

# .50 BMG

<b>.50 BMG</b>	
	
<p>From left: <b>.50 BMG</b>, 300 Win Mag, .308 Winchester, 7.62×39mm, 5.56×45mm NATO, .22LR</p> <p>(Can also use cursor to identify)</p>	
<b>Type</b>	Machine gun/Rifle
<b>Place of origin</b>	 United States
<b>Service history</b>	
<b>In service</b>	1921–present
<b>Used by</b>	NATO and many others
<b>Wars</b>	World War II Korean War Vietnam War Cambodian Civil War Falklands War Persian Gulf War Global War on Terrorism Iraq War War in Afghanistan
<b>Production history</b>	
<b>Designer</b>	Winchester Repeating Arms Co. and Frankford Arsenal
<b>Specifications</b>	
<b>Case type</b>	Rimless, bottleneck
<b>Bullet diameter</b>	.510 in (12.95 mm)
<b>Neck diameter</b>	.560 in (14.2 mm)
<b>Shoulder diameter</b>	.714 in (18.1 mm)
<b>Base diameter</b>	.804 in (20.4 mm)
<b>Rim diameter</b>	.804 in (20.4 mm)
<b>Rim thickness</b>	.083 in (2.1 mm)
<b>Case length</b>	3.91 in (99 mm)
<b>Overall length</b>	5.45 in (138 mm)
<b>Case capacity</b>	292.8 gr H <sub>2</sub> O (18.97 cm <sup>3</sup> )
<b>Primer type</b>	#35 Arsenal Primer
<b>Maximum pressure</b>	54,800 psi (378 MPa)

Ballistic performance			
Bullet weight/type	Velocity	Energy	
647 gr (42 g) Speer	3,044 ft/s (928 m/s)	13,144 ft·lbf (17,821 J)	
655 gr (42 g) ADI	3,029 ft/s (923 m/s)	13,350 ft·lbf (18,100 J)	
700 gr (45 g) Barnes	2,978 ft/s (908 m/s)	13,971 ft·lbf (18,942 J)	
750 gr (49 g) Hornady	2,820 ft/s (860 m/s)	13,241 ft·lbf (17,952 J) [1]	
800 gr (52 g) Barnes	2,895 ft/s (882 m/s)	14,895 ft·lbf (20,195 J)	
<i>Test barrel length: 45 in (1143 mm)</i>			
<i>Source(s): Ammoguide.com</i> <sup>[2]</sup>			

The **.50 Browning Machine Gun (.50 BMG)** or **12.7×99mm NATO** is a cartridge developed for the Browning .50 caliber machine gun in the late 1910s. Entering service officially in 1921, the round is based on a greatly scaled-up .30-06 cartridge.<sup>[citation needed]</sup> Under STANAG 4383, it is a standard cartridge for NATO forces as well as many non-NATO countries.<sup>[3]</sup> The cartridge itself has been made in many variants: multiple generations of regular ball, tracer, armor piercing, incendiary, and sabot sub-caliber rounds. The rounds intended for machine guns are linked using metallic links.

The .50 BMG cartridge is also used in long-range target and sniper rifles, as well as other .50 caliber machine guns. The use in single-shot and semi-automatic rifles has resulted in many specialized match-grade rounds not used in .50 caliber machine guns. A McMillan Tac-50 .50 BMG sniper rifle was used by Canadian Army Corporal Rob Furlong of the PPCLI to achieve what was then the longest-range confirmed sniper kill in history, when he shot a Taliban combatant at 2,430 meters (2,657 yards) during the 2002 campaign in the Afghanistan War.<sup>[4]</sup> This record was surpassed in 2009 in Afghanistan by a British sniper, though using a .338 Lapua Magnum (8.58×70 mm) rifle.<sup>[5][6]</sup>

A former record for a confirmed long-distance kill was set by U.S. Marine sniper Carlos Hathcock in 1967, at a distance of 2,090 metres (2,286 yd).<sup>[7]</sup> Hathcock used the .50 BMG in an M2 Browning Machine Gun equipped with a telescopic sight. This weapon was used by other snipers, and eventually purpose-built sniper rifles were developed specifically for this round.

DARPA (Defense Advanced Research Projects Agency) has contracted with Lockheed Martin to develop the EXACTO program, including .50-caliber bullets complete with microprocessors and steering vanes that allow the bullet to adjust its trajectory mid-flight to stay on target when the flight path has been altered by uncontrollable variables, as well as weapons that fire these rounds and monitor their flight. The weapon system is expected to be available in 2015.

A wide variety of ammunition is available, and the availability of match grade ammunition has increased the usefulness of .50 caliber rifles by allowing more accurate fire than lower quality rounds.

## History

John Browning had the idea for this round during World War I in response to a need for an anti-aircraft weapon,<sup>[citation needed]</sup> based on a scaled-up .30-06 Springfield design,<sup>[citation needed]</sup> used in a machine gun based on a scaled-up M1919/M1917 design that Browning had initially developed around 1900 (but which was not adopted by the U.S. military until 1917, hence the model designation). Armor-piercing incendiary tracer (APIT) rounds were especially effective against aircraft, and the AP rounds and API rounds were excellent for destroying concrete bunkers, structures, and lighter AFVs. The API and APIT rounds left a flash, report, and smoke on contact, useful in detecting strikes on enemy targets.<sup>[8]</sup>

The development of the .50 BMG round is sometimes confused with the German 13.2 mm TuF, which was developed by Germany for an anti-tank rifle to combat British tanks during WWI. However, the development of the

U.S. .50 caliber round was started before this later German project was completed or even known to the Allied countries. When word of the German anti-tank round spread, there was some debate as to whether it should be copied and used as a base for the new machine gun cartridge. However, after some analysis the German ammunition was ruled out, both because performance was inferior to the modified Springfield .30-06 round and because it was a semi-rimmed cartridge, making it sub-optimal for an automatic weapon. The round's dimensions and ballistic traits are totally different. Instead, the M2HB Browning with its .50 caliber armor-piercing cartridges went on to function as an anti-aircraft and anti-vehicular machine gun, with a capability of completely perforating 0.875" (22.2 mm) of face-hardened armor steel plate at 100 yards (91 m), and 0.75" (19 mm) at 547 yards (500 m).<sup>[9]</sup>

Decades later, the .50 BMG was chambered in high-powered rifles as well. The concept of a .50 caliber machine gun was not an invention of this era; this caliber (.50) had been used in Maxim machine guns and in a number of manual rapid fire guns such as the original Gatling.



During World War II the .50 BMG was primarily used in the M2 Browning machine gun for anti-aircraft purposes. An upgraded variant of the M2 Browning machine gun used during World War II is still in use today. Since the mid-1950s, some armored personnel carriers and utility vehicles have been made to withstand 12.7 mm machine gun

fire, thus making it a much less flexible weapon. It still has more penetrating power than lighter weapons such as general-purpose machine guns, though it is significantly heavier and more cumbersome to transport. Its range and accuracy, however, are superior to light machine guns when fixed on tripods, and it has not been replaced as the standard caliber for western vehicle mounted machine guns (Soviet and CIS armoured vehicles mount 12.7mm DShK, NSV, which are ballistically very similar to the .50 BMG, but 14.5 mm KPV machine guns have significantly superior armor penetration compared to any 12.7 mm round.

The Barrett M82 .50 caliber rifle and later variants were born during the 1980s and have upgraded the anti-materiel power of the military sniper. A skilled sniper can effectively neutralize an infantry unit by eliminating several targets (soldiers or equipment) without revealing his precise location. The long range (1 mile+) between firing position and target allows time for the sniper to avoid enemy retribution by either changing positions repeatedly, or by safely retreating.

## Power

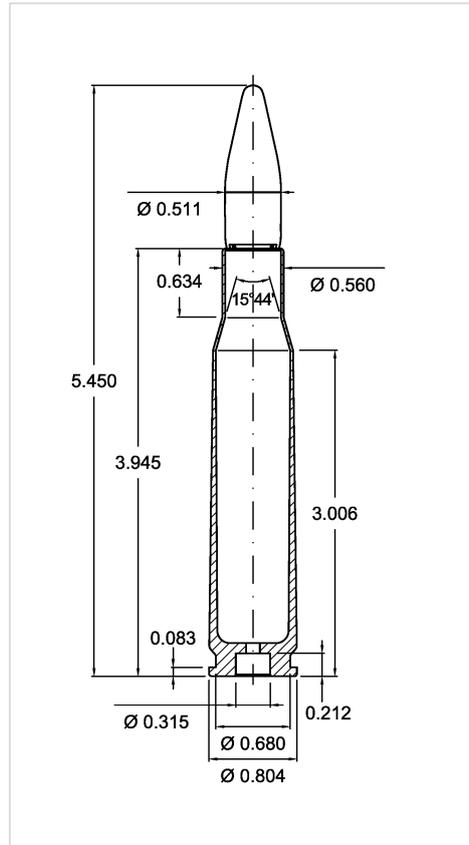
A common method for understanding the actual power of a cartridge is by comparing muzzle energies. The Springfield .30-06, the standard caliber for American soldiers in both World Wars and a popular caliber amongst American hunters, can produce muzzle energies between 2,000 and 3,000 foot pounds of energy (between 3 and 4 kilojoules). The .50 BMG round can produce between 10,000 and 15,000 foot pounds (between 14 and 18 kilojoules), depending on its powder and bullet type, as well as the rifle it was fired from. Due to the high ballistic coefficient of the bullet, the .50 BMG's trajectory also suffers less "drift" from cross-winds than smaller and lighter calibers, making the .50 BMG a good choice for high-powered sniper rifles.

## Cartridge dimensions

The 50 BMG 12.7 × 99 NATO cartridge has a capacity of 290 grains H<sub>2</sub>O (19 ml). The round is a scaled up version of the .30-06 Springfield but uses a case wall with a long taper to facilitate feeding and extraction in various weapons.

50 BMG basic cartridge dimensions-All sizes in inches (in). The common rifling twist rate for this cartridge is 1 in 15 in (381 mm), with 8 lands and grooves. The primer type specified for this ammunition is Boxer primer that has a single centralized ignition point (US and NATO countries). However, some other countries produce the ammunition with Berdan primers that have two flash holes.

Average chamber pressure in for this round as listed in TM43-0001-27<sup>[10]</sup> the U.S. Army Ammunition Data Sheets—Small Caliber Ammunition, not including plastic practice, short cased spotter, or proof/test loads, is 54,923 PSI (378 MPa or 3,787 bar). The proof/test pressure is listed as 65,000 psi (448 MPa or 4,482 bar).



## Military cartridge types

.50 BMG cartridges are also produced commercially with a plethora of different bullets and to a number of different specifications.

- **Cartridge, Caliber .50, Tracer, M1**

Tracer for observing fire, signaling, target designation, and incendiary purposes. This bullet has a red tip.

- **Cartridge, Caliber .50, Incendiary, M1**

This cartridge is used against unarmored, flammable targets. The incendiary bullet has a light blue tip.

- **Cartridge, Caliber .50, Ball, M2**

This cartridge is used against personnel and unarmored targets. This bullet has an unpainted tip.

- **Cartridge, Caliber .50, Armor-Piercing, M2**

This cartridge is used against lightly armored vehicles, protective shelters, and personnel, and can be identified by its black tip.

- **Cartridge, Caliber .50, Armor-Piercing-Incendiary, M8**

This cartridge is used, in place of the armor-piercing round, against armored, flammable targets. The bullet has a silver tip.

- **Cartridge, Caliber .50, Tracer, M10**



Left to right, rear: Mk211, Spotter, Silver tip (Armor Piercing Incendiary), Blue tip (Incendiary), Black tip (Armor Piercing), SLAP-T, SLAP, Tracer, and Ball. Front row are 5.56×45mm NATO and .500 S&W Magnum for size comparison.

Tracer for observing fire, signaling, target designation, and incendiary purposes. Designed to be less intense than the M1 tracer, the M10 has an orange tip.

- **Cartridge, Caliber .50, Tracer, M17**

Tracer for observing fire, signaling, target designation, and incendiary purposes. Can be fired from the M82/M107 series of rifles.

- **Cartridge, Caliber .50, Armor-Piercing-Incendiary-Tracer, M20**

This cartridge is used, in place of the armor-piercing round, against armored, flammable targets, with a tracer element for observation purposes. This cartridge is effectively a variant of the M8 Armor-Piercing Incendiary with the added tracer element. Can be fired from the M82/M107 series of rifles. This bullet has a red tip with a ring of aluminum paint.

- **Cartridge, Caliber .50, Tracer, Headlight, M21**

Tracer for use in observing fire during air-to-air combat. Designed to be more visible, the M21 is 3 times more brilliant than the M1 tracer.

- **Cartridge, Caliber .50, Incendiary, M23**

This cartridge is used against unarmored, flammable targets. The tip of the bullet is painted blue with a light blue ring.

- **Cartridge, Caliber .50, Ball, M33**

This cartridge is used against personnel and unarmored targets. Can be fired from the M82/M107 series of rifles.

- **Cartridge, Caliber .50, Saboted Light Armor Penetrator, M903**

This cartridge has a 355 – 360 gr (23.00 – 23.33 g) heavy metal (tungsten) penetrator that is sabot-launched at a muzzle velocity of 4,000 ft/s (1,219 m/s). The 0.30 in (7.7 mm) diameter sabot, which is designed to break up at the muzzle to release the penetrator, must also survive the gun environment until launch. It is injection molded of special high strength plastic and is reinforced with an aluminum insert in the base section. The cartridge is identified by an amber sabot (Ultem 1000). For use only in the M2 series of machine guns. This round can penetrate 19mm of steel armor at 1500 yards.<sup>[11]</sup>

- **Cartridge, Caliber .50, Saboted Light Armor Penetrator-Tracer, M962**

Like the M903, this is a Saboted Light Armor Penetrator (SLAP) round, with the only difference being that the M962 also has a tracer element for observing fire, target designation, and incendiary purposes. It uses red colored plastic sabot for identification. For use only in the M2 series of machine guns.

- **Cartridge, Caliber .50, Ball, XM1022**

A long-range match cartridge specifically designed for long range work using the M107 rifle.

- **Cartridge, Caliber .50, M1022 Long Range Sniper**

The .50 Caliber M1022 has an olive green bullet coating with no tip ID coloration. The projectile is of standard ball design. It is designed for long-range sniper training and tactical use against targets that do not require armor-piercing or incendiary effect. It exhibits superior long range accuracy and its trajectory is matched to MK211 grade A. The M1022 is ideal for use in all .50 Caliber bolt action and semi-automatic sniper platforms.<sup>[1]</sup>

- **Cartridge, Caliber .50, Armor-Piercing-Incendiary, Mk 211 Mod 0**

A so-called "combined effects" cartridge, the Mk 211 Mod 0 High-Explosive-Incendiary-Armor-Piercing (HEIAP) cartridge contains a .30 caliber tungsten penetrator, zirconium powder, and Composition A explosive. It can be used in any .50 caliber weapon in US inventory with the exception of the M85 machine gun. Cartridge is identified by a green tip with a grey ring.

- **Cartridge, Caliber .50, MK257 Armor Piercing Incendiary Dim Tracer**

The .50 Caliber MK257 API-DT has a purple bullet tip. The bullet has a hardened steel core and incendiary tip. The .50 Caliber MK257 is used in machine guns M2, M3, and M85. Dim trace reduces the possibility of the weapon being located during night fire and is visible with night vision devices only.<sup>[1]</sup>

- **Cartridge, Caliber .50, Armor-Piercing-Incendiary-Tracer, Mk 300 Mod 0**

As with the Mk 211 Mod 0, but with a tracer component. This cartridge likely can be used in any .50 caliber weapon in US inventory with the exception of the M85 machine gun, as with the Mk 211 Mod 0.

- **Cartridge, Caliber .50, Armor-Piercing-Explosive-Incendiary, APEI-169, M02**

This cartridge is used against hardened targets such as bunkers, for suppressive fire against lightly armored vehicles, and ground and aerial threat suppression. It is generally fired either from pilot-aimed aircraft-mounted guns or anti-aircraft platforms both produced by FN Herstal.<sup>[12]</sup> It is identified by a gray over yellow tip.<sup>[13]</sup> A tracer variant of it also exists.

## Links used for feeding machine guns

Two distinct and non-compatible metallic links have been used for the .50 BMG cartridge, depending upon the machine gun which will be firing the cartridges. The M2 and M9 links, "pull-out" designs, are used in the Browning M2 and M3 machine guns. Pull-out cloth belts were also used at one time, but have been obsolete since 1945. The M15-series "push-through" links were used in the M85 machine gun. When the M85 was taken out of service, large stocks of ammunition linked with the M15 link remained in US military storage because of the ease with which linked ammunition can be de-linked and re-linked with different (i.e. in service) links.

## Legal issues

The specified maximum diameter of an unfired .50 BMG bullet is 0.510-inch (13.0 mm); while this appears to be over the .50 inch (12.7 mm) maximum allowed for non-sporting Title I small arms under the U.S. National Firearms Act, the barrel of a .50 BMG rifle is only .50 inch (12.7 mm) across the rifling lands and slightly larger in the grooves. The oversized bullet is formed to the bore size upon firing, forming a tight seal and engaging the rifling, a mechanism which in firearms terms is known as engraving. Subject to political controversy due to the great power of the cartridge (it is the most powerful commonly available cartridge not considered a destructive device under the National Firearms Act), it remains popular among long-range shooters for its accuracy and external ballistics. While the .50 BMG round is able to deliver accurate shot placement (if match grade ammunition is used) at ranges over 1,000-yard (910 m), smaller caliber rifles produce better scores and tighter groups in 1,000-yard (910 m) competitions.<sup>[14]</sup>

In response to legal action against the .50 BMG in the United States and Europe, an alternative chambering was developed. The .510 DTC Europ uses the same bullet, but has slightly different case dimensions. .510 DTC cases can be made by fire-forming .50 BMG cases in a .510 DTC chambered rifle. The new round has almost identical ballistics, but because of the different dimensions, rifles chambered for .50 BMG cannot fire the .510 DTC, and therefore rifles chambered for .510 DTC do not fall under many of the same legal prohibitions. Barrett offers a similar alternative, the .416 Barrett, which is based on a shortened .50 BMG case necked down to .416 caliber (10.3 mm).

A 1999 Justice Department Office of Special Investigations briefing on .50 caliber rifle crime identified several instances of the .50 BMG being involved in criminal activities.<sup>[15]</sup> Most of the instances of criminal activity cited in the Office of Special Investigations briefing involved the illegal possession of a .50 BMG rifle. The briefing did not identify any instance of a .50 BMG rifle being used in the commission of a murder.

Within the United Kingdom, it is possible to own a .50 BMG rifle as a section 1 firearm.<sup>[16]</sup>

## Typical uses

The primary military use of this round is in the Browning M2HB heavy machine gun.

The primary civilian users of .50 caliber rifles, which range in price from around US\$1,600<sup>[1]</sup> for single shot AR-15 upper conversions to well over US\$8,000<sup>[17]</sup> for the semi-automatic, magazine-fed Barrett M82A1, are long-range target shooters; the Fifty Caliber Shooters Association, for instance, holds .50 BMG shooting matches nationwide in the U.S.<sup>[18]</sup>

The U.S. Coast Guard uses .50 BMG rifles to disable outboard engines from armed helicopters during interdictions. Similarly, .50 BMG weapons have attracted attention from law enforcement agencies; they have been adopted by the New York City Police Department as well as the Pittsburgh Police. A .50 BMG round can effectively disable a vehicle when fired into the engine block. If it is necessary to breach barriers, a .50 BMG round will penetrate most commercial brick walls and concrete cinder blocks.

In addition to long-range and anti-materiel sniping, the U.S. military uses .50 BMG weapons to detonate unexploded ordnance from a safe distance. The Raufoss Multipurpose round has sufficient terminal performance to disable most unarmored and lightly armored vehicles, making .50 BMG caliber weapons helpful in anti-insurgency operations.

The cartridge is also used by some hunters for taking game at extreme ranges; while the energy of the .50 BMG at close range is excessive for most game, at long ranges the velocity has dropped to levels that allow the taking of game animals without excessive damage to the animal.<sup>[19][20]</sup>

## Partial list of .50 BMG firearms

### Carbines

- Barrett M82CQ (a carbine version of the M82A3)
- Bushmaster BA50 carbine (22" barrel version of the BA50)

### Rifles

- Accuracy International AW50
- Accuracy International AS50
- OM 50 Nemesis<sup>[21]</sup>
- Anzio Iron Works Anzio-50
- Armalite AR-50
- Pindad SPR-2 and Pindad SPR-3<sup>[22]</sup>
- Barrett M82/M107
- Barrett M95
- Barrett M99
- Bluegrass Armory Viper<sup>[23]</sup>
- Bushmaster BA50
- ČZW-127
- Desert Tactical Arms HTI
- DSR-50
- East Ridge / State Arms Gun Co. Inc.<sup>[24]</sup>
- Bohica MK III AR-15 Upper<sup>[25]</sup>
- Bushmaster BA50 Rifle<sup>[26]</sup>
- L.A.R. Manufacturing, Inc. Grizzly Big Boar
- McMillan Tac-50
- POLY-Technologies M99-II<sup>[27]</sup> and M99B-II<sup>[28]</sup>

- Ramo M600 and M650<sup>[29]</sup>
- Robar RC-50
- Safety Harbor Firearms SHF/R50<sup>[30]</sup>
- Serbu Firearms BFG-50 (single shot bolt action) and BFG-50A (Semi-Automatic)
- Spider Firearms Ferret 50
- Steyr HS .50
- TGR Co. LLC \$1599 Noreen 50 BMG<sup>[31]</sup>
- Gepard anti-materiel rifle
- Zastava M93 Black Arrow
- PGM Hecate II
- Ultralite50/Ligamec Corp.<sup>[1]</sup>
- Vulcan Armament V50<sup>[32]</sup>
- EDM Arms Windrunner<sup>[33]</sup>
- WKW Wilk
- Zel Custom Manufacturing/Tactilite<sup>[1]</sup>

## Machine guns

- CIS 50MG
- GAU-19
- M2 Browning machine gun
- M85 machine gun
- MAC-58 - did not enter production
- Rolls-Royce Experimental Machine Gun - only built as prototype
- WKM-B
- XM312

## References

[1] <http://www.hornady.com/store/50-BMG-750-gr-A-MAX-Match/>

[2] <http://ammoguide.com/>

[3] NATO Infantry Weapons Standardization, Per G. Arvidsson, Chairman Weapons & Sensors Working Group Land Capability Group 1 - Dismounted Soldier NATO Army Armaments Group (<http://www.dtic.mil/ndia/2008Intl/Arvidsson.pdf>)

[8] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), pp. 311–312.

[9] Barnes, Frank C., *Cartridges of the World*, U.S. Army .50 BMG Cartridge Specifications, DBI Books (1989), ISBN 978-0-87349-033-7, p. 432.

[11] [http://i381.photobucket.com/albums/oo255/FEDE\\_EL\\_SOMALI/1-15.jpg](http://i381.photobucket.com/albums/oo255/FEDE_EL_SOMALI/1-15.jpg)

[12] Janes listing of the FN Herstal .50 cal M3P coaxial weapon system (Belgium) (<http://www.janes.com/extracts/extract/jaau/jaau0098.html>).

[13] Igman Ammunition Cal. 12.7 x 99 mm, APEI, M 02 (<http://www.igman.co.ba/ammunition.htm#10>).

[16] <http://www.fcsa.co.uk>

[18] Match dates at the Fifty Caliber Shooters Association (<http://www.fcsa.org/visitors/matches.htm>)

[22] <http://www.pindad.com>

## **External links**

- TM43-0001-27 (<http://www.dtic.mil/dticasd/sbir/sbir032/a044a.pdf>) US Army Ammunition Data Sheets – Small Caliber Ammunition, HQ Department of the Army, 6/81, Including changes (Not to be used as reloading data)
  - .50 Caliber Browning (12.7 × 99 mm) Ammunition ([http://www.inetres.com/gp/military/infantry/mg/50\\_ammo.html](http://www.inetres.com/gp/military/infantry/mg/50_ammo.html))
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