# MEASURING BARREL LENGTHS

In the United Kingdom a firearm's barrel and overall length can determine the level of control that a firearm is subject to. This is derived from the State's desire to make the most concealable firearms subject to the greatest level of control (opinion).

The principal firearms legislation in the UK is the Firearms Act 1968, which has been amended numerous times since its introduction. A firearm is defined as being a lethal barrelled weapon [1] and each type of firearm has its possession controlled commensurate with the potential hazard to public safety.

In the case of a shot gun the length of the barrel is restricted to a minimum of twenty four inches if the shot gun is to be held on a shot gun certificate. Any shot gun with a barrel of less than twenty four inches (but more than 30 cm) requires a firearm certificate to possess. The latter, a firearm certificate, has stricter conditions imposed than a shot gun certificate and the applicant is required to demonstrate specific need/s for wishing to possess one, for instance a .22LR rifle for vermin destruction.

The legislation imposes minimum overall lengths for pump action and self-loading shot guns, and certain 'small firearms' such as handguns. Firearms with barrel lengths of less than thirty centimetres and/or overall lengths of less than sixty centimetres became 'prohibited weapons', with exceptions: air weapons, muzzle loading firearms and signalling apparatus. [2] Prohibited weapons require the authority of the Secretary of State. The prohibition on small firearms puts handguns in the same general prohibited category as sub-machine gun, machine guns, rocket launchers and mortars, in general these types of weapons cannot be held by civilians.

Lengths become critical in determining if a prosecution for possession of prohibited weapons can be brought, long prison sentences can hinge on which side of the line a measurement falls, with a mandatory minimum prison sentence of 5 years for unauthorised possession in some cases.

Calibrated measuring tools of known precision need to be used. A clear explanation of how they are used needs to be provided to the court.

In the case of the length of the barrel UK law defines barrel length:

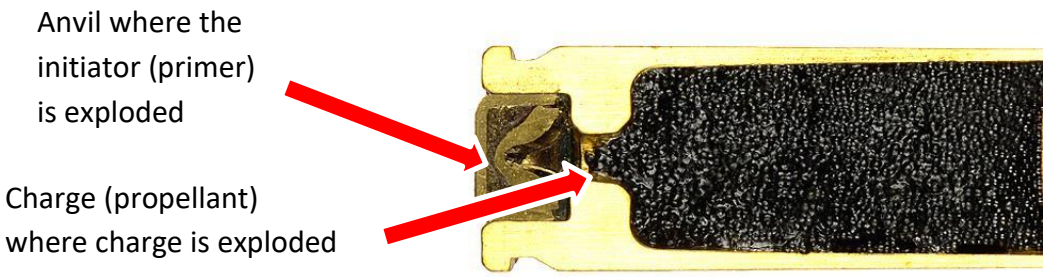
The Firearms Act 1968 as amended says:

*57-(6) for the purposes of this Act –*

a) *The length of a barrel of a firearm shall be measured from the muzzle to the point at which the charge is exploded on firing, and…*

An allowance for inaccuracies in the measurement process of barrel lengths, must be made and declared for the court to be fully informed.

An opinion can be that the primer is part of the charge or the charge could be the propellant and the primer is actually the initiator! Whilst the definition in the legislation may be clear, the interpretation can vary.




Pic 1 Cartridge Case

To measure the point at which the charge is exploded a calculation would need to be made of the exact position where this occurs, in the case of a cartridge using a primer it could be at the point of the anvil, when the primer cup is struck by the firing pin. The inside of the cup crushes the primer compound against the anvil. This is the point at which the 'priming charge is exploded'. The position of the primer in the chamber, would also need to be considered. Of course this approach may be considered to be over-pedantic, it is included to remind the scientist it is his duty to test all hypotheses, when there are viable alternative propositions.

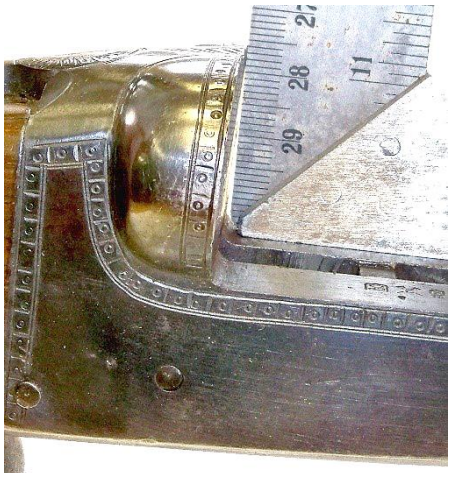
One could presume that the breech face is where '*the explosion takes place*' and where the measurement should be taken, not an unreasonable way to proceed as long as it is clearly stated in the report or statement.

This approach favours the accused as it gives the longest possible barrel length.

CARTRIDGE HEADSPACE (CHS)

Like any measurement chamber and cartridge case dimensions have uncertainties of measurement associated with them. For manufacturers and Proof testing issues these are laid down in tables, (see C.I.P. and SAAMI tables for dimensions). When the primer is struck by the firing pin the cartridge can move forward to its seated position in the chamber and be 'off the face' at the point of 'explosion', if this happens the primer will not be seated firmly on the breech face.

STANDING BREECH. In the case of a conventional breech-loading, side by side, shot gun, the breech face is normally set at an angle to help account for the position of the hinge pin, a typical angle of 5° is applied.



Pic 2 Shot gun breech face

The point at where the measurement on the breech face is taken will affect the overall length measurement to a very small degree (see above).

MUZZLE

MUZZLE is not defined in the Firearms Acts, and would therefore take its meaning from common language:

Muzzle: "the end of a gun barrel from which the bullet or shot emerges" (NABIS)
"the open circular discharging end of a gun" (Vocabulary.com)

Muzzle*: "the open end of the barrel of a firearm*" (English Oxford Living Dictionaries)

Gun muzzle*: "the open circular discharging end of a gun"* (The Free Dictionary)

The muzzle of a gun: *"the end where the bullets come out when its fired"* (Advanced English Dictionary)

Pic 3 Revolver muzzle

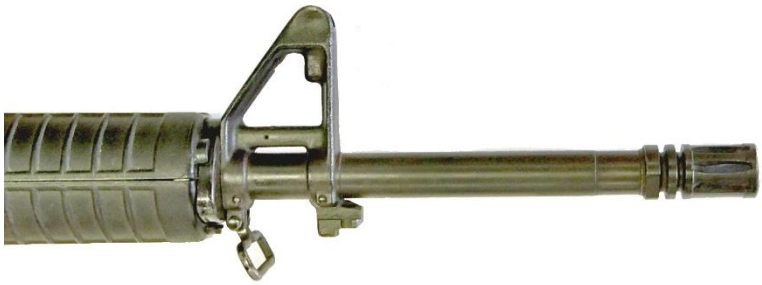
Pic 4 Shot gun muzzle

Consider that the measurement shall be taken at the longest part of the muzzle (in line with the bore), and include permanently fixed parts that form any part of the barrel. Removable accessories such as a moderator, flash hider, muzzle brake or extended shot gun choke shall be removed.

Pic 5 Extended shot gun chokes

Pic 6 “Sawn off” barrel

Some muzzle attachments are fixed with a bonding solution such as ‘lock tite’ if non-destructive efforts are used to remove the attachment fails, an opinion of ‘non-readily detachable’ could be reached and the attachment be regarded as part of the barrel.
Note: A flash hider if removable from a rifled barrel is a ‘firearm’ that requires authority to possess (according to UK law).

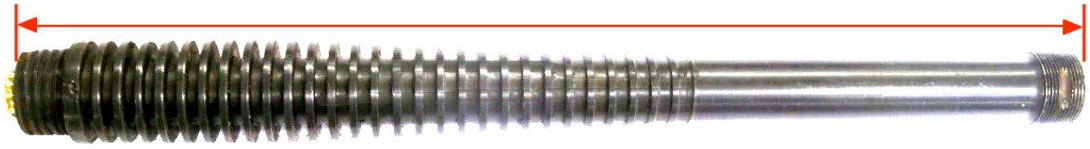


Pic 7 5.56mm rifle with flash hider attached

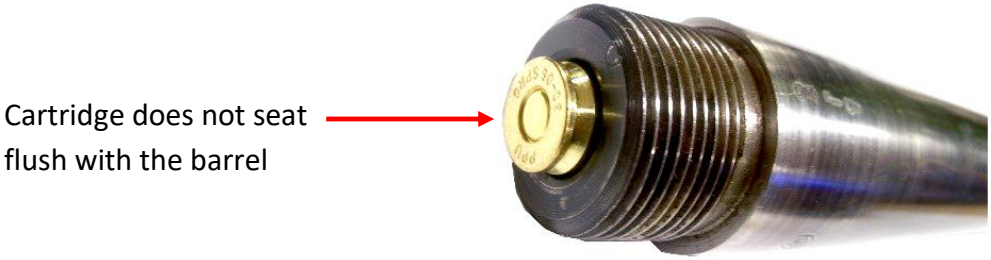
One should consider that if using the rod-length method, where a rod is pushed down the bore until it touches the breech face, some cartridges protrude from the end of the actual barrel. This is OK when measuring for UK and US [3] legal reasons, but not necessarily correct when describing the actual barrel length, see pictures 8, 9 and 10.

Cartridge does not seat flush with the barrel

Pic 8 .45 ACP Thompson 1928A1 barrel, the actual barrel length is shorter than the length the “rod down the bore system” gives.



Pic 9 .45 ACP Thompson barrel length



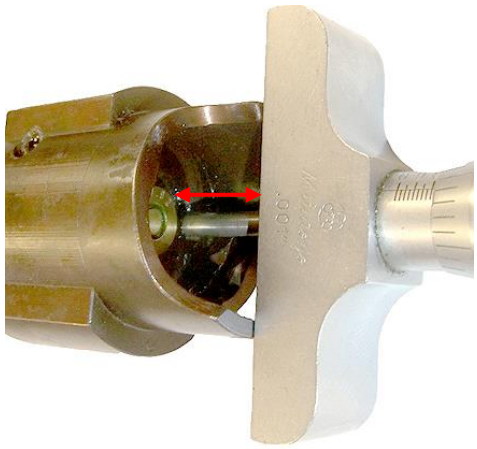

Pic 10 30-06 Winchester Model 70 Sporter barrel, the actual barrel length is shorter than the length “rod down the bore system” gives.

When specifying a revolver’s barrel length it is advisable to explain that the measurement includes the length of the barrel and cylinder, from the breech face to the muzzle.

A diagram is most useful for persons with no firearms experience, this can include members of a jury.

Pic 11 Revolver barrel length (UK law)

Another example, where the barrel contains part of all of a locking system the barrel length can exceed the UK legal definitions, see picture 12.



Pic 12 MG 34 barrel, barrel length 24.650 inches (626.11 millimetres). Barrel length in UK law 23.859 inches (606.0186 millimetres).

Muzzle loading firearms

"*the point at which the charge is exploded*" could be at the top of the nipple for a percussion firearm, and the external end of touch hole for a flint lock, or if the charge is the actual propellant the point of ignition will be in the bore, so a careful strategy needs to be considered when measuring these types of firearms.

MUZZLE FLASH

Pic 13 Photo by Neil Cohen Israel Defense Forces

Muzzle flash: "the illumination that occurs during firing which is the result of the expanding gasses from the burning propellent particles emerging from the barrel behind the projectile and uniting with oxygen in the air" (AFTE)

Muzzle blast: "is an explosive shockwave created at the muzzle of a firearm during shooting" (Wikipedia)

2.0 DESCRIPTION OF MUZZLE BLAST FLOWFIELD

As noted in the introduction, the muzzle blast flowfield is a complex, inherently unsteady and multi-dimensional flowfield which includes numerous fluid mechanical phenomena. The problem provides a severe test of any numerical simulation technique, due to the wide range of flow conditions which exist as the transient flowfield develops. The detailed simulation of the problem would, however, considerably aid attempts to alleviate undersirable weapon characteristics such as recoil, noise, flash and projectile disperison. Devices to suppress such characteristics are termed muzzle devices and have been designed almost exclusively by trial and error experimental programs. By way of introduction to the numerical technique and test cases presented in subsequent sections, some background on muzzle gas flow problems is presented in this section. This section includes a qualitative description of the transient flowfield and some insight into the phenomena of interest.

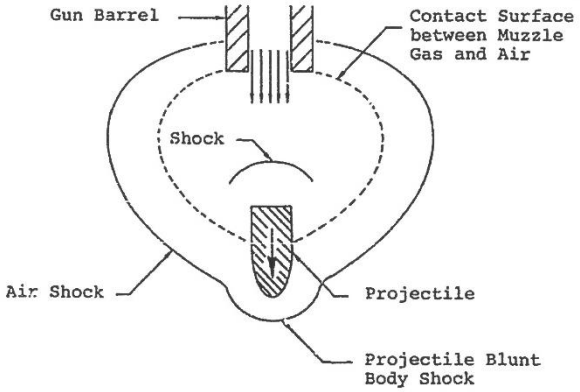
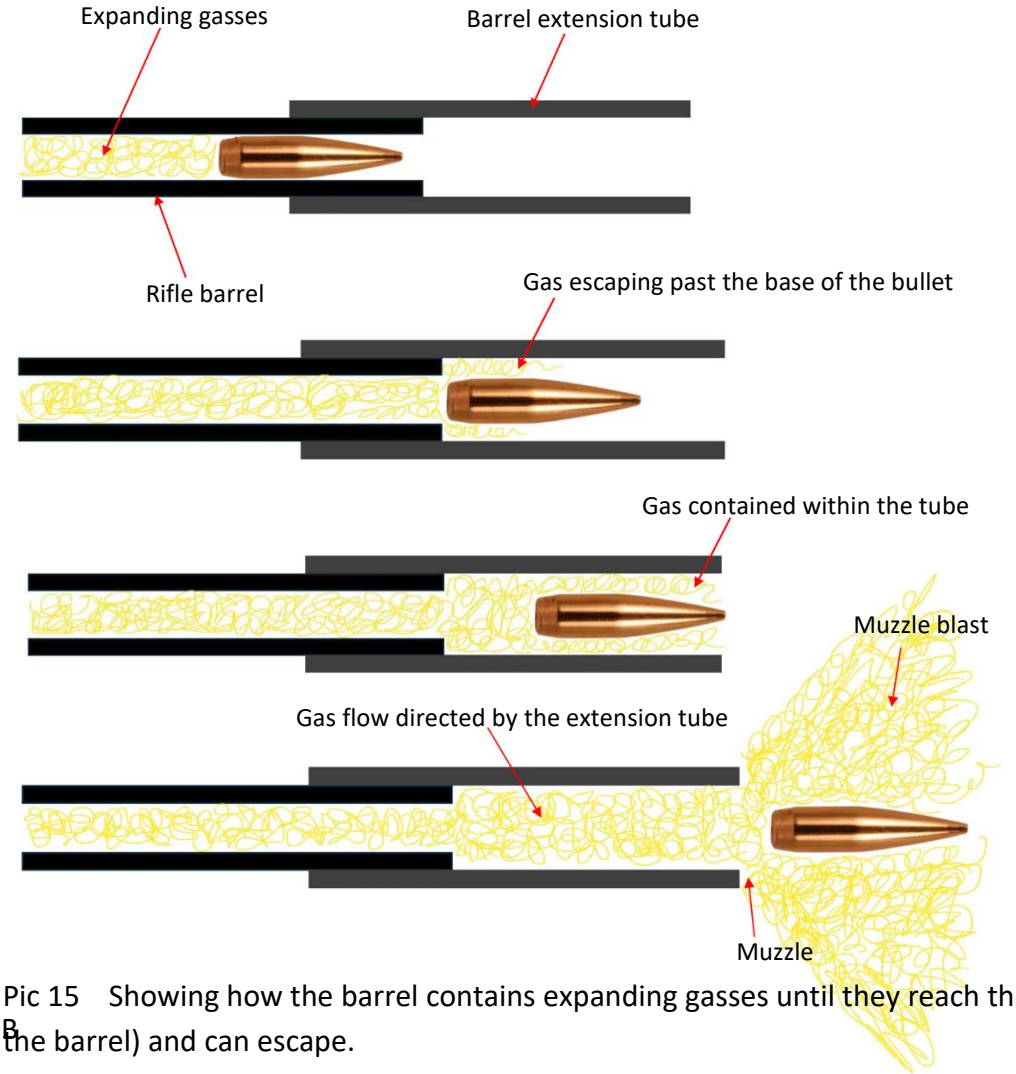



FIGURE 1. SCHEMATIC OF MUZZLE BLAST FLOWFIELD

Pic 14 Schematic of muzzle blast flowfield (Army ballistic research laboratories June 1974)




Pic 15 Showing how the barrel contains expanding gasses until they reach the muzzle (the end of the barrel) and can escape.

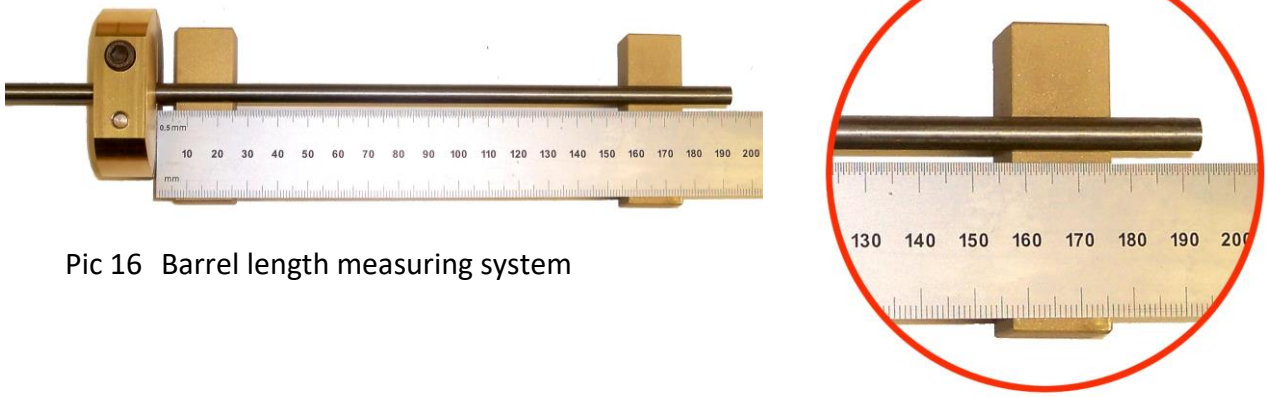
Different measuring tools can be used to measure barrel length:

i) Stand the barrel on a flat surface vertically and use a height gauge.
ii) Vernier caliper
iii) Steel rule
iv) Measuring tape
v) Bore rod

Note: If the firearm requires test firing for breech face markings to the cartridge case, to avoid damage to the breech face when measuring, consider using a plastic or carbon fibre rod.

To give confidence when declaring a measurement it is essential calibrated measuring equipment is used. The most affordable will be a steel rule.

A report or notes taken at the time of an examination should refer to the equipment used, calibration certificate reference number and date of last calibration.
Note: contemporaneous notes taken at the time of an examination may be required or can be called for by the court.




Pic 16 Barrel length measuring system

User instructions will be contained in your standard operating procedures (SOP.), these will include all safety instructions, an example:

1] Check to ensure the firearm is unloaded and safe to handle;

2] Clean the breech face and bore of the firearm;

3] Check there is no firing pin protrusion;

4] With the gun closed and the breech locked; select the rod to pass down the barrel from the muzzle;

5] Clean the rod face and slide down the barrel to contact the breech face;

6] Slide the clamp assembly down the rod until it comes into contact with the end of the muzzle;

7] Tighten the clamp assembly screw; then remove the rod/clamp assembly and lay the rod on the rule rest blocks;

8] Place the calibrated steel rule with the end touching the clamp assembly alongside the steel rod;

9] Read off the measurement;

10] Consider photographing the rule/rod set up, and a close up of the measurement for future reference.

11] For a critical finding check, where the measurement is close to a barrel length limit, the measurement observed should be agreed by a component colleague who signs and dates the findings.

References:

[1] Firearms Act 1968 section 57-(1)

[2] Firearms (Amendment) Act 1997 section 1-(2)

[3] ATF National Firearms Handbook chapter 2 (2.1.1)

https://www.atf.gov/firearms/docs/atf-national-firearms-act-handbook-chapter-2/download