

MODERN FIREARMS Series



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FN FAL (Belgium)

Caliber : 7,62mm NATO (7.62x51)

Action: Gas operated, tilting breechblock, select-fire or semi-auto only

Length: 1100 mm (990 / 736 mm for "Para" model)

Barrel length: 533 mm (431 mm for "Para" model)

Weight: 4.45 kg empty (3.77 kg empty for "Para" models)

Magazine capacity: 20 rounds (30 rounds for heavy barreled SAW versions)

Rate of fire: 650-700 rounds per minute

The FN FAL (Fusil Automatique Leger - Light Automatic Rifle) is one of the most famous and widespread military rifle designs of the XX century. Developed by the Belgian Fabrique Nationale company, it was used by some 70 or even more countries, and was manufactured in at least 10 countries. At the present time the service days of the most FAL rifles are gone, but it is still used in some parts of the world.



Belgian FAL prototype (ca.1950) chambered for British .280 (7x43mm) intermediate cartridge

The history of the FAL began circa 1946, when FN began to develop a new assault rifle, chambered for German 7.92x33mm Kurz intermediate cartridge. The design team was lead by Dieudonne Saive, who at the same time worked at the battle rifle, chambered for "old time" full-power rifle cartridges, which latter became the SAFN-49. It is not thus surprising that both rifles are mechanically quite similar. In the late 1940s Belgians joined the Britain and selected a British .280 (7x43mm) intermediate cartridge for further development. In 1950 both Belgian FAL prototype and British EM-2 bullpup assault rifles were tested by US Army. The FAL prototype greatly impressed the Americans, but the idea of the intermediate cartridge was at that moment incomprehensible for them, and USA insisted on adoption of their full-power T65 cartridge as a NATO standard in 1953-1954. Preparing for this adoption, FN redesigned their rifle for the newest T65 / 7.62x51mm NATO ammunition, and first 7.62mm FALs were ready in 1953. Belgium was not the the first country to adopt their own rifle in 1956. Probably the first one was a Canada, adopting their slightly modified version of FAL as C1 in 1955. Canadians set to produce C1 and heavy barreled C2 squad automatic rifles at their own Canadian Arsenal factory. Britain followed the suit and adopted the FAL in 1957 as an L1A1 SLR (Self-loading rifle), often issued with 4X SUIT optical scopes. Britain also produced their own rifles at the RSAF Enfield and BSA factories. Austria adopted the FAL in 1958 as a Stg.58 and manufactured their rifles at Steyr arms factory.

Various versions of FAL were also adopted by the Brazil, Turkey, Australia, Israel, South Africa, West Germany and many other countries. The success of the FAL could be even greater if Belgians would sell the license to W.Germany, which really liked to produce the FAL as a G1 rifle, but Belgians rejected the request. Germany purchased the license for Spanish CETME rifle and as a result of this H&K G3 rifle became probably the most notable rival to FAL.



Austrian Steyr Stg.58 - license built FN FAL

During the time, FAL was built in numerous versions, with different furniture, sights, barrel lengths etc. There are, however, four basic configurations of FAL rifle: FAL 50.00, or simply FAL, with fixed buttstock and standard barrel; FAL 50.63 or FAL "Para", with folding skeleton butt and short barrel; FAL 50.64 with folding skeleton butt of "Para" model and standard length barrel; and the FAL 50.41, also known as FAL Hbar or FALO - a heavy barreled model which was intended primary as a light support weapon. There are also two major patterns of FALs around the globe: "metric" and "inch" FALs. As the names implied, these were built in countries with metric or imperial (inch) measure systems. These patterns are slightly different in some dimensions, and magazines of metric and inch pattern sometimes could not be interchanged. Most "inch" pattern FALs were made in British Commonwealth countries (UK, Canada, Australia) and have had folding cocking handles and were mostly limited to semi-automatic fire only (except for Hbar versions like C2). Most "metric" pattern rifles had non-folding cocking handles and may or may not have select-fire capability, but as with other light select-fire weapons chambered for 7.62x51mm NATO round, the controllability of the full auto fire is disappointing and shots spread in burst is extremely wide. But, regardless of this, the FAL is one of the best so known "battle rifles", reliable, comfortable and accurate. It is somewhat sensitive to fine sand and dust but otherwise is a great weapon.



British L1A1 SLR - license built "inch pattern" FN FAL with SUIT optical sight

The only countries still producing the FAL rifles until the present time are the Brazil and, most surprisingly, the USA.

Brazil adopted the FAL under the name LAR and manufactured it at the IMBEL facilities. The USA produced a small amount of FALs as the T-48 at H&R factory in early 1950s for Army trials, but at the present time a number of private US Companies is manufacturing various versions of FAL rifles using either surplus parts kits or newly manufactured parts. Most of these rifles are limited to semi-auto only and are available for civilian users. Probably most notable US manufacturer of FAL modifications is the DS Arms company, which produced its rifles under the name of DSA-58.



Brazilian IMBEL LAR - another license built FN FAL, one of few FAL models still in production now

The FN FAL is a gas operated, selective fire or semi-automatic only, magazine fed rifle. It uses short piston stroke gas system with gas piston located above the barrel and having its own return spring. After the shot is fired, the gas piston makes a quick tap to the bolt carrier and then returns back, and the rest of the reloading cycle is commenced by the inertia of bolt group. The gas system is fitted with gas regulator so it could be easily adjusted for various environment conditions, or cut off completely so rifle grenades could be safely launched from the barrel. The locking system uses bolt carrier with separate bolt that locks the barrel by tipping its rear part into the recess in the receiver floor. The receivers initially were machined from the forged steel blocks, and in 1973 FN began to manufacture investment cast receivers to decrease production costs. Many manufactures, however, stuck to the machined receivers. The trigger housing with pistol grip is hinged to the receiver behind the magazine well and could be swung down to open action for maintenance and disassembly. The recoil spring is housed in the butt of the rifle in fixed butt configurations or in the receiver cover in folding butt configurations, so the folding butt versions require a slightly different bolt carrier, receiver cover and a recoils spring.



Canadian C2 Squad Automatic Weapon - a heavy barreled version of FAL, intended as Light Machine Gun

The cocking handle is located at the left side of the receiver and does not move when gun is fired. It could be folding or non-folding, depending on the country of origin. The safety - fire selector switch is located at the trigger housing, above the triggerguard. It can have two (on semi-automatic) or three (on select-fire rifles) positions. The firing mechanism is hammer fired and use single sear for both semi-automatic or full automatic fire. Barrel is equipped with long flash hider which also serves as a rifle grenade launcher. Design of flash hider may differs slightly from country to country. The furniture of the FAL also can differ - it could be made from wood, plastic of various colors or metal (folding buttstocks, metallic handguards on some models). Some models, such as Austrian Stg.58 or Brazilian LAR were fitted with light bipods as a standard. Almost all heavy barrel versions also were fitted with bipods of various design. Sights usually are of hooded post front and adjustable diopter rear types, but can differ in details and markings. Almost all FAL rifles are equipped with sling swivels and most of rifles are fitted with bayonet lugs.



DSA-58OSW - a select-fire "sawed off" FAL clone made by DS Arms (USA) for police use



FN FAL "Paratrooper" model (also known as FAL 50.63) with shortened barrel and folding butt

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FN FNC assault rifle (Belgium)

Caliber: 5.56x45mm NATO

Action: Gas operated, rotating bolt

Overall length: standard model 997 mm (776 mm with folded butt); "Para" model 911 mm / 680 mm

Barrel length: 449 mm (363 mm "Para" model)

Weight with empty magazine: 4.06 kg (3.81 kg "Para" model)

Magazine capacity: 30 rounds (accept all STANAG-compatible magazines)

Rate of fire: about 700 rounds per minute

Effective range: 450 meters

Following the market failure of their previous 5.56mm caliber assault rifle, the CAL, famous Belgian company Fabrique Nationale began to develop the new assault rifle for 5.56mm NATO cartridge in the early 1970s. The final design, called the FNC (Fabrique Nationale Carbine) was produced circa 1978 and was consequently adopted by the Belgian Armed forces. It was also adopted by Sweden and Indonesia, and both those countries purchased the licenses to build more or less modified FNC carbines at their own facilities. Swedish version is known as Bofors AK-5 and Indonesian version is known as Pindad SS1. The FNC also was sold to some police forces around the world, and, in limited numbers for civilians - as a "Sporter" model, limited to semi-automatic mode only.



FN FNC rifle of late manufacture (with enlarged triggerguard)

The FNC is a sound design which accumulated best features from other famous designs, such as Kalashnikov AK-47, Colt/Armalite M16, and others.

FNC is a gas operated, selective fire, magazine fed weapon.

The gas drive and rotating bolt of FNC strongly resembles the AK-47 system, but adapted for more advanced production technologies such as CNC machining and with some modifications. The long stroke gas piston is located above the barrel and is linked to the bolt carrier. Unlike the AK-47, the gas piston rod could be separated from the bolt carrier when gun is disassembled. The gas system featured two-positions gas regulator (for normal or adverse conditions) and a separate gas cutoff, combined with folding rifle

grenade sights. When grenade sights are raised into the ready position, the gas cutoff automatically blocks the gas supply to the action, allowing for safe launching of rifle grenades. Both gas cutoff and a grenade sight are located on the gas chamber, just behind the front sight. The now common rotating bolt has two massive lugs that locks into the barrel extension.



Same rifle, right side view. note the spring-loaded dust cover on the cocking handle slot

The receiver is made from two parts that are linked by two cross-pins. The receiver could be opened for disassembly and maintenance by removing the rear pin, so the parts could be hinged around the forward pin (which also can be removed to separate receiver parts). Upper receiver is made from stamped steel, the lower receiver, along with magazine housing, is made from aluminum alloy.

Barrel of the FNC is equipped with flash hider which also served as a rifle grenade launcher.

FNC is equipped with hooded post front sight and a flip-up, "L" shaped rear diopter sight with 2 settings, for 250 and 400 meters range.



FN FNC of earlier manufacture, with butt folded

The controls of the FNC consist of the 4-positions safety / mode selector switch on the left side of the receiver. Available modes are Safe, Single shot, 3-rounds bursts and Full automatic fire. The cocking handle is attached to the bolt carrier at the right side and does reciprocate with the bolt group when gun is fired. The rear part of the cocking handle slot, cut in the upper receiver for cocking handle, is covered by the spring-loaded cover which automatically opens by the handle when it goes back and automatically closes the opening when cocking handle returns forward.

FNC is equipped with side-folding buttstock, made of steel and covered by plastic. A solid, non-folding plastic butt is available as an option. The pistol handle and the forend are made from plastic. FNC is equipped with sling swivels and can be fitted with special bayonet or with adapter for US M7 knife-bayonet. FNC can be fed from any STANAG (NATO standard) compliant magazine, and issued with 30 rounds magazines. If required, FNC could be fitted with 4X telescope sight or various IR / night vision sights.



FN FNC Para, with shorter barrel, butt folded and magazine removed

FN SCAR: Mark 16 and Mark 17- Special Forces Combat Assault Rifle (USA / Belgium)

	Mk.16 SCAR-L (Light)	Mk.17 SCAR-H (Heavy)
Caliber	5.56x45 NATO	7.62x51 NATO basic 7.62x39 M43 and others additionally
Overall length, standard configuration	850 mm (max) / 620 mm (min)	997 mm (max) / 770 mm (min)
Barrel length	254mm/10" (CQC), 355mm/14" (Std), 457mm/18" (LB)	330mm/13" (CQC), 406mm/16" (Std), 508mm/20" (LB)
Weight	3.5 kg empty	3.86 kg empty
Rate of fire	600 rounds per minute	600 rounds per minute
Magazine capacity	30 rounds standard	20 rounds (7.62x51 NATO) 30 rounds (7.62x39 M43)

The US Special Operations Command (US SOCOM) issued a solicitation for the procurement of SOF Combat Assault Rifles (SCAR) on October 15th, 2003. This solicitation requested a new combat rifle, specially tailored for the current and proposed future needs of the US Special Forces, which are somewhat different from latest generic US Army requirements, which are being fulfilled by the newest Heckler-Koch XM8 assault rifle. The key difference in basic requirements between XM8 and SCAR is that, while XM8 is a single-caliber weapon system, tailored for 5.56x45mm NATO ammunition, the SCAR should be available in various different calibers. Initial SOF requirements included two basic versions of SCAR system - the SCAR Light (SCAR-L), available in 5.56mm NATO, and the SCAR heavy (SCAR-H), which should be initially available in significantly more powerful 7.62x51 NATO chambering, and should be easily adaptable in the field to other chamberings.



FN SCAR-L / Mk.16 rifle prototype (1st generation, late 2004), left side view

These other chamberings initially include the well-spread 7.62x39 M43 ammunition of the Soviet / Russian origins, and probably some others (like the proposed 6.8x43 Remington SPC cartridge, especially developed for US Special Forces). The key idea of SCAR rifle system is that it will provide the Special Forces operators with wide variety of options, from short-barreled 5.56mm SCAR-L CQC variation, tailored for urban close combat, and up to long range 7.62x51 SCAR-H Sniper variant, as well as 7.62x39 SCAR-H, which will accept "battlefield pickup" AK-47/AKM magazines with 7.62 M43 ammunition, available during the operations behind the enemy lines. Both SCAR-L and SCAR-H shall be initially available in three versions, Standard (S), Close Quarters Combat (CQC) and Sniper Variant (SV; now it is dubbed Long Barrel - LB). All these variants, regardless the caliber and exact configuration, will provide the operator with the same controls layout, same handling and maintenance procedures, and same optional equipment, such as sights, scopes, and other current and future attachments.



FN SCAR-L / Mk.16 rifle, 2nd generation prototype, with FN EGLM 40mm grenade launcher attached

Late in 2004 US SOCOM announced, that the winner for the initial SCAR contracts is the FN USA, an US-based subsidiary of the famous Belgian company Fabrique Nationale Herstal. prototype rifles were manufactured by FN Manufacturing Inc, US-based subsidiary to FN Herstal; This company will also handle series production of rifles. Starting mid-2005, first SCAR rifles went to end users in US Special Operation Forces. Since US SOCOM uses Navy-type "mark" designations, SCAR rifles were officially designated as 5.56mm Rifle Mark 16 (SCAR-L / Light) and 7.62mm Rifle Mark 17 (SCAR-H / Heavy). It is believed that Mk.16 and Mk.17 rifles will gradually replace most rifle systems now in service with US SOCOM forces, such as M4 carbines, M16 rifles, M14 rifles and Mk. 25 sniper rifles.



FN SCAR-H / Mk.17 rifle prototype in CQC (Close Quarter Combat, short barrel) configuration, 7.62x51 mm NATO version

As it turned out, FN SCAR rifles are not based on any previous weapons but designed from the scratch. In all variants FN SCAR rifles feature gas operated, short stroke piston action with rotating bolt locking. Bolt system appears to be somewhat similar to that of FN Minimi / M249 SAW machine gun. This system apparently is less sensitive to fine sand, dust and any other fouling inside the receiver, than any system with M16-type multi-lug bolt and plunger type ejector.



FN SCAR-L / Mk.16 rifle partially disassembled; note additional quick-detachable barrel

Receiver is made from two parts, upper and lower, connected with two cross-pins. Upper part is made from extruded aluminium, lower part is made from polymer. SCAR-L and SCAR-H use similar upper receivers that differ only in the size of ejection port. Other different parts include caliber-specific bolt, barrel, and lower receiver with integral magazine housing. Parts commonality between SCAR-L and SCAR-H is astonishing 90%. Barrels are quick-detachable, and held in the upper receiver with two cross-bolts. Barrel change procedure requires minimum amount of tools, takes just several minutes and there is no need to adjust the headspace after the change. The trigger unit with ambidextrous safety-fire mode selector switch allows for single shots and full automatic fire, with no provisions for limited-length bursts mode. The charging handle could be easily installed on either side of the weapon, so the upper receiver has respective cuts on both sides. Top of the upper receiver is covered by the full-length integral Picatinny rail (MIL-STD 1913); additional Picatinny rails are mounted on both sides and under the free-floating handguards. Side-folding polymer buttstock is adjustable for length of pull, and is shaped to provide positive cheek rest with adjustable cheek support. SCAR rifles are fitted with removable, adjustable iron sights, with folding diopter-type rear sight on the receiver rail, and folding front sight on the gas block. Any additional type of sighting equipment, necessary for current tasks, including telescope and night sights, can be installed using MIL-STD 1913 compatible mounts. Mk.16 SCAR-L rifle will use improved M16-type magazines, made of steel; Mk.17 SCAR-H will use proprietary 20-round magazines in 7.62x51 NATO chambering, or standard AK-type magazines in proposed 7.62x39 M43 chambering. Current prototypes of SCAR rifles do not have bayonet mounts, and, probably, will never have one.



5.56mm NATO FN SCAR-L / Mk.16 rifles of current (2007/2008) production, top to bottom in Long Barrel (LB), standard (Std) and Close Quarter Combat (CQC) configurations



7.62mm NATO FN SCAR-H / Mk.17 rifles of current (2007/2008) production, top to bottom in Long Barrel (LB), bstandard (Std) and Close Quarter Combat (CQC) configurations

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FX-05 Xiuhcoatl assault rifle (Mexico)

Caliber: 5.56x45 mm NATO

Action: Gas operated, rotating bolt

Overall length: 1087 mm (stock extended) or 887 mm (stock folded)

Barrel length: mm

Weight: 3.89 kg empty

Rate of fire: 750 rounds per minute

Magazine capacity: 30 rounds

FX-05 Xiuhcoatl (Fire serpent) assault rifle was developed in Mexico by Directorate of Military Industry (*Dirección General Industria Militar Mexicana - DGIM*), and was first displayed to public in 2006. The rifle is already in limited production and is issued to Mexican armed forces on limited basis. It is planned to replace older 7.62x51 HK G3 rifles in Mexican service with 5.56mm FX-05 rifles in the coming years. While the FX-05 rifle bears more than passing similarity to the German-made HK G36 rifle, suspicions of the patent infringement from HK were turned down, as the FX-05 does not have any of the patented features of the G36, and have enough internal differences to be considered an original design, although its design is obviously heavily influenced by the German rifle. The FX-05 is currently available in three basic versions - rifle, carbine and short carbine, which differ in barrel length.



The FX-05 Xiuhcoatl assault rifle is gas operated, selective fired weapon. Gas piston is located above the barrel, barrel locking is achieved via multi-lugged rotary bolt. Charging handle can be installed on either side of the weapon. Receiver of the rifle is made from impact-resistant polymer, translucent magazines also made from polymer. Safety / fire mode selector switches are located above the pistol grip, on both sides of the gun. Rifle is equipped with integral Picatinny type rail on the top of receiver, and can be fitted either with removable carrying handle / optical sight unit or with detachable iron sights, with protected front post and diopter-type flip-up rear sights. The shoulder stock is also made from polymer; it folds to the right and can be adjusted for the length of pull.

When folded, shoulder stock is located below the ejection port on the right side of the receiver, so the gun can be fired with stock folded.



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Galil ACE assault rifles (Israel)

Data for Galil ACE 20 21 22 rifles

	Galil ACE 21	Galil ACE 22	Galil ACE 23
Caliber	5.56x45 NATO		
Action	Gas operated, rotating bolt		
Overall length (butt extended / collapsed)	730 / 650 mm	847 / 767 mm	975 / 875 mm
Barrel length	215 mm	332 mm	460 mm
Weight	2.8 kg	3.3 kg	3.44 kg
Rate of fire	~ 700 rounds per minute		
Magazine capacity	35 rounds		

Data for Galil ACE 31 32 rifles

	Galil ACE 31	Galil ACE 32
Caliber	7.62x39 M43	
Action	Gas operated, rotating bolt	
Overall length (butt extended / collapsed)	730 / 650 mm	895 / 815 mm
Barrel length	215 mm	380 mm
Weight	2.95 kg	3.4 kg
Rate of fire	~ 650 rounds per minute	
Magazine capacity	30 rounds	

Data for Galil ACE 52 53 rifles

	Galil ACE 52	Galil ACE 53
Caliber	7.62x51 NATO	
Action	Gas operated, rotating bolt	
Overall length (butt extended / collapsed)	935 / 855 mm	1043 / 963 mm
Barrel length	400 mm	508 mm
Weight	3.56 kg	3.69 kg
Rate of fire	~ 650 rounds per minute	
Magazine capacity	25 rounds	

The Galil ACE rifles are the new generation of the famous Israeli Galil assault rifles. The Galil ACE represents full product line of military rifles in world's three most popular calibers (5.56x45 NATO, 7.62x39 M43 and 7.62x51 NATO) made in full spectrum of configurations, from compact carbine and up to long barreled marksman rifle. All Galil ACE rifles feature same basic design, based on combat-proven Galil action, and feature same array of ergonomic enhancements, including ambidextrous controls, adjustable telescoping buttstocks, comfortable pistol grips, integral Picatinny rails etc. The 5.56mm version of the Galil ACE assault rifle is adopted by Colombian army, and is manufactured under the Israeli license by Colombian government-owned factory Indumil.



7.62x39 Galil ACE model 32 rifle

The Galil ACE rifle is gas operated, select-fire weapon. It uses long-stroke gas operated action with gas piston located above the barrel. Locking is achieved by rotating bolt with dual locking lugs. The receiver is machined from steel, with polymer magazine housing / pistol grip unit attached below. The detachable stamped steel receiver cover houses an integral Picatinny rail and rear sight base. The charging handle is located on the left side of the receiver and is attached directly to the bolt carrier. To provide maximum protection from dust and dirt at all times, the charging handle slot is covered with spring-loaded dust cover which opens and closes after each shot automatically.



7.62x51 Galil ACE model 52 rifle

The safety / fire mode selector is duplicated at both sides of the weapon, and has better shape when compared to predecessors. Feed is from detachable box magazines; the

NATO caliber versions (in 5.56 and 7.62mm) use standard Galil magazines with 35- and 25-round capacity, respectively. The 7.62x39 versions use standard AK magazines with 30-round capacity. Standard sighting equipment includes protected front post (adjustable for zeroing) and protected flip-up type rear diopter sight. A wide array of modern optical sights can be installed on the integral Picatinny rail. All Galil ACE rifles (except for sub-compact ACE 21 and ACE 31 carbines) also feature a bayonet lug on the barrel.



5.56mm Galil ACE models 21, 22 and 23 rifles (from top to bottom)

GIAT FAMAS assault rifle (France)

	FAMAS F1	FAMAS G2
Caliber	5.56mm NATO (.223rem)	
Action	Delayed blowback	
Overall length	757 mm	
Barrel length	488 mm	
Weight	3.61 kg with empty magazine	3.8 kg with empty magazine
Magazine capacity	25 rounds (proprietary)	30 rounds (STANAG)
Muzzle velocity	960 m/s	925 m/s
Rate of fire	900-1000 rounds per minute	1000-1100 rounds per minute
Effective range	300 meters	450 meters

FAMAS stands for Fusil d'Assaut de la Manufacture d'Armes de St-Etienne (Assault Rifle by St-Etienne Arms Factory - a member of the French govt. owned GIAT Industries concern). Development of this rifle began in 1967, under the leadership of the Paul Tellie, a French arms designer. This new rifle was intended to replace in service the MAS Mle.49/56 semi-automatic rifles, MAT-49 submachine guns and some MAC Mle.1929 light machine guns. First FAMAS prototype had been built in 1971.



FAMAS F1 (original version).

French military began to test this rifle in 1972-73, but, in the meantime, France adopted a Swiss-designed SIG SG-540 5.56mm assault rifle as an intermediate solution.

FAMAS rifle was adopted by the French in 1978 and since then became a standard French Army shoulder fired small arm, known among the French soldiers as "Le Clairon" (the bulge). According to the Janes Infantry Weapons 2000, the total number of FAMAS F1 rifles built is estimated at 400 000, and the production of the F1 variant is now completed. It is still used by the French army, and was exported in small numbers to some countries like the Senegal or United Arab Emirates. Since then, the GIAT Industries developed an improved version of the F1, known as the G1. This rifle featured an enlarged trigger guard, that covered a whole hand, and a slightly improved plastic handguards. G1 was an intermediate design, and was consequently replaced by the latest production model, the FAMAS G2, which appeared circa 1994. This rifle has the G1-style enlarged trigger guard but can accept only STANAG type (M16-compatible) magazines. It was adopted and purchased by the French Navy in the 1995, with the French Army soon following the suit, and also offered for export. At the present time the slightly upgraded FAMAS G2 rifle is used as a platform for the future FELIN system (a French counterpart to the US "Land Warrior" programme), which incorporates a various electronic sights and sensors, connected to the soldier carried equipment, like the helmet mounted displays, ballistic and tactical computers etc. GIAT also now offers some variations of the basic FAMAS G2 rifle, such as "Submachine gun" with shortened receiver and barrel of 320 mm long, "Commando" with the standard receiver and the 405 mm barrel, and the "Sniper", with longer and heavier 620 mm barrel and an integral scope mount instead of the carrying handle.



FAMAS G2 (latest version, with 30 rounds STANAG magazine)

The FAMAS rifles seen some action during the operation "Desert Storm" in Kuwait in 1991, as well as in some peace-keeping operations in the mid and late 1990s, and proved itself as a reliable and trustworthy weapons.



Modifications of the FAMAS G2

Technical description

The FAMAS assault rifles are built using the bullpup layout, with the magazine housing behind the pistol grip and trigger. The gun is built around the compact receiver, which is enclosed in the plastic housing. FAMAS is one of the relatively rare systems that uses a lever delayed blowback action, borrowed from the French AAT-52 machine gun, but originally invented by the Hungarian designer Paul de Kiraly prior to the Second World War, and improved by the Paul Tellie for the FAMAS rifle.

This system consists of the two-part bolt (breech block) with the delay lever interposed between the light forward part (the bolt itself), which has a bolt face and the provisions for extractor mountings, and the heavier rear part (the bolt carrier). The lever is pivotally mounted on the front part of the breech block (bolt), with its lower legs resting against the cross pin in the receiver and the upper legs resting against the face on the bolt carrier (assuming that the bolt group is in its forward position). Gun is fired from the closed bolt. When cartridge is ignited and fired, the gas pressure against the cartridge base pushes the cartridge case back in the fluted chamber, against the bolt face. The bolt begin to move back under the pressure, but at initial stages of the movement, when the pressure is still high, the delay lever transforms the short movement of the bolt into the longer movement of the heavier bolt carrier, thus delaying the opening of the bolt. As soon as the pressure in the chamber is dropped down to reasonable level, the lever is completely withdrawn from the contact with the cross pin, and from this moment on both bolt and its carrier begin to move back with the same speed, compressing the return spring and extracting and ejecting the spent case.

The bolt face has extractor mounting points on both sides, so user can mount the extractor claw on the left or the right side of the bolt, which will result in the left-side or right-side extraction of the spent cartridge cases through the ejection ports on both sides of the gun. One of the ejection ports, which is not used at the moment, is always covered with detachable cheek piece, which can be installed on either side of the gun, as required. This allows to solve the problem of the left-hand use, which is essential for most bullpup rifles. The charging handle is located above the receiver, under the carrying handle, is shaped like trigger and completely ambidextrous. The charging handle does not reciprocate when gun is fired.



FAMAS-FELIN system prototype (2001). Modified FAMAS G2 rifle fitted with electronic day/night optical sight, laser rangefinder and an interface to the other soldier equipment, such as helmet-mounted display (HMD).

The firing mechanism unit is contained in the detachable plastic housing just behind the magazine port. The unit is linked to the trigger by the long trigger rod, and the safety / fire selector is located within the triggerguard, just ahead of the trigger. The selector has 3 positions for safe, single shots, and automatic fire. Additional three-rounds bursts module is built into the firing mechanism housing, with the additional selector under the housing, behind the magazine, that allows for the unlimited full automatic fire or 3 rounds burst modes to be selected (when the main selector is in the full auto mode).

The sighting system of the FAMAS consists of the blade front and the diopter rear sight, adjustable for range and with two flip-up apertures, for good visibility and low light conditions. Both sights are mounted on the pillars, that are in turn mounted on the receiver, and concealed by the large plastic carrying handle. The carrying handle has the provisions for mounting a Weaver or Picatinny-style sight bases. A special receivers also available with the integral sights base instead of the carrying handle.

The standard FAMAS barrel is 488 mm long and has a NATO-standard 22mm diameter flash hider, which also is used to launch rifle grenades from the muzzle. Current FAMAS barrels are rifled with 1:9 twist (1 turn in 228 mm, right hand), so both older M193 and newer 5.56mm NATO / SS109 / M855 ammunition can be fired with good results. Another interesting fact about FAMAS barrels is that it has only 3 grooves (while most other rifles have 4 to 6 grooves). The "Commando" variant has the shorter barrel which cannot be used to launch grenades. Both standard and the Commando versions can be fitted with the 40mm M203 underbarrel grenade launcher, if required. Every FAMAS rifle (except for the shortest "Submachine gun" version) can be fitted with folding, non-adjustable lightweight bipods that can be folded along the gun body when not in use. On most rifles these bipods are fitted as a standard. Every FAMAS rifle is equipped with the carrying sling and with detachable bayonet.



FAMAS rifle stripped into major components

"Groza" OC-14 / OTs-14 assault rifle (Russia)

Caliber, mm: 9x39 SP-6, 7.62x39 M43

Action: Gas operated, rotating bolt with 2 lugs

Length: 610 mm (with grenade launcher installed)

Barrel length: 240 mm

Weighth: 2.7 kg in basic configuration; 4.0 kg with attached grenade launcher

Magazine: 20rds (9mm), 30rds AK-47 type (7.62mm)

Rate of fire: 700 rounds per minute

The OTs-14 "Groza" ("thunder") modular assault rifle was developed during the early 1990s by V. Telesh and Ju. Lebedev at the TSKIB SOO (Central Design Bureau for Sporting and Hunting Arms, located in the city of Tula). It was intended for various Special Forces in the Russian army and Internal Affairs Ministry as an dedicated CQB / Urban warfare weapon. It was briefly manufactured in small numbers at the Tula Arms factory during the mid-1990s. OTs-14 rifles saw some action during the first anti-terrorist campaign in Chechnya in 1999, but soon felt out of favor and are no longer made.



"Groza" OC-14 / OTs-14 Assault Rifle in "assault" configuration

The OTs-14 is based on the familiar AKS-74U receiver and action, modified for the larger 9 x 39 subsonic ammunition favored by various SpetsNaz troops. It is fitted into a bullpup layout, with removable trigger / pistol grip unit which could be replaced with an alternative unit integral with 40 mm grenade launcher. In the grenade-launching configuration, a single trigger controls both the 40 mm GL and the rifle itself, with a separate barrel selector. The safety / fire mode selector of AK pattern is retained and in bullpup configuration is especially uncomfortable to operate. The barrel can be fitted with a quick-detachable silencer.

Standard open sights are built into the carrying handle, which results in relatively short sight base. The carrying handle also has mounting points for telescope, red dot or night sights.



"Groza" OC-14 / OTs-14 Assault Rifle in "Grenadier" configuration



"Groza" OC-14 / OTs-14 Assault Rifle with silencer and telescope sight

SPO-JGAS 2010

Haenel / Schmeisser MKb.42(H) machine carbine / assault rifle (Germany)

Caliber: 7.92 x 33 (7.92 mm Kurz)

Action: Gas operated, tilting bolt

Overall length: 940 mm

Barrel length: 364 mm

Weight: 4.9 kg empty

Rate of fire: 500 rounds per minute

Magazine capacity: 30 rounds

In 1939 HWaA (Hitler's army Weapons command) issued a contract for the development of a "Maschinenkarabiner", or machine carbine (MKb for short), chambered for the new 7.92x33 Kurz cartridge, to the company C. G. Haenel Waffen und Fahrradfabrik. Initial development took place under the designation of MKb.42 - Maschinenkarabiner, 1942. The new weapon was intended as a replacement for submachine guns, bolt action rifles and, partly, light machineguns for front troops and was intended to have an effective range of 600 meters or so.



The famous designer Hugo Schmeisser led the Haenel development team, which produced the first working prototypes of new weapon by 1942. In accordance with the specification, the new weapon inherited several features from MP-40 submachine gun, such as the left-side charging handle with slot safety and magazine housing with button release. Because the new weapon had to be made with the maximum usage of stamping and welding, Haenel was joined by the Merz Werke, a company with no knowledge in firearms but a great deal of experience in steel stamping and forming. The first weapons were issued to front line units on the Eastern front by the mid-1942, and the low-rate mass production began in late 1942. A total of about 10,000 MKb.42(H) were produced for the German Army before its production was ceased in favour of an improved design, the MP-43 / Stg.44.

The MKb.42(H) is a gas operated, selective-fire weapon. It uses a long-stroke gas piston, located above the barrel in a long gas tube. The barrel locking is achieved by tipping the rear part of the bolt down into the locking recess, cut in the machined steel insert in the stamped steel receiver. The gun fires from an open bolt at all times, and the only safety is the MP-40-type slot, cut at the rear of the charging handle slot, in which the charging handle can be hooked when the bolt is open. The cross-bolt type fire mode selector is located above the trigger guard. The MKb.42(H) could be fitted with standard bayonet, and has a wooden butt.

SPO-JGAS 2010

Heckler & Koch G3 rifle (Germany)

Caliber: 7.62mm NATO (.308 win)

Action: Roller-delayed blowback

Weight: 4.5kg

Overall length: 1023 mm

Barrel length: 450 mm (315 mm on G3KA4 model)

Magazine capacity: 20 rounds

During the early- to mid-1950s West Germany, like the other NATO countries, faced the need for rearming its army for the newest common 7.62x51mm NATO caliber small arms. Initially Germans preferred the Belgian FN FAL rifle, and adopted it circa 1956 under the designation of G1. Due to obvious reasons Germany wanted to manufacture its military rifles, and attempted to buy a manufacturing license for FAL, but Belgium rejected the deal. So, Germany turned to the another design, available from Spanish company CETME, and known as the CETME mod. A rifle. Germany bought the manufacturing license for CETME rifle and transferred it to the Heckler und Koch (HK) company, located in Oberndorf. HK slightly modified the CETME design, and in 1959 the Bundeswehr (W.Germany Army) finally adopted the CETME / Heckler - Koch rifle as G3 (Gewehr 3 - Rifle, [model] 3). Since that time and until the 1995 the G3 in various modifications served as a general issue shoulder weapon not only for German Armed forces, but also for many other countries. Those include Greece, Iran, Mexico, Norway, Pakistan, Portugal, Sweden, Turkey and many other countries. Total of more than 50 countries during the last 40 years issued the G3 to its forces. The G3 was or still is manufactured in countries like the Greece, Pakistan, Iran, Turkey, Portugal and others.



Earliest variant of G3 rifle with flip-up rear sight and metallic ventilated handguards

The key reason of high popularity of the G3 is that it is much simpler and cheaper to manufacture, than its major contemporary rivals - Belgian FN FAL and US M14. To the best of my knowledge, the HK itself continued to produce and offer the G3 until the year 2000 or 2001, when it finally disappeared from HK catalogs and web-sites. However, the HK still manufactures a wide variety of firearms, based on the G3 design but of different purposes and calibers, like 9mm MP-5 submachine guns, 5.56mm HK 33 assault rifles, 5.56mm and 7.62mm HK 23 and HK 21 machine guns, PSG1 sniper rifles etc. In general, the HK G3 rifle can be described as one of the best 7.62mm NATO battle / assault rifles -

reliable, versatile, controllable, non-expensive and, finally, very popular. For the civilian markets, HK produced the semi-automatic only versions of the G3, initially known as HK 41 and later - as HK 91.



G3A3 with drum type rear sight, plastic ventilated handguards and fixed stock

The G3 rifle is a selective fire, magazine fed rifle, built using delayed blowback action, developed by German engineers at Mauser Werke late in the 2nd World War and refined in Spain, at the CETME company. Initial models of the G3 rifle were quite similar to CETME rifles, and even had "CETME" markings on the receivers (until 1961 or so). The roller-delayed blowback action is described under the CETME Rifles, so I will not repeat it here. The G3 is built using as many stamped parts as possible. The receiver is stamped from sheet steel. The trigger unit housing along with pistol handle frame, also are stamped from steel and hinged to the receiver using the cross-pin in the front of the trigger unit, just behind the magazine housing. Earliest G3 rifles also featured stamped handguards and CETME-type flip-up rear diopter sights. In the mid-1960s the initial design was upgraded to the G3A3 and G3A4 configurations. These rifles had ventilated plastic handguards and a drum-type rear diopter sights, marked from 100 to 400 meters.



G3A3 with attached bayonet and plain plastic handguards of more modern appearance

The G3A3 was a fixed butt version, with buttstock made from plastic, and the G3A4 was a telescope butt version, with retractable metallic buttstock with rubber buttplate. Late German production G3A3 and G3A4 models were built using new trigger units, integral with restyled pistol grip and triggerguard, made from plastic. The shortest version of the G3 was the G3KA4, similar to G3A4 but with shortened barrel. Every G3 rifle can be equipped with detachable bipods, claw-type detachable scope mounts. Long-barreled versions can be fitted with bayonet or used to launch rifle grenades from the barrel. Folding cocking handle is located on the special tube above the barrel, at the left side, and does not reciprocate when gun is fired. The safety / fire selector is located above the triggerguard on the left side of the trigger group housing and usually is marked "S - E -

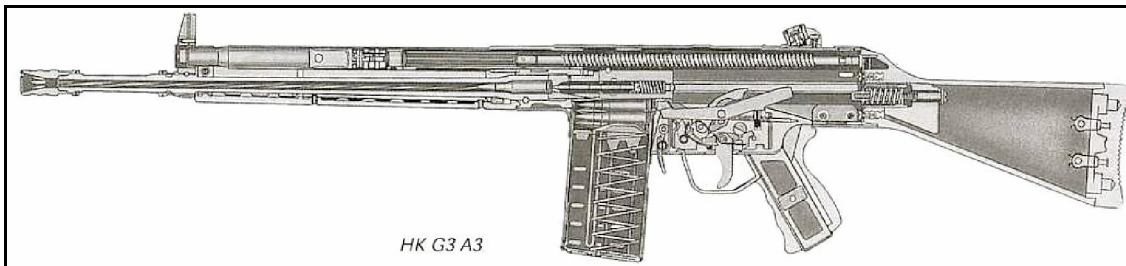
F" (Safe - Single shots - Full auto). Latest models could have selectors marked with colored icons.

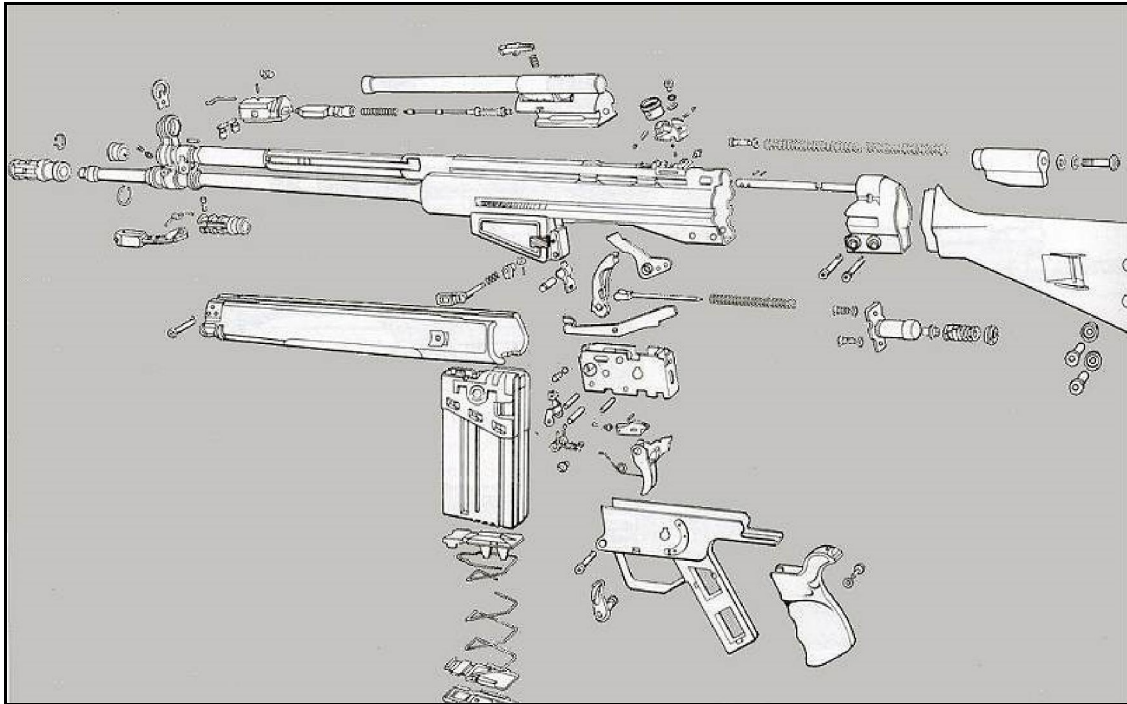


G3A4 - retractable butt version of the G3



G3KA4 - the shortest G3 variant with retractable buttstock and most modern integral pistol grip / trigger unit made entirely of plastic





SPO-JGAS 2010

Heckler&Koch HK 33 and HK 53 (Germany)

	HK33	HK33K	HK53
Caliber	5.56x45mm (.223 Rem)	5.56x45mm (.223 Rem)	5.56x45mm (.223 Rem)
Length	919 mm 740 mm with retracted stock in A3 variant	865 mm 670 mm with retracted stock in A3 variant	780 mm 590 mm with retracted stock in A3 variant
Barrel length	390 mm	322 mm	211 mm
Weight empty	3.9 kg	3.65 kg	3.0 kg
Magazine capacity	25, 30, 40 rounds	25, 30, 40 rounds	25, 30, 40 rounds
Rate of fire	750 rds/min	750 rds/min	750 rds/min

HK33 had been developed by the German company Heckler und Koch in mid- to late 1960s as a scaled-down version of their G3 battle rifle, and entered production in 1968. HK33 was developed for then-new cartridge, 5.56x45mm (.223 Remington), and while it had not been adopted by German military, it saw significant use by some West Germany police and security units, and also widely exported, and used by Malaysia, Chile and Thailand armed forces. Since 1999, HK33 also manufactured under license in Turkey. HK33 is still in production in Germany by HK, and also served as a platform for further developments, such as G-41 assault rifle and HK53 compact assault rifle (known by the HK as submachine gun).



HK33A2

HK53 is a ultra-compact version of HK33, which advertised by HK as "submachine gun" and, by common sense, falls in the same category as soviet AKS-74U or Colt "Commando". All these guns can be classified as "compact (or short) assault rifles" by the fact, that they are used the intermediate rifle round. Hk53 was developed in mid-1970s and is still in production and offered for export.

HK33 is a delayed blowback operated, selective fire rifle, that utilized two pieces bolt with two rollers that used to delay bolt blowback. The receiver is made from stamped steel, and HK33 is available with either a polymer fixed buttstock (HK33A2) or retractable metallic buttstock (HK33A3). Carbine version of the HK33 also available and featured shorter barrels and similar fixed or retractable stocks (HK33KA2 and HK33KA3, respectively).



HK33A2

All HK33 variants available with different trigger units, with or without 3-rounds burst mode. HK's proprietary claw-type mounts allow telescopic sights to be mounted on any version of HK33. Full-length HK33s can be equipped with bayonet or underbarrel 40mm grenade launchers, HK79A1, also made by Heckler & Koch. Full-length HK33 rifles also can launch rifle grenades from combined muzzle compensator/flash hider. All HK33 and HK53 guns are equipped with drum-type rear sights.



HK33A3 with retractable buttstock

HK53 is internally similar to the HK33 but cannot fire rifle grenades nor mount underbarrel 40mm grenade launcher. HK53 also cannot be equipped with bayonet, and featured long, four-prong flash hider.

Both HK33 and HK53 can use 25, 30 and 40 round box magazines, but latter are out of production by HK for some time.

SPO-JGAS 2010

Heckler-Koch HK G36 assault rifle (Germany)

	G36	G36K	G36C
Caliber	5.56x45mm (.223 Rem)		
Length (buttstock open / folded)	998 / 758 mm	860 / 615 mm	720 / 500 mm
Barrel length	480 mm	320 mm	228 mm
Weight empty	3.6 kg (3.3 kg G36E)	3.3 kg (3.0 kg G36KE)	2.8 kg
Magazine capacity	30 rounds standard		
Rate of fire	750 rounds per minute		

The Heckler und Koch G-36 assault rifle had been born as HK-50 project in early 1990s. The reason behind that project was that the Bundeswehr (the German army), after the cancellation of the G11 and G41 projects, was left with outdated G3 rifle and no modern rifle, compatible with the current NATO standards at hands. Therefore the famous company Heckler & Koch was set to develop a new assault rifle for both German army and the export.



HK G36 assault rifle (standard German army version with dual sight system) with 40mm AG36 underbarrel grenade launcher

The new 5.56mm assault rifle has been adopted by the Bundeswehr in the 1995, and in the 1999 the Spain adopted its slightly different, export version, G36E as its standard infantry rifle. The G36 also found its way into the hands of various law enforcement agencies worldwide, including British police and some US police departments. So far I've heard very few complaints about this rifle, and a lot of good reviews and opinions. In fact, the only complaints about G36 that I know are the overheating of the handguards during the sustained fire, and the loose of zero of built in scope on some G36KE rifles, used by US police.

Some German soldiers also complained about position of dual optical sights and those sights being easily fogged in bad weather (rain or snow). Otherwise it is a good rifle, accurate, reliable, simple in operations and maintenance, and available in a wide variety of versions - from the short-barreled Commando (some even said that it's a submachine gun) G36C and up to a standard G36 rifle. The MG36 squad automatic weapon (light machine gun), which was initially designed as a heavy-barreled version of the G36, was in fact a short-lived proposition that never went into mass production.



HK G36E rifle (Export version) with single 1.5X telescope sight and spare magazine clamped to the left side of the inserted one.

The G36, in severely modified form, was used as a "kinetic energy" part of the now-cancelled US XM-29 OICW weapon and it also served as a base for XM8 assault rifle (also cancelled).

Technical description.

From the technical point of view, the G36 is a radical departure from all the previous HK rifles, based on the proven G3 roller-delayed system. The G36 is a conventional gas operated, selective fire rifle, made from most modern materials and using most modern technologies.



HK G36 assault rifle with optional accessory kit which includes forearm with four Picatinny rails and a low-profile scope rail on the receiver

The receiver and most of the others external parts of the G36 are made from reinforced polymers, with steel inserts where appropriate. The operating system appears to be a modification of the older American Armalite AR-18 rifle, with short stroke gas piston,

located above the barrel, square-shaped bolt carrier and the typical rotating bolt with 7 locking lugs. Of course, there also are many differences from the AR-18. The bolt carrier rides on a single guide rod, with the return spring around it. The charging handle is attached to the top of the bolt carrier and can be rotated to the left or to the right. When not in use, the charging handle aligns itself with the axis of the weapon under the pressure of its own spring, and reciprocates with the bolt group at the top of the receiver. The gas block is fitted with the self-adjustable gas valve that expels all the used gases forward, away from the shooter. The ejection window is located at the right side of the receiver and features a spent cases deflector to propel the ejected cases away from the face of the left-handed shooter.



HK G36K "short" (Kurz) assault rifle, with buttstock folded; standard version with iron sights and Picatinny rail

All the major parts are assembled on the receiver using the cross-pins, so rifle can be disassembled and reassembled back without any tools.

The typical HK trigger unit is assembled in a separate plastic housing, integral with the pistol grip and the triggerguard. Thanks to this feature, a wide variety of firing mode combinations can be used on any rifle, simply by installing the appropriate trigger unit. Standard options are single shots, full automatic fire, 2 or 3 round bursts in any reasonable combinations. The default version is the single shots + 2 rounds burst + full auto. The ambidextrous fire selector lever also serves as a safety switch.

G36 is fed from the proprietary 30-rounds box magazines, made from translucent plastic. All magazines have special studs on its sides, so two or three magazines can be clipped together for faster reloading. The magazine housings of the G36 are made as a separate parts, so G36 can be easily adjusted to the various magazine interfaces. By the standard, the magazine release catch is located just behind the magazine, in the G3 or AK-47 style, rather than on the side of the magazine housing (M16-style). A 100-round Beta-C dual drum magazines of US origins also can be used (these magazines are standard for the MG36 squad automatic versions of the G36).

The side-folding skeletonized buttstock is standard on all G36 rifles. It folds to the right side and does not interfere with rifle operation when folded.



HK G36KE short assault rifle, export version, with 'E' type telescope sight / carrying handle setup

The standard sighting equipment of the G36 consists of the TWO scopes - one 3.5X telescope sight below, with the second 1X red-dot sight above it. The sights are completely independent, with the former suitable for long range accurate shooting, and the latter suitable for the fast target acquisition at the short ranges. Both sights are built into the plastic carrying handle. The export versions of the G36 are available with the single 1.5X telescope sight, with the emergency open sights molded into the top of the carrying handle. The subcompact G36K Commando version is available with the integral Picatinny-type scope and accessory rail instead of the carrying handle and standard sights.

The standard G36 rifles can be fitted with the HK AG36 40mm underbarrel grenade launcher. It also can be fitted with the bayonets. Interestingly enough, G36 uses an AK-74-type bayonets, which are left from the now non-existent NVA (East Germany Army) stocks.



HK G36C 'Compact' or 'Commando' assault rifle, with optional Picatinny rails on forend

Heckler-Koch HK417 assault rifle (Germany)

Caliber: 7,62x51mm NATO

Action: Gas operated, rotating bolt

Overall length: 905 - 985 mm with 406 mm barrel / 35.6" - 38.8" with 16" barrel

Barrel length: 305 mm / 12", 406 mm / 16" or 508 mm / 20"

Weight: 4.36 kg - 4.96 kg, depending on barrel length

Rate of fire: 600 rounds per minute

Magazine capacity: 10 or 20 rounds

HK417 assault rifle was recently developed by famous German arms-making company Heckler und Koch, as a "big brother" to the 5.56mm HK416 assault rifle. Information on this weapon first surfaced in 2005, on the wave of new interest for the 7.62mm NATO caliber military rifles. This interest came in from experience of international forces gained in Afghanistan and Iraq, where increased range and penetration of the 7.62mm NATO bullets was (and still is) quite useful. Several companies developed new or updated versions of 7.62mm weapons, with intent to sell to military, law enforcement and in certain cases - to civilian shooters as well. The HK417 is one of such weapons.



2006 prototype of HK417 rifle with 20" barrel; note that it used HK G3-compatible magazines

It is primarily oriented toward US market, as it mimics the popular 5.56mm AR-15 / M16 rifles in external appearance, controls, and many design features. However, there are more than few new and original features in HK417, including Heckler-Koch's patented piston-operated gas system, user-changeable barrels etc. Like most other competitors, HK417 rifles are available in several barrel lengths, suitable for full scale of military operations, from close combat in urban or forest areas and up to long-range accurate shooting.

HK417 rifle is a gas operated, selective fired weapon of modular design. It uses short-stroke gas piston located above the barrel, that operates the 7-lug rotating bolt. Barrels are cold hammer forged, and could be replaced by end user in several minutes using simple tools. There are four basic patterns of barrels available for HK417 as of now (2008):305

mm / 12" and 406 mm / 16" standard barrels and 406 mm / 16" and 508 mm / 20" accurized barrels. Accurized barrels provide 1 MOA accuracy (with proper ammunition). Receiver is made from high grade aluminum alloy and consists of two parts (upper and lower), connected by two cross-pins a-la AR-15 / M16 rifles. Combination-type safety / fire selector allows for single shots and full automatic mode. HK417 retains all M16-style controls, including last round bolt hold-open device, bolt closure device, rear-based charging handle and magazine release button on the right side of the magazine well. HK417 is fitted with four Picatinny rails on free-float handguard as standard, and will accept any type of sighting devices on STANAG-1913 compliant mounts.



Current (2008) version of HK417 rifle with 12" / 30cm barrel, basic version

It also can accept modified HK AG36/AG-C 40mm grenade launcher, which is clamped directly to bottom rail. Buttstock is of modified M4 design, multi-position telescoped. Production HK417 rifles use proprietary 10- or 20-round box magazines, made of translucent polymer (early prototypes used HK G3 magazines).



Current (2008) version of HK417 rifle with 12" / 30cm barrel, fitted with telescope sight with night vision adapter, folding bipod and a sound moderator (silencer)



Current (2008) version of HK417 rifle with 16" / 40cm barrel



Current (2008) version of HK417 rifle with 20" / 50cm barrel, with telescope sight and detachable bipod

SPO-JGAS 2010

Heckler und Koch G11 (Germany)

Caliber: 4.7 mm caseless
Action: Gas operated, rotating breech
Overall length: 750 mm
Barrel length: 540 mm
Weight: 3.6 kg empty
Magazine capacity: 50 or 45 rds

The development of the G11 rifle was started in the late 1960's, when West German government decided to replace existing G3 rifle with lighter weapon with much better hit probability.



HK G11 rifle

The initial studies lead to the idea of the small-caliber, rapid-fire rifle that fires caseless ammunition. To ensure sufficient stopping/killing power for small-caliber bullets used, the rifle should have the three-round bursts capability and high capacity magazine.



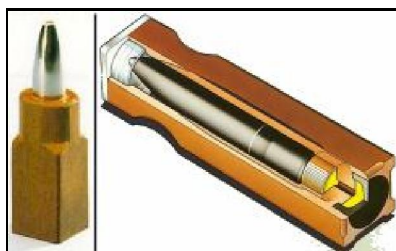
Second prototype of the G11

The new design, called G11, was created by German company Hecler und Koch, with the Dynamit Nobel company in team. The HK was responsible for the rifle itself, while Dynamit Nobel had to develop caseless ammunition.



HK G11K2 pre-production rifle

The basic concept of the G11 is as follows: The rifle features unique cylinder breech/chamber system that rotates 90 degrees. The cartridges in the magazine are located above the barrel, bullets down. Prior to each shot, first cartridge is pushed down from magazine into chamber and then breech/chamber rotates 90 degrees to align the cartridge with the barrel (see pic). After that, the cartridge is fired and the breech/chamber rotates back, ready for the next cartridge to be chambered. In the case of the cartridge ignition failure, the failed cartridge is pushed down from the chamber by the next cartridge. The breech can be manually "cocked" by the rotating handle at the side of the rifle, located beyond the pistol handle. The cocking handle does not move when gun is fired. Another interesting detail is that barrel, rotating breech, feed module and magazine are mounted in the housing that can move in the rifle back and forth. When firing single shots, the housing moves back and forward after the each shot. When firing the full-auto, the housing moves back and forward during each shot, resulting in moderate rate of fire of some 600 round per minute. But, when firing the three-round bursts, second and third cartridges are feed and fired as soon as the chamber is ready for it, and third bullet leaves the barrel PRIOR to the moment when the housing becomes to its rearward position. This results in very high rate of fire with three-shots bursts - ca. 2000 rounds per minute. Also, this results in that the actual recoil affects the rifle AFTER the last bullet in the burst is fired.



Caseless ammunition - early variant at the left, latest variant DM11 (cutout view) - at the right

Rifle featured built-in 1X optical sight with simple circle aiming reticle. Early prototypes featured one 50 rounds polymer magazine, while latest versions featured 45 rounds magazines - one in the loaded position within the movable housing and two spare magazines on the top of the rifle, asides from the loaded magazine.



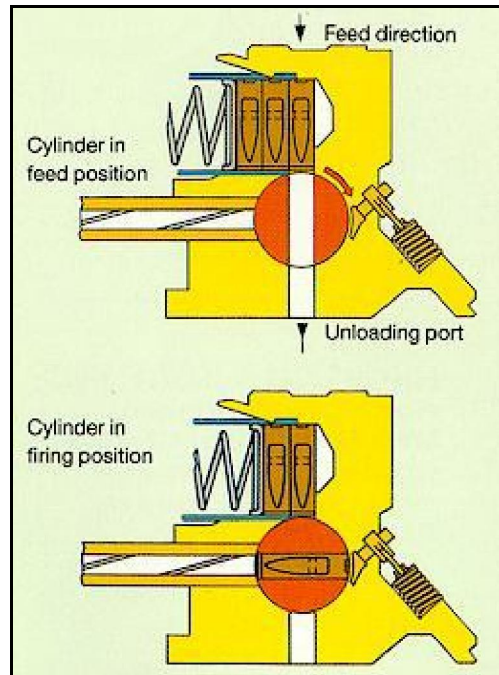
13th prototype of the G11

The caseless ammunition in its early appearance was designed as a block of the propellant, coated with flammable laquer, with bullet and primer "glued on" the propellant. Final ammunition design DM11, that appeared in the mid-1980s, featured "telescopic" design, when bullet was fully enclosed in the block of the propellant. The cartridge propelled the bullet that weights 3.25 gramms, to the 930-960 meters per second.



HK G11 rifle with the optional optical scope installed

Early prototypes were prone to the ammunition cook-offs during the sustained fire, but later Dynamit Nobel solved this issue.



Schematic drawing of the G11 bolt & feeding system

In the late 1980s the Bundeswehr (West German Army) began the field tests of the pre-production G11s. After the initial tests, some improvements were devised, such as removable optical sight, mounting of two spare magazines on the rifle, and bayonet/bipod mount under the muzzle.

The modified variant, called G11K2, was tested in 1989, scoring at least 50% better combat accuracy when compared to G3 rifle. Initial batch of some 1000 G11K2s was received by Bundeswehr in 1990 or so, but due to some reasons the whole programme was cancelled by German Government. Main reasons of this cancellation were, in my opinion, the lack of fundings after the re-union of the West and East Germanies, and the general NATO policy for unification of the ammunition and even magazines for the assault rifles.

The slightly modified G11 was also tested in the USA under the ACR (Advanced Cobat Rifle) programme, in 1990. The ACR programme was not intended to result in adoption of the new rifle for the US Army, just to test new technologies and designs, and the G11 proved itself as a very accurate, comfortable to handle and fire, and reliable weapon.

Heckler und Koch G41 (Germany)

Caliber: 5.56x45 mm NATO

Action: Delayed blowback

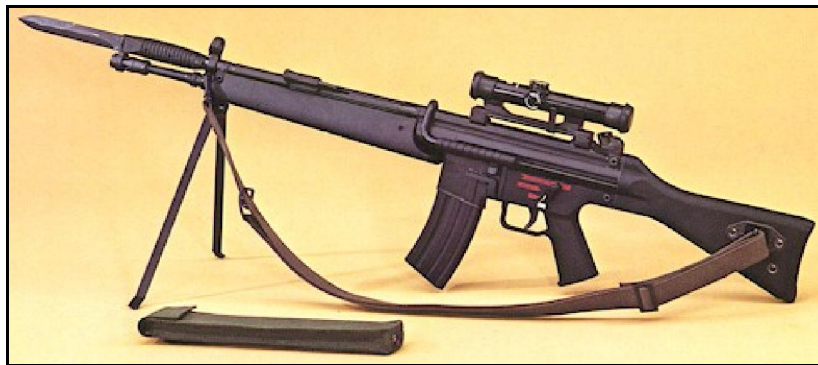
Overall length: 997 mm (fixed butt) or 996/806 mm (folding butt)

Barrel length: 450 mm

Weight: 4.1 kg

Magazine capacity: 20, 30 or 40 rds

The G-41 assault rifle had been developed in early 1980s from HK-33E assault rifle as a companion to the G-11. While the caseless G11 had to be issued to the front line troops, the G-41 had to be issued to second line troops. When G-11 programme collapsed due to financial and political reasons in early 1990s, the G-41 had been offered for many customers but found no sales, being of high quality, but too expensive.



HK G41

Basically, the G-41 is a further development of the early G-3 rifle, having the same roller delayed blowback action, but chambered for 5.56mm NATO ammunition. The G-41 also featured the 0-1-3-30 trigger group, STANAG compatible magazines and scope mountings, silent bolt closure device (similar to the "forward assist device" on the M16A1 and M16A2), integral dust cover on the ejection port, and integral side-folding carrying handle. The G-41 could be issued with fixed plastic butt or with telescopic (folding) butt.



close-up view to the G41 receiver with dust cover, forward assist button and STANAG magazine well

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Heckler-Koch HK M27 IAR Infantry Automatic Rifle (USA / Germany)

Caliber: 5.56x45mm NATO
Action: Gas operated, rotating bolt
Overall length: 838 - 937 mm / 33" - 36.9"
Barrel length: 420 mm / 16.5"
Weight: 3.6 kg / 7.9 lbs empty
Rate of fire: rounds per minute
Magazine capacity: 30 rounds standard

The IAR - Infantry Automatic Rifle program was originally initiated by US Marine Corps (USMC) in an apparent intent to replace aging M249 SAW light machine guns in their "automatic rifle" (squad automatic) role. USMC sought lighter and more maneuverable weapon, still capable of at least some sustained firepower. Original contenders included guns from FN, Colt and Heckler-Koch, as well as some other, lesser known names. After extensive trials in 2009 USMC finally selected the HK IAR rifle, which, in fact, is no more that heavy-barreled version of their HK 416 automatic carbine (assault rifle), and it hardly looks like adequate replacement for a dedicated squad automatic weapon with belt feed and quick-change barrel. By all accounts, it looks like USMC played the whole IAR trick to get the replacement for their M4 carbines without entering the political hassle and budgetary debates. In May 2010 the USMC representative officially announced the adoption of the Heckler-Koch IAR as "M27 Infantry Automatic Rifle". It is not clear when HK will begin delivery of the M27 rifles, and how much rifles will be delivered to USMC.



M27 IAR Infantry Automatic Rifle, as made by HK USA for US Marine Corps

The M27 Infantry Automatic Rifle is a gas-operated weapon which is based on the HK 416 assault rifle. It uses short-stroke gas piston that operates the 7-lug rotating bolt, and fires from closed bolt. Receiver is made from high grade aluminum alloy.

Combination-type safety / fire selector allows for single shots and full automatic mode. M27 IAR retains all M16-style controls, including last round bolt hold-open device, rear-based charging handle and magazine release button on the right side of the magazine well. M27 IAR is fitted with four Picatinny rails as standard, and may accept any type of sighting devices on STANAG-1913 compliant mounts. Buttstock is of typical M4 design, multi-position telescoped. M27 Infantry Automatic Rifle can feed from standard M16-type 30 round magazines, and will also accept high-capacity double-drum magazines from Beta Co (100 rounds capacity) and Armatac (150 rounds capacity).

SPO-JGAS 2010

Alliant Techsystems / Heckler-Koch XM-29 SABR / OICW assault rifle (USA)

Caliber: 5.56 mm NATO (KE) and 20x85mm (HE)
Action: Gas operated, rotating bolt (KE), unknown (HE)
Overall length: 890 mm
Barrel length: 250 mm (KE) 460 mm (HE)
Weight: ca 5.5 kg empty; ca 6.8 kg loaded
Magazine capacity: 20 or 30 rounds box (KE) and 6 rounds box (HE)

The history of the one of the most ambitious projects in the history of small arms, known as the OICW, or the Objective Individual Combat Weapon, began late in the 1986, when the US Army Infantry School at Ft. Benning published a military paper, named "Small Arms System 2000" (SAS-2000). Despite the current trends towards the caseless and flechette ammunition and appropriate weapons, researched and developed under the ACR program (see HK G11 and Steyr ACR entries for some details), this paper stated that the conventional small arms already reached its technological peak, and the only way to increase the hit probability in the small arms is to introduce a weapon that will fire explosive and fragmentation warheads, combined with the smart fusing and sighting / aiming technologies.



The XM-29 SABR OICW (Objective Individual Combat Weapon) in its present configuration (2002)

While the most small arms research during the late 1980s in the USA was conducted under the ACR program, the idea first developed in the SAS-2000 was supported by another US military paper, published in 1989 by the US Army TRADOC (Training & Doctrine) center. This paper, called "The Small Arms Master Plan" (SAMP), requested for a family of infantry "Objective" weapons, namely the Objective Individual Combat Weapon (OICW), Objective Personal Defense Weapon (OPDW), and the Objective Crew Served Weapon (OCSW). The SAMP stated that such weapons must utilize the latest developments in computers and visual technologies, as well as in the small arms, and combine both high explosive warheads and traditional bullets fire capabilities in a single weapon, that should be fielded circa 2000.

Of course, the timelines and most of the weight and cost requirements set in this paper looked unrealistic from the start, but the development of the Objective weapons began in the early 1990s.

During the early stages of research and development in the mid-1990 one out of the two teams was selected as a winner for further development contract. This team is lead by the US based Alliant Techsystems corporation (ATK), with the Heckler-Koch (Germany), Brashear and the Omega companies (both of USA) as the other team members. The ATK is responsible for system integration, and also develops the 20mm Air Burst munitions; HK is responsible for both the 5.56mm rifle and the 20mm grenade launcher; Brashear works on the sighting equipment and Omega provides the training means. The resulting weapon was type-classified by the US Army as the XM-29 circa 2002, and is scheduled to enter the service during the year 2008 in limited numbers. It will be then consequently upgraded with the new technologies then available. Present plans for fielding the M-29 are to issue four units per one infantry squad of 9 men. Early in the 2002 the XM-29 test weapons were successfully tested with the newest 20mm HEAB (High Explosive Air Bursting) munitions, which will be a major "kill factor" for the M-29 weapon. At the same time the "kinetic energy" part of the XM-29 was type-classified as the XM-8 light rifle, and, in the near future, could possibly replace the current Colt M4 carbines as a standalone compact conventional small arms.



*Some of the early OICW configuration alternatives (late 1990s).
1 - combined 5.56mm rifle and 20mm launcher (present configuration);
2 - 20 mm launcher with detachable 4.6mm HK PDW submachine gun;
3 - 20mm launcher in the standalone configuration*

XM29 status update (September 2005): following the increase of caliber of OICW grenade launcher component from 20 to 25mm, in 2004 it has been decided to split the OICW system into two separate weapons, the 5.56mm XM8 modular assault rifle (OICW Increment 1), and the 25mm XM25 airburst assault weapon / grenade launcher (OICW Increment 2). Development of the complete XM29 (OICW Increment 3) system has been shelved, and will be resumed in the future only if all current problems with OICW Block 1 rifle component are solved, and weight constraints of entire system are met.

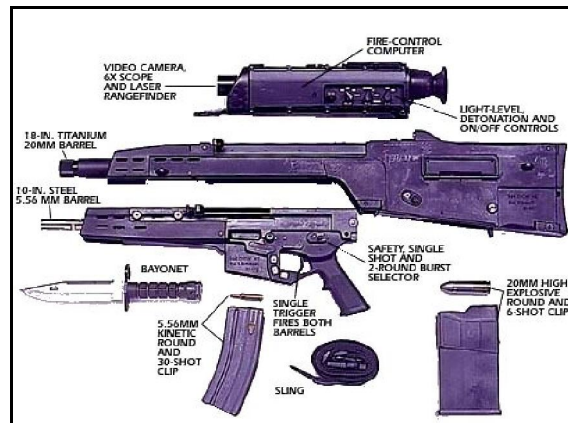
The XM-29 is a combination weapon, which has the 20mm semi-automatic, magazine fed grenade launcher as its primary part, and the 5.56mm compact assault rifle as its secondary part. Both parts are assembled into the single one-man portable unit, with the addition of the target acquisition / fire control system (TA/FCS), which is an essential part of the whole system. The XM-29 will become an integral part of the future Land Warrior system, capable of communicating with the other parts of this system, including the tactical computers and helmet-mounted displays.



The left side view on the XM-29 OICW, showing its controls on the sighting unit

The grenade launcher is capable to fire in semi-automatic mode only, and is gas operated. It has a bullpup layout with the detachable box magazine located in the butt of the weapon. The rifled barrel is used to launch the 20mm grenades up to the 1000 meters range with good accuracy. In the standard configuration most of the fire controls for the grenade launcher part are located on the rifle part, including the single trigger for both firing modules. It is quite possible, however, that the separate stock will be developed for the grenade launcher part, so it will be possible to use it without the rifle part attached. The launcher has the provisions for the TA/FCS system to be mounted on its top, and the appropriate interfaces, so the data provided from the TA/FCS can be used to program the 20mm grenade fuses. These fuses, used for the 20mm HEAB ammunition, has multiple mode of detonation, including the direct impact mode and the Air Burst mode. In the latter mode the fuse is pre-programmed to explode the warhead at the preset range, which is calculated during the flight by counting the number of the grenade rotations. This allows to defeat targets without the direct impact, using the blast and fragmentation effect of the high explosive warhead. This is a major advantage over the present small arms, which in most cases require the direct hit on the target to be effective, as it allows for greater aiming errors, and also makes possible to defeat targets in defilade, like the trenches and so. The high explosive warhead also has the advantage of not being dependent on its velocity to be effective, so unlike with the bullets, its effectiveness does not decreased with the increase of range. The disadvantages of this system is the extreme complexity of the electronic fuses, which results in the high price of a single round of ammunition. The present plans stated that the one HEAB round must cost about US \$25, and it is still to be seen which will be an actual price when the M29 system will be fielded.

It is interesting that the present design of the HEAB ammunition actually has two small HE warheads at the front and at the rear of the projectile, with the electronic fuse module located between them. While the HEAB is considered a primary round for the 20mm grenade launcher, it is entirely possible to develop a low cost, direct hit only anti-armour 20mm round with Shaped Charge warhead, which will be effective against lightly armored vehicles (APC, MICV and alike) and various hardened targets.



the major components of the XM-29

The rifle, or "kinetic energy" part of the XM-29 system, on the other hand, is a fairly conventional, short-barreled assault rifle, derived from the Heckler-Koch G36 assault rifle. The basic "rifle" part of the XM-29 has no buttstock and no own sights, and thus can be used separately from the whole system only as emergency, personal defense weapon. While being mounted to the whole system, it can be used for a close quarters work, both defensive or offensive (the 20mm grenade launcher has its minimum range of fire of about 50-100 meters), or as a low-cost, low intensity medium range offensive weapon. Most of the XM-29 system controls are built into the "rifle" part, around the trigger guard.



XM-29 OICW ammunition - HE (High Explosive) and TP (target practice) rounds for 20mm unit and KE (Kinetic Energy) 5.56mm NATO round

The target acquisition / fire control system (TA/FCS) is the most expensive and complicated unit of the whole system, since it must combine day and night vision capabilities, laser rangefinding unit, ballistic computer and various interfaces to the grenade launcher and external systems. It is used to find the targets in any light and weather conditions, determine the range to the target, calculate and display the aiming data, so the grenade or bullet could be fired to the desired point of impact, and then supply the data to the grenade launcher, so the range could be preset into the grenade fuse. In the case of damage to the TA/FCS the 20mm grenade launcher still can be used in the direct impact mode, as well as the rifle part of the system.

The current research and testing showed that the XM-29 can be up to 500% more effective than the present small arms, but it is still to be seen if all the requirements will be met in the resulting system, especially regarding to the reliability of electronic components, weight, and, at last but not at least, the unit price.

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