

MDRX Gas Plug Characterization

Kinetic Systems, ARG

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Revision -

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1.0 Introduction

The Micro Dynamic Rifle extreme (MDRx) platform[2] is a semi-automatic auto loading rifle produced by Desert Tech[1], a United States Bullpup manufacturer. Desert Tech is most known for the Desert Tech HTI and SRS series of long-range bullpup bolt rifles that have been adopted by military and police around the world[3].

The MDRx platform is the second generation of semi-automatic rifle produced by Desert Tech, superseding the original Micro Dynamic Rifle (MDR) that made its debut at shot show in 2014 and the NGSAR[4]. The NGSAR was Desert Tech's entry into the Army's Next Generation Squad Weapon Program based on the MDR platform that concluded in 2022.

In mid-2022 Kinetic Systems, Advanced Research Group (ARG) commissioned a large-scale community driven performance characterization[5] of the MDRx 308 Rifle in several different configurations and produced a report titled MDRX 308 Characterization. Throughout the characterization a significant number of platform differences were identified between all of the different chassis and barrel assemblies tested that appear to be tied to differing generations of components.

One of these differences was the identification of different generations of Gas Plug Design.

2.0 Scope

The Scope of this report is to characterize the different generations of gas plug available to the Kinetic Systems ARG and map them to the MDR, MDRx, generations of Rifles. The first two generations of the gas plug were originally developed with the MDR Rifle [8] that shifted the gas plug design from 3 position to a 6-position design. An additional two generations of gas plug were identified by inscription inspection of the MDR[6] and MDRx manuals[7] identified .

3.0 References

ID	Name	URL If Applicable
[1]	Desert Tech Website	https://deserttech.com/index.php
[2]	Desert Tech MDR Wiki Page	https://en.wikipedia.org/wiki/Desert_Tech_MDR
[3]	Desert Tech Timeline	https://deserttech.com/timeline.php
[4]	NGSAR on Soldier System	https://soldiersystems.net/2020/03/10/the-desert-tech-next-generation-squad-weapons-submissions/
[5]	MDRX 308 Characterization Rev -	https://www.docdroid.net/LS6eOty/mdrx-308-characterization-rev-pdf
[6]	MDR Manual	https://deserttech.com/media/download/Desert-Tech-MDR-Manual.pdf
[7]	MDRx Manual	https://deserttech.com/media/download/MDRX-Manual-V2-Low-res.pdf
[8]	MDR Gas Plug 6 Position Video	https://www.youtube.com/watch?v=4kiZRSnQ2Zc
[9]	Desert Tech 308 Failure Analysis Video	https://www.youtube.com/watch?v=9ed01kq20dM
[10]	Yakamoz Micro Drill Bits	https://www.amazon.com/gp/product/B01MS1CNLV/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

4.0 Gas Plug General Designs

4.1 Original Gas Plug Design

The MDR Rifle was originally shipped with a 3-position gas plug design that was then replaced with a 6 positions design, as seen in Figure 1, to combat ammunition sensitivity in the original MDR design most commonly found in the 308 platform [9]. The gas plug required adjustment with a flat screw driver from the front of the Rifle. Note it is marked numerically on the top surface and alphabetically radially along the detent ring.



Figure 1: Original Gas Plug Design

Desert tech released the hole sizes of the new 2019 308 gas plug in the Desert Tech 308 Failure Analysis Video [9] as seen in Figure 2 below.

- **2019 6-hole valve hole sizes & Fire Mode Settings**
 1. 0.018"
 2. 0.029" **Suppressed Setting (S)**
 3. 0.042"
 4. 0.049" **Normal Setting (N)**
 5. 0.052"
 6. 0.055" **Adverse Setting (A)**

Figure 2: 2019 MDRX 308 Gas Plug Hole Sizes

4.2 MDRx Gas Plug Design

The Gas plug was redesigned with a Castle/Crown, as seen in Figure 3 below, for the MDRx Rifle to allow for side adjustment through the MDRx front furniture. The standard gas plug design provides a 45-degree offset between the détente position and the first gas plug hole with roughly a 36.5° spacing between each holes.



Figure 3: MDRx Gas Plug Crown/Castle Design

The MDRx rifle has a number of improvements, and one of them was a new design for their glass filled nylon chassis components, during the update the MDRx front furniture received a cut out window that allowed adjustment using a bullet tip or other alternative tool. The differences between the original handguard design and the MDRx handguard design can be seen directly below the left most pic rail in Figure 4 and Figure 5.



Figure 4: MDR Reflex Handguard



Figure 5: MDRx Handguard

4.3 300 BLK Gas Plug

When the MDRx was announced, two additional factory calibers were announced, the 300 blk and the 6.5 Creedmoor. The later plug is similar to the 308-plug construction. However, the former diverged significantly from the 223 and 308 gas plug designs with an odd non sequential gas plug hole size increment with a “S-“, “S“, “N-“, “N+“, “A-“, “A+” nomenclature.



Figure 6: 300 BLK Gas Plug Design

This design was changed to a more traditional hole pattern for 300 BLK design in the latest 2022. In addition, the prior markings were changed to incremental numbers from 1 to 6 with the attached advisory circular in Figure 7 below.

RECOMENDED GAS VALVE SETTINGS	
Gas Valve Setting	Setting used for
1	Suppressed & Unsuppressed Supersonic
2	Suppressed & Unsuppressed Supersonic
3	Unsuppressed Super-sonic, Suppressed & Unsuppressed Subsonic
4	Suppressed and Unsuppressed Subsonic
5	Suppressed & Unsuppressed Subsonic
6	Unsuppressed Subsonic

Please follow recommended procedure for choosing the correct setting. The procedure involves starting on setting 1 and testing the gun with your ammo. Increase the gas setting (within recommended range, as shown above) until the gun functions reliably.

Important Note: Do not shoot supersonic ammo on settings 4, 5, and 6. Using the gun with supersonic ammo on the wrong setting will damage the rifle.

Figure 7: 300 BLK Gas Setting Chart

5.0 Manual Comparison

5.1 MDR Manual

The MDR manual, on page 14, details the gas as having the caliber marking engraved on the plug as well as only having 3 settings, "N" Normal, "A" (Adverse), and "S" (Suppressed). After the increasement to 6 gas plug holes "+" and "-" settings were added between different gas plug positions.

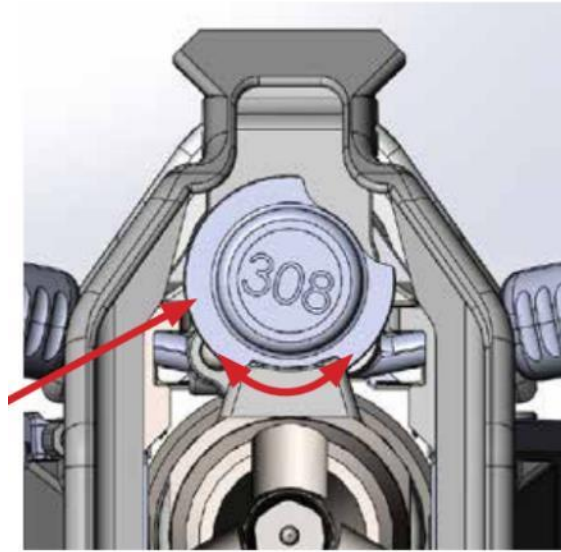


Fig. b-1

Figure 8: MDR Manual Gas Plug (2020 manual)

5.2 MDRx Manual

The online published MDRx manual that is presented[7] above actually diverges from the final printed MDRx manual. However, it does contain an error on page 14 that details the MDRx contains the same number of gas settings as the MDR (3) on page 14. As can be seen in Figure 9 and Figure 10.

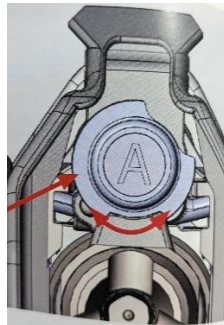


Figure 9: New MDRx Gas Plug Marking (2022 manual)

Gas Valve Labels					
.308 16" FE .308 20" FE	.223 16" FE .223 20" FE	.223 16" SE	.223 20" SE	.223 11.5" SE 6.5 CM 20" FE	.300 BLK 16" FE

Figure 10: New MDRx Gas Plug Inscriptions (2022 manual)

6.0 Measurement Methodology

Due to the small size of the gas plug holes, measurements are incredibly difficult to conduct with calipers. Instead, micro drill bits were purchased such as the Yakamoz 20 pcs drill bits[10] and the non-drill bit end was inserted into the smallest gas hole possible and measured with calipers as seen in Figure 11 below.



Figure 11: Yakamoz 20 pcs drill bits

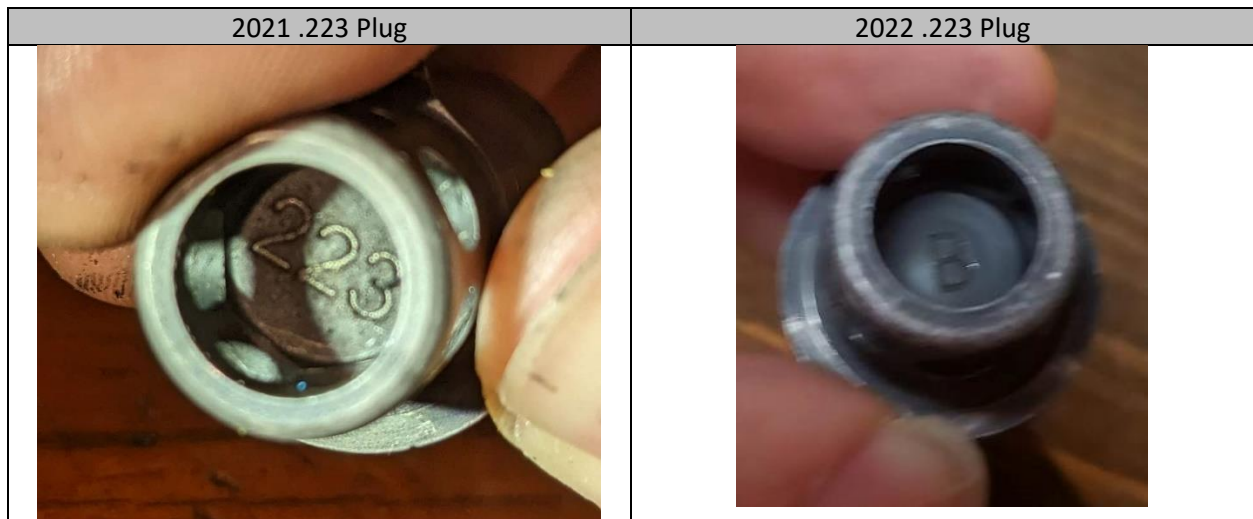
NOTE: the drill bits used were a metric set with only 20 individual bits between 0.3 and 1.6mm. There are tens to hundreds more drill bit sizes available in imperial as well as metric sizes between the ranges tested. As such the hole sizes reported are close to the actual hole size, but may not have the granularity to tell differences in some of the hole sizes, see Table 7 for an example of this.

7.0 .223 Gas Plug Comparison

Table 1: .223 Gas Port Size measured

Setting	2021 .223 Plug 300 Rounds Hole Size (Inches)	2022 .223 Plug 200 Rounds Hole Size (Inches)
S-	0.026	.0255
S	0.0305	.0374
N-	0.0375	0.043
N	0.0460	.0472
N+	0.0500	.0511
A	0.0500-.0535	0.055

Table 2: .223 Image Comparisons







8.0 300 BLK Gas Plug Comparison

Table 3: 300 BLK Gas Port Size measured

Setting	2020 300 BLK Plug 200 Super/50 Subs Hole Size (Inches)	Setting	2023 300 BLK Plug 80 Super/40 Subs Hole Size (Inches)
S-	N/A	1	0.055
S+	0.147	2	0.062
N-	0.05	3	0.093
N+	0.156	4	0.125
A-	0.093	5	0.140
A+	0.163	6	0.156

Table 4: .300 BLK Image Comparisons







9.0 .308 Gas Plug Comparison






Table 5: 308 Gas Port Size measured


Setting	2020 308 Plug 500 Rounds Hole Size (Inches)	2020 308 Plug 600 Rounds Hole Size (Inches)	2022 308 Plug 600 Rounds Hole Size (Inches)	2022 308 Plug 300 Rounds Hole Size (Inches)
S-	X<0.011	0.018	0.011	X<0.011
S	0.295	0.029	0.025	0.029
N-	0.039	0.042	0.043	0.039
N	0.047	0.049	0.047	0.047
N+	0.051	0.052	0.051	0.051
A	0.035	0.055	0.055	0.055

Table 6: .308 Image Comparisons

2020 308 Plug (Note also has two sets of markings)	2020 308 Plug	2022 .308 Plug	2022 .308 Plug
			
			
			



			
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10.0 6.5 Creed Gas Plug Comparison

Table 7: 6.5 Gas Port Size measured

Setting	2020 308 Plug 600 Rounds Hole Size (Inches)
S-	0.035
S	0.035
N-	0.035
N	0.035
N+	0.040
A	0.044

Table 8: .308 Image Comparisons



