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How do these  
things work?

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 **BRIDGESTONE**

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# How do these things work

## *The Tire Doctor Responds:*

*Some are round with a dial, others long and thin, like a chrome-plated stick. And they serve a very useful purpose – measuring inflation pressure in your tires. They can save you fuel, tread life – maybe even your life.*

*You may have wondered, “How does that thing measure tire pressure? And why doesn’t the little scale just blow out the end?”*

*Well, like magic, it’s simple when you know the secret.*



ANOTHER  
FROM  
volume FOUR  
ISSUE three  
RA  
LOOK



**Okay, so how does a tire pressure gauge work?**

Let's start with the "stick" or "pencil" gauge. Inside the body of the gauge is a small plunger. The inside of the tube is polished smooth and the plunger is made of soft rubber so it seals nicely. It's lubricated with a light oil to improve the seal.

The plunger is at one end and a stop is at the other. A spring runs the length of the tube, and pushes the plunger against the end.

The "foot" on the end is hollow. Inside are a rubber seal and small pin. The seal presses against the lip of the valve stem to prevent leaks during the measurement, and the pin pushes the valve stem pin to let air into the gauge's plunger chamber.

When the gauge is applied to the stem, the air pushes the plunger a distance that is proportional to the pressure in the tire.

The more pressure, the farther it moves.

The gauge is designed for some maximum pressure, say 160 psi. The spring is carefully calibrated so that 160 psi will move the plunger to nearly the end of the tube, while 80 psi moves it half-way, and so on.

The indicator bar fits inside the spring. It touches the plunger, but is not attached to it. When the plunger moves, it pushes the indicator bar out the end.

When the pressure is released, the spring pushes the plunger back, but the rod stays where it was, allowing you to read the pressure. The end of the indicator bar is wider than its main portion, so it won't fall – or fly – out the end of the gauge.

**What can cause a gauge like this to lose accuracy?**

Although the manufacturer calibrates these gauges at the factory (typical accuracy is +1 psi/-2 psi), poor care can damage a gauge.

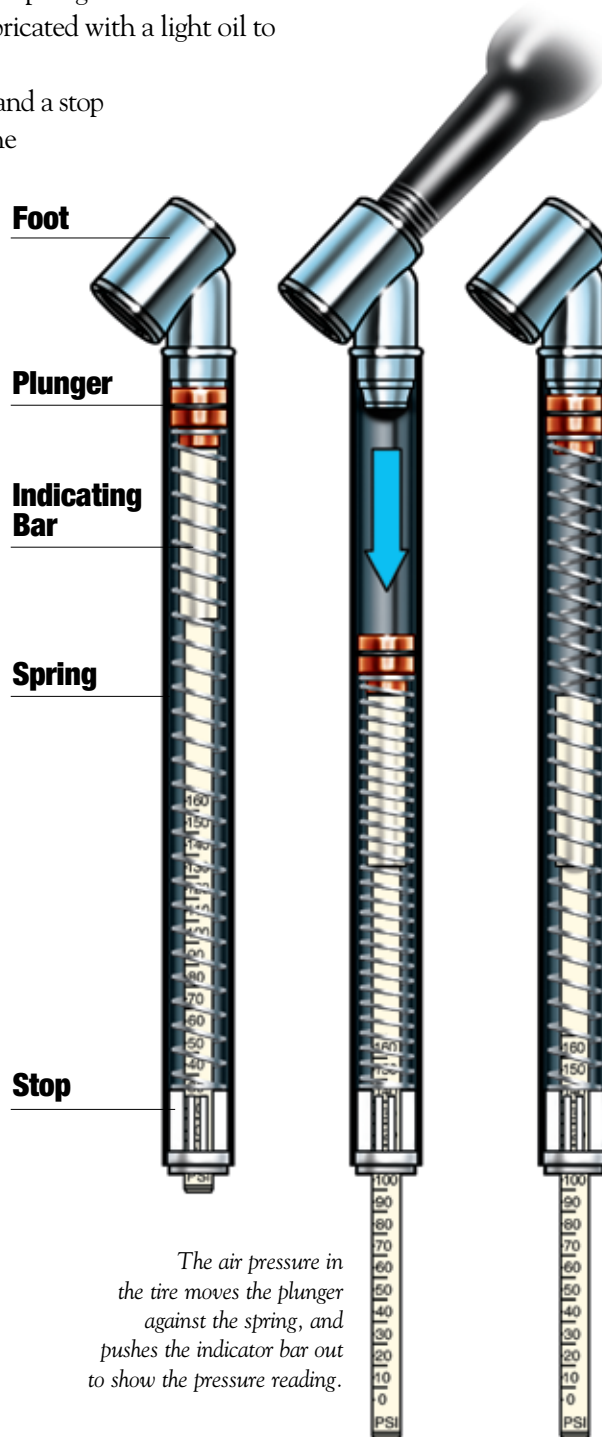
Keep stick gauges clean and dry. They're very sturdy, but if you dent the tube, it can cause parts to stick, resulting in incorrect readings.

Never try to oil or clean a gauge. If the indicator bar gets dirty, just wipe it with a cloth or paper towel.

Because a gauge can lose its accuracy, it's a good idea to check it regularly, using a precision gauge, like the one we described in **Real Answers**, Volume 3, Issue 4, page 30. (If you don't have a copy, you'll find it on the Bridgestone Internet site: [BridgestoneTrucktires.com](http://BridgestoneTrucktires.com).)

**What do we do if the gauge is no longer accurate?**

Most stick gauges are not repairable. So, you'll probably have to throw it away.



*The air pressure in the tire moves the plunger against the spring, and pushes the indicator bar out to show the pressure reading.*

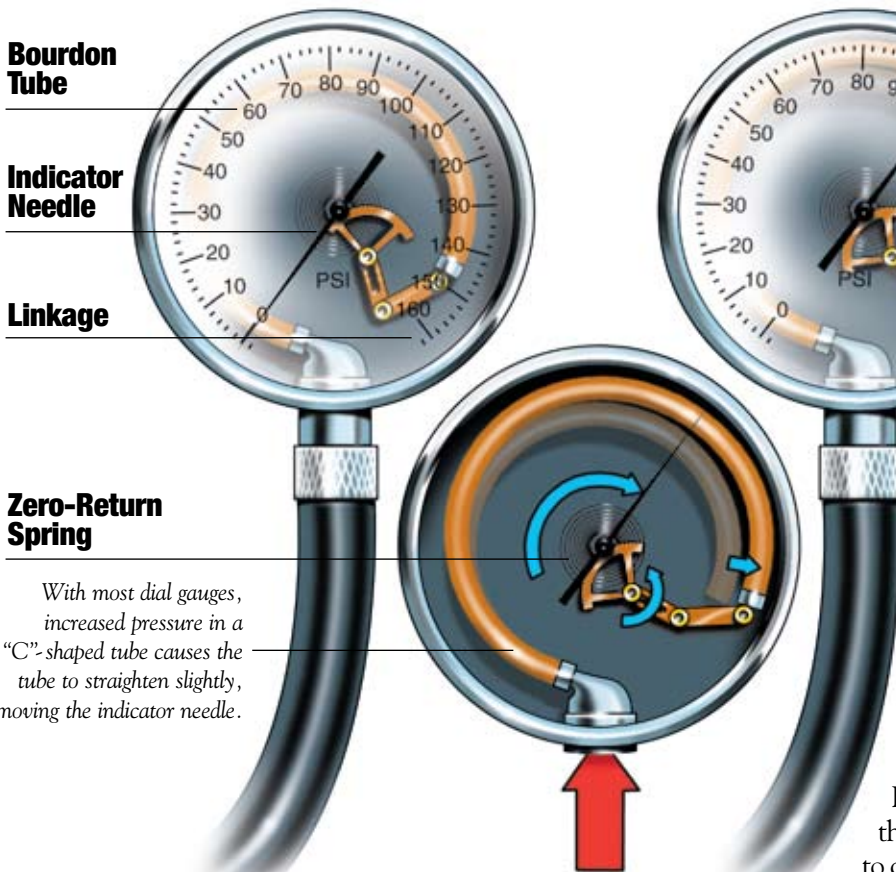
*When the pressure is released, the spring pushes the plunger back to its starting position, but the indicator bar remains where it is, until pushed back manually.*

### What about dial-type gauges?

Dial gauges do the same job, but use a different method. Inside, behind the dial, is a “C”-shaped, sealed tube. When pressurized air flows into this tube (called a “Bourdon” tube), the tube straightens out slightly.

A greatly exaggerated example is the classic party favor noisemaker that uncoils itself when you blow into it.

In a dial gauge, the end of the tube is attached, using a linkage, to the mechanism that moves the pointer. The greater the pressure, the more the tube “straightens,” and the more the dial pointer moves.



**Bourdon Tube**

**Indicator Needle**

**Linkage**

**Zero-Return Spring**

With most dial gauges, increased pressure in a “C”-shaped tube causes the tube to straighten slightly, moving the indicator needle.

### What’s the advantage?

Dial gauges can be easier to read, can be set up to read continuously (to show pressure fluctuations), and can be calibrated to very high accuracy. Some can even be re-calibrated if necessary.

### And the downside?

Dial gauges are usually much larger, heavier, more expensive, and more fragile. The tiny mechanism inside can be damaged by shock, vibration, corrosion, etc.

### OK, now how is it that pressure gauges can save fuel, tread, maybe even a life?

Your tires are the direct link between the vehicle’s drive train and the road. You are transferring energy from the fuel to the tires.

If your tires are underinflated, they flex too much as they go around. That creates excess heat, which wastes fuel. It’s amazing sometimes, the lengths people will go to for fuel economy, but they won’t bother to check inflation pressure, one of the simplest and least expensive ways to save.

### Is that all?

We’ve only begun. Not only does excessive heat from underinflation waste fuel, it also causes the tread to wear faster and cuts the life of the casing. In extreme cases, the casing may not even last for the life of the original tread. So, with underinflation, you can lose fuel economy, tread life and retreadability.

And, maintaining correct inflation pressure is crucial to optimizing traction. “Soft,” underinflated tires won’t grip the way they should on wet roads, and “hard,” overinflated tires may not provide optimum traction on dry roads.

You want inflation pressures to be “just right.”

### How close do we have to be?

Ideally, it would be best if you were right on the button. It doesn’t take much difference to cause trouble.

In fact, the industry considers any tire found with 20 percent or more underinflation to have been “run flat,” and recommends that it be pulled from service, and not used until it has had a thorough inspection for damage.

If your normal inflation pressure is 100 psi, that means just 20 psi low, and you’ve got a “run flat.” That’s why you’ve got to have good quality pressure gauges – and use them regularly.

*Editor’s Note: Our thanks to Schrader-Bridgport International, Inc. for technical assistance in preparing this article. RA*