

TYPE A & TYPE I WELL ACTIVATION

AND SAFETY
PROTECTION
RUPTURE DISCS



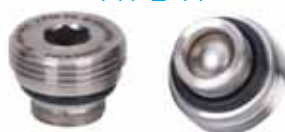
Continental Disc Corporation Well Activation and Safety Protection Rupture Discs are engineered specifically for downhole applications involving all aspects of producing a well ... exploration, drilling, completion and production.

Designed to release pressure to activate downhole tools in the well or to protect downhole components from overpressure failure, our Well Activation and Safety Protection Product Family uses rupture disc technology to achieve high accuracy and reliability. These rupture discs can replace shear pins and other moving devices in most applications and save valuable time and labor on the well-site.

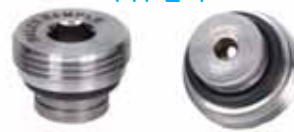
Both the WMR and WSP Rupture Discs are offered in two configurations, Type A and Type I, depending on required burst direction:

- **Type A** (External Pressure) Well Activation and Safety Protection Rupture Discs can be used to activate downhole equipment/tools from the annulus during drilling or completion operations.
- **Type I** (Internal Pressure) Well Activation and Safety Protection Rupture Discs can be used to protect downhole equipment /tools from overpressure within tubing or drill string. Type I rupture discs are also designed to activate downhole equipment/tools from pressure: internal from the tubing or drill string.

TYPE A



TYPE I



The Well Activation and Safety Protection Product is offered in two versions:

- The Machined Reverse Acting design (WMR) is a single-piece design with a rupture disc machined out of Alloy 625. The WMR Rupture Disc provides high pressure solutions up to 20,000 psig.
- The Welded Tension Acting design (WSP) is a three-piece design with an Alloy 600 rupture disc welded to a 316 SS inlet and outlet. The WSP Rupture Disc provides low pressure solutions down to 1,000 psig.

FEATURES

- Simple pressure activation device
- Accurate, reliable and consistent rupture disc performance
- Corrosive resistant materials of construction
- Quick opening rupture discs have response times in milliseconds
- Rugged and reliable design
- Designed to mate with standard/existing port dimensions

BENEFITS

- Quick delivery keeps your operation running smoothly and on-time
- Simple pressure activation allows operators to activate downhole tools and devices at any depth without relying on pyrotechnics, electronic signals or mechanical systems
- Easily replaceable parts save drilling and production time by reducing down-time
- The rupture disc is designed to be self-protecting, minimizing damage by downhole debris



APPLICATION SOLUTIONS

APPLICATION
SOLUTIONS

WSP Rupture Discs Used for Tool Activation of DrillStem Testing, Replacing Shear Pins

THE ISSUE:

An oil and gas service company was designing a downhole tool to perforate and hydraulic fracture a well using shear pins. The shear pins did not perform to a high level of accuracy during the development stage of the downhole tool. The service company determined the shear pin performance would not be acceptable for downhole operation.

THE PRODUCT:

WSP Rupture Disc

THE SOLUTION:

After an on-site meeting, the service company lead engineer contacted Continental Disc about our WSP Rupture Disc. The WSP Rupture Disc is manufactured with a $\pm 2\%$ performance tolerance for a wide range of downhole applications.

THE OUTCOME:

After receiving the WSP Rupture Disc, the service company was able to verify the performance of the rupture disc. They completed on-site testing of the WSP Rupture Disc installed on the downhole hydraulic fracturing tool, and confirmed it was able to perform at a highly accurate level. The highly accurate WSP Rupture Disc allowed the service company to use the downhole tool for hydraulic fracturing oil and gas wells.



WMR Rupture Discs Used for High Viscous Downhole Applications

THE ISSUE:

An international downhole tool manufacturer was experiencing inaccurate activation pressure and a lower than expected flow rate from their current rupture disc. After retrieving the downhole tool from the well, it was discovered that the rupture disc had a build-up of the high viscous well fluid which was adversely affecting the burst pressure and reducing the flow area.

THE PRODUCT:

WMR Rupture Disc

THE SOLUTION:

The engineering manager contacted the Continental Disc technical team about the issues they were having. Continental's engineering team was able to design a new rupture disc with the membrane in close contact with the process media, thus not allowing the well fluids to build up. The Machined Reverse Acting technology allows the rupture disc to withstand backpressure equal to 100% of the specified burst pressure. This is accomplished without restricting flow through the device.

THE OUTCOME:

The WMR Rupture Disc was provided to the downhole tool company for testing and to validate the performance of the rupture disc in the high viscous application. The performance of the WMR Rupture Disc exceeded the expectation of the tool manufacturer and quickly replaced the other rupture disc.



WMR // Machined Reverse Acting Rupture Disc

The Machined Reverse Acting design (WMR) provides high pressure solutions up to 20,000 psig. The WMR Rupture Disc membrane is closer to the process media, which reduces the possibility of process build-up. Process build-up may adversely affect the burst pressure.

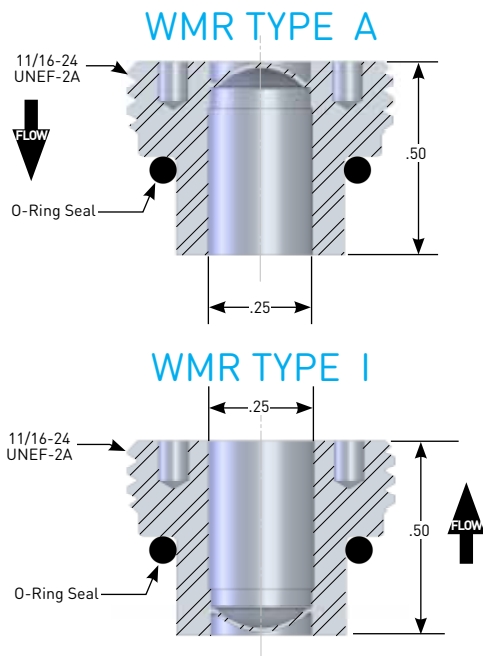
The Machined Reverse Acting technology allows the rupture disc to withstand backpressure equal to 100% of the specified burst pressure. This is accomplished without restricting flow through the device.

The WMR Rupture Disc is a single piece design that incorporates Machined Reverse Acting technology. The advantages of MRA technology is that the rupture disc membrane is thicker, thus less likely to be damaged. MRA Rupture Discs are also more durable in harsh service conditions such as pressure cycles.

WMR // SPECIFICATIONS

Applies to both **Type A & Type I**:

- Materials of Construction:
Rupture Disc = Alloy 625 & O-Ring = FKM
- Operating pressure up to 90% of specified burst pressure
- Maximum backpressure ratio:
100% of specified burst pressure
- Burst pressure available from:
8,500 psig – 20,000 psig in
500 psi increments
Other burst pressures available upon request
- Performance Tolerance: $\pm 2\%$ of burst pressure
- Maximum temperature up to 450°F



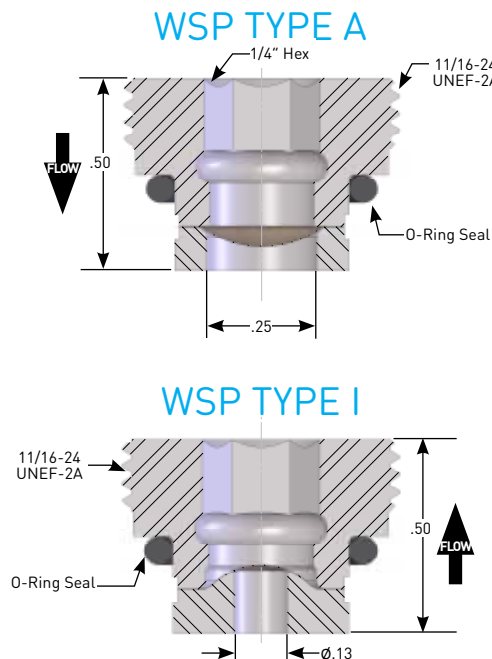
WSP // Welded Tension Acting Rupture Disc

The Welded Tension Acting design (WSP) provides low pressure solutions as low as 1,000 psig. The WSP Rupture Disc is a versatile rupture disc for downhole applications including cementing, completion and hydraulic fracturing applications.

The WSP Rupture Disc Assembly is a solid metal tension acting rupture disc that is welded to a threaded body and ring. The threaded body has a 1/4" internal hexagon shape head for easy installation with a standard hex key. The rupture disc is welded to the threaded body and ring for a leak-tight seal.

WSP // SPECIFICATIONS

- Materials of Construction:
Rupture Disc = Alloy 600, Body = 316 SS
& O-Ring = FKM
- Operating pressures:
Type A up to 90% of specified burst pressure
Type I up to 70% of specified burst pressure
- Burst pressures: See Table 1 & 2 for standard pressures and temperatures
Type A & Type I burst pressures available from: 1,000 psig – 8,000 psig in 500 psi increments
Other burst pressures available upon request
- Performance Tolerance:
 ± 100 psig for burst pressures 1,000 psig - 5,000 psig
Type A $\pm 2\%$ of burst pressures > 5,000 psig
Type I $\pm 5\%$ of burst pressures > 5,000 psig
- Maximum temperature up to 450°F



SPECIFICATIONS

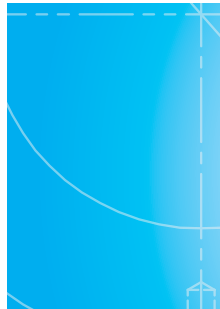


TABLE 1 // TYPE A // List of Standard Burst Pressures and Temperatures

PRODUCT TYPE	PART NUMBER	SPECIFIED BURST PRESSURE AT TEMPERATURE (PSIG)	BURST PRESSURE AT TEMPERATURE (PSIG)							
			100°F	150°F	200°F	250°F	300°F	350°F	400°F	450°F
WSP // Welded Tension Acting Rupture Disc	WSP-A01	1,000 @ 100°F	1,000	980	960	949	939	929	929	919
	WSP-A02	1,500 @ 100°F	1,500	1,470	1,439	1,424	1,409	1,394	1,394	1,379
	WSP-A03	2,000 @ 100°F	2,000	1,960	1,919	1,899	1,879	1,859	1,859	1,838
	WSP-A04	2,500 @ 100°F	2,500	2,449	2,399	2,374	2,348	2,323	2,323	2,298
	WSP-A05	3,000 @ 100°F	3,000	2,939	2,879	2,848	2,818	2,788	2,788	2,758
	WSP-A06	3,500 @ 100°F	3,500	3,429	3,359	3,323	3,288	3,253	3,253	3,217
	WSP-A07	4,000 @ 100°F	4,000	3,919	3,838	3,798	3,758	3,717	3,717	3,677
	WSP-A08	4,500 @ 100°F	4,500	4,409	4,318	4,273	4,227	4,182	4,182	4,136
	WSP-A09	5,000 @ 150°F	5,103	5,000	4,897	4,845	4,794	4,742	4,742	4,691
	WSP-A10	5,500 @ 150°F	5,613	5,500	5,387	5,330	5,273	5,216	5,216	5,160
	WSP-A11	6,000 @ 150°F	6,124	6,000	5,876	5,814	5,753	5,691	5,691	5,629
	WSP-A12	6,500 @ 150°F	6,634	6,500	6,366	6,299	6,232	6,165	6,165	6,098
	WSP-A13	7,000 @ 200°F	7,295	7,147	7,000	6,926	6,853	6,779	6,779	6,705
	WSP-A14	7,500 @ 200°F	7,816	7,658	7,500	7,421	7,342	7,263	7,263	7,184
	WSP-A15	8,000 @ 200°F	8,337	8,168	8,000	7,916	7,832	7,747	7,747	7,663
WMR // Machined Reverse Acting Rupture Disc	WMR-A01	8,500 @ 200° F	9,120	8,628	8,500	8,400	8,308	8,236	8,217	8,172
	WMR-A02	9,000 @ 200° F	9,657	9,135	9,000	8,894	8,797	8,720	8,701	8,652
	WMR-A03	9,500 @ 250° F	10,315	9,758	9,613	9,500	9,397	9,314	9,294	9,242
	WMR-A04	10,000 @ 250° F	10,858	10,271	10,119	10,000	9,891	9,805	9,783	9,729
	WMR-A05	10,500 @ 250° F	11,401	10,785	10,625	10,500	10,386	10,295	10,272	10,215
	WMR-A06	11,000 @ 250° F	11,944	11,299	11,131	11,000	10,881	10,785	10,761	10,701
	WMR-A07	11,500 @ 250° F	12,486	11,812	11,637	11,500	11,375	11,275	11,250	11,188
	WMR-A08	12,000 @ 300° F	13,172	12,461	12,277	12,132	12,000	11,895	11,868	11,802
	WMR-A09	12,500 @ 450° F	13,951	13,198	13,002	12,849	12,709	12,598	12,570	12,500
	WMR-A10	13,000 @ 450° F	14,509	13,725	13,522	13,363	13,218	13,102	13,073	13,000
	WMR-A11	13,500 @ 350° F	14,950	14,143	13,934	13,769	13,620	13,500	13,470	13,395
	WMR-A12	14,000 @ 350° F	15,504	14,667	14,450	14,279	14,124	14,000	13,969	13,891
	WMR-A13	14,500 @ 350° F	16,058	15,190	14,966	14,789	14,628	14,500	14,468	14,388
	WMR-A14	15,000 @ 350° F	16,611	15,714	15,482	15,299	15,133	15,000	14,967	14,884
	WMR-A15	15,500 @ 350° F	17,165	16,238	15,998	15,809	15,637	15,500	15,466	15,380
	WMR-A16	16,000 @ 350° F	17,719	16,762	16,514	16,319	16,142	16,000	15,965	15,876
	WMR-A17	16,500 @ 350° F	18,272	17,286	17,030	16,829	16,646	16,500	16,463	16,372
	WMR-A18	17,000 @ 350° F	18,826	17,810	17,546	17,339	17,151	17,000	16,962	16,868
	WMR-A19	17,500 @ 350° F	19,380	18,333	18,062	17,849	17,655	17,500	17,461	17,364
	WMR-A20	18,000 @ 350° F	19,934	18,857	18,578	18,359	18,159	18,000	17,960	17,860
	WMR-A21	18,500 @ 350° F	20,487	19,381	19,094	18,869	18,664	18,500	18,459	18,357
	WMR-A22	19,000 @ 350° F	21,041	19,905	19,610	19,379	19,168	19,000	18,958	18,853
	WMR-A23	19,500 @ 350° F	21,595	20,429	20,126	19,889	19,673	19,500	19,457	19,349
	WMR-A24	20,000 @ 350° F	22,148	20,952	20,642	20,399	20,177	20,000	19,956	19,845

Bold type indicates specified burst pressure. Regular type indicates estimated nominal burst pressure for other temperatures.

TYPE A

Burst Pressures
& Temperatures

TABLE 2 // TYPE I // List of Standard Burst Pressures and Temperatures

PRODUCT TYPE	PART NUMBER	SPECIFIED BURST PRESSURE AT TEMPERATURE (PSIG)	BURST PRESSURE AT TEMPERATURE (PSIG)							
			100°F	150°F	200°F	250°F	300°F	350°F	400°F	450°F
WSP // Welded Tension Acting Rupture Disc	WSP-I01	1,000 @ 100°F	1,000	980	960	949	939	929	929	919
	WSP-I02	1,500 @ 100°F	1,500	1,470	1,439	1,424	1,409	1,394	1,394	1,379
	WSP-I03	2,000 @ 100°F	2,000	1,960	1,919	1,899	1,879	1,859	1,859	1,838
	WSP-I04	2,500 @ 100°F	2,500	2,449	2,399	2,374	2,348	2,323	2,323	2,298
	WSP-I05	3,000 @ 100°F	3,000	2,939	2,879	2,848	2,818	2,788	2,788	2,758
	WSP-I06	3,500 @ 100°F	3,500	3,429	3,359	3,323	3,288	3,253	3,253	3,217
	WSP-I07	4,000 @ 100°F	4,000	3,919	3,838	3,798	3,758	3,717	3,717	3,677
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	WSP-I09	5,000 @ 150°F	5,103	5,000	4,897	4,845	4,794	4,742	4,742	4,691
	WSP-I10	5,500 @ 150°F	5,613	5,500	5,387	5,330	5,273	5,216	5,216	5,160
	WSP-I11	6,000 @ 150°F	6,124	6,000	5,876	5,814	5,753	5,691	5,691	5,629
	WSP-I12	6,500 @ 150°F	6,634	6,500	6,366	6,299	6,232	6,165	6,165	6,098
	WSP-I13	7,000 @ 200°F	7,295	7,147	7,000	6,926	6,853	6,779	6,779	6,705
	WSP-I14	7,500 @ 200°F	7,816	7,658	7,500	7,421	7,342	7,263	7,263	7,184
	WSP-I15	8,000 @ 200°F	8,337	8,168	8,000	7,916	7,832	7,747	7,747	7,663
WMR // Machined Reverse Acting Rupture Disc	WMR-I01	8,500 @ 200° F	9,120	8,628	8,500	8,400	8,308	8,236	8,217	8,172
	WMR-I02	9,000 @ 200° F	9,657	9,135	9,000	8,894	8,797	8,720	8,701	8,652
	WMR-I03	9,500 @ 250° F	10,315	9,758	9,613	9,500	9,397	9,314	9,294	9,242
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	WMR-I06	11,000 @ 250° F	11,944	11,299	11,131	11,000	10,881	10,785	10,761	10,701
	WMR-I07	11,500 @ 250° F	12,486	11,812	11,637	11,500	11,375	11,275	11,250	11,188
	WMR-I08	12,000 @ 300° F	13,172	12,461	12,277	12,132	12,000	11,895	11,868	11,802
	WMR-I09	12,500 @ 350° F	13,843	13,095	12,901	12,749	12,611	12,500	12,472	12,403
	WMR-I10	13,000 @ 350° F	14,396	13,619	13,417	13,259	13,115	13,000	12,971	12,899
	WMR-I11	13,500 @ 350° F	14,950	14,143	13,934	13,769	13,620	13,500	13,470	13,395
	WMR-I12	14,000 @ 350° F	15,504	14,667	14,450	14,279	14,124	14,000	13,969	13,891
	WMR-I13	14,500 @ 350° F	16,058	15,190	14,966	14,789	14,628	14,500	14,468	14,388
	WMR-I14	15,000 @ 350° F	16,611	15,714	15,482	15,299	15,133	15,000	14,967	14,884
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	WMR-I16	16,000 @ 350° F	17,719	16,762	16,514	16,319	16,142	16,000	15,965	15,876
	WMR-I17	16,500 @ 350° F	18,272	17,286	17,030	16,829	16,646	16,500	16,463	16,372
	WMR-I18	17,000 @ 350° F	18,826	17,810	17,546	17,339	17,151	17,000	16,962	16,868
	WMR-I19	17,500 @ 350° F	19,380	18,333	18,062	17,849	17,655	17,500	17,461	17,364
	WMR-I20	18,000 @ 350° F	19,934	18,857	18,578	18,359	18,159	18,000	17,960	17,860
WMR-I21	18,500 @ 350° F	20,487	19,381	19,094	18,869	18,664	18,500	18,459	18,357	
WMR-I22	19,000 @ 350° F	21,041	19,905	19,610	19,379	19,168	19,000	18,958	18,853	
WMR-I23	19,500 @ 350° F	21,595	20,429	20,126	19,889	19,673	19,500	19,457	19,349	
WMR-I24	20,000 @ 350° F	22,148	20,952	20,642	20,399	20,177	20,000	19,956	19,845	

Bold type indicates specified burst pressure. Regular type indicates estimated nominal burst pressure for other temperatures.

TYPE I
Burst Pressures
& Temperatures



CUSTOMIZED RUPTURE DISC SOLUTIONS

Customized rupture disc solutions are specifically designed to meet the unique needs of the oil and gas industry. If the rupture disc is intended to be used upstream or downstream, for pressure protection or activation, Continental Disc Corporation customized solutions is the right choice!

Welded rupture disc devices are designed to meet the needs of the oil & gas industry. These designs are available with reverse acting or tension type rupture discs, for high pressure and high temperature applications.

The material of construction of the assembly is available with exotic materials such as Alloy 600 or Alloy C276. It is common for downhole applications to withstand a high amount of backpressure, and customized backpressure support designs are available.

The MRA (Machined Reverse Acting) Rupture Disc is a single-use device that incorporates the rupture disc membrane and the rupture discs' body into a single machined device. The MRA Rupture Disc is able to relieve pressure or activate downhole tools at extremely high burst pressures. The MRA Rupture Disc is well suited for pressure protection for: high pressure pumps, hydraulic fracturing and high pressure/high temperature downhole applications.

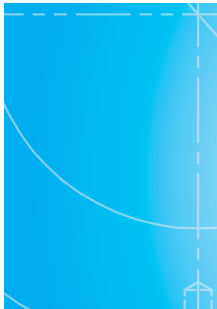


CUSTOMIZED

WORKING WITH SPECIALIZED TECHNOLOGIES...LIKE YOURS

Solving pressure relief problems for you is the special role played by Continental Disc Corporation's Product Development Group and the Special Products Group. This pool of product development expertise has been retrofitting Continental Disc Corporation products into clients' systems for 50 years. They are engineers who are at home with special or exotic materials, ultra-high or ultra-low burst pressures, as well as state-of-the-art processing and testing requirements.

Whether your needs are for quantities of one or one hundred thousand, Continental Disc Corporation is ready to solve your pressure relief obstacles.





1965-2015



of Performance Under Pressure®

NOTE: Product parameters are based on United States customary units. Values in metric units are provided for reference only.

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