



Phone: (919) 362-6805
Fax: (919) 362-5752
1434 Farrington Road
Suite 300
Apex, NC 27523
www.barnesprecision.com
info@barnesprecision.com

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This BPM technical document dated 1-1-19, helps to explain-

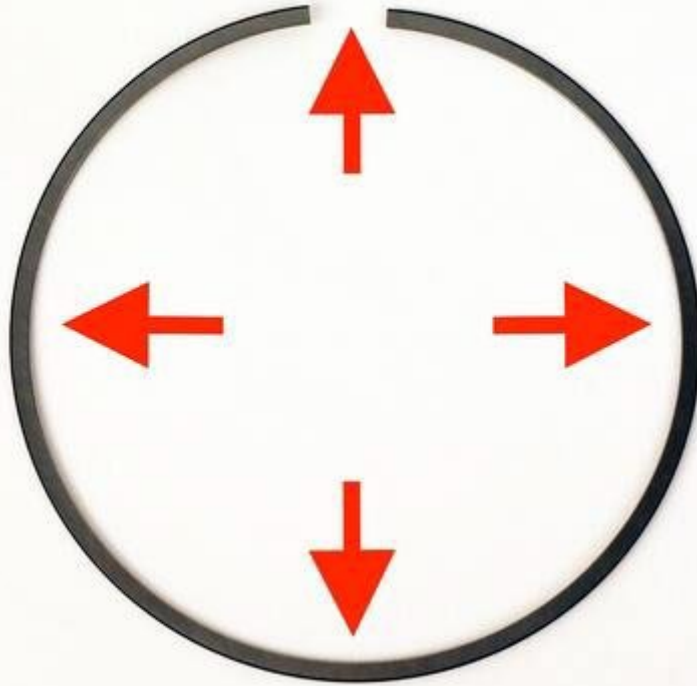
“Basics of piston ring tension, relative to sealing of combustion chamber/gas impingement system”

i.e. bolt rings to bolt carrier ID Bore interface of M4/AR platform weapons system.

This document can be used in discussion/understanding of Ring Tension vs. Ring Wear, relative to the 3 ring gas ring pack on the bolt of M4/AR gas impingement type weapons platform, and the proper maintenance/fit/sealing of said bolt rings, to bolt carrier bore interface.

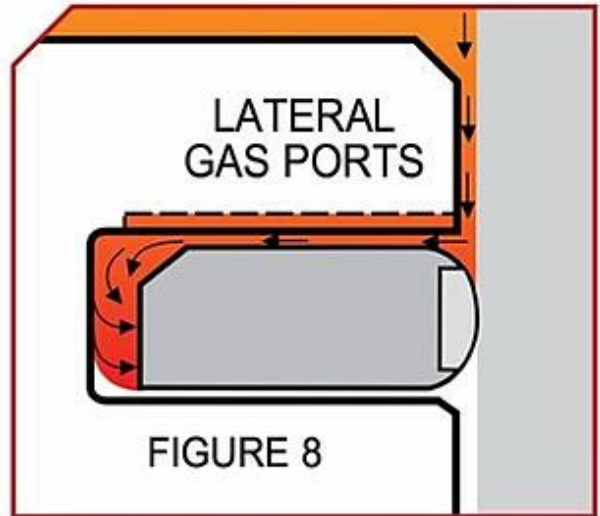
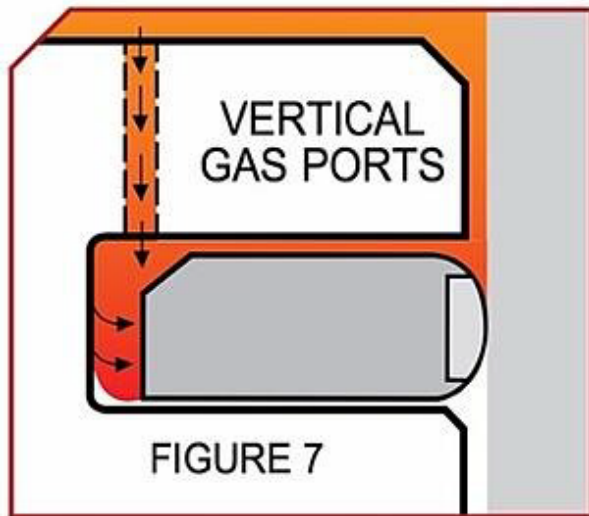
Bolt Ring tension is not as critical an element of combustion/pressure sealing in The M4/AR weapons platform design as commonly thought, but myths surrounding it, as well as inspection of actual condition of gas rings, run rampant. We clear the air and set the record straight on gas ring tension vs. gas ring wear, i.e. ring cross section reduction, and interface of bolt rings, to bolt carrier ID bore.

“Gas Ring Tension vs. Gas Ring Wear “is among the more misunderstood dynamics of the M4/AR weapons platform and it’s unique gas impingement system/bolt carrier group. Proper inspection /maintenance-and common procedures to check gas ring condition/viability are discussed in this document, with input/visual aids from industry documents/discussion used.



Tangential ring tension is the force that pushes the ring into the cylinder wall. In an M4/AR weapons platform, Static/relaxed tension of gas rings, is not what seals combustion/firing cycle, gas pressure pushing entire diameter of ring outward during that cycle is what seals the ring, to the cylinder wall, during high pressure event/combustion stroke. See diagram below.

It's difficult to predict what the actual friction or drag, that is, the pull tension of a ring pack in a M4/AR weapons platform BCG because Various modern Industry coatings / combined with machined surface conditions /dimensional tolerances all contribute to differences in surface condition, as well as friction/drag of assembled components, i.e. bolt ring pack to bolt carrier ID bore.



Gas ports can help very thin, low-tension rings seal on the combustion stroke. Whether it is using vertical gas port designs on a performance racing piston on left – or utilizing lateral gas ports per piston to carrier ID bore diameter clearances on right, as in bolt gas ring to bolt carrier ID bore interface, during cycling/pressurization of gas system.

Ed .Note - Quotes/excerpts from automotive industry experts/articles/discussions used in this document to support the fact that “bolt rings seal under pressure, to the bolt carrier inside bore diameter, regardless of static ring tension/diameter, and regardless of popular bolt carrier to bolt tension test. Measured Dimension of Cross Section of Gas ring, determines wear/life usage of ring, NOT ring tension, relative to common armorer’s bench/drop test of carrier to bolt , which is also often performed incorrectly by the most skilled armorer , in the wrong orientation , i.e. bolt carrier on top during bench test –and bolt on bottom.

Correct method per US DOD manuals is “bolt on top during vertical bench test – not carrier on top.”

Tools/method/criteria needed for proper inspection/measurement/replacement of bolt gas ring relative to wear of cross section -

1) digital/dial/Vernier Calipers.

2) Measure across width of cross section of one side of ring(s) with calipers, compare to original OEM dimension of gas ring cross section width in three locations –

With Ring Gap at 12:00, measure each side of gap at approx. 11 and 1 o’clock positions-
With cross section measuring approx.0220” at 11 and 1 o’clock – and cross section measuring approx .0400” at 6:00 position, as new stamped.

3) Reduction in measured cross section width of more than .003” (min/recommended replacement) or .005” (max/mandatory replacement) from original measured OEM dimension cross section width, requires immediate replacement of said gas ring(s).

In conclusion, as stated -

It is not uncommon for bolt gas ring tension to be contracted in static (unfired) condition, with cross section being within usable/acceptable spec.

Therefore cross section measurement, not ring tension, is the correct method of condition to determine replacement of said bolt gas rings.

Respectfully-

Andrew S Barnes President /CEO

Barnes Precision Machine Inc.
1434 Farrington Rd. Suite 300
Apex, N.C. 27523
919-362-6805 office 919-819-4106 cell
email-andrew@barnesprecision.com
