

The best barrels

David Crispin looks at choosing a new rifle barrel and how to pick the right specifications

If you shoot your centrefire rifle regularly there will come a time when the barrel is no longer capable of producing the precision it did when it was new. I say 'precision' rather than 'accuracy' because precision is how tightly the shots are grouped together and accuracy is how close they are to the centre of the target. Precision is the group size and the level of acceptability depends upon the discipline that you shoot.

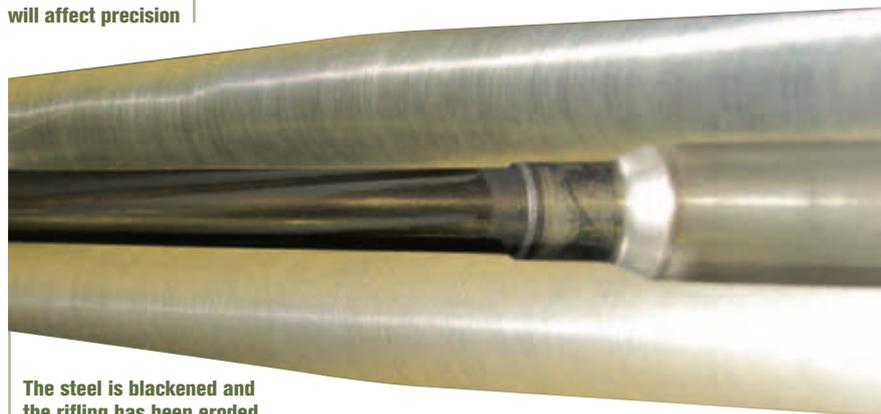
In Target and Match Rifle, using the .308" Winchester cartridge, I think the best you can get is around 0.5 minutes of angle. This equates to around 0.5" at 100 yards and just over 5" at 1,000 yards. An acceptable level would be one minute of angle as the bulls eye is around two minutes of angle on the TR target. In F-Class shooting the bull is one minute of angle across so they like things a little tighter. For bench rest shooters this would be unacceptable as they measure group size in thousandths of an inch. The current 100 yard world record for a five shot group is just 7.7 thousandths of an inch centre to centre.

So, how do you know when your barrel has had it? That, unfortunately, is a difficult question to answer. Some barrels go suddenly and you see the group size open up noticeably with a batch of ammo that you know was shooting well before. Sometimes they wear gradually and it's hard to tell. I went through two seasons of Target Rifle shooting getting average scores before I realised that my barrel was eight years old and had had around 10,000 rounds through it. I had a new barrel fitted and the difference was immediately noticeable. I was back to shooting lots of bulls like I had done three years ago.

People at the top level replace barrels every two or three years before they deteriorate. As a rough guide, a premium quality .308" Winchester barrel could start



An eroded barrel will affect precision



The steel is blackened and the rifling has been eroded



A fluted barrel

to open up groups after 3,000 rounds. 5,000 rounds is a good innings.

Of course, there are exceptions. I know somebody that has a barrel with over 10,000 rounds through it that still shoots to an acceptable level. Magnum cartridges and some wildcats like the 6.5/284 are known 'barrel burners' and can make the barrel lose precision after 1,000 rounds.

Why does a barrel stop shooting acceptable groups? The most common reason is that they burn out rather than wear out. The first few inches of the barrel immediately in front of the case mouth gets subjected to intense heat and pressure. Looking at this area with a bore scope you see what looks like a dry river bed. The steel is blackened and

there are small cracks in the surface. Sometimes the rifling has gone and does not appear again until a few inches down the barrel. This causes the bullet to enter the rifling at a slight angle and as it will be spinning off its longitudinal axis will cause larger groups. There is the possibility of erratic muzzle velocity caused by gas escaping around the bullet in the eroded area. Sometimes the shooter just loses confidence in the barrel. I've heard it said: "More barrels are shot out between the ears than on the rifle."

If you have made the decision that you need a new barrel, what do you go for? The choice of material is fairly straightforward. Chrome molybdenum or stainless steel. Barrels that are

blackened or blued are probably chrome molybdenum. You may want to keep that finish and not have a shiny stainless one. Krieger are one of the top barrel makers and this is what they say about the choice between the two: “For the most part neither one is better than the other. The only difference we find is that sometimes the chrome moly might take a little longer to break in and might have a little more affinity for copper, or seems to show it easier. In terms of barrel life and accuracy, we can find no difference comparing clean barrels.”

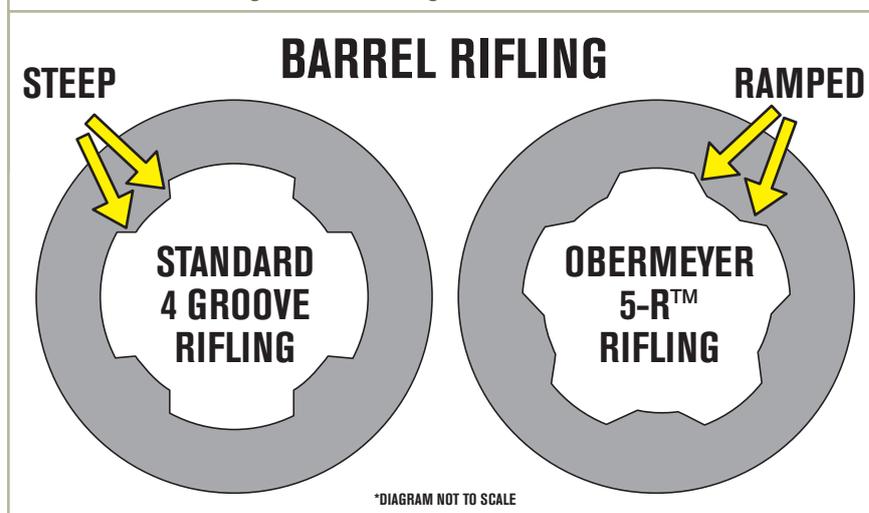
There are three main ways to make a barrel. There is (in my order of preference): cut rifling, button rifling and hammering. Hammered barrels (Armalon) are available, but I’ve not fitted one to a target rifle. There are some good button rifled barrels (Lothar Walther) and they tend to be cheaper than a cut rifled barrel. If you want the best then go for a cut rifled barrel. There are many good manufacturers out there; Krieger and Bartlein are currently popular. There are a few British barrel makers like Sassen (Border) and GB Barrels.

Next, the choices concern length, twist rate, bore and groove dimensions, the number of grooves and the style, and finally the exterior profile and whether it is plain or fluted.

Barrel length is a factor in muzzle velocity. Thirty years ago 28” was the standard Target Rifle barrel length, now it’s 30” with some 32” ones around. In Match Rifle a 34” fluted is the norm. If the propellant has finished burning, extra barrel length will just create friction and may reduce the velocity. A longer barrel does not give increased precision. In some disciplines a short, fat, stiff, barrel gives the best results with a faster burning powder. If you are shooting with open (iron) sights, having the fore sight a bit further away can help improve the sight picture for ageing eyes. In target rifle it is desirable to have the correct distance between the sights to give a true minute of angle when adjusting them.

Spin gives the bullet stability in flight. The spin rate is determined by the rate of twist in the barrel. You want to select a twist rate that gives a gyroscopic stability factor greater than 1.4. You can

The difference between 4 groove and 5-R rifling



calculate this using an online tool like the excellent ballistics calculator from Bryan Litz at www.appliedballisticsllc.com. For the Sierra 155 grain 2156 bullet that is used in the RWS and GGG issued ammunition, a twist of 1:13 is ideal. You can have too much of a good thing. If you spin the bullet too quickly there is a possibility it can blow apart in flight due to excessive centrifugal forces. If the bullet does not have uniform mass (air bubbles in the lead core) it will be out of balance and the more you spin it the worse the problem will be, so you want just enough twist to stabilise it.

You might think that the groove dimension should match the diameter of the bullet. In 99 per cent of cases that is true. For several years some target rifles have had tight bore and groove dimensions. Specifically, I’m talking about the 7.62 x 51, .308” Winchester cartridge. Normally, a barrel for this cartridge would have a bore of 0.300” and a groove depth of 0.004” to give a groove diameter of 0.308”. If you measure the diameter of a 30 calibre bullet it will be 0.308” or a fraction greater. So why have a tighter than normal barrel? It goes back to the days of 144 grain RG ammunition. I’m told that some bullets were nearer 0.307” diameter. In order to get them to shoot to acceptable levels of precision the bore and groove were made slightly smaller to match the bullet. Today, we shoot high quality, full-size bullets and I don’t think there is a need to do this anymore.

Another effect of reducing the dimensions is to raise the pressure, and therefore, the velocity. Forcing a full size 0.308” diameter bullet through a 0.307” barrel produces these effects. It is desirable to keep the bullet comfortably supersonic at 1,000 yards with the issued ammunition, as you cannot work up a hand load to give the result you want.

Most barrels have four grooves. You can get three and five groove as well. To quote Krieger again: “Does a barrel with more grooves shoot better or last longer than a barrel with fewer grooves? No. With the single point cut rifled barrels that we make we have found no difference in performance based on the number lands/grooves as long as the surface area ratio remains the same.” You can get a style of rifling called 5-R that has its fans, but I don’t think there is any real benefit. Some folks just want to have something different.

Lastly, there is the choice of external profile. Most barrels have a taper from just in front of the chamber to the muzzle. Bench rest and F-Class rifles might have a straight parallel profile from the action to the muzzle. The choice is largely due to weight restrictions. A target rifle cannot weigh more than 6.5kgs in total, so a Palma Light profile is popular. In match rifle the barrel itself cannot weigh more than 2.5kg, so fluting is used to get a 34” barrel down to the weight limit.

As for me, I shoot a Swing mark 5 with a Krieger 32” 300/308 1:12 twist, four groove with a Palma Light profile. ■