

Final Drive Ratios; Revised by the Author, 10/14/2007

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Wednesday, 01 September 2004
Last Updated Sunday, 14 October 2007

Variables are your actual on-the-road tire diameters(modest effect) and tire pressures/temperature (tiny effect). The variation in UNLOADED diameter of a 4.00-18 rear tire versus a 120-90x18 rear tire is about 15 mm in the WORST case I know of. However, the actual rolling circumference varies very little (probably about 2%). Hence the values shown below are THEORETICALLY fairly accurate, and some are taken from a BMW chart dated 1978, others are calculated, and some are actual test data. See notes at end of this article!!

ratio

ring/pinion teeth

rpm @55mph

rpm @70mph

speed @7200rpm

speedometer ratio

usual model

2.91

32/11

3050

3881

130

1.078

R100

3.00

33/11

3147

4005

126

1.112

R90S-R100

3.09

34/11

3241

4125

122

1.144

R90-R100/7

3.20

32/10

3357

4273

118

1.186

R75-R80

3.36

37/11

3525

4486

112

1.244

R60-R75

3.44

31/9

3608

4592

110

1.259

3.56

32/9

3734

4752

106

1.318

R60-R65

2.62

34/13

This was for racing, /5 and later

NOTE 1. Above are for original stock size tires at recommended original inflation pressures. Values are theoretical.

NOTE 2. If you have a standard 5 speed transmission, the following is in 4th gear:

2.91
32/11
4320 rpm for 70mph
7200 rpm for 117mph

3.36
37/11

7200 rpm for 101.3mph

NOTE 3. speedometer ratio is usually printed in small characters on face of the speedometer. BMW speedometers are notorious for reading HIGH. The 85 mph speedometers are often VERY accurate.

NOTE 4. It is UNlikely that you will ACTUALLY have the same results as the table, due to accumulated errors, tolerances, etc. It is unlikely that your RPM for any given road speed will be the same as the table indicates. Probably the rpm it takes for the table speeds will be about 5-8% more, assuming no slippage at the tire, and other accumulated errors are minimal. Interestingly, this is about the amount many stock speedometers are in error. Examples: If you have a 3.20 rear gearset, expect closer to 62 mph at 4000; 3.44 expect 57 mph at 4000. In actual on-road measurements, you can expect as much as a 15% higher rpm, for a given TRUE road speed....if the accumulated errors are additive, which they are usually NOT (some add, some subtract).

Note 5. Prior to the /5 series, BMW had very different sets of rear drive gear ratios. See my website, URL is at the bottom of this article, below.

Note 6. The most accurate methods of calibrating a speedometer are, in NO specific order of accuracy:

- Mile posts and stopwatch
- Radar gun
- GPS

Calibration is best done on a clean, dry, paved road.

Note 7. OLD rear drives, without the vent, generally used SAE 40 oil. I do NOT think that straight weight oils should be used ANYplace on any airhead today. With the vent it is a must to use hypoid oil, 80W90, non-synthetic. Rumors (??) have it that hypoid oil in the ancient drives will destroy seals, or damage bronze/brass bushings, or?....totally unconfirmed by myself.

Note 8. Measuring the radius of the tire, bike on tires, not stands, you and passenger seated on bike, bike pointed straight ahead, and balanced straight up, buddy measuring the CENTER of axle to the floor, multiplied by 2, multiplied by pi, will give the working circumference close enough to the actual in-use number. The formula for determining the relationships, suitably simplified is as follows:

Let T = the tach reading

Let M = miles per hour

Let C = circumference in INCHES

Let S = small number in the rear end ratio

Let L = large number in the rear end ratio

example: you have 37/11 gears (which is 3.36:1 btw). S = 11; and L = 37 THEN, multiply the following: (T)(C)(S)

Divide that result by (1584)(L). The result is M.

Rearrange this formula to find any of the values, like you learned in jr. high school in beginning algebra.

Practical example: Most early BMW's came with a 4.00 x 18 rear tire. That tire is likely, even if you have an oversize 120-90 x 18, to measure about 80 inches in circumference. The formula will show that for a 70 mph speed, the tach should be reading 4667 rpm.

Final note:vastly expanded information is available on the Author's website:

<http://bmwmotorcycletech.info/ringgears,etc.htm>

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