

Data Input [With Units Conversions to MKS Units]:

[Sample data values for a known accurate Heavy Barrel 6.5x47 Lapua are included and must be modified as needed for your rifle.]

[MKS Data Inputs and Calculated Values to be used in subsequent calculations are all in **Column F**. Many have to be copy/pasted or manually entered.]

[Formulations used are noted in comments.]

[User Inputs for units conversion are indicated in **Bold**.]

Barrel Material Specification (isotropic steel)

Steel Type =	416R	
Density (rho) =	7750.00	kg/m ³
Units Conversions:	lbm/ft³	Kg/m³
	484.000	7752.94
	483.817	7750.00

Young's (Linear) Modulus of Elasticity (E) =

Shear Modulus of Elasticity (G) =	200.00	GPa
	72.30	GPa
Units Conversions:	Pounds/Sq. In. (psi)	GigaPascals
	29,000,000	199.95
	29,007,368	200.00

Calc. Transverse Shear-Wave Propagation Rate =

SQRT(G/rho) =	3054.35	m/s
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Bore Inside Diameter (Caliber, d) =

Units Conversions:	Inches	meters
	0.2640	0.006706
	0.2640	0.006706

Actual Barrel Length (L') from Bolt-Face to Muzzle =

Units Conversions:	27.0000	0.685800	0.685800	meters
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[Measured Internally with a rod]

Actual Barrel Length (L") from Receiver-Face to Muzzle =

Units Conversions:	26.0000	0.660400	0.660400	meters
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[Measured Externally]

Barrel Mass (M' if known) Excluding Any Muzzle Attachment (kg) =

Pounds =	8.8632	4.0203
Ounces =	0.0000	0.0000
		Sum (kg) = 4.0203 kg

or 8.8632 pounds

Estimated Barrel Mass (M') based on M' = rho*L*(Pi/4)*(Dm² - d²):

D(Midpoint) = Dm =	1.2500	0.031750	4.0203	kg
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or 8.8632 pounds

Muzzle Attachment Mass =

Pounds =	0.000	0.0000
Ounces =	0.000	0.0000
		Sum (kg) = 0.0000 kg

or 0.0000 pounds

Summed Total Barrel Mass (M) Including Any Muzzle Attachment =

4.0203	kg
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or 8.8632 pounds

Unthreaded Muzzle OD of Barrel (D") =

0.031750	meters
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or 1.2500 inches

Calculated Average OD of Barrel (D') =

0.031750	meters
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or 1.2500 inches

Calculated Vibrationally Effective OD of Barrel (D) = SQRT(D" * D') =

0.031750	meters
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or 1.2500 inches

Calc. Vibrationally Effective Barrel Length with Attachment (L) =

0.685800	meters
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or 27.0000 inches

[Extending the Average OD (D') to Match Total Mass (M)]

Measured Rifle CG Offset (dCG) Below Bore Axis =

0.010000	meters
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or 0.3937 inches

[Measured at CG by Suspending Rifle via Bore vs Plumb Line]

Interior Ballistics Data [All times in microseconds (mu-sec) based on t = 0 at 10-percent P-Max]

Time of Bullet Engraving (6.0 ksi) =	109	mu-sec
Rise time to 60-percent Peak Base-Pressure (t60) =	322	mu-sec
Time of Peak Base Pressure (tp) =	511	mu-sec
Time of Bullet Exit from Muzzle (tb) =	1328	mu-sec
Bullet Muzzle Velocity (fps) =	2746	836.98 m/s
Peak Base Pressure (CIP Transducer psi) =	54,790	377.76 MPa
Bullet Exit Velocity per Double Barrel Length =	610.22	hertz
Ring-Damping Time Constant = Round Trip Delay =	449.06	mu-sec

[6,000 psi]

[About 0.98% of Time to P-Max]

[Affected by Barrel Length]

[Affected by Barrel Length]

[About 90% of P-Max]

[Frequency Mode 2/3 Discriminator]

[2*L/Propagation Rate, microseconds]

Suggested Steel Properties:

		Cro-Mo	Stainless	
Steel Type =		4140	416R	
Density rho =		7850	7750	kg/m ³
Linear Elasticity E =		205.00	200.00	GPa
Bulk Elasticity B =		160.00	160.00	GPa
Shear Elasticity G =		80.00	72.30	GPa
Poisson's Ratio nu =		0.29	0.30	
Linear Rod "Speed of Sound" = SQRT(E/rho) =		5110.25	5080.01	m/s
Bulk Material "Speed of Sound" = SQRT(B/rho) =		4514.66	4543.69	m/s
Transverse Shear-Wave Speed = SQRT(G/rho) =		3192.35	3054.35	m/s

120,250 in/sec

0.2640 inches