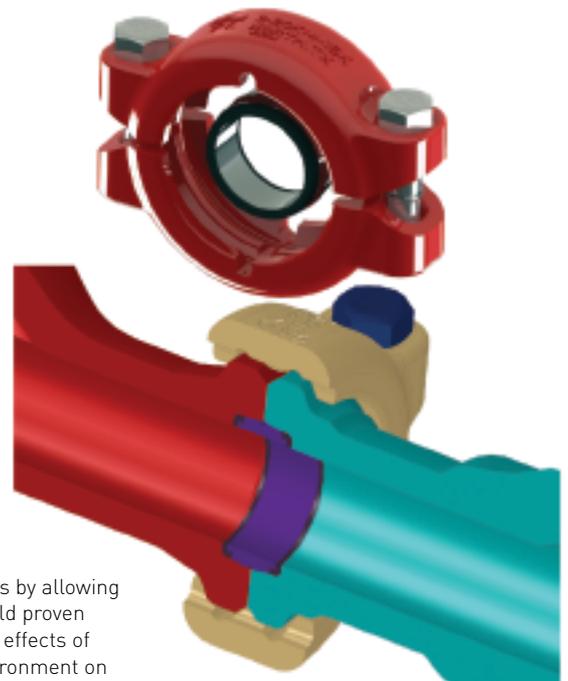
- Greater Safety
- Less Physically Demanding Assembly/Disassembly
- Less Injury Prone
- Less Labor Intensive & Less Expensive Reinspection
- Faster Break-down
- More Reliable Seal
- Fatigue Resistant Due to Side Loading Ability

SAFETY IRON PRODUCT LINE:

- Swivel Joints
- Check Valves
- Plug Valves
- Relief Valves
- Integrals (Tees, Wyes, Elles, Crosses, and Crossovers)
- Pipe
- Pump Discharge Manifolds

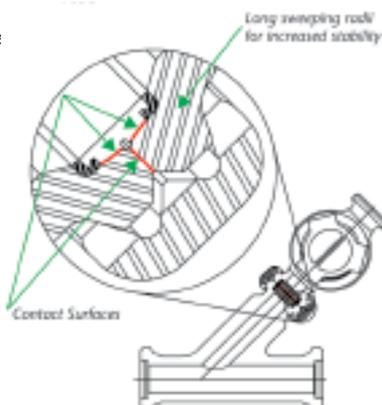
A SAFER MORE RELIABLE CONNECTION

SPM®'s Safety Iron® gives users the opportunity to reduce the risk of accident incidents by allowing the user to "throw away the hammer." The durability of Safety Iron® seals has been field proven in harsh pumping environments and has maintained its sealing properties despite the effects of extreme vibration and cavitation. Not only does Safety Iron® result in a safer work environment on site, but also increases productivity as a superior performing flow line iron system compared to the traditional hammer union connections. The product line is currently available in sizes 1½" to 4" in pressure ratings up to 20,000 psi. Nearly every flow control product manufactured by SPM® is offered with Safety Iron® connections, and DNV certification is also available. For ultimate safety on site, SPM® suggests applying Safety Iron® along with the Flow Line Safety Restraint System.



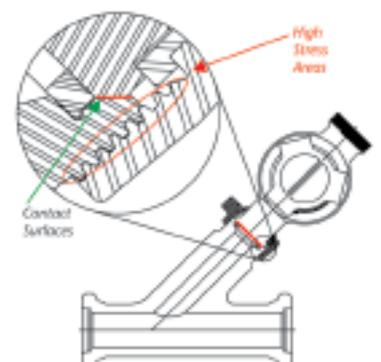
SAFETY IRON® CONNECTION

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 additional strength and vibration resistance.



TRADITIONAL HAMMER UNION CONNECTION

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



SAFETY HAMMER™

SPM®'s newest product designed to increase safety on the work site is the Safety Hammer™. The Safety Hammer™ promotes a safer work environment by reducing the dangers associated with assembling hammer union connections using a sledgehammer. Safety Hammer™ is a pneumatic tool designed to properly seal hammer union connections with the ease of pushing a button. The dangers of using a sledgehammer are greatly reduced as most connections on-site can be made with the Safety Hammer™.

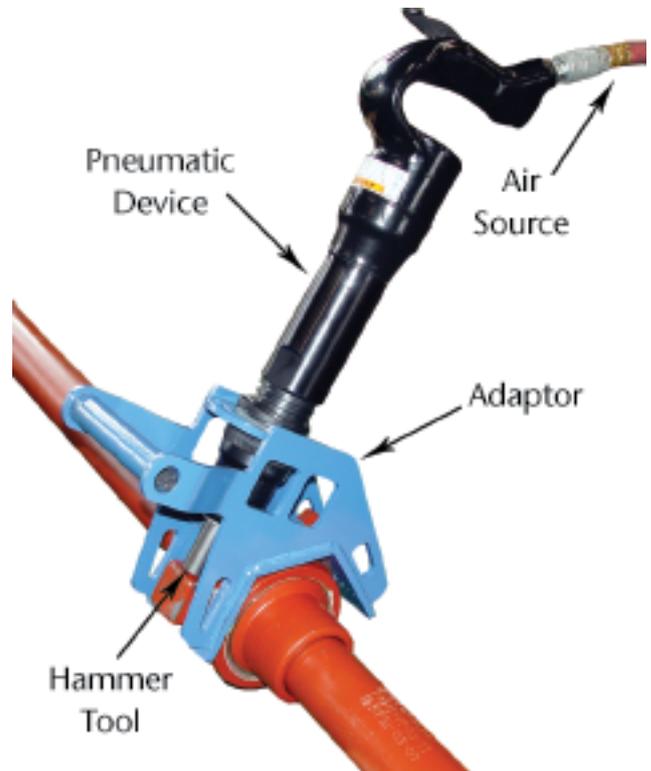
The Safety Hammer™ is an assembly composed of two main parts: high strength alloy steel adaptor and pneumatic hammer. The steel adaptor can be changed out as needed to fit different union sizes. In order for the Safety Hammer™ to function as intended, SPM® recommends 29 SCFM per hammer, with an air pressure of 90 psi and 1/2" air supply hose size. The Safety Hammer™ will make up and break down the hammer union depending on its orientation.

AVAILABLE IN 2" 1502, 3" 1502, 4" 200/206 AND 4" 602/1002.

There is no other tool on the market that allows for such convenient and safe assembly of hammer union connections.

BENEFITS:

- Lightweight design that is easy to install and operate.
- Less labor intensive assembly/disassembly.
- Lower risk of injury by removing hammer from assembly process.
- Adaptor can easily be interchanged for different size wing unions.



The Safety Hammer now features an upgraded impact tool made of a harder and tougher material for improved life with extended utility, and a redesigned contact end to minimize flaring of the edge.

FLOW LINE SAFETY RESTRAINT SYSTEM

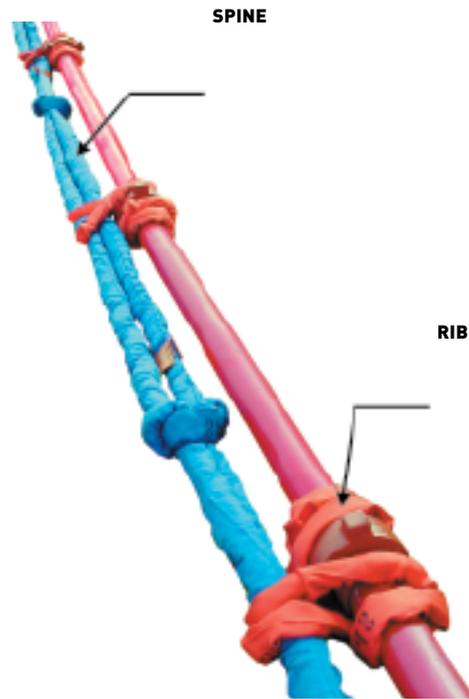
The Flow Line Safety Restraint System, or FSR, is the first and most utilized engineered restraint system specifically designed to reduce the area of danger around high-pressure flow line disengagements. Now, the FSR System is available in two styles: the original Medium Duty FSR and the new Light Duty FSR.

FEATURES OF THE SPM® FSR SYSTEM:

- Extreme high strength and reliability
- Flexible & lightweight
- Easy to install
- Corrosion resistant
- Works in both fluid and gas pumping operations
- Water resistant exterior covers
- Uniquely identifiable colors and labeling
- Available Full-Service Assistance in the field
- Ten years of proven, successful utilization

INSPECTION / REJECTION CRITERIA:

- Easy visual inspection process which can be performed in the field by competent personnel.
- Any damaged items must be taken out of service immediately.
- For more detailed inspection information visit the website below to view the FSR Operations Manual.

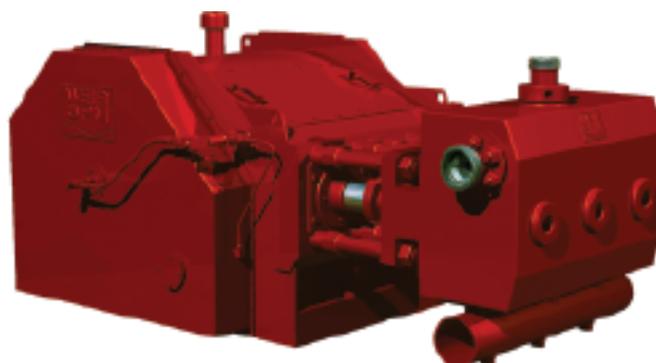


Duty	Color Code		Weights		Ratings		
	Rib	Spine	Rib	Spine	2" Iron	3" Iron	4" Iron
Medium Duty	Red	Blue	.85 lbs. / ft.	1.7 lbs. / ft.	20,000 psi	15,000 psi	10,000 psi
Light Duty	Yellow	White	.64 lbs. / ft.	1.00 lbs. / ft.	15,000 psi	7,500 psi	5,000 psi



WELL SERVICE PUMPS

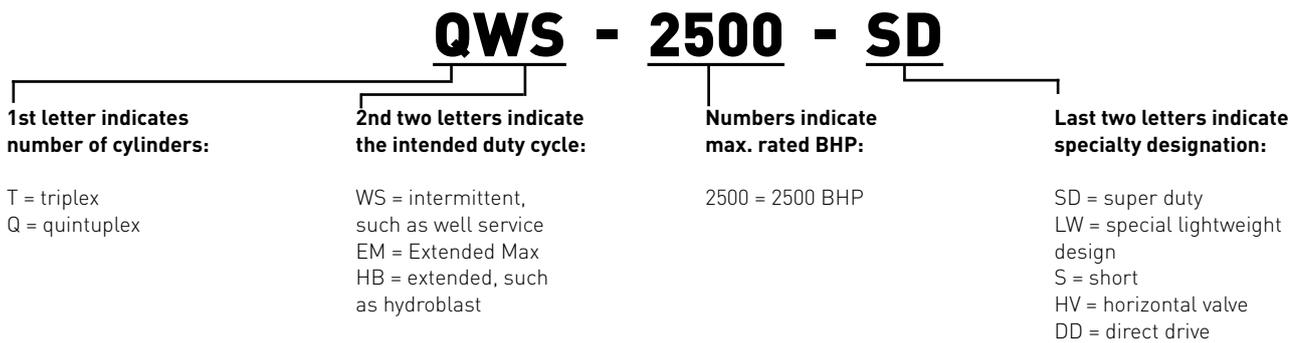
- SPM® manufactures the most comprehensive range of high-pressure plunger pumps in the industry. Weir SPM®'s plunger pump designs incorporate the ultimate in weight and space savings while having a reputation for dependable service even in today's hybrid extended duty applications, such as under-balanced coiled tubing drilling.
- © SPM offers intermittent duty pump models for the full range of well service applications, and extended duty plunger pump models for those oilfield and industrial applications requiring greater work periods with a small-footprint, lightweight pump.
- SPM®'s DNV Type Approved intermittent duty plunger pumps range from 250 BHP to 3500 BHP with pressure capabilities up to 20,000 psi. Premium plungers, valves, seats, packing, etc. can be configured to a variety of well service needs from mud based coiled tubing support services to hot oil, cementing, acidizing, fracturing, gravel packing, etc.
- SPM®'s durable extended duty plunger pumps range from 175 BHP to 1575 BHP. These extended duty plunger pumps are specially designed to provide durable service in extended applications one day and provide exceptional high pressure / high rate intermittent service the next. These pumps' unique versatility in duty cycle adaptability greatly increases the range of work that can be performed and the amount of revenue than can be generated with a single pump. These pumps are designed so that the expendable parts (packing, etc.) can easily be reconfigured for mud, water, drill cutting, acid, cement, etc.
- SPM® pumps are available with life cycle enhancing "auto-fretting" processing of the fluid cylinder. This very economical process adjusts for the harmful effects of cyclic stress and the stress corrosion cracking which can occur in high-pressure fluid cylinders. SPM®'s state-of-the-art auto-fretting process results in a fluid cylinder with several times the fatigue life expectancy at a fractional increase in cost.
- SPM® provides a wealth of technical data, assembly drawings and maintenance information on it's pumps (and flow control products as well) through an interactive home page on the Internet at www.weiroilandgas.com.



Every SPM pump is tested to full power inhouse before it is delivered to the customer to ensure quality and proper performance. SPM®'s 4500 hp test booth can run any pump up to full working power before delivery to the end user.

PUMP REFERENCE GUIDE

WEIR SPM PUMP MODEL EXPLANATION:



Common Pump Formulas:

- Hydraulic Horse Power (HHP) = (GPM x PSI) / 1714
- Brake Horse Power (BHP) = (GPM X PSI) / (1714 x ME)
- Pressure (PSI) = (BHP x 1714 x ME) / GPM
- GPM = (BHP x 1714 x ME) / PSI
- Rod Load = PD x PD x .7854 x PSI
- GPR = (PD x PD x .7854 x SL x NC) / 231
- GPM = GPR x RPM

- GPM - Gallons Per Minute
- PD - Plunger Diameter
- NC - Number of Cylinders
- ME - Mechanical Efficiency
- SL - Stroke Length
- GPR - Gallons Per Revolution

EXTENDING PUMP LIFE & PREVENTATIVE MAINTENANCE PROGRAM

Extending Pump Life:

Extending pump life requires careful operation by the customer. The customer should observe and utilize the following tools and practices:

- Dual inlet or Zoomie manifold
- Properly sized and maintained suction pulsation dampeners
- Properly maintained valves/seats/inserts
- Improved discharge harmonics (may require high pressure dampener)
- Correct piping placement, proper supercharging
- Proper sand and gel concentrations and blender operations

Maintenance:

At the very least, the following maintenance programs should be set up, operated, and recorded for review:

- Power end lube oil and filter inspection
- Fluid end valves and inserts inspection
- Fluid end seats inspection
- Fluid end valve springs inspection
- Plunger packing inspection

Proper maintenance practices are the best way to increase the life of your pumps and pump components. SPM® strongly suggests that each customer develop a maintenance program to be followed at all times.

Pump Duty Cycles

For information on pump duty cycles, Contact SPM® Engineering.

The TWS 600S offers a versatile small footprint pump that can perform a variety of duties for the well service industry. The unique design features an offset crankshaft / crosshead design which substantially reduces the load on both the crosshead and crosshead guides as well as the main roller bearings supporting the crankshaft. The TWS 600S can be utilized in a back-to-back configuration to perform rugged acidizing, cementing, gravel packing and snubbing operations.

APPLICATIONS: Acidizing, cementing, gravel packing, snubbing

Rated Max. Brake HP.....600 BHP (447 Kw)
 Maximum Rod Load.....100,000 Lbs. (43,360 kg)
 Stroke Length.....6" (152.4 mm)
 Gear Ratio.....4.61:1
 Length.....50-1/4" (1,276 mm)
 Width.....52-15/16" (1,344 mm)
 Height.....23-7/8" (607 mm)
 Weight Dry (Approx.).....4,940# (2,040 kg)

Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.

WELL SERVICE PUMP TWS 600S

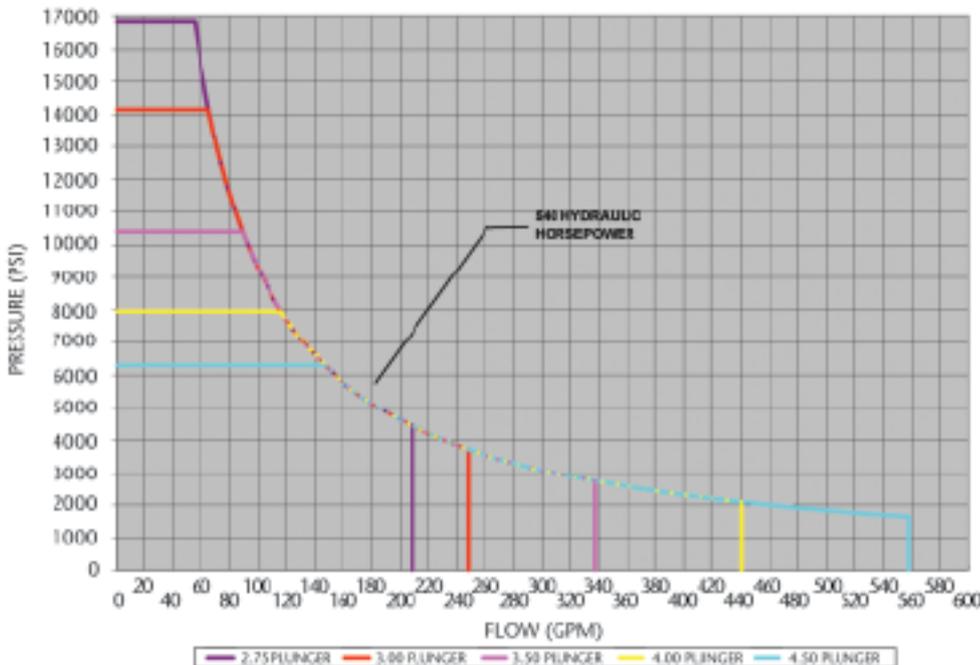


TWS 600S PERFORMANCE DATA ^{1,2}

Plunger Diameter	Output per rev	Displacement at Pump Strokes per Minute / Pinion RPM									
		50/230		120/552		200/920		300/1380		450/2070	
in (mm)	gal/rev (liter/rev)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)
2½ (63.5)	.38 (1.4)	19 (72)	20,372 (1436)	46 (174)	20,165 (1421)	76 (290)	12,099 (853)	115 (434)	8,066 (568)	172 (651)	5,377 (379)
2¾ (69.9)	.46 (1.8)	23 (87)	16,836 (1186)	56 (210)	16,665 (1174)	93 (350)	9,999 (705)	139 (526)	6,666 (470)	208 (788)	4,444 (313)
3 (76.2)	.55 (2.1)	28 (104)	14,147 (997)	66 (250)	14,003 (987)	110 (417)	8,402 (592)	165 (625)	5,601 (395)	248 (938)	3,734 (263)
3½ (88.9)	.75 (2.8)	37 (142)	10,394 (732)	90 (341)	10,288 (725)	150 (568)	6,173 (435)	225 (851)	4,115 (290)	337 (1277)	2,744 (193)
4 (101.6)	.98 (3.7)	49 (185)	7,958 (561)	118 (445)	7,877 (555)	196 (741)	4,726 (333)	294 (1112)	3,151 (222)	441 (1668)	2,100 (148)
4½ (114.3)	1.24 (4.7)	62 (235)	6,288 (443)	149 (563)	6,224 (439)	248 (938)	3,734 (263)	372 (1407)	2,489 (175)	558 (2111)	1,660 (117)
INPUT POWER: BHP (Kw)		253 (188)		600 (448)		600 (448)		600 (448)		600 (448)	

1 Based on 90% ME and 100% VE - Intermittent Service Only.
 2 For applications demanding pressures over 15,000 psi, contact SPM® Engineering.

TWS 600S HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

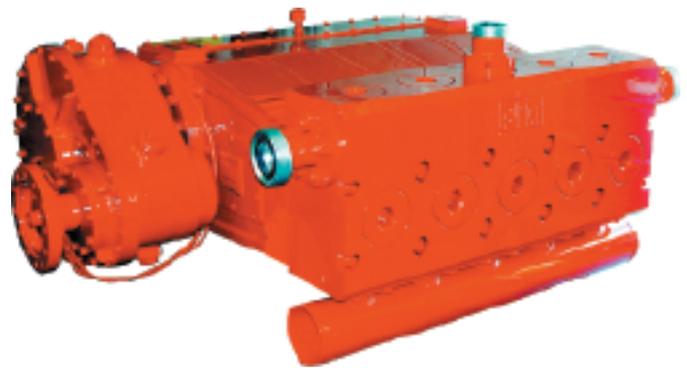
The QWS 1000S offers a similar design as the TWS 600S with its small footprint, but offers a larger power output. The QWS 1000S can also be set up in the back-to-back configuration to perform acidizing, cementing, gravel packing, and snubbing operations.

WELL SERVICE PUMP QWS 1000S

APPLICATIONS: Acidizing, cementing, gravel packing, snubbing

Rated Max Brake HP.....1,000 BHP (746 Kw)
 Maximum Rod Load.....100,000 Lbs. (45,359 kg)
 Stroke Length.....6" (152.4 mm)
 Gear Ratio.....4.61:1
 Length.....50" (1,270 mm)
 Width.....73" (1,854 mm)
 Height.....24" (609 mm)
 Weight Dry (Approx.).....7,040# (3,193 kg)

Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.



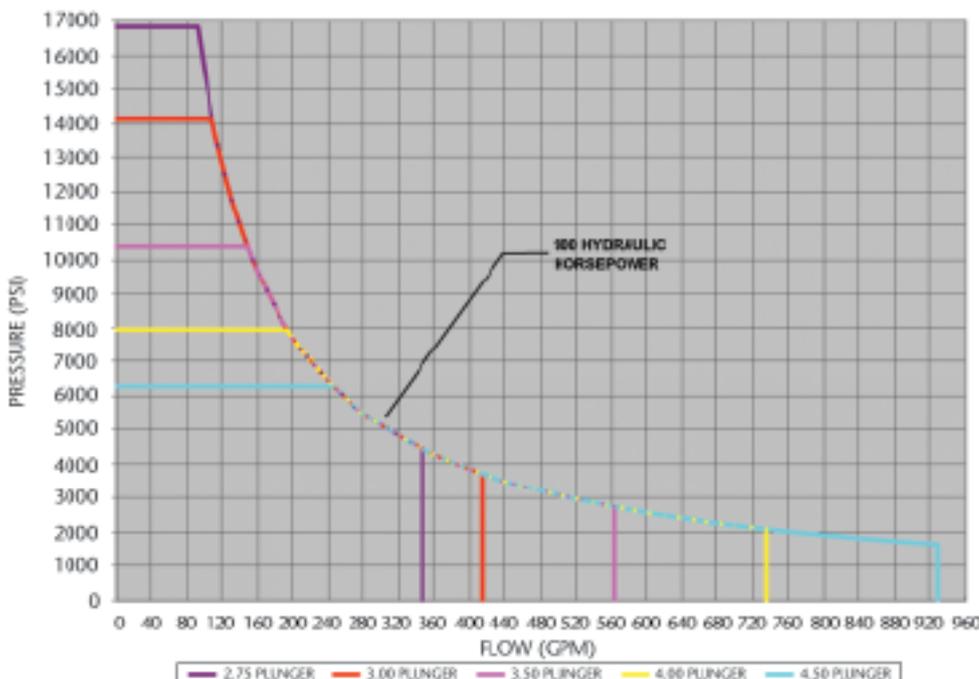
QWS 1000S PERFORMANCE DATA ^{1,2}

Plunger Diameter in (mm)	Output per rev gal/rev (liter/rev)	Displacement at Pump Strokes per Minute / Pinion RPM											
		50/231		100/461		119/548		200/922		300/1380		450/2070	
		gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)
2½ (63.5)	0.64 (2.4)	32 (121)	20,372 (1436)	64 (241)	20,372 (1436)	76 (287)	20,368 (1435)	127 (483)	12,009 (853)	191 (724)	8,066 (568)	287 (1086)	5,377 (379)
2¾ (69.9)	0.77 (2.9)	39 (146)	16,836 (1186)	77 (292)	16,836 (1186)	92 (347)	16,833 (1186)	154 (584)	9,999 (705)	231 (876)	6,666 (470)	347 (1314)	4,444 (313)
3 (76.2)	0.92 (3.5)	46 (174)	14,147 (997)	92 (347)	14,147 (997)	109 (413)	14,145 (997)	184 (695)	8,402 (592)	275 (1042)	5,601 (395)	413 (1564)	3,734 (263)
3½ (88.9)	1.25 (4.7)	62 (236)	10,394 (732)	125 (473)	10,394 (732)	148 (562)	10,392 (732)	250 (946)	6,173 (435)	375 (1419)	4,115 (290)	562 (2128)	2,744 (193)
4 (101.6)	1.63 (6.2)	82 (309)	7,958 (561)	163 (618)	7,958 (561)	194 (734)	7,956 (561)	326 (1235)	4,726 (333)	490 (1853)	3,151 (222)	734 (2780)	2,100 (148)
4½ (114.3)	2.07 (7.8)	103 (391)	6,288 (443)	207 (782)	6,288 (443)	245 (929)	6,287 (443)	413 (1564)	3,734 (263)	620 (2345)	2,489 (175)	929 (3518)	1,660 (117)
INPUT POWER: BHP (Kw)		421 (314)		842 (628)		1000 (746)		1000 (746)		1000 (746)			

1 Based on 90% ME and 100% VE - Intermittent Service Only.

2 For applications demanding pressures over 15,000 psi, contact SPM® Engineering.

QWS 1000S HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

The TWS 2250 is the most powerful triplex in SPM®'s line of well service pumps. This staple of the Weir SPM® line of well service pumps offers great pressure and flow ratings in a smaller package than the large quintuplex pumps offered

FRAC PUMP TWS 2250

APPLICATIONS: Fracturing

Rated Max Brake HP.....2,250 BHP (1678 kW)
 Maximum Rod Load.....238,000/570 Lbf (108,213 kg)
 Number of Cylinders.....3 Cly
 Stroke Length.....8" (203 mm)
 Gear Ratio.....6.353:1
 Length.....89.9" (2284 mm)
 Width.....59.8" (1519 mm)
 Height.....44.3" (1125 mm)
 Weight Dry (Approx.).....11,750 Lbf (5330 kg)



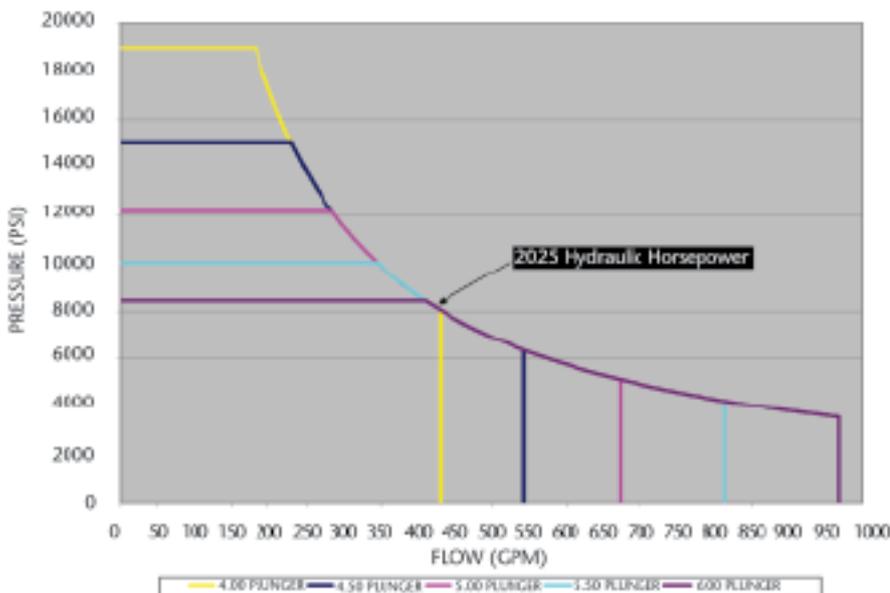
Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.

TWS 2250 PERFORMANCE DATA ^{1,2}

Plunger Diameter in (mm)	Displace per rev gal/rev (liter/rev)	Displacement at Pump Strokes per Minute / Pinion RPM											
		75 / 476		115 / 731		115 / 731		200 / 1271		300 / 1906		330 / 2096	
		gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)
3½ (88.9)	1.00 (3.8)	75 (284)	24,796 (1743)	115 (435)	24,796 (1743)	148 (562)	23,390 (1648)	200 (757)	17,361 (1223)	300 (1135)	11,574 (816)	330 (1249)	10,522 (742)
3¾ (95.3)	1.15 (4.3)	86 (326)	21,600 (1519)	132 (500)	21,600 (1519)	170 (645)	20,375 (1436)	229 (869)	15,124 (1066)	344 (1303)	10,082 (711)	379 (1433)	9,166 (646)
4 (101.6)	1.31 (4.9)	98 (371)	18,985 (1335)	150 (568)	18,985 (1335)	194 (734)	17,908 (1262)	261 (988)	13,292 (937)	392 (1483)	8,861 (624)	431 (1631)	8,056 (568)
4½ (114.3)	1.65 (6.3)	124 (469)	15,000 (1055)	190 (719)	15,000 (1055)	245 (929)	14,150 (997)	330 (1251)	10,502 (740)	496 (1876)	7,002 (493)	545 (2064)	6,365 (449)
5 (127.0)	2.04 (7.7)	153 (579)	12,150 (854)	235 (888)	12,150 (854)	303 (1146)	11,461 (808)	408 (1544)	8,507 (600)	612 (2317)	5,671 (400)	673 (2548)	5,156 (363)
5½ (139.7)	2.47 (9.3)	185 (701)	10,042 (706)	284 (1075)	10,042 (706)	366 (1387)	9,472 (668)	494 (1869)	7,031 (495)	741 (2803)	4,687 (330)	815 (3083)	4,261 (300)
5¾ (146.1)	2.70 (10.2)	202 (766)	9,187 (646)	310 (1174)	9,187 (646)	401 (1516)	8,666 (611)	540 (2043)	6,433 (453)	809 (3064)	4,288 (302)	890 (3370)	3,898 (275)
6 (152.4)	2.94 (11.1)	220 (834)	8,438 (593)	338 (1279)	8,438 (593)	436 (1651)	7,959 (561)	588 (2224)	5,908 (416)	881 (3336)	3,938 (278)	969 (3670)	3,580 (252)
6½ (165.1)	3.45 (13.1)	259 (979)	7,190 (505)	396 (1501)	7,190 (505)	512 (1937)	6,782 (478)	690 (2610)	5,034 (355)	1,034 (3915)	3,356 (236)	1,138 (4307)	3,051 (215)
6¾ (171.5)	3.72 (14.1)	279 (1056)	6,667 (469)	428 (1618)	6,667 (469)	552 (2089)	6,289 (443)	744 (2810)	4,668 (329)	1,115 (4222)	3,112 (219)	1,227 (4644)	2,829 (199)
7 (177.8)	4.00 (15.1)	300 (1135)	6,199 (436)	460 (1740)	6,199 (436)	594 (2247)	5,548 (412)	800 (3027)	4,340 (306)	1,200 (4541)	2,894 (204)	1,319 (4995)	2,630 (185)
7½ (190.5)	4.59 (17.4)	344 (1303)	5,400 (380)	528 (1998)	5,400 (381)	681 (2579)	5,094 (359)	918 (3475)	3,781 (266)	1,377 (5,212)	2,521 (178)	1,515 (5734)	2,291 (161)
INPUT POWER: BHP (Kw)		1205 (899)		1848 (1378)		2250 (1678)		2250 (1678)		2250 (1678)		2250 (1678)	

1 Based on 90% ME and 100% VE - Intermittent Service Only.
 2 For applications demanding pressures over 15,000 psi, contact SPM® Engineering.

TWS 2250 HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

FRAC PUMP QWS 2500SD

The QWS 2500SD was developed to handle harsh frac conditions, as seen in the premier North American shale plays. The QWS 2500SD is designed to withstand 10 hours of operation up to 6 days a week while maintaining a high performance rod load capacity that is necessary for pumping in harsh conditions.

APPLICATIONS: Fracturing

Rated Max. Brake HP.....2,500 BHP (1,866 Kw)
 Maximum Rod Load.....192,325 Lbs. (87,239 kg)
 Stroke Length.....8" (203.2 mm)
 Gear Ratio.....6.353:1
 Length.....84 3/4" (2,153 mm)
 Width.....73 7/8" (1,877 mm)
 Height.....43 3/8" (1,102 mm)
 Weight Dry (Approx.).....16,000# (7,257 kg)

Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.

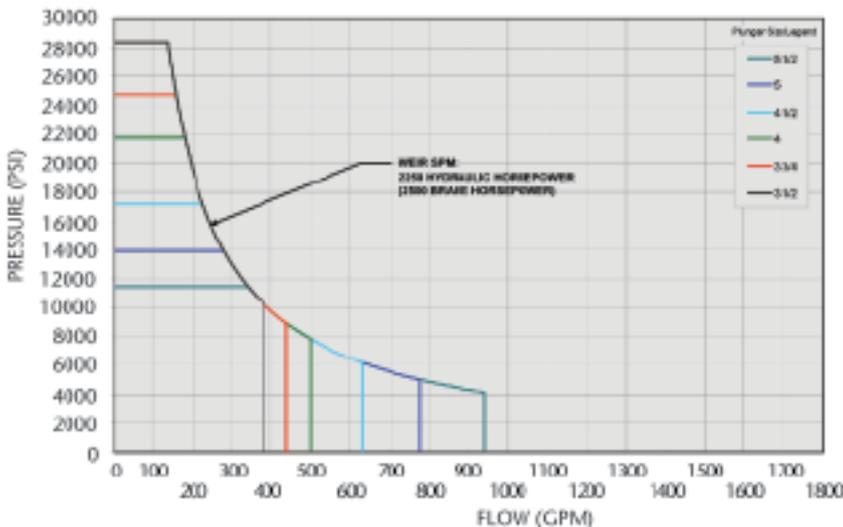


QWS 2500SD PERFORMANCE DATA ^{1,2}

Plunger Diameter	Displace per rev	Displacement at Pump Strokes per Minute / Pinion RPM																							
		50		319		75		478		110		701		150		956		250		1594		305		1944	
in (mm)	gal/rev (liter/rev)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)	gpm (lpm)	psi (kg/cm²)
3 1/2 (88.9)	1.25 (4.7)	62 (236)	28,375 (2000)	94 (355)	28,375 (2000)	137 (520)	28,375 (2000)	187 (709)	20,805 (1466)	312 (1182)	12,483 (880)	381 (1442)	10,232 (721)												
3 3/4 (95.3)	1.43 (5.4)	72 (271)	24,718 (1742)	108 (407)	24,718 (1742)	158 (597)	24,718 (1742)	215 (814)	18,123 (1277)	359 (1357)	10,874 (766)	437 (1656)	8,913 (628)												
4 (101.6)	1.63 (6.2)	82 (309)	21,725 (1531)	122 (463)	21,725 (1531)	179 (679)	21,725 (1531)	245 (927)	15,929 (1123)	408 (1544)	9,557 (674)	498 (1884)	7,834 (552)												
4 1/2 (114.3)	2.07 (7.8)	103 (391)	17,165 (1210)	155 (586)	17,165 (1210)	227 (860)	17,165 (1210)	310 (1173)	12,586 (887)	516 (1954)	7,551 (532)	630 (2384)	6,190 (436)												
5 (127.0)	2.55 (9.7)	217 (483)	13,904 (980)	191 (724)	13,904 (980)	280 (1061)	13,904 (980)	382 (1448)	10,194 (718)	637 (2413)	6,117 (431)	779 (2944)	5,014 (353)												
5 1/2 (139.7)	3.09 (11.7)	154 (584)	11,491 (810)	231 (876)	11,491 (810)	339 (1284)	11,491 (810)	463 (1752)	8,425 (594)	771 (2920)	5,055 (356)	941 (3562)	4,144 (292)												
INPUT POWER: BHP (Kw)		1137 (848)		1705 (1272)		2500 (1865)		2500 (1866)		2500 (1866)		2500 (1866)													

1 Based on 90% ME and 100% VE - Intermittent Service Only.
 2 For applications demanding pressures over 15,000 psi, contact SPM® Engineering.

QWS 2500S HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

FRAC PUMP QWS 3500

The QWS 3500 is the most powerful well service pump on the market. With 3500 BHP, the pump is designed to eliminate the number of units required on a site to reach its high pressure pumping capabilities, reducing the user's operational costs.

APPLICATIONS: Fracturing

Rated Max. Brake HP.....3,500 BHP [2,609 Kw]
 Maximum Rod Load.....260,000 Lbs. [117,934 kg]
 Stroke Length.....10" [254 mm]
 Gear Ratio.....7.091:1
 Length.....94" [2,388 mm]
 Width.....108" [2,743 mm]
 Height.....36" [914 mm]
 Weight Dry (Approx.).....24,000# [10,866 kg]

Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.

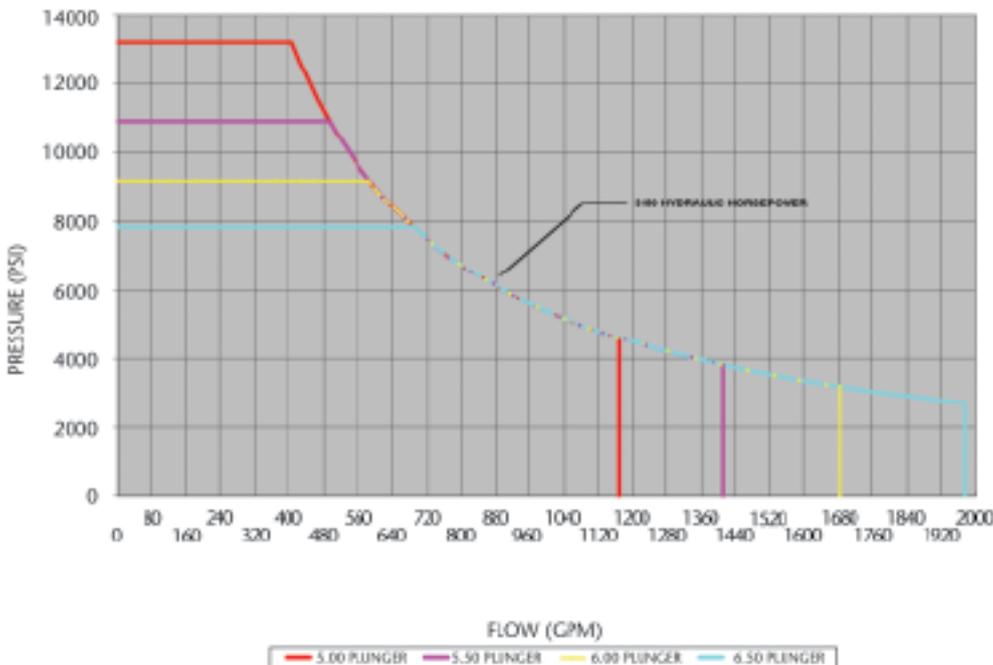


QWS 3500 PERFORMANCE DATA ^{1,2}

Plunger Diameter	Displace per rev	Displacement at Pump Strokes per Minute / Pinion RPM											
		50 / 355		75 / 532		96 / 680		150 / 1064		200 / 1418		275 / 1950	
in (mm)	gal/rev (liter/rev)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)
4 (101.5)	2.72 (10.3)	136 (515)	20,690 (1458)	204 (772)	20,690 (1458)	261 (988)	20,690 (1458)	408 (1544)	13,233 (933)	544 (2059)	9,925 (699)	748 (2831)	7,218 (509)
4½ (114.3)	3.44 (13.0)	172 (651)	16,348 (1152)	258 (977)	16,346 (1152)	330 (1250)	16,346 (1152)	516 (1954)	10,456 (737)	688 (2606)	7,842 (553)	947 (3583)	5,703 (402)
5 (127.0)	4.25 (16.1)	212 (804)	13,242 (933)	319 (1206)	13,242 (933)	408 (1543)	13,242 (933)	637 (2413)	8,469 (597)	850 (3217)	6,352 (448)	1,169 (4424)	4,620 (326)
5½ (139.7)	5.14 (19.5)	257 (973)	10,944 (771)	386 (1460)	10,944 (771)	493 (1867)	10,944 (771)	771 (2920)	6,999 (493)	1,028 (3893)	5,250 (370)	1,414 (5353)	3,818 (269)
6 (152.4)	6.12 (23.2)	306 (1158)	9,196 (648)	459 (1737)	9,196 (648)	587 (2222)	9,196 (648)	918 (3475)	5,881 (414)	1,224 (4633)	4,411 (311)	1,683 (6370)	3,208 (226)
6½ (165.1)	7.18 (27.2)	359 (1359)	7,835 (552)	539 (2039)	7,835 (552)	689 (2608)	7,835 (552)	1,077 (4078)	5,011 (353)	1,436 (5437)	3,759 (265)	1,975 (7476)	2,733 (193)
7 (177.8)	8.33 (31.5)	416 (1576)	6,756 (476)	625 (2365)	6,756 (476)	799 (3025)	6,756 (476)	1249 (4729)	4,321 (305)	1,666 (6306)	3,241 (228)	2291 (8670)	2,357 (166)
INPUT POWER: BHP (Kw)		1824 (1361)		2736 (2042)		3500 (2612)		3500 (2612)		3500 (2612)		3500 (2612)	

1 Based on 90% ME and 100% VE - Intermittent Service Only.
 2 For applications demanding pressures over 15,000 psi, contact SPM® Engineering.

QWS 3500 HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

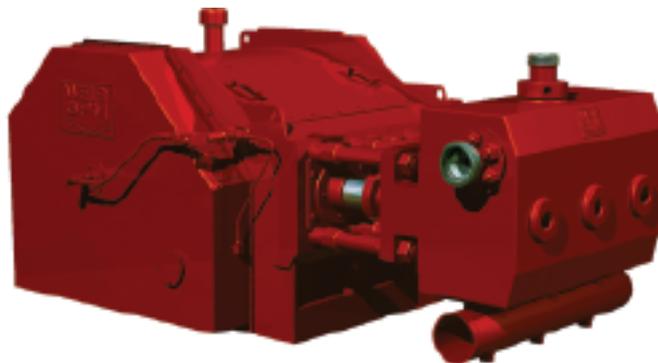
The TWS 2400 is a frac pump designed to better handle the extreme operating conditions seen in the new unconventional gas formations. The TWS 2400 has successfully completed a 1.5 million cycle test proving its durable design and performance capability.

FRAC PUMP TWS 2400

APPLICATIONS: Acidizing, cementing, gravel packing, snubbing

Rated Max. Brake HP.....2,400 BHP (1,790 Kw)
 Maximum Rod Load.....273,000 Lbs. (117,934 kg)
 Stroke Length.....8" (203 mm)
 Gear Ratio.....5.588:1
 Length.....90" (2,381 mm)
 Width.....60" (1,519 mm)
 Height.....44" (1,125 mm)
 Weight Dry (Approx.).....11,750# (5,335 kg)

Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.

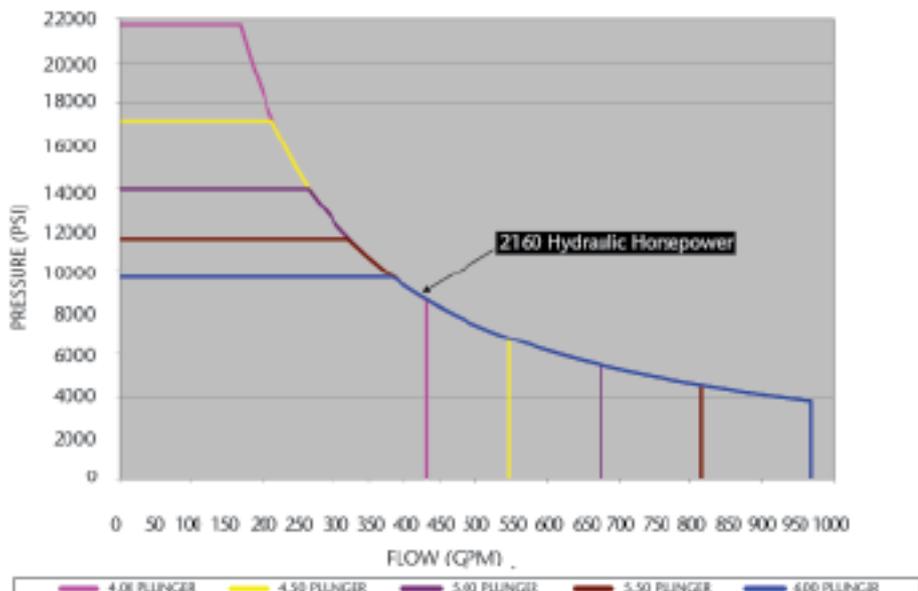


TWS 2400 PERFORMANCE DATA ^{1,2}

Plunger Diameter	Displace per rev	Displacement at Pump Strokes per Minute / Pinion RPM											
		75 / 419		115 / 643		131 / 730		200 / 1118		300 / 1676		348 / 1945	
in (mm)	gal/rev (liter/rev)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)
3½ (88.9)	1.00 (3.8)	75 (284)	28,385 (2000)	115 (435)	28,385 (2000)	131 (494)	28,359 (1999)	200 (757)	18,519 (1305)	300 (1135)	12,346 (870)	348 (1317)	10,643 (750)
3¾ (95.3)	1.15 (4.3)	86 (326)	24,718 (1742)	132 (499)	24,718 (1742)	150 (567)	24,704 (1741)	229 (869)	16,132 (1137)	344 (1303)	10,755 (758)	399 (1511)	9,271 (653)
4 (101.6)	1.31 (4.9)	98 (371)	21,725 (1531)	150 (568)	21,725 (1531)	171 (645)	21,713 (1530)	261 (988)	14,178 (999)	392 (1483)	9,452 (666)	454 (1720)	8,148 (574)
4½ (114.3)	1.65 (6.3)	124 (469)	17,165 (1210)	190 (719)	17,165 (1210)	216 (817)	17,156 (1209)	330 (1251)	11,203 (789)	496 (1876)	7,468 (526)	575 (2177)	6,438 (454)
5 (127.0)	2.04 (7.7)	153 (579)	13,904 (980)	235 (888)	13,904 (980)	266 (1008)	13,896 (979)	408 (1544)	9,074 (639)	612 (2316)	6,049 (426)	710 (2687)	5,215 (368)
5½ (139.7)	2.47 (9.3)	185 (701)	11,491 (810)	284 (1074)	11,491 (810)	322 (1220)	11,484 (809)	494 (1869)	7,499 (528)	741 (2803)	5,000 (352)	859 (3251)	4,310 (304)
5¾ (146.1)	2.70 (10.2)	202 (766)	10,513 (741)	310 (1174)	10,513 (741)	352 (1334)	10,507 (740)	540 (2042)	6861 (484)	809 (3063)	4,574 (322)	939 (3554)	3,943 (278)
6 (152.4)	2.94 (11.1)	220 (834)	9,655 (680)	338 (1279)	9,655 (680)	384 (1452)	9,650 (680)	588 (2224)	6,301 (444)	881 (3336)	4,201 (296)	1,022 (3869)	3,622 (255)
6½ (165.1)	3.45 (13.0)	259 (979)	8,227 (580)	396 (1501)	8,227 (580)	450 (1704)	8,223 (579)	690 (2610)	5,369 (378)	1,034 (3915)	3,580 (252)	1,200 (4541)	3,086 (217)
6¾ (171.5)	3.72 (14.1)	279 (1055)	7,629 (538)	428 (1618)	7,629 (538)	486 (1838)	7,625 (537)	744 (2814)	4,979 (351)	1,115 (4222)	3,319 (234)	1,294 (4897)	2,861 (202)
7 (177.8)	4.00 (15.1)	300 (1135)	7,094 (500)	460 (1740)	7,094 (500)	522 (1976)	7,090 (500)	800 (3027)	4,630 (326)	1,200 (4540)	3,086 (218)	1,391 (5297)	2,661 (188)
7½ (190.5)	4.59 (17.4)	344 (1303)	6,179 (435)	528 (1998)	6,179 (435)	599 (2269)	6,176 (435)	918 (3475)	4,033 (284)	1,377 (5212)	2,689 (189)	1,597 (6046)	2,318 (163)
INPUT POWER: BHP (Kw)		1137 (1029)		2114 (1578)		2400 (1791)		2400 (1791)		2400 (1791)		2400 (1791)	

1 Based on 90% ME and 100% VE - Intermittent Service Only.
 2 For applications demanding pressures over 15,000 psi, contact SPM® Engineering.

TWS 2400 HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

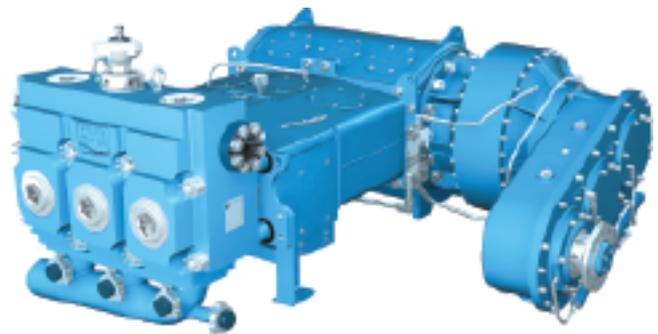
The SPM® Destiny™ TWS 2500 frac pump is designed for operation in today's harshest multistage frac applications with a 2500 horsepower rating, 273,000 lb rod load, and 10" stroke. The longer stroke requires fewer cycles to produce an equivalent flow rate compared to an 8" stroke quintuplex pump; resulting in less overall wear on expendables and improved overall pump durability. This combination provides more operating ranges than other triplex pumps in this category currently in the market.

APPLICATIONS: Acidizing, cementing, gravel packing, snubbing

Rated Max. Brake HP.....600 BHP (447 Kw)
 Maximum Rod Load.....100,000 Lbs. (43,360 kg)
 Stroke Length.....6" (152.4 mm)
 Gear Ratio.....4.61:1
 Length.....50-1/4" (1,276 mm)
 Width.....52-15/16" (1,344 mm)
 Height.....23-7/8" (607 mm)
 Weight Dry (Approx.).....4,940# (2,040 kg)

Pump dimensions are approximate. For full detailed drawings, please contact SPM® Engineering.

FRAC PUMP Destiny™ TWS 2500

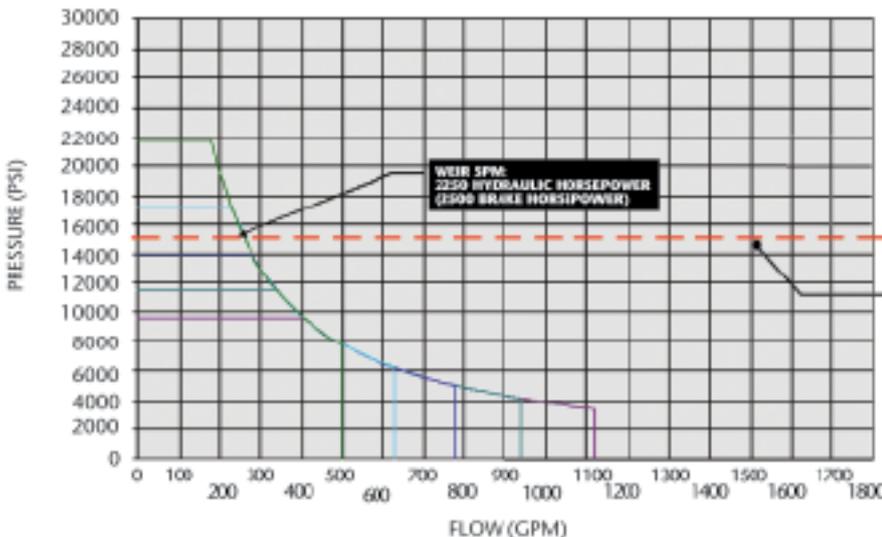


DESTINY™ TWS 2500 PERFORMANCE DATA ^{1,2}

Plunger Diameter	Displace per rev	Displacement at Pump Strokes per Minute / Pinion RPM											
		50 / 319		75 / 478		110 / 701		150 / 956		250 / 1594		305 / 1944	
in (mm)	gal/rev (liter/rev)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)	gpm (lpm)	psi (kg/cm ²)
3½ (88.9)	1.25 (4.7)	62 (236)	28375 (2000)	94 (355)	28375 (2000)	137 (520)	28375 (2000)	187 (709)	20805 (1466)	312 (1182)	12483 (880)	381 (1442)	10232 (721)
3¾ (95.3)	1.43 (5.4)	72 (271)	24718 (1742)	108 (407)	24718 (1742)	158 (597)	21725 (1531)	215 (814)	18123 (1277)	359 (1357)	10874 (766)	437 (1656)	8913 (628)
4 (101.6)	1.63 (6.2)	82 (309)	21725 (1531)	122 (463)	21725 (1531)	179 (679)	21725 (1531)	245 (927)	15929 (1123)	408 (1544)	9557 (674)	498 (1884)	7834 (552)
4½ (114.3)	2.07 (7.8)	103 (391)	17165 (1210)	155 (586)	17165 (1210)	227 (860)	17165 (1210)	310 (1173)	12586 (887)	516 (1954)	7551 (532)	630 (2384)	6190 (436)
5 (127.0)	2.55 (9.7)	127 (483)	13904 (980)	191 (724)	13904 (980)	280 (1061)	13904 (980)	382 (1448)	10194 (718)	637 (2413)	6117 (431)	778 (2944)	5014 (353)
5½ (139.7)	3.09 (11.7)	154 (584)	11491 (810)	231 (876)	11491 (810)	339 (1284)	11491 (810)	463 (1752)	8425 (594)	771 (2920)	5055 (356)	941 (3562)	4144 (292)
5¾ (146.1)	3.37 (12.8)	169 (638)	10513 (741)	253 (957)	10513 (741)	371 (1404)	10513 (741)	506 (1915)	7708 (543)	843 (3191)	4625 (326)	1029 (3893)	3791 (267)
6 (152.4)	3.67 (13.9)	184 (695)	9655 (680)	275 (1042)	9655 (680)	404 (1528)	9655 (680)	551 (2085)	7079 (499)	918 (3475)	4248 (299)	1120 (4239)	3482 (245)
6½ (165.1)	4.31 (16.3)	215 (816)	8227 (580)	323 (1223)	8227 (580)	474 (1794)	8227 (580)	646 (2447)	6032 (425)	1077 (4078)	3619 (255)	1314 (4975)	2967 (209)
6¾ (171.5)	4.65 (17.6)	232 (880)	7629 (538)	349 (1319)	7629 (538)	511 (1934)	7629 (538)	697 (2639)	5594 (394)	1162 (4398)	3356 (237)	1417 (5365)	2751 (194)
7 (177.8)	5.00 (18.9)	250 (946)	7094 (500)	375 (1419)	7094 (500)	550 (2080)	7094 (500)	750 (2838)	5201 (367)	1249 (4729)	3121 (220)	1524 (5770)	2558 (180)
7½ (190.5)	5.74 (21.7)	287 (1086)	6179 (435)	430 (1629)	6179 (435)	631 (2388)	6179 (435)	861 (3257)	4531 (319)	1434 (5429)	2719 (192)	1750 (6624)	2228 (157)
INPUT POWER: BHP (Kw)		1137 (848)		1705 (1272)		2500 (1865)		2500 (1866)		2500 (1866)		2500 (1866)	

1 Based on 90% ME and 100% VE - Intermittent Service Only.
 2 For applications demanding pressures over 15,000 psi, contact SPM®.

DESTINY™ TWS 2500 HYDRAULIC HORSEPOWER CURVE



Note: This chart shows this pump's performance at max hydraulic horsepower. Notice as the plunger size for the pump increases, a greater max flow rate is achieved while the max pressure decreases.

PUMP ACCESSORIES



PLUNGERS

SPM® plungers are engineered and manufactured to precise dimensions with the proper coatings and surface finishes necessary for rugged well service applications.



HIGH PERFORMANCE PLUNGER PACKING

SPM®'s line of high performance packing is designed and manufactured to give extended and dependable service life in high pressure, corrosive and abrasive pumping applications.

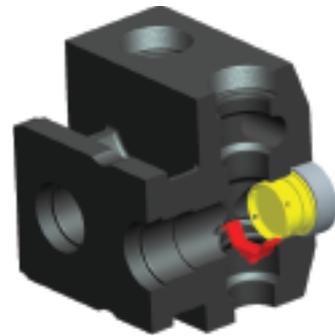


VALVES and SEATS

SPM® valves and seats are designed for severe well service applications including high pressure. SPM®'s new Bonded Valves feature a greater flow area, less abrasion and lower fluid velocity through the seat.

AUTOFRETTAGE

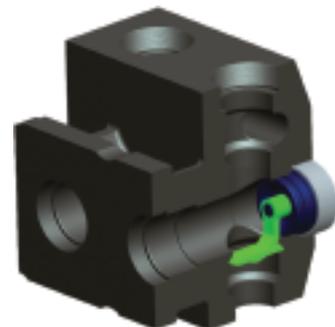
Intersecting bores in a fluid cylinder exhibit very high stresses at the corners of the intersection. To combat this problem created at the bore intersections, SPM® recommends that the customer utilize the Autofrettage option when purchasing a fluid end. The Autofrettage procedure is a technique where a "one-time" high hydraulic pressure is imposed on the bore intersection of a new cylinder inducing plastic strain at the intersection while elastic strain remains elsewhere. Relaxation of this one time pressure treatment causes these high-risk areas to develop a residual compressive stress, mitigating the destructive effects of the fatigue. The Autofrettage process may not completely eliminate the likelihood of fatigue failure (since corrosion and erosion still occur). However, it should significantly increase the number of cycles the product can tolerate, ultimately extending the life of the fluid cylinder.



The traditional "wing style" fluid end uses a grooved suction bore to lock the valve stop in place. This groove reduces material in key locations possibly leading to cracks in the cylinder during the mature phase of its life cycle.

FLUID END CONFIGURATIONS

SPM® currently offers fluid ends in three configurations, OPI, "Wing" Style Suction Valve Stop, and Grooveless. The "Wing" style fluid end was an improvement over the industry standard OPI style for a number of reasons including cost, serviceability and fluid cylinder life. Due to the customer's need for increased pumping durations, rates, and pressures, SPM® has adopted a Grooveless (GL) version of the suction valve stop. The GL design eliminates a groove in the fluid cylinder and is intended to extend the cylinder's life. All three versions are available and can be used throughout a broad range of the SPM® pump product line. Consult SPM® Sales to determine which style would be beneficial for you.



Weir SPM's new **Grooveless Fluid End** eliminates the groove in the fluid cylinder by replacing the old "wing style" valve stop. The new valve stop design locks under a ridge in the fluid cylinder bore and is held in place through a stem on the suction cover.

PUMP REPAIR

SPM®'s professionally trained technicians perform complete pump repair services for many makes and models of well service pumps. SPM® reduces downtime through convenient repair services in the field (when possible) or at one of its pump repair facilities located around the globe. The most effective way to keep your fleet of units up and running is to utilize SPM®'s pump repair services.

Procedures Include:

- Disassembly of all components
- Inspection, including magnetic particle
- Evaluation of repairs
- Cost estimates
- Repair utilizing SPM technicians
- Test
- Documentation to verify product quality
- Repaint



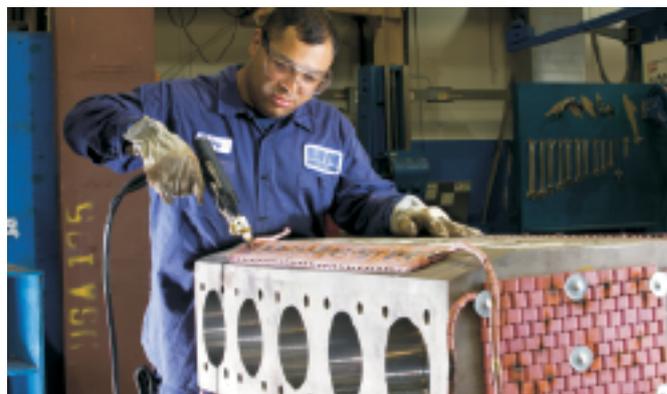
CONTACT FLUID CONTROL FOR ALL OF YOUR PUMP REPAIR NEEDS

FLUID END REPAIR

In the past, the only option for operators with cracked, washed or eroded fluid ends was to simply discard them. In an effort to offer customers an alternative to disposing of their equipment, SPM® has developed a process to return used blocks as reconditioned fluid ends in "like-new" condition. SPM® has been implementing this process in select areas with great success. Now, all customers will have the opportunity to evaluate the status of their fluid cylinders and have options of whether to replace or refurbish.

Refurbishment Process Includes:

- Disassembly of all components.
- Visual inspection vital areas.
- Thorough examination using multiple techniques.
- Evaluation of repairs & cost estimates.
- Repair utilizing skilled Weir SPM technicians.
- Test & documentation to verify product quality.
- Repaint.
- Record of all visual findings and dimensional data on formatted reports presented to customer.



PLUNGER REPAIR

SPM® now offers Plunger Repair services. This service gives customers the opportunity to repair damaged plungers that would normally be scrapped. The reliable repaired plungers are returned to the customer in "like new" condition, offering a less expensive alternative to the purchase of new plungers.



