

# FORSTER PRODUCTS

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## User Instructions for the Co-Ax<sup>®</sup> Case and Cartridge Inspector

Issue 8

### 1.0 GENERAL INFORMATION

The Co-Ax Case and Cartridge Inspector measures both bullet and case alignment in relation to the case and cartridge long axis, as well as neck wall thickness and bullet runout. By fine-tuning the uniformity of your cases and cartridges, you can improve your shooting accuracy.

Figure 1. Co-Ax<sup>®</sup> Case and Cartridge Inspector – Dial Included (010482)



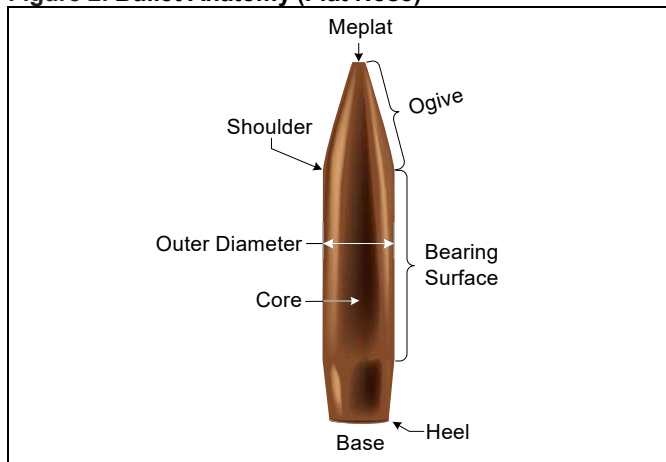
### 2.0 BACKGROUND: UNDERSTANDING CONCENTRICITY AND TIR

The term concentricity refers to a “concentric circle.” In simple terms, the outside of the cartridge is ideally aligned in a concentric circle around the axis — a line that runs through the center of the cartridge, from the head of the case to the tip of the bullet.

Concentricity includes the angle and position at which the bullet enters the bore, commonly known as total indicated (bullet) runout, or TIR. You can think of it like a car axle that can cause numerous problems to the vehicle when it's out of alignment. Concentricity is used to identify a number of issues that affect ammunition loaded for accuracy.

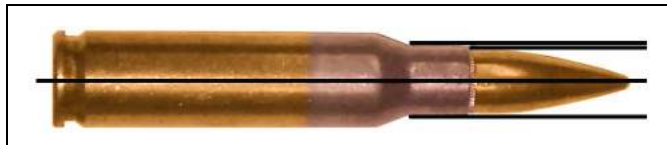
Since cartridges are usually tapered, the tip provides the smallest cross section that you can measure point by point to verify the concentric circle around the axis or center of mass.

Figure 2. Bullet Anatomy (Flat Nose)



The purpose of loading your own ammo is to control all of the variables that can affect accuracy by applying proper, conscientious loading procedures. It's important to strive to make each round the same as the one before and the one after. The goal is simply uniformity, including concentricity and TIR, whether you shoot Benchrest, National Match or just hunt. The Forster Case and Cartridge Inspector is important for measuring not only TIR, but also the variation in the thickness of the case neck walls, which can offset the bullet in alignment with the bore.

Figure 3. Slight Offset in the Neck Wall of an M80 Ball Round

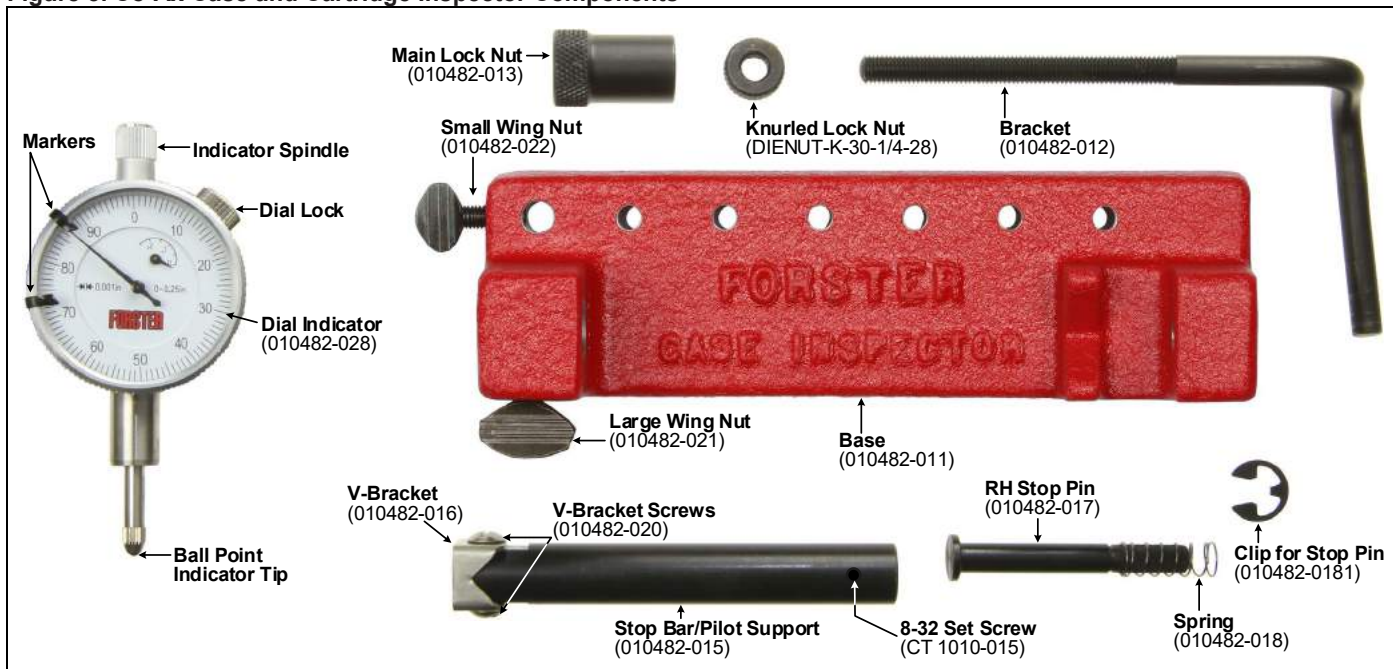


Bullet runout, or TIR, refers to the way the bullet “runs out” or enters into the throat of the barrel in alignment with the center of the bore. The ideal runout is zero, as measured with your Forster Case and Cartridge Inspector. Most serious shooters limit their TIR to no more than 0.002” to 0.005”, depending on where you measure along the cartridge. Checking the runout with the Case and Cartridge Inspector requires the use of the proper pilot for specific calibers (sold separately).

Figure 4. An M80 Ball Round with TIR Off-center Enough to Be Considered a “Tipped” Bullet



**Figure 5. Co-Ax Case and Cartridge Inspector Components**



### 3.0 SAFETY INFORMATION

Always wear safety glasses. Take precaution around cutters and sharp edges.

### 4.0 ASSEMBLE THE CO-AX CASE AND CARTRIDGE INSPECTOR

1. With the Base (010482-011) upright and facing you, insert the small wing nut (010482-022) into the hole as shown in Fig. 4. Do not tighten it yet.
2. Also, insert the large wing nut (010482-021) into the base without tightening it.
3. Place the Pilot (sold separately, specific to your caliber) into the end of the Stop Bar/Pilot Support (010482-015), and tighten it with the 8-32 Set Screw (CT1010-015)
4. Ease the Stop Bar/Pilot Support into the large hole on the left side of the Base (010482-015). Make sure your V-Bracket Screws (010482-020) are loose, so you can shift the V-Bracket (010482-016) as needed.
5. Screw the Knurled Lock Nut (DIENUT-K-30-1/4-28) onto the Bracket (010482-012).
6. Then, slide the Dial Indicator (010482-028) onto the bracket, and secure it with the Main Lock Nut (010482-013).
7. Place the Bracket into the top left hole, and gently snug the Small Wing Nut enough to secure the Bracket temporarily.
8. Finally, tighten the Knurled Lock Nut and the Main Lock Nut to prepare the Dial Indicator and Stop Bar/Pilot Support for the current inspection.

### 5.0 INSPECTOR DIAL NOTES

- The dial is accurate within  $\pm 0.001$ " with travel up to 0.300".
- The large pointer reads from 0" to 0.10".
- The smaller pointer reads from 0" to 0.300".
- You can turn the outer dial to zero the large pointer when you change positions. Simply loosen the dial lock and rotate till it points at 0, then tighten the lock.

- By turning the Knurled Nut and Main Lock Nut, you can adjust the position of the dial as needed while you continue to work.

#### TIP



Always "preload" the Dial Indicator to at least 0.030", regardless of what you are measuring (that is, the Dial Indicator should change at least 0.030" before you zero it).

### 6.0 CRITICAL ACCURACY CHECK A: MEASURE CASE NECK WALL THICKNESS

Monitoring the thickness of the case neck is necessary for a few reasons:

- Brass can vary from one maker to another.
- The same manufacturer's production lots of brass can change from one lot to another (including new brass).
- Brass tends to "flow," in layman's terms, after being fired, especially multiple times, altering the neck wall thickness from one point to another.

A case neck that is thicker in one area can add inconsistent tension on the bullet from one point to another. Uneven thickness directly affects concentricity and TIR, and can even cause bullet tipping.

#### TIPS



- Make sure to clean the brass properly, preferably with stainless steel media. Dirty cases can give false readings.
- Ultimately, the reloader must determine the thickness of the case neck wall, depending on the caliber and type of shooting.

The following example uses 7.62 mm M80 ball cases. Note that many Benchrest shooters trim the neck walls to 0.011" thick. However, in semi-auto magazine-fed rifles like an M1, M14 or M1A, it is crucial for the neck walls to stay from 0.014" to 0.0145".

M80 ball brass typically has variations of 0.007" from one point to another. Even the best military brass available in this caliber (M118) contains variations of up to 0.005".

To set the Case and Cartridge Inspector to measure neck wall thickness:

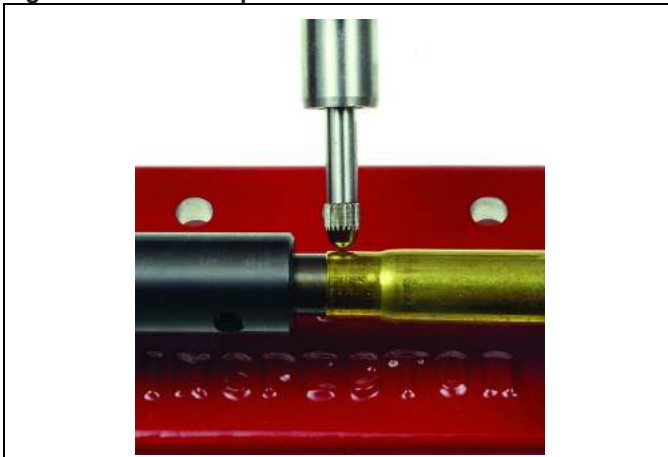
1. Secure the caliber-specific Pilot into the Stop Bar/Pilot Support (010482-015), and place them into the Base (010482-011) with the Pilot facing the Stop Pin (010482-017). You may first need to remove the V-Bracket [010482-016] to position shorter cases.
2. Set up the Inspector to measure the neck wall using one of the following methods, making sure that the Stop Pin does not apply pressure on the cartridge case:
  - With the Dial set back, pull the Stop Pin back and slide the case mouth onto the Pilot. After easing the Stop Pin forward, tighten the Dial back into place, and zero it out.
  - Or, with the Dial already in place on the Pilot, ease the Ball Point Indicator Tip back towards the Dial as you insert the cartridge. Then, zero the dial, and verify that it is tightened.

**Figure 6. Co-Ax Case and Cartridge Inspector Ready to Measure Neck Wall Thickness**



3. Set your Dial Indicator Tip to measure the neck halfway between the case mouth and shoulder, as shown in Fig. 7.
4. Take the readings at a minimum of three different spots around the case neck. (We recommend four to five measurements for improved accuracy.)
5. Rotate the case head along the V-Bracket with a slight downward pressure to select a new point to measure.

**Figure 7. Indicator Tip Set Between Mouth and Shoulder**



## 7.0 CRITICAL ACCURACY CHECK B: CASE CONCENTRICITY, OR CASE RUNOUT

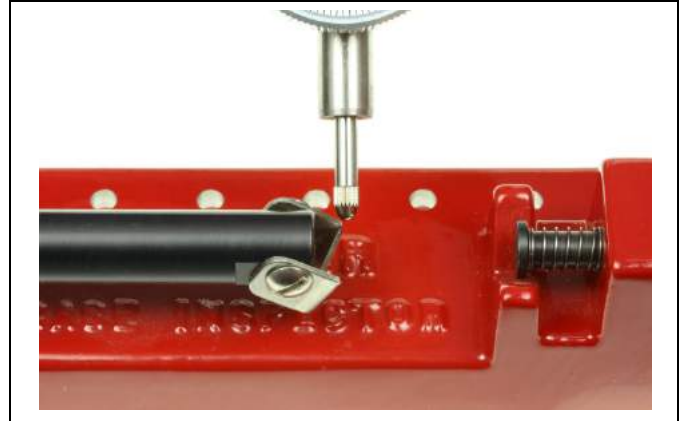
This inspection is important to check an empty cartridge case, especially in the following scenarios:

- When operating a standard single-stage press, such as the Rockchucker, you can improperly index the case, affecting both concentricity and TIR by sizing the neck out of alignment.
- Using the wrong shell holder or just not properly indexing each case.

To inspect the cartridge case for concentricity:

1. Take the Stop Bar/Pilot Support out and reverse it so that the Pilot end is pointing out of the base. This step leaves the V-Bracket facing the Stop Pin, as shown below.

**Figure 8. Positioning the Stop Bar/Pilot Support**



2. Adjust the V-Bracket screws so that the case mouth is resting on the V-Bracket with the case parallel to the base and the case head resting on the V-Block. (The case must be parallel, since you will be turning with slight downward pressure.)
3. Measure the neck  $\frac{1}{8}$ " (0.125") above the shoulder, as shown in Fig. 9.
4. Zero the dial, and then repeat step 3.

**Figure 9. Verifying Concentricity**



## 8.0 CRITICAL ACCURACY CHECK C: MEASURING TIR, OR BULLET RUNOUT

When the TIR, or bullet runout, is “off” (not as close to zero as possible), the bullet will enter the bore out of alignment. Because the bullet has additional stress or the bullet jacket gets damaged, your groups will open up or you get flyers.

The advantages of minimizing TIR are remarkable: one Forster customer reports testing a lot of M1As with .308 chambers, M1s and an M21 with 7.62x51 chambers. Even at 100 yards he knocked ¼” off 10 shot groups with Sierra 175 MKs, with a runout of no more than 0.003”.

1. Set up the Co-Ax Case and Cartridge Inspector as shown in “Critical Accuracy Check B: Case Concentricity,” where the V-Bracket faces the cartridge.
2. Adjust the V-Bracket so that the tip of the bullet is resting on the V-Bracket just behind the tip of the bullet to prevent the tip (meplat) from interfering. Make sure that the base or rim of the cartridge is forward on the V-block so the round can be turned level, supported by the V-Bracket and V-Block.
3. Rotate the cartridge, applying slight downward pressure with your finger to the head of the cartridge, which is resting on the V-Block.

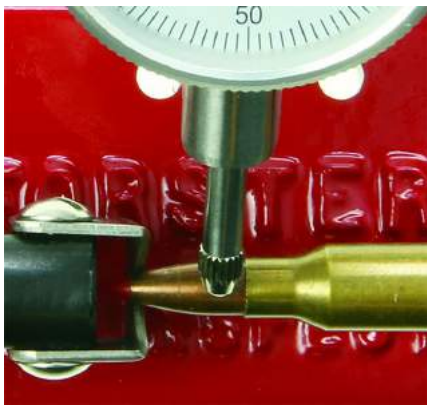
### TIP



If the case is not aligned for smooth rotation in the Case and Cartridge Inspector, your readings will vary widely. Adjust as needed to make sure the axis remains centered.

4. Set the dial onto the bullet either at ⅙” above the case mouth (Fig. 10) or at any point along the ogive (Fig. 2), whichever you prefer.
5. Repeat step 3, record the offset, and correct as needed.

Figure 10. Measuring TIR



## 9.0 ACKNOWLEDGEMENTS AND “TIPS FROM A PRO”

**Bob Kohl**, a longtime Forster reloader and partner, contributed this revision of the User Instructions, generously sharing his real-world experience, including this advice:

*Most shooters who load for accuracy try to keep it to 0.003” or less (0.005” if you’re measuring by the ogive). If you’re having a consistency problem, try an old Mid Thompkins trick of seating your bullets halfway, back off the seating die, and then rotate the cartridge 180° in your press to finish seating the bullet.*

*Be sure to check your cartridge overall length (COAL) as determined for your cartridge with quality calipers like Starrett, available from Brownells. In this instance, it’s 2.83” for the National Match M1A/M14s using USGI magazines. Rounds loaded with more than 0.003” TIR should be used at shorter ranges. If it gets as bad as 0.010 or worse, just use them for practice.*

*If you prefer not to constantly change your Case and Cartridge Inspector, you can skip the neck thickness measurement by using a ball micrometer to measure the neck walls. Again check the thickness at three to five different areas on the neck wall to give you a more accurate idea of the variations. I suggest Sinclair Ball Micrometer (from sinclairintl.com).*

Thanks, Bob!

## 10.0 ORDERING INFORMATION

See [forsterproducts.com](http://forsterproducts.com) for complete documentation and part numbers, including pilots and collets.

We recommend ordering from a dealer or distributor. Their experience and knowledge will help you select the best products that meet your specific requirements. In addition, they usually offer the best prices and convenient delivery options.

To find a Reseller go to [forsterproducts.com](http://forsterproducts.com) and click **Distributors**. If your distributor cannot supply you, or if you need parts, please contact Forster Products directly by email, phone or fax.

## WARRANTY

All Forster Products are warranted against defects in materials and workmanship for the life of the product. Parts excluded from the warranty are those that, by nature of their function, are subject to normal wear (such as springs, pins, etc.) or that have been altered, abused, or neglected. If the product is deemed defective by workmanship or materials, it will be repaired, reconditioned or replaced (at Forster’s option). This warranty supersedes all other warranties for Forster Products, whether written or oral.