Voluntary Industry Performance Standards
for Pressure and Velocity
of Centerfire Pistol and Revolver Ammunition
for the Use of Commercial Manufacturers
Voluntary Industry Performance Standards for Pressure and Velocity of Centerfire Pistol and Revolver Ammunition for the Use of Commercial Manufacturers

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Approved December 14, 2015
Abstract  In the interests of safety and interchangeability, this Standard provides pressure and velocity performance and dimensional characteristics for centerfire pistol and revolver sporting ammunition. Included are procedures and equipment for determining these criteria.
Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

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The development of this voluntary industry performance standard was initiated under the auspices of the Sporting Arms and Ammunition Manufacturers’ Institute, Inc. (SAAMI). A Products Standards Task Force was established by the Institute in 1975 and charged with the drafting of this and other standards with their subsequent periodic revisions.

The material presented provides the commercial manufacturer of factory-loaded ammunition with pressure and velocity performance and dimensional characteristics. Included are procedures and equipment for determining these criteria. For the purpose of this standard a commercial manufacturer is defined as one who produces ammunition by fabricating component parts from raw materials as opposed to remanufacture with parts originally made by others.

This standard for Centerfire Pistol and Revolver Sporting Ammunition was first published in 1979 and periodically updated until this revision in 2015. Changes in the standard with each revision include minor adjustments of velocities, the addition of new load offerings, and updating of recommended equipment sources and the latest procedures for reporting reference ammunition assessments.

Suggestions for improvement of this standard will be welcome. They should be sent to: The Sporting Arms and Ammunition Manufacturers’ Institute, Inc., Flintlock Ridge Office Center, 11 Mile Hill Road, Newtown, Connecticut 06470-2359.

Consensus for this standard was achieved by use of the Canvass Method.

The following individuals and organizations recognized as having an interest in the standardization of safety requirements for factory-loaded sporting ammunition were contacted prior to the approval of this standard. Inclusion in this list does not necessarily imply that the individual or organization concurred with the submittal of the standard to ANSI:

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The following list presents the recommended full names and abbreviated names of the centerfire pistol and revolver cartridges and chambers currently supplied for various types of firearms. These full or abbreviated names should be used on cartridge headstamps and on firearm markings to properly identify the caliber.

**ORDER OF LISTING**
Lists of centerfire pistol and revolver cartridges are arranged according to the following rules:

1) All Metric cartridges
   a) First in ascending numerical order of approximate caliber designation,
   b) Then in alphabetical order.

2) Followed by American cartridges
   a) First in ascending numerical order of approximate caliber designation,
   b) Then alphabetical order.

3) Within each of the above groups, cartridges are arranged in order of:
   a) 2-digit numbers,
   b) 2-digit numbers and a hyphen followed by more numbers,
   c) 3-digit numbers.

For lists that present both cartridge name and several bullet weights, list in ascending numerical order of bullet weights.

**Active Cartridges and Chambers**

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<td>32 NAA</td>
</tr>
<tr>
<td>32 Short Colt</td>
<td>32 SC</td>
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* This ammunition is loaded to a higher pressure, as indicated by the +P marking on the case headstamp, to achieve higher velocity. Use only in firearms especially designed for this cartridge and so recommended by the manufacturer.
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* This ammunition is loaded to a higher pressure, as indicated by the +P marking on the case headstamp, to achieve higher velocity. Use only in firearms especially designed for this cartridge and so recommended by the manufacturer.
VELOCITY DATA INTERPRETATION

Velocity recommendations are stated on the basis of a nominal lot mean velocity as measured using equipment in accordance with the requirements of Section III and the procedures detailed in Section II. Due to the fact that sporting firearms for general distribution are typically manufactured to dimensional tolerances greater than those specified for test barrels, there should be no expectation that these velocities can be duplicated from any test utilizing firearms. This situation is further confounded by discrepancies in barrel length. Furthermore, once ammunition has left the control of the manufacturer, storage conditions outside those recommended by the manufacturer may cause variations in the velocity as measured using test equipment and procedures which conform to the requirements of this Standard.

The values presented on pages 9 through 24 are recommended values for the use of ammunition producers at the time of manufacture. It is the responsibility of the manufacturer to establish sample sizes, sampling frequencies, and tolerances to ensure the performance of the ammunition obtained by the ultimate user meets all applicable safety and functional standards. Of particular importance in establishing velocity tolerances is the understanding that velocities significantly higher than the nominal lot mean can cause actual maximum range performance to exceed expected values.

Ammunition tested subsequent to manufacture using equipment and procedures conforming to these guidelines can be expected to produce velocities within a tolerance of ±90 fps of the tabulated values.
FACTORS AFFECTING PRESSURE MEASUREMENTS

Two principal methods of measuring centerfire pistol and revolver pressures are recognized: the copper crusher method and the piezoelectric transducer method. One or the other may be used or they may be used simultaneously.

There are three principal factors affecting pressure measurements. These are instrumentation, ammunition and procedure. The following lists present the items in each category that may cause difficulties in testing carried out with the two methods.

I. FACTORS IN COPPER CRUSHER TESTING

INSTRUMENTATION

1. Condition of test barrel (whether minimum or maximum bore, chamber size and headspace, amount of erosion at throat and bore).
2. Diameter of piston and piston hole.
3. Fit of piston in piston hole.
4. Location of piston hole.
5. Tightness of barrel mounting in Universal Receiver, if used.
6. Shape, size and protrusion of firing pin beyond breech face.
7. Force of firing pin blow.
8. Size, material and characteristics of the pressure-sensitive element of the gauge (copper crusher cylinders).
9. Type, size and condition of gas check.
10. Type of piston and gas check lubricant.
11. Quality and tolerance of piston hole gauges and headspace gauges.
12. Quality of crusher measuring instrument.

AMMUNITION

1. Condition of cartridge.
2. Position of powder in cartridge case.
3. Temperature of ammunition.

PROCEDURE

1. Failure to mount pressure barrel properly in Universal Receiver or other test action to assure minimum headspace.
2. Failure to rotate cartridge and close breech carefully to assure proper powder positioning.
3. Failure to wipe piston ends, crusher and setscrew face to remove excess oil.
4. Failure to center crusher cylinder on piston and properly adjust setscrew.
5. Failure to fire warming shots.
6. Overheating barrel by excessive rate of fire.
7. Failure to clean bore and control metal fouling.
8. Failure to clear barrel of brass disk blanked from the case wall and gas check from previous shot.
II. FACTORS IN PIEZOELECTRIC TRANSDUCER TESTING

INSTRUMENTATION

1. Condition of test barrel (whether minimum or maximum bore, chamber size and headspace, amount of erosion at throat and bore).
2. Fit of transducer in barrel.
3. Location of transducer.
4. Tightness of barrel mounting in Universal Receiver, if used.
5. Shape, size and protrusion of firing pin beyond breech face.
7. Characteristics of the transducer.
8. Quality of the transducer.
9. Quality of the read-out system.

AMMUNITION

1. Condition of cartridge.
2. Position of powder in cartridge case.
3. Temperature of ammunition.

PROCEDURE

1. Failure to mount pressure barrel properly in Universal Receiver or other test action to assure minimum headspace.
2. Failure to rotate cartridge and close breech carefully to assure proper powder positioning.
3. Failure to fire warming shots.
4. Overheating barrel by excessive rate of fire.
5. Failure to clean bore and control metal fouling.
6. Failure to protect transducer against contamination, such as oil or water.
7. Transducer calibration.
8. Read-out system calibration.
EXPLANATION OF PRESSURE TERMINOLOGY

The SAAMI Pressure data outlined in this section is based on a Maximum Average Pressure for each cartridge and a Coefficient of Variation of 5%. The Coefficient of Variation (CV) of 5% was based on the CV that exists for the 40,000 psi pressure level and is calculated by dividing the population standard deviation (σ = 2,000 psi) by the Maximum Average Pressure (MAP = 40,000 psi) which equals 0.05 (5%). All other pressure terminology is derived directly from these two terms.

SAAMI recognizes two pressure-measuring systems. The preferred system is the piezoelectric transducer system with the transducer flush-mounted in the chamber of the test barrel. Pressure developed by the burning propellant exerts force on the transducer through the cartridge case wall causing the transducer to deflect, creating a measurable electric charge. Pressures measured with this system are expressed in units of "pounds per square inch" (abbreviated psi).

The second, older system employs a copper crusher cylinder which is compressed by a piston fitted to a piston hole into the chamber of the test barrel. Pressure generated by the burning propellant acts on the base of the piston forcing the piston to move, thereby permanently compressing the copper cylinder. Pressures measured by this system are expressed in "Copper Units of Pressure" (abbreviated as "CUP").

Throughout the following text the pressure is expressed in terms of "pounds per square inch" ("psi") however, it should be understood that the same procedures apply to pressures expressed in "Copper Units of Pressure" (CUP).

Maximum Average Pressure - is the recommended maximum pressure level for loading commercial sporting ammunition.

Standard Deviation (σ) - The Standard Deviation for each Maximum Average Pressure level is based on a Coefficient of Variation of 5%. This 5% Coefficient of Variation is maintained throughout the SAAMI pressure spectrum providing a realistic Standard Deviation for each pressure level. To obtain the Standard Deviation for a particular MAP, multiply the MAP by 0.05 (i.e., 40,000 psi x 0.05 = 2,000 psi).

Standard Error (σₓ) - The standard error is calculated by dividing the Standard Deviation (population S. D. = σ) by the square root of the sample size σₓ = σ/√n

Maximum Probable Lot Mean (MPLM) - The MPLM is calculated by adding two standard errors to the Maximum Average Pressure in order to assure there is a 97.5% probability that the Maximum Probable Lot Mean pressure is not exceeded. See Figure 1.

The SAAMI pressures are calculated based on a sample size of ten (10). The Maximum Probable Lot Mean represents the midpoint of the upper service pressure distribution. See Figure 1. For example, if the Maximum Average Pressure is 40,000 psi, the Maximum Probable Lot Mean (MPLM) is calculated as follows:

\[
\text{MPLM} = \text{Maximum Average Pressure} + 2 \text{ standard errors}
\]

\[
\text{MPLM} = 40,000 \text{ psi} + [(40,000 \text{ psi} \times 0.05)/\sqrt{10}] \times 2
\]

\[
\text{MPLM} = 40,000 \text{ psi} + (633 \text{ psi} \times 2) = 40,000 + 1266 \text{ psi} = 41,266 \text{ psi rounded to 41,300 psi}
\]
Maximum Probable Sample Mean (MPSM) - is the maximum expected average pressure that may be observed in the testing of product subsequent to its manufacture and is not intended for use as a loading control point. The Maximum Probable Sample Mean is positioned three (3) standard errors above the Maximum Probable Lot Mean i.e., MPLM + 3 \( \sigma \). See Figure 1. The Maximum Probable Sample Mean defined here is the value previously referred to in the ANSI/SAAMI Standards as the Maximum Product Average.

**Figure 1**

Maximum Extreme Variation - The maximum allowable sample E.V. (Extreme Variation or Range) is a statistic derived from the knowledge of the population Standard Deviation. Applying table figures from the Relative Range Tables (Biometrika Tables for Statisticians) we calculate the Maximum E.V. or Range as (population \( \sigma \)) x 5.16 (table constant for sample of 10 at 99.0% confidence level) i.e., 2,000 psi x 5.16 = 10,320 psi rounded down to 10,300 psi.
EXPLANATION OF PRESSURE MEASURING SYSTEMS

The two SAAMI recognized pressure-measuring systems for centerfire pistol and revolver cartridges are the copper crusher system and the piezoelectric transducer system.

A brief explanation of these two systems follows:

**COPPER CRUSHER SYSTEM**

This system employs a copper crusher cylinder that is compressed by a piston fitted to a piston hole into the chamber of the test barrel. The pressure developed by the gases from the burning propellant acts through the piston hole, allowing the gases to force the piston upward, and thereby permanently compressing the copper crusher cylinder. The Sporting Arms and Ammunition Manufacturers' Institute has adopted the pressure units designation of "Copper Units of Pressure" (abbreviated CUP) for this system. This designation applies only to values obtained using the particular crushers, targets, and methods outlined in this Standard.

**PIEZOELECTRIC TRANSDUCER SYSTEM**

This system employs a piezoelectric transducer flush mounted in the chamber of the test barrel. Pressure developed by the gases from the burning propellant exerts force on the transducer through the cartridge case wall causing the transducer to deflect, creating a measurable electric charge. This electrical charge is converted into a reading of pressure.

The Sporting Arms and Ammunition Manufacturers’ Institute has adopted the pressure units designation of "pounds per square inch" (abbreviated psi) for this system. This designation applies to values obtained with transducers and methods as outlined in this Standard.
### VELOCITY AND PRESSURE: VELOCITY & PRESSURE DATA – CRUSHER

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Velocity (fps)</th>
<th>Copper Units of Pressure (Solid test barrel, CUP/100)(^{(1)})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@ 15'</td>
<td></td>
<td>Maximum Average Pressure (MAP)</td>
</tr>
<tr>
<td></td>
<td>@ 15'</td>
<td></td>
<td>N/E</td>
</tr>
<tr>
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<td>88 (3)</td>
<td>1,500</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>1,330</td>
<td></td>
</tr>
<tr>
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<td>1,195</td>
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</tr>
<tr>
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<td>1,130</td>
<td></td>
</tr>
<tr>
<td></td>
<td>147</td>
<td>1,060</td>
<td></td>
</tr>
<tr>
<td>9mm Luger +P</td>
<td>90 (3)</td>
<td>1,375</td>
<td>N/E</td>
</tr>
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<td></td>
<td>101</td>
<td>1,225</td>
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<tr>
<td></td>
<td>115</td>
<td>1,100</td>
<td></td>
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<tr>
<td></td>
<td>124</td>
<td>1,130</td>
<td></td>
</tr>
<tr>
<td>9x18 Makarov</td>
<td>90 (3)</td>
<td>990</td>
<td>N/E</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>1,000</td>
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</tr>
<tr>
<td>9x23 Winchester</td>
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<td>125</td>
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<tr>
<td>10mm Automatic</td>
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<tr>
<td></td>
<td>170</td>
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<tr>
<td></td>
<td>175</td>
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<tr>
<td></td>
<td>200</td>
<td>1,320</td>
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<tr>
<td>221 Remington Fireball</td>
<td>50 (3)</td>
<td>2,520</td>
<td>520</td>
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</table>

\(^{(1)}\) Based on sample size \(\eta=10\).
\(^{(2)}\) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.
\(^{(3)}\) Revolvers not normally chambered for this cartridge.
### VELOCITY AND PRESSURE DATA: CENTERFIRE PISTOL & REVOLVER

#### CENTERFIRE PISTOL & REVOLVER VELOCITY AND PRESSURE DATA – CRUSHER

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Velocity (fps)</th>
<th>Copper Units of Pressure (Solid test barrel, CUP/100)</th>
<th>(N/E = Not Established)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@ 15' Vented Bbl.</td>
<td></td>
<td>Maximum Lot Mean Pressure (MAP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@ 15' Test Bbl.</td>
<td></td>
<td>Maximum Probable Lot Mean (MPLM)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instrumental Mean</td>
<td></td>
<td>Maximum Probable Sample Mean (MPSM)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instrumental Average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instrumental Probable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 Automatic</td>
<td>35</td>
<td>(3)</td>
<td>900</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td></td>
<td>805</td>
<td>186</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
<td>755</td>
<td>195</td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>35</td>
<td>(3)</td>
<td>1,200</td>
<td>N/E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/E</td>
</tr>
<tr>
<td>30 Luger (7.65mm)</td>
<td>93</td>
<td>(3)</td>
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<td>280</td>
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<tr>
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</tr>
<tr>
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<td></td>
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<td>302</td>
</tr>
<tr>
<td>32 Automatic</td>
<td>60</td>
<td>(3)</td>
<td>970</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td></td>
<td>1,000</td>
<td>155</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>162</td>
</tr>
<tr>
<td>32 H&amp;R Magnum</td>
<td>85</td>
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<td>210</td>
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<tr>
<td></td>
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<td></td>
<td>N/E</td>
</tr>
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<td>32 Short Colt</td>
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<tr>
<td>32 Smith &amp; Wesson</td>
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<td>130</td>
</tr>
<tr>
<td>32 Smith &amp; Wesson Long</td>
<td>98</td>
<td>N/E</td>
<td>775</td>
<td>120</td>
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<tr>
<td></td>
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<td>124</td>
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<td></td>
<td></td>
<td>130</td>
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<tr>
<td>327 Federal Magnum</td>
<td>115</td>
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<td>1,535</td>
<td>N/E</td>
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<td></td>
<td>N/E</td>
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<tr>
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<td></td>
<td></td>
<td>N/E</td>
</tr>
<tr>
<td>356 TSW</td>
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<td>(3)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>N/E</td>
</tr>
</tbody>
</table>

(1) Based on sample size $\eta=10$.

(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

(3) Revolvers not normally chambered for this cartridge.
## VELOCITY AND PRESSURE DATA – CRUSHER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Nominal @ 15’</th>
<th>Nominal @ 15’</th>
<th>Maximum Average Pressure (MAP)</th>
<th>Maximum Probable Lot Mean (MPLM)</th>
<th>Maximum Probable Mean Sample (MPSM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Instrumental Vented Bbl.</td>
<td>Instrumental Test Bbl.</td>
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<td>1,270</td>
<td>1,650</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>1,220</td>
<td>1,500</td>
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</tr>
<tr>
<td></td>
<td>130</td>
<td>1,300</td>
<td>1,600</td>
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</tr>
<tr>
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<td>N/E</td>
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<td>150</td>
<td>1,130</td>
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</tbody>
</table>

(1) Based on sample size $\eta=10$.

(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

(3) Revolvers not normally chambered for this cartridge.
### VELOCITY AND PRESSURE: VELOCITY & PRESSURE DATA – CRUSHER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Nominal @ 15' Vented Bbl. (2)</th>
<th>Nominal @ 15' Test Bbl.</th>
<th>Maximum Average Pressure (MAP)</th>
<th>Maximum Probable Lot Mean (MPLM)</th>
<th>Maximum Probable Sample Mean (MPSM)</th>
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<td>230</td>
<td>237</td>
<td>248</td>
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<tr>
<td></td>
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<td>950</td>
<td>N/E</td>
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<tr>
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<td>1,000</td>
<td>N/E</td>
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<td>950</td>
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<td>1,000</td>
<td></td>
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<tr>
<td></td>
<td>130</td>
<td>N/E</td>
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<td>170</td>
<td>175</td>
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</tr>
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<td>38 Special Match(4)</td>
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<td>170</td>
<td>175</td>
<td>183</td>
</tr>
<tr>
<td></td>
<td>158</td>
<td>750</td>
<td>900</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>95</td>
<td>1,080</td>
<td>1,330</td>
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<td>985</td>
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<td>158</td>
<td>880</td>
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</tbody>
</table>

(1) Based on sample size η=10.
(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.
(3) Revolvers not normally chambered for this cartridge.
(4) The velocity figures listed for Match items are nominal values; optimum accuracy may require a velocity different from the nominal values.
## VELOCITY AND PRESSURE DATA – CRUSHER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Velocity (fps)</th>
<th>Copper Units of Pressure (Solid test barrel, CUP/100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nominal Mean</td>
<td>Maximum Average Pressure (MAP)</td>
</tr>
<tr>
<td></td>
<td>Instrumental</td>
<td>@ 15’ Vented Bbl.</td>
</tr>
<tr>
<td></td>
<td>@ 15’</td>
<td>@ 15’</td>
</tr>
<tr>
<td>38 Super Automatic +P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>1,280</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>1,230</td>
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<tr>
<td>130</td>
<td>1,200</td>
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</tr>
<tr>
<td>380 Automatic</td>
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<tr>
<td>100</td>
<td>990</td>
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<td>40 Smith &amp; Wesson</td>
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<td>140</td>
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<td>41 Remington Magnum</td>
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(1) Based on sample size \(\eta=10\).

(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

(3) Revolvers not normally chambered for this cartridge.
<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Velocity @ 15'</th>
<th>Copper Units of Pressure (MAP)</th>
<th>Maximum Pressure</th>
<th>Average Pressure</th>
<th>Maximum Probable Pressure</th>
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<tbody>
<tr>
<td>44 Remington Magnum</td>
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<td></td>
<td>300</td>
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<tr>
<td>44 S&amp;W Special</td>
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<td>900</td>
<td>140</td>
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</tbody>
</table>

(1) Based on sample size $\eta=10$.
(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.
### VELOCITY AND PRESSURE DATA: CENTERFIRE PISTOL & REVOLVER

#### VELOCITY AND PRESSURE DATA – CRUSHER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet</th>
<th>Weight @15' (gr.)</th>
<th>Nominal velocity @15' (fps)</th>
<th>Nominal pressure (MAP)</th>
<th>Maximum pressure (MAP)</th>
<th>Maximum probable pressure (MAP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vented Bbl.(2)</td>
<td>@ 15'</td>
<td>Vented Bbl.</td>
<td>Test Bbl.</td>
<td>Test Bbl.</td>
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<td>155</td>
<td>1,125</td>
<td>180</td>
<td>186</td>
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<td></td>
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<td>180</td>
<td>186</td>
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<td>1,050</td>
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<td>186</td>
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<td>230</td>
<td>870</td>
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<td>186</td>
<td>195</td>
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<td>45 Auto Rim</td>
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<td>150</td>
<td>155</td>
<td>162</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>825</td>
<td>150</td>
<td>155</td>
<td>162</td>
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<td>200</td>
<td>1,120</td>
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<td>151</td>
</tr>
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<td>950</td>
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<td>151</td>
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<td>950</td>
<td>140</td>
<td>144</td>
<td>151</td>
</tr>
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<td></td>
<td></td>
<td>250-255</td>
<td>750</td>
<td>140</td>
<td>144</td>
<td>151</td>
</tr>
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<td>45 Glock Automatic Pistol</td>
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<td>N/E</td>
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<td>995</td>
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<td>N/E</td>
<td>N/E</td>
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<td>1,200</td>
<td>400</td>
<td>413</td>
<td>432</td>
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</tr>
</tbody>
</table>

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1. Based on sample size $\eta = 10$.
2. Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.
3. Revolvers not normally chambered for this cartridge.
4. The velocity figures listed for Match items are nominal values; optimum accuracy may require a velocity different from the nominal values.
### VELOCITY AND PRESSURE DATA

**VELOCITY & PRESSURE DATA – CRUSHER (Cont’d)**

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Velocity (fps) @ 15'</th>
<th>Copper Units of Pressure (Solid test barrel, CUP/100)</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>Nominal Mean Instrumental</td>
<td>Nominal Mean Instrumental</td>
</tr>
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<td>260</td>
<td>2,000</td>
<td>N/E N/E N/E</td>
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<td></td>
<td>300</td>
<td>1,625 1,825</td>
<td>N/E N/E N/E</td>
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<td>N/E N/E N/E</td>
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<tr>
<td>500 Special</td>
<td>350</td>
<td>N/E 1,375</td>
<td>N/E N/E N/E</td>
</tr>
</tbody>
</table>

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(1) Based on sample size $\eta=10$.  
(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.  
(3) Revolvers not normally chambered for this cartridge.
### VELOCITY AND PRESSURE: VELOCITY & PRESSURE DATA – TRANSDUCER

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Velocity (fps)</th>
<th>Transducer Pressure (Solid test barrel, psi/100)$^{(1)}$</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Nominal Mean</td>
</tr>
<tr>
<td>Bullet</td>
<td>Instrumental</td>
<td>Instrumental</td>
</tr>
<tr>
<td>Weight (gr.)</td>
<td>@ 15'</td>
<td>@ 15'</td>
</tr>
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<td>(3) 1,500</td>
<td>(3) 1,500</td>
</tr>
<tr>
<td>95</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9mm Luger</td>
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<td>1,135</td>
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<td>(3) 1,375</td>
<td>(3) 1,375</td>
</tr>
<tr>
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<td></td>
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<td>90 990</td>
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<td>9x23 Winchester</td>
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<tr>
<td>221 Remington Fireball</td>
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<td>2,520</td>
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</tbody>
</table>

$^{(1)}$ Based on sample size $\eta=10$.

$^{(2)}$ Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

$^{(3)}$ Revolvers not normally chambered for this cartridge.
### VELOCITY AND PRESSURE: VELOCITY & PRESSURE DATA – TRANSDUCER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Velocity (fps)</th>
<th>Transducer Pressure (Solid test barrel, psi/100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@ 15' Vented Bbl.</td>
<td>@ 15' Test Bbl.</td>
<td>Maximum</td>
</tr>
<tr>
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<td>Nominal Mean Instrumental</td>
<td>Nominal Mean Instrumental</td>
<td>Pressure (MAP)</td>
</tr>
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<td>900</td>
</tr>
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<td>755</td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>35</td>
<td>(3)</td>
<td>1,200</td>
</tr>
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<td>30 Luger (7.65mm)</td>
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<td>1,190</td>
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<td>(3)</td>
<td>1,240</td>
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</tbody>
</table>

(1) Based on sample size η=10.
(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.
(3) Revolvers not normally chambered for this cartridge.
### VELOCITY AND PRESSURE DATA – TRANSDUCER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Velocity (fps)</th>
<th>Transducer Pressure (Solid test barrel, psi/100)¹</th>
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</thead>
<tbody>
<tr>
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<td>Nominal Mean @ 15'</td>
<td>Nominal Mean @ 15'</td>
</tr>
<tr>
<td>Bullet Weight (gr.)</td>
<td>Vent Bbl.</td>
<td>Test Bbl.</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>101</td>
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<tr>
<td>110</td>
<td>1,270</td>
<td>1,650</td>
</tr>
<tr>
<td>125</td>
<td>1,220</td>
<td>1,500</td>
</tr>
<tr>
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<tr>
<td>158</td>
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<td>1,545</td>
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<tr>
<td>180</td>
<td>1,000</td>
<td>1,400</td>
</tr>
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<td>357 Magnum</td>
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</tr>
<tr>
<td>357 Sig</td>
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</tr>
</tbody>
</table>

¹ Based on sample size $\eta=10$.

(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

(3) Revolvers not normally chambered for this cartridge.
## VELOCITY AND PRESSURE:
### VELOCITY & PRESSURE DATA – TRANSDUCER (Cont’d)

(N/E = Not Established)

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<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Nominal Instrumental Mean Velocity (fps)</th>
<th>Nominal Instrumental @ 15’ Vented Bbl.</th>
<th>Transducer Pressure (Solid test barrel, psi/100)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 Automatic</td>
<td>130</td>
<td>(3) 1,035</td>
<td></td>
<td>265 273 286</td>
</tr>
<tr>
<td>38 Smith &amp; Wesson</td>
<td>145-146</td>
<td>N/E 680</td>
<td></td>
<td>145 150 157</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>950</td>
<td>1,000 N/E</td>
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<tr>
<td></td>
<td>110</td>
<td>N/E 975</td>
<td>945 1,150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>N/E 950</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38 Special</td>
<td>130</td>
<td>N/E 1,050</td>
<td>775</td>
<td>170 175 183</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>N/E 900</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>158</td>
<td>750</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>630</td>
<td>780</td>
<td></td>
</tr>
<tr>
<td>38 Special Match</td>
<td>148</td>
<td>700</td>
<td>800</td>
<td>170 175 183</td>
</tr>
<tr>
<td></td>
<td>158</td>
<td>750</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>38 Special +P</td>
<td>95</td>
<td>1,080</td>
<td>1,330</td>
<td>200 206 215</td>
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<td>945</td>
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<td>110</td>
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<td>125</td>
<td>965</td>
<td>1,135</td>
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<td>130</td>
<td>925</td>
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<tr>
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<td>147</td>
<td>855</td>
<td>985</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>840</td>
<td>1,050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>158</td>
<td>880</td>
<td>1,050</td>
<td></td>
</tr>
</tbody>
</table>

¹ Based on sample size η=10.

² Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

³ Revolvers not normally chambered for this cartridge.

⁴ The velocity figures listed for Match items are nominal values; optimum accuracy may require a velocity different from the nominal values.
### VELOCITY AND PRESSURE:

**VELOCITY & PRESSURE DATA – TRANSDUCER (Cont’d)**

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Velocities (fps)</th>
<th>Transducer Pressure (Solid test barrel, psi/100)$^{(1)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nominal Mean</td>
<td>Nominal Mean Instrumental @ 15’</td>
</tr>
<tr>
<td></td>
<td>Weight (gr.)</td>
<td>@ 15’ Vented Bbl.$^{(2)}$</td>
</tr>
<tr>
<td>38 Super Automatic +P</td>
<td>115 (3)</td>
<td>1,280</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>1,230</td>
</tr>
<tr>
<td></td>
<td>130</td>
<td>1,200</td>
</tr>
<tr>
<td>380 Automatic</td>
<td>65 (3)</td>
<td>1,050</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>980</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>990</td>
</tr>
<tr>
<td></td>
<td>88-90</td>
<td>980</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>945</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>910</td>
</tr>
<tr>
<td>40 Smith &amp; Wesson</td>
<td>125 (3)</td>
<td>1,300</td>
</tr>
<tr>
<td></td>
<td>135</td>
<td>1,150</td>
</tr>
<tr>
<td></td>
<td>140</td>
<td>1,185</td>
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<td>1,135</td>
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<td>180</td>
<td>985</td>
</tr>
<tr>
<td>400 Cor-Bon</td>
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</tr>
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</tr>
<tr>
<td></td>
<td>165</td>
<td>1,300</td>
</tr>
<tr>
<td>41 Remington Magnum</td>
<td>170</td>
<td>1,400</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>1,250</td>
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<td>180</td>
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</tr>
<tr>
<td></td>
<td>180 N/E</td>
<td>1,550</td>
</tr>
<tr>
<td></td>
<td>180 N/E</td>
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<tr>
<td></td>
<td>955</td>
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</tr>
<tr>
<td></td>
<td>1280</td>
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</tbody>
</table>

$^{(1)}$ Based on sample size $\eta=10$.

$^{(2)}$ Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

$^{(3)}$ Revolvers not normally chambered for this cartridge.
<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Nominal Velocity @ 15'</th>
<th>Nominal Instrumental Velocity @ 15'</th>
<th>Transducer Pressure (MAP)</th>
<th>Maximum Average Pressure (MPLM)</th>
<th>Maximum Probable Pressure (MPSM)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vented Bbl. (2)</td>
<td>Test Bbl.</td>
<td>(fps)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 Remington Magnum</td>
<td>180</td>
<td>1,600</td>
<td>1,800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>210</td>
<td>1,250</td>
<td>1,425</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>220</td>
<td>N/E</td>
<td>1,580</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
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<td></td>
<td>240</td>
<td>995</td>
<td>1,175</td>
<td>360</td>
<td>371</td>
<td>388</td>
</tr>
<tr>
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<td></td>
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<td>1,500</td>
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<td>1,170</td>
<td>1,600</td>
<td></td>
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<td>1,335</td>
<td>1,600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>250</td>
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<td>1,150</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>300</td>
<td>N/E</td>
<td>1,200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 S&amp;W Special</td>
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</tbody>
</table>

(1) Based on sample size η=10.
(2) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.
### VELOCITY AND PRESSURE: VELOCITY & PRESSURE DATA – TRANSDUCER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Velocity (fps)</th>
<th>Transducer Pressure (Solid test barrel, psi/100)(^{(1)})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@ 15’</td>
<td>Nominal Mean</td>
<td>Maximum Average Pressure (MAP)</td>
</tr>
<tr>
<td></td>
<td>Vented Bbl.(^{(2)})</td>
<td>Instrumental</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test Bbl.</td>
<td>Instrumental</td>
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#### 45 Automatic

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<td>165</td>
<td>1,065</td>
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<tr>
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<td>170</td>
<td>1,050</td>
<td></td>
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</tr>
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<td>185</td>
<td>915</td>
<td>230</td>
<td>237</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>995</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>230</td>
<td>870</td>
<td>915</td>
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#### 45 Automatic Match\(^{(4)}\)

<table>
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#### 45 Automatic +P

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<tr>
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<th>990</th>
<th>230</th>
<th>237</th>
<th>248</th>
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</thead>
<tbody>
<tr>
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#### 45 Auto Rim

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<th>825</th>
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<th>N/E</th>
<th>N/E</th>
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#### 45 Colt

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<tbody>
<tr>
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<td>915</td>
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<td></td>
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<tr>
<td></td>
<td>250</td>
<td>950</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>250-255</td>
<td>750</td>
<td></td>
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#### 45 Glock Automatic Pistol

<table>
<thead>
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<th>995</th>
<th>230</th>
<th>237</th>
<th>248</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

#### 45 Winchester Magnum

<table>
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<th>1,380</th>
<th>415</th>
<th>428</th>
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<tbody>
<tr>
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<td>260</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

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\(^{(1)}\) Based on sample size \(\eta=10\).

\(^{(2)}\) Vented barrel velocities are provided for information only. Vented test barrels are used for the establishment of catalog velocity values for cartridges normally chambered in revolvers.

\(^{(3)}\) Revolvers not normally chambered for this cartridge.

\(^{(4)}\) The velocity figures listed for Match items are nominal values; optimum accuracy may require a velocity different from the nominal values.
### VELOCITY AND PRESSURE: VELOCITY & PRESSURE DATA – TRANSDUCER (Cont’d)

(N/E = Not Established)

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (gr.)</th>
<th>Nominal Velocity (fps)</th>
<th>Nominal Pressure (MAP)</th>
<th>Transducer Pressure (Solid test barrel, psi/100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>454 Casull</td>
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<td>1,420</td>
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<td>650, 671, 702</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>1,775</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>260</td>
<td>2,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>1,625</td>
<td>1,825</td>
<td></td>
</tr>
<tr>
<td>460 S&amp;W Magnum</td>
<td>200</td>
<td>N/E</td>
<td>2,540</td>
<td>650, 671, 702</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>1,650</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>260</td>
<td>2,150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>475 Linebaugh</td>
<td>400</td>
<td>1,300</td>
<td>1,400</td>
<td>500, 516, 540</td>
</tr>
<tr>
<td>480 Ruger</td>
<td>325</td>
<td>1,350</td>
<td>1,425</td>
<td>480, 495, 518</td>
</tr>
<tr>
<td>50 Action Express</td>
<td>325</td>
<td>(3)</td>
<td>1,400</td>
<td>350, 361, 378</td>
</tr>
<tr>
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<td>275</td>
<td>N/E</td>
<td>1,620</td>
<td></td>
</tr>
<tr>
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<td>300</td>
<td></td>
<td>2,050</td>
<td></td>
</tr>
<tr>
<td>500 S&amp;W Magnum</td>
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<td>1,400</td>
<td>600, 619, 647</td>
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<td>1,625</td>
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</tr>
<tr>
<td>500 Special</td>
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<td>1,375</td>
<td>360, 371, 388</td>
</tr>
</tbody>
</table>

(1) Based on sample size $\eta=10$.

(2) Vented barrel velocities are provided for information only. These values are not used for product manufacturing control.

(3) Revolvers not normally chambered for this cartridge.
BULLET TYPE ABBREVIATIONS

LEAD:
HP .................. Hollow Point
L .................. Lead
LHP .................. Lead Hollow Point
LSWC ............. Lead Semi-Wadcutter
LWC ............. Lead Wadcutter
MP .............. Metal Point
SWC ............. Semi-Wadcutter
SWCHP .......... Semi-Wadcutter Hollow Point

JACKETED:
BJHP .............. Brass Jacketed Hollow Point
FP .................. Flat Point
FMJ .............. Full Metal Jacket
FMC .............. Full Metal Case
JFP .............. Jacketed Flat Point
JHP .............. Jacketed Hollow Point
JSP .............. Jacketed Soft Point
MC .............. Metal Case
MCHP ............ Metal Case Hollow Point
PHP .............. Plated Hollow Point
PSP .............. Pointed Soft Point
PT .............. Polymer Tip
SP .............. Soft Point

SEMI-JACKETED:
SJHP .............. Semi-Jacketed Hollow Point
SJSP .............. Semi-Jacketed Soft Point

OTHER:
Solid ................ Indicates a bullet constructed of a single material other than lead.
PRIMERS AND PRIMER POCKETS

CUP MAY BE ROUNDED OR FLAT

“Small Pistol” Primer
“Small Rifle” Primer

“Large Pistol” Primer

“Large Rifle” Primer

PRIMERS TO BE SEATED FLUSH TO 0.008” (0.20) BELOW FACE OF CARTRIDGE CASE HEAD

NOTE
(XX.XX) = MILLIMETERS
Section I – Characteristics
Centerfire Pistol & Revolver
Saami Voluntary Performance Standards

Notice: This drawing is subject to change. Current version is available at www.saami.org.

Maximum Cartridge / Minimum Chamber

9mm Luger / 9mm Luger +P

Cartridge and Chamber Drawing

9mm Luger / 9mm Luger +P

Note:

B = Basic
Ω = Headspace Dimension
Δ = Reference Dimension
(XX.XX) = Millimeters
* = Dimensions to Intersections of Lines
All calculations apply at maximum material condition (MMC)
NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
(XX.XX) = MILLIMETERS
*= DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

9x23 Winchester

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE AND CHAMBER DRAWING
10mm AUTOMATIC

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

10MM AUTOMATIC

NOTE
B = BASIC
Ø = HEADSPACE DIMENSION
(XX.XX) = MILLIMETERS
*= DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

221 REMINGTON FIREBALL

CARTRIDGE UNLESS OTHERWISE NOTE
BODY DIA ~008 (0.20)

BULLET

1.400 (35.56) MIN
1.780 (45.21) MAX
1.830 (46.48) MAX

BREACH FACE

0.300 (0.76) MAX
0.450 (1.14) MIN
0.270 (0.69) MIN

35°
20°

0.375 (9.60) Min
0.378 (9.63) Min

330 (8.38) B
3618 (9.190) A
3607 (9.162) A

25°-6° 23° B

0.250 (0.64) R MAX

0.800 (20.32) B

1.0707 (27.196) A
1.1068 (28.113) MIN
1.1975 (30.417) A
1.400 (35.56) MIN

0.030 (0.76) MAX
0.145 (3.69) MIN

1.138 (28.82) MAX
1.1038 (28.037) MIN

1.922 (3.282) A
1.4320 (36.437)
1.4470 (36.754) A
1.4720 (37.389) A
1.4911 (37.874)
1.5197 (38.600) A

0.025 (0.64) R MAX

0.060 (1.58) R MAX

1.760 (44.71) MIN
1.820 (46.22) MAX

219 (5.56) BORE DIA
1.224 (5.69) GROOVE DIA
2.224 (5.64) B

3.500 (88.38) A
3.610 (91.68) A
3.650 (92.71) A
3.769 (95.73)

0.304 (7.72) A
0.3804 (9.662)

A = REFERENCE DIMENSION
\( \Delta \) = REFERENCE DIMENSION
\( \Theta \) = HEADSPACE DIMENSION
(XX.XX) = MILLIMETERS
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

NOTE
B = BASIC
Ø = HEADSPACE DIMENSION
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ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER
30 LUGER (7.65MM)

NOTE
B = BASIC
(XX.XX) = MILLIMETERS
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTION OF LINES
Δ = REFERENCE DIMENSION
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CARTRIDGE AND CHAMBER DRAWING
30 LUGER (7.65mm)

34
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

CARTRIDGE AND CHAMBER DRAWING
32 SHORT COLT

NOTE
B = BASIC
Ø = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
XX.XX = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.
NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

Δ = REFERENCE DIMENSION
(XX.XX) = MILLIMETERS

MAXIMUM CARTRIDGE / MINIMUM CHAMBER
32 SMITH & WESSON

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.002 (.05)
LENGTH TOL +.015 (.38)

BULLET (.3150-.0060)
(8.001-.152)

Maximum Cartridge / Minimum Chamber

32 SMITH & WESSON
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER

SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE AND CHAMBER DRAWING
32 SMITH & WESSON LONG
(32 COLT NEW POLICE)

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

32 SMITH & WESSON LONG
(32 COLT NEW POLICE)

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

BREACH FACE

BARREL FACE

5 GROOVES

Δ .095+.002(2.41+.05)WIDE
TWIST 18.75(476.3) LH
OPTIONAL

MIN BORE & GROOVE AREA
.074.3 SQ. IN. (47.935 mm²)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL +.015 (0.38)

NOT ALL MANUFACTURERS USE A RECESS IN THE CYLINDER

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
XX.XX = MILLIMETERS
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

### SAAMI VOLUNTARY PERFORMANCE STANDARDS

**SECTION I – CHARACTERISTICS**

**CENTERFIRE PISTOL & REVOLVER**

**CARTRIDGE AND CHAMBER DRAWING**

**32 SMITH & WESSON LONG WADCUTTER**

**NOTE**

B = BASIC

\(\times\) = HEADSPACE DIMENSION

\(\ast\) = DIMENSIONS TO INTERSECTIONS OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.008 (0.20)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL +.015 (0.38)

Δ 5 GROOVES
Δ .095+.002 (2.41+0.05) WIDE
TWIST 16.00 (406.4) LH – OPTIONAL
MIN. BORE & GROOVE AREA:
.0742 IN² (47.870 mm²)

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
(XX.XX) = MILLIMETERS
*= DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
**NOTE**

B = BASIC  \( \Delta = \) REFERENCE DIMENSION

\( \Theta = \) HEADSPACE DIMENSION  \( (XX.XX) = \) MILLIMETERS

\( * = \) DIMENSIONS TO INTERSECTIONS OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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**NOTICE:** This drawing is subject to change. Current version is available at www.saami.org.
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

357 MAGNUM

NOTE
B = BASIC
Ο = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

357 SIG

NOTE: This drawing is subject to change. Current version is available at www.saami.org.
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER

CARTRIDGE AND CHAMBER DRAWING
38 SMITH & WESSON
(38 COLT NEW POLICE)

SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change.
Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER
38 SMITH & WESSON
(38 COLT NEW POLICE)

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

\[ \Delta = \text{REFERENCE DIMENSION} \]

\[ (XX.XX) = \text{MILLIMETERS} \]

\[ \Delta 5 \text{ GROOVES} \]
\[ \Delta .114 + .002 (2.90 + 0.05) \text{ WIDE} \]
\[ TWIST 18.75 (476.3) \text{ LH-OPTIONAL} \]
\[ \text{MIN BORE & GROOVE AREA} \]
\[ .0990 \text{ SQ IN. (63.871 mm}^2) \]

BULLET
3610-0060
(9.169-0152)

BARREL FACE
.
.

\[ .555-010 \]
\[ (1.40-0.25) \]
\[ .040-010 \]
\[ (1.02-0.25) \]
\[ 35^\circ+20^\circ \]

\[ .440-012 \]
\[ (1.18-0.30) \]
\[ .3865 \Delta \]
\[ (9.817) \]

\[ .200 B \]
\[ (5.08) \]

\[ .775-020 \]
\[ (19.69-0.51) \]

\[ 1.150 (29.21) \text{ MIN} \]
\[ 1.240 (31.50) \text{ MAX} \]

UNDERCUT AHEAD OF RIM IS OPTIONAL

NOT ALL MANUFACTURERS USE A RECESS IN THE CYLINDER

\[
\begin{align*}
3856 (9.794) & \Delta \\
3855 (9.792) & \Delta \\
3863 (9.812) & \\
3865 (9.817) & \\
\end{align*}
\]

\[ .200 B \]
\[ (5.08) \]

\[ .500 B \]
\[ (12.70) \]

\[ \text{CYLINDER FACE} \]

\[ \text{BORE DIA} \]
\[ .350 (8.89) \]
\[ .3595 (9.13) \]

\[ \text{GROOVE DIA} \]

\[ .3900 \Delta \]
\[ (9.906) \]

\[ .7738 (19.655) \Delta \]

\[ .8144 (20.686) \]

\[ .8324 (21.143) \Delta \]

\[ \Delta 5 \text{ GROOVES} \]
\[ \Delta .114 + .002 (2.90 + 0.05) \text{ WIDE} \]
\[ TWIST 18.75 (476.3) \text{ LH-OPTIONAL} \]
\[ \text{MIN BORE & GROOVE AREA} \]
\[ .0990 \text{ SQ IN. (63.871 mm}^2) \]

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

Maximum Cartridge / Minimum Chamber

38 Special / 38 Special +P

Cartridge

Unless otherwise noted,
Body Dia. -.006 (0.15)

Cylinder

Lead Bullet

Jacketed Bullet

NOT ALL MANUFACTURERS USE A RECESS IN THE CYLINDER

NOTE
B = Basic
O = Headspace Dimension
* = Dimensions to Intersections of Lines

All calculations apply at maximum material condition (MMC)

6 Grooves
Δ .105+.002 (2.67+0.05) Wide
Twist 18.75 (476.3) RH – Optional
Min. Bore & Groove Area:
.0969 in² (62.516 mm²)

Notice: This drawing is subject to change. Current version is available at www.saami.org.
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

38 SPECIAL MATCH

NOTE

B = BASIC

= HEADSPACE DIMENSION

= DIMENSIONS TO INTERSECTIONS OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

$\Delta$ 6 GROOVES

$\Delta$ $0.105 + 0.002 (2.67 + 0.05)$ WIDE

TWIST 18.75 (476.3) RH – OPTIONAL

MIN. BORE & GROOVE AREA:

$0.0969 \text{ in}^2 (62.516 \text{ mm}^2)$
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

CARTRIDGE AND CHAMBER DRAWING
38 SUPER AUTOMATIC +P / 38 AUTOMATIC

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

38 SUPER AUTOMATIC +P
38 AUTOMATIC

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

NOTE
B = BASIC  Δ = REFERENCE DIMENSION
Θ = HEADSPACE DIMENSION  (XX,XX) = MILLIMETERS
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

**CARTRIDGE AND CHAMBER DRAWING**

**380 AUTOMATIC**

**MAXIMUM CARTRIDGE / MINIMUM CHAMBER**

**380 AUTOMATIC**

Notice: This drawing is subject to change. Current version is available at www.saami.org.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORE DIA</td>
<td>355 (9.02)</td>
</tr>
<tr>
<td>GROOVE DIA</td>
<td>348 (8.84)</td>
</tr>
<tr>
<td>CARTRIDGE</td>
<td>UNLESS OTHERWISE NOTED</td>
</tr>
<tr>
<td>BODY DIA -</td>
<td>.006 (0.15)</td>
</tr>
<tr>
<td>MAXIMUM CARTRIDGE / MINIMUM CHAMBER</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

- B = BASIC
- (XX.XX) = MILLIMETERS
- ⊗ = HEADSPACE DIMENSION
- △ = REFERENCE DIMENSION
- *DIMENSIONS ARE TO INTERSECTION OF LINES ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.
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SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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MAXIMUM CARTRIDGE / MINIMUM CHAMBER

41 REMINGTON MAGNUM

NOTE
B = BASIC
Ø = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CARTRIDGE AND CHAMBER DRAWING
41 REMINGTON MAGNUM

LEAD BULLET
0.59-0.10 (1.50-0.25)
0.44-0.10 (1.12-0.25)
35° +20°

CENTERFIRE PISTOL & REVOLVER CARTRIDGE AND CHAMBER DRAWING
41 REMINGTON MAGNUM

SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTE
B = BASIC
Ø = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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CARTRIDGE AND CHAMBER DRAWING
44 REMINGTON MAGNUM

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA. -.006 (0.15)

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

BREACH FACE

CYLINDER FACE

BORE DIA

GROOVE DIA

BARREL FACE

NOT ALL MANUFACTURERS USE A RECESS IN THE CYLINDER

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
(XX XXX) = MILLIMETERS
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL +.015 (0.38)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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CARTRIDGE AND CHAMBER DRAWING
44 SMITH & WESSON SPECIAL

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

**44 SMITH & WESSON SPECIAL**

**CARTRIDGE**
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

**CHAMBER**
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL. +.015 (0.638)

---

**NOTE**
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
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* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE AND CHAMBER DRAWING
45 AUTOMATIC / 45 AUTOMATIC +P

MAXIMUM CARTRIDGE / MINIMUM CHAMBER
45 AUTOMATIC / 45 AUTOMATIC +P

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NOTE

B = BASIC
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ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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CARTRIDGE AND CHAMBER DRAWING
45 AUTO RIM

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

45 AUTO RIM

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
*= DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

NOT ALL MANUFACTURERS USE A RECESS IN THE CYLINDER

△ 6 GROOVES
△ .156+.002 (3.96+0.05) WIDE
TWIST 16.00 (406.4) LH – OPTIONAL
MIN. BORE & GROOVE AREA:
.1582 IN² (102.064 mm²)

BULLET (.4520-.0060)
1.1481-.1522
65°±20°

UNDERCUT AHEAD OF RIM IS OPTIONAL

.089-.010
(2.26-.25)
.074-.010
(1.88-.25)
.4755(12.078)
.4723(11.996)
.4720(11.989)△

.516-.012
(13.11-.30)
.4760△
(12.090)
.200 B
(5.08)
.645 B
(16.38)
.898-.020
(22.81-.51)

.4555(11.570)

.090(2.29)MIN
.104(2.64)MAX

.4730(12.04)△
.4734(12.024)
.4785(12.154)

.526+.012
(13.36+.30)
.4794△
(12.177)
.200 B
(5.08)
.645 B
(16.38)
.900(22.86)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL +.015 (0.38)

△ .156+.002 (3.96+0.05) WIDE
TWIST 16.00 (406.4) LH – OPTIONAL
MIN. BORE & GROOVE AREA:
.1582 IN² (102.064 mm²)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL +.015 (0.38)

NOTE
B = BASIC
⊗ = HEADSPACE DIMENSION
*= DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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MAXIMUM CARTRIDGE / MINIMUM CHAMBER

45 GLOCK AUTOMATIC PISTOL

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

CHAMBER
UNLESS OTHERWISE NOTED
ALL DIA +.004 (0.10)
LENGTH TOL +.015 (0.38)
Δ 6 GROOVES
Δ .147+.002 (3.73+0.05) WIDE
TWIST 16.00 (406.4) LH – OPTIONAL
MIN. BORE & GROOVE AREA:
.1570 IN² (101.290 mm²)

NOTE
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
(XX.XX) = MILLIMETERS
*= DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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CARTRIDGE AND CHAMBER DRAWING
45 WINCHESTER MAGNUM

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

45 WINCHESTER MAGNUM

CARTRIDGE
UNLESS OTHERWISE NOTED
BODY DIA -.006 (0.15)

BREECH FACE

NOTE
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
(XX.XX) = MILLIMETERS
* = DIMENSIONS TO INTERSECTIONS OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

454 CASULL

NOTE:
B = BASIC
\( \phi \) = HEADSPACE DIMENSION
\( \Delta \) = REFERENCE DIMENSION
*DIMENSIONS ARE TO INTERSECTION OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

\( \Delta \) 6 GROOVES
\( \Delta \) 1.60 + .002 [4.06 + 0.05] WIDE
TWIST: 24,000 ± 125 [609.6 ± 3.18] R.H.
MIN. BORE & GROOVE
AREA: .1585 SQ. IN. [102.257 mm²]
NOTE:

B = BASIC
Φ = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
*DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

Δ.5 GROOVES
Δ.144+0.003 [3.66+0.08] WIDE
TWIST: 20 [508.0] R.H. OPTIONAL
MIN. BORE & GROOVE
AREA: .1572 SQ. IN. [101.419 mm²]
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

475 LINEBAUGH

BULLET

CARTRIDGE

UNLESS OTHERWISE NOTED
BODY DIA. -.006 [0.15]

MAXIMUM CARTRIDGE

MINIMUM CHAMBER

0.504 [12.80]

0.542 [.007 35°+20° 13.77 -0.18]

0.4755 [-0.0030 12.078 -0.076]

0.504 [12.80]

1.400 -.020 [35.56 -.051]

1.765 -.100 [44.83 -2.54]

1.400 - .020

0.504 [12.80]

990 [25.15] B

.200 [5.08] B

30° B

5° B

BARREL FACE

CYLINDER FACE

.071 [.085] MIN

BREECH FACE

.085 [2.16] MAX

R.010 MAX

[0.25]

5042 [12.806] Δ

5060 [12.852]

5045 [12.814]

.4755 [12.078]

.475 [12.07]

GROOVE DIA

.465 [11.81] BORE DIA

NOTE:

B = BASIC
XX.XX = MILLIMETERS
Θ = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
*DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

Δ.6 GROOVES
Δ.160 +0.002 [4.06 +0.05] WIDE
TWIST: 18 [457.2] R.H. OPTIONAL
MIN. BORE & GROOVE
AREA: .1747 SQ. IN. [112.097 mm²]
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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MAXIMUM CARTRIDGE / MINIMUM CHAMBER

480 RUGER

NOTE:
B = BASIC
Θ = HEADSPACE DIMENSION [XX.XX] = MILLIMETERS
*DIMENSIONS ARE TO INTERSECTION OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CHAMBER
UNLESS OTHERWISE NOTED
All Dia. + .004 [0.10]
Length Tol. + .012 [0.30]
Δ6 GROOVES
Δ.160+.002 [4.06+.005] WIDE
Twist: 18 [457.2] R.H. OPTIONAL
Min. Bore & Groove
Area: .1747 SQ. IN. [112.709 mm²]
NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE UNLESS OTHERWISE NOTED BODY DIA. -.006 (0.15)

50 ACTION EXPRESS

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

B = BASIC
(XX.XX) = MILLIMETERS
Ω = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
* DIMENSIONS ARE TO INTERSECTION OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (M.M.C.)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

500 SMITH & WESSON MAGNUM

NOTE:
B = BASIC
Ø = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
* DIMENSIONS ARE TO INTERSECTION OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

6 GROOVES
Δ .130+.003 (3.30+0.08) WIDE
TWIST: 18.75 (476.3) R.H. OPTIONAL
MIN BORE & GROOVE AREA: .1911 IN² (123.29 mm²)
SECTION I – CHARACTERISTICS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

NOTICE: This drawing is subject to change. Current version is available at www.saami.org.

CARTRIDGE AND CHAMBER DRAWING
500 SPECIAL

MAXIMUM CARTRIDGE / MINIMUM CHAMBER

500 SPECIAL

NOTE:
B = BASIC
Ø = HEADSPACE DIMENSION
Δ = REFERENCE DIMENSION
* DIMENSIONS ARE TO INTERSECTION OF LINES
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

Δ 6 GROOVES
Δ .130+.003 (3.30+0.08) WIDE
TWIST: 18.75 (476.3) R.H. OPTIONAL
MIN BORE & GROOVE AREA: .1911 in² (123.29 mm²)

68
To be considered “frangible” against AR500 steel targets for the purposes of law enforcement training, ammunition for centerfire pistol and revolver shall not produce any individual fragments weighing more than 5% of the nominal bullet weight when tested as follows:

(1) A sample size of ten (10) rounds shall be fired.

(2) The distance from the muzzle to the impact point shall be 10.0’ ± 1.0’ (3.0 m ± 0.3 m).

(3) A minimum of 85% of the total nominal weight of the bullets fired shall be recovered.

(4) Testing is in accordance with the procedures detailed in Section II and equipment as shown in Section III.
**BASIC CARTRIDGE**

Conventional cartridge case; black oxide finish or visual equivalent

- 0.060 ± 0.010
  - (1.52 ± 0.25)

Hole in primer cup - **REQUIRED**

Conventional bullet of weight appropriate for the cartridge; natural finish

- 0.085 ± 0.010
  - (2.16 ± 0.25)

**ALTERNATE CARTRIDGE**

Conventional cartridge case; black oxide finish or visual equivalent

- Conventional headstamp
- No primer pocket or flash hole

Conventional bullet of weight appropriate for the cartridge; natural finish

- 0.085 ± 0.010
  - (2.16 ± 0.25)

Hole(s) optional

**NOTE**

Illustrates form only!
Pertinent dimensions shown on appropriate cartridge drawing.

(XX.XX) = millimeters
**NOTE**
Illustrates form only!
Pertinent dimensions shown on appropriate cartridge drawing.

(XX.XX) = millimeters
NOTE
Illustrates form only!
Pertinent dimensions shown on appropriate cartridge drawing.
TOLERANCE – BULLET WEIGHT

1. Lead and lead-core bullets:

   Less than 100 grains.............................. Nominal weight ± 2.0%

   Equal to or greater than 100 grains ...... Nominal weight ± 1.5%

2. Bullets of principally non-lead construction:

   All bullet weights................................. Nominal weight ± 3.0%
PROCEDURE: VELOCITY & PRESSURE TESTING

I. SCOPE
A. This procedure covers the testing of ammunition for assessment of velocity and pressure using either the copper crusher method of pressure measurement or with piezoelectric pressure transducers (“transducers”).

II. GENERAL
A. When testing using copper crushers, velocities and pressures are measured simultaneously using test barrels fitted with short pistons and gas checks.
B. When testing using transducers, velocities and pressures are measured simultaneously.
C. Recommended values for velocity and pressure of all centerfire pistol and revolver cartridges are tabulated in Section I. When required, a retest of double the original quantity may be fired with statistically equivalent tolerances.
D. Velocities and pressures should be measured using horizontally-mounted test barrels in accordance with the drawings and descriptions listed in Section III.

III. EQUIPMENT
A. COMMON

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Universal receiver</td>
<td>“Frankford Arsenal”</td>
<td>or equivalent</td>
</tr>
<tr>
<td>2. Photoelectric screens</td>
<td>Oehler Model 55 or 57</td>
<td>or equivalent</td>
</tr>
<tr>
<td>3. Ballistic measurement system</td>
<td>Oehler Model 85</td>
<td>or equivalent</td>
</tr>
</tbody>
</table>

B. COPPER CRUSHER TESTING

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Test barrel</td>
<td>Piston type</td>
<td>- - -</td>
</tr>
<tr>
<td>2. Pistons</td>
<td>Short</td>
<td>- - -</td>
</tr>
<tr>
<td>3. Gas Checks</td>
<td>0.206”, waxed or unfilled</td>
<td>- - -</td>
</tr>
<tr>
<td>4. Copper crushers</td>
<td>.146” x .400” or .225” x .400” as needed</td>
<td>- - -</td>
</tr>
<tr>
<td>5. Micrometer</td>
<td>Capable of measuring to 0.0005”</td>
<td>- - -</td>
</tr>
<tr>
<td>6. Tarage table</td>
<td>Specific for lot of crushers in use</td>
<td>- - -</td>
</tr>
</tbody>
</table>

C. TRANSDUCER TESTING

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Charge Amplifier</td>
<td>PCB, Model 443B02</td>
<td>or equivalent</td>
</tr>
<tr>
<td>2. Voltmeter, Peak Capture</td>
<td>PCB, Model 444A152</td>
<td>or equivalent</td>
</tr>
<tr>
<td>3. Transducer</td>
<td>PCB, Model 117BXXX</td>
<td>or equivalent</td>
</tr>
<tr>
<td>4. Low Noise Cable</td>
<td>PCB, Model 003CXX</td>
<td>or equivalent</td>
</tr>
<tr>
<td>5. Integrated Data</td>
<td>Oehler Research, Inc., System 85</td>
<td>or equivalent</td>
</tr>
</tbody>
</table>
IV. HANDLING OF AMMUNITION

A. Cartridges to be tested should be placed in a vertical position with primer-end down in a recessed holding block.

B. When the appropriate test barrel has been properly serviced and the chronograph reset, a cartridge should be lifted vertically from the block. It should be rotated slowly, end over end, in a vertical plane through 360° pausing momentarily when the powder is at the bullet end and again when the powder is at the primer end.

C. The cartridge is then rotated slowly, a minimum amount to enter the chamber, keeping the primer end in the lowest possible position until inserted gently and carefully into the chamber.

D. The cartridge should be seated in the chamber as far as practicable with the fingers. The bolt or breech mechanism should be closed gently in order not to disturb the position of the powder in the cartridge case. The object of this method of handling cartridges is to position the propellant powder at the primer end of the cartridge case by permitting it to fall gently against the primer while rotating the case.

E. The rate of fire should not be rapid enough to cause excessive heating of the barrel. The time between rounds depends on the equipment, as the barrel may be cooled by a constant stream of air on the outside or by directing air through the bore after each ten rounds.

F. Ammunition conditioning should be between 60° - 80°F (15.6° - 26.7°C).

G. A minimum of one and up to three warming shots should be fired before firing each series for record. The velocity and/or pressure of these shots may be recorded, but should not be included in the record of the sample.

V. PRESSURE DETERMINATION

A. COPPER CRUSHER TESTING

1. Insert wax-filled gas check in piston hole with open end toward chamber and seat to approximately one-half the depth of the piston hole with seating tool. (Exceptions: 357 Magnum, 41 Remington Magnum – unfilled gas checks may be used.)

2. Dip piston shank in oil and drain until but one drop of oil remains. Scrape the remaining drop from the bottom of the piston or blot remaining oil on a flannel patch.

3. Insert piston in piston hole and seat on gas check manually. Do not force by striking or hammering.

   CAUTION: The piston must be checked to make sure it slides freely, but not loosely, in the piston hole at all times. If the piston does not slide freely, it should be withdrawn from the piston hole and examined. Any black deposits should be removed with worn crocus cloth. If the piston is still not free in the piston hole, the hole should be cleaned with worn crocus cloth.

4. Insert cartridge to be tested in chamber of standard velocity and pressure test barrel in the manner described in paragraphs IV(B) through IV(D), above.

5. Using finger pressure, push the piston down into the piston hole until the piston/gas check is fully seated.

6. Center crusher cylinder appropriate for the cartridge under test upon the head of the piston. Slide the anvil bridge so as to center it over the crusher/piston and securely
tighten the set screws on the bridge. Gently tighten the anvil against the crusher cylinder using light finger pressure.

**CAUTION:** Overtightening the anvil can cause precompression of the crusher cylinder and affect the subsequent pressure reading. Use care to not over-tighten the anvil.

**CAUTION:** The face of the piston head, face of set screw and faces of crusher must be free from oil.

7. The breech mechanism should be closed gently.
8. After firing the cartridge, the compressed crusher cylinder should be removed and measured for remaining length. Pressure is determined from this length by the use of the Tarage Table, furnished with the cylinders, for the piston diameter used.
9. Wax-filled gas checks should be changed after firing each series of two warming shots and ten rounds for record. Unfilled gas checks should be removed after each shot by driving the gas check downward with the knockout tool.
10. The fired cartridge case containing the gas check and disk blanked from the cartridge case is removed from the chamber.
11. Gas checks knocked into the bore should be ejected from the muzzle by the introduction of compressed air directed through the chamber.

**CAUTION:** The chamber and bore should be checked to make certain that the barrel is unobstructed before proceeding further.

12. For subsequent shots in a series, the procedure shown in paragraphs V(A)(1) through V(A)(11) is repeated.

B. PIEZO-ELECTRIC TRANSDUCER TESTING

1. **EQUIPMENT PREPARATION**
   1.1 Refer to the SAAMI-recommended piezo pressure transducer installation in a pressure barrel illustrated in Section III.
   1.2 The charge amplifier and peak capture voltmeter should have a certified calibration traceable to the National Institute of Standards and Technology.

2. **INITIAL SET-UP**
2.1 Turn on the electronic equipment and allow to stabilize as recommended by the manufacturer.

2.2 Inspect the transducer mounting cavity in the pressure barrel to assure that the seal seat is free of dirt and any other foreign matter.

2.3 Mount transducer with steel spacer rings into the test barrel as described in PCB Operating Instructions Manual.

2.4 Loosen, but do not remove, the slotted clamp.

2.5 Thread the transducer into the mounting port. Adjust the slotted clamp to allow guide pin to enter guide hole. Continue to turn transducer nut into the mounting port. When transducer bottoms, tighten the slotted clamp and torque the transducer as recommended by the manufacturer.

2.6 It is essential that the sensing surface of the transducer be flush with the chamber inside diameter. Care must be exercised to obtain correct depth as well as exact rotational alignment. Depth adjustment is accomplished by the use of various thickness spacers. In order to set the depth exactly it may be necessary to hone the spacers to the desired thickness.

2.7 Connect equipment as shown in Figure 5 or Figure 6, page 91-92.

   a. NOTE: Configurations 1 and 2 are interchangeable.

   **IMPORTANT:** Always switch the amplifier to the “zero lock” mode by pressing the “ZERO” button before making connections to the Model 443B02, and allow switch to remain in this position during such connections. This protects the FET input stage against possible gate damage from excessive accumulated static charge.

2.8 Set the charge amplifier controls for 0.2 Hz short time constant, transducer sensitivity to the slope (m) obtained from the transducer least square line equation, output sensitivity to 0.100 mV/unit, and set the amplifier to operating mode (releasing the “zero lock” by pressing the “ZERO” button a second time).

2.9 Select digital peak meter, positive input, peak mode, and 10-volt range.

2.10 Take note of the transducer offset value (P) obtained from the least square line equation. This value will be used later in making final peak pressure determination.

   (a) The offset value may also be dialed into an instrumentation system capable of providing direct peak pressures without data manipulation.

3. **PROCEDURE**

3.1 Reset all pressure instrumentation and assure that the peak meter digital display reads all zeros. Test rounds may now be fired.

3.2 For each round fired, the pressure reading on the digital display should be recorded and pressure instrumentation reset.

4. **PEAK PRESSURE DETERMINATION**

4.1 To determine peak pressures, add as required, the pressure offset value to the pressure readings obtained in the firing test. Adding the offset value is not required if it is dialed in on the peak meter.

**VI. VELOCITY DETERMINATION**
A. Handling of the ammunition should be in accordance with the instructions in paragraph IV.

B. Photoelectric screens should be arranged in accordance with the arrangement shown in Section III, page 131, “Equipment: Schematic Layout of Velocity Screens”.

C. A table of time of flight vs. velocity should be used to determine instrumental velocity at 15 feet (4.57 m), nominal, from the gun muzzle (not required when using direct reading equipment).

D. It is recommended that a blast shield be positioned between the muzzle of the Universal Receiver test barrel and the first velocity screen to minimize possibility of premature triggering of the velocity screens. With velocities below the speed of sound, the muzzle blast and/or muzzle flash will reach the screen before the bullet and may cause premature triggering of the screen. For example, premature triggering of the first screen will result in abnormally low velocity readings. Premature triggering of both screens will result in velocity readings which correspond to the speed of sound (approximately 1,120 fps at sea level and normal atmospheric conditions).

   (i) The blast shield should be made of rigid, opaque material of sufficient strength to withstand the shock wave but not be resistant to the passage of the projectile.

VII. RECORDING OF TEST RESULTS

A. The following data should be recorded for each series of shots fired for velocity and pressure.

   1. Ammunition Data
      1.1 Date of test
      1.2 Nominal cartridge identification
      1.3 Cartridge caliber
      1.4 Bullet weight and type
      1.5 Powder charge, type, and lot
      1.6 Priming
      1.7 Type of lubricant (if any)
      1.8 Code or date of loading
   2. Average velocity, uncorrected.
   3. Average pressure, uncorrected.
   4. Maximum and minimum individual velocity.
   5. Maximum and minimum individual pressure.
   6. Extreme variation (range) of velocity.
   7. Extreme variation (range) of pressure.
   8. Other statistical indication of variation (optional).
   9. Correction to results from firing Reference Ammunition (optional).
   10. Corrected average velocity (optional).
   11. Corrected average pressure (optional).
   12. Recommended values
      12.1 Average velocity
      12.2 Average pressure
      12.3 Velocity and pressure variation
   13. Test firearm and range data
13.1 Barrel length and serial number
13.2 Barrel history
13.3 Transducer serial number / copper crusher lot number
13.4 Type of chronograph and screens

14. Test personnel.

VIII. USE OF REFERENCE AMMUNITION

A. Purpose
1. Reference ammunition, assessed by firings at the ranges of member companies, is available for calibrating ranges, firearms and other equipment for velocity and pressure only.

B. Supply
1. On request, the SAAMI Technical Office\(^1\) will supply information on the manufacturer of specific Reference Ammunition. The method of identifying Reference Ammunition is shown in Section II.
2. Requests for Reference Ammunition should be addressed to the manufacturer of the specific cartridge.

C. Assessment
1. Details of the assessment tests are shown in Section II.

D. Clearing House
1. Results of assessment tests of Reference Ammunition are tabulated, analyzed and distributed by the SAAMI Technical Office.

E. Corrections
1. For method of applying corrections to tests of service loads see Section II.

F. Calibration
1. For method of calibrating ranges and equipment, see Section II.

IX. TEST BARREL CLEANING

A. Test barrels should be cleaned regularly using solvents, brushes and/or other equipment as dictated by the type and severity of fouling in the test barrel.

---

\(^1\) Refer to Section III, Page 130, for contact information for the SAAMI Technical Office.
VELOCITY & PRESSURE BARRELS: QUALIFICATION

All barrels are not necessarily suitable for use in determining pressure or velocity levels, even though they may conform to the dimensions given on the appropriate Standard Velocity and Pressure Barrel drawing in this Standard. New barrels may require a number of rounds to be fired to remove sharp corners or burrs resulting from the manufacturing process. Barrels in service do not have an unlimited life and may become unserviceable from wear and erosion. There is no predictable number of rounds to which a barrel should be exposed before use for pressure and velocity determinations, nor is there a predictable round life for such equipment.

The following procedure is suggested for determining the suitability of any barrel for pressure and velocity test use:

Fire ten rounds of SAAMI Reference Ammunition following the procedures as shown in this Standard. The average velocity and pressure results of the test should be within the Inclusion Limits as given on the latest assessment of the lot fired.

In the case of a new barrel, the firing of more breaking-in shots may be indicated after which the Reference Ammunition test should be repeated.

In the case of barrels which have been in service, refurbishing of the piston and piston hole, removal of fouling, or other corrective procedures may be implemented followed by a retest.
VELOCITY & PRESSURE BARRELS:
MOUNTING IN RECEIVERS

It is essential that close headspace be maintained in velocity-pressure testing equipment if reliable test results are to be achieved.

In mounting test barrels to Universal Receivers or test actions, a headspace not exceeding 0.003” (0.07 mm) over minimum should be maintained. This may be measured by headspace gauges, shim stock or feeler gauges, or a combination thereof whichever is most appropriate for the type of equipment being used.

Headspace adjustments with the Universal Receiver may be accomplished by several methods:

1. Formed shim stock behind the firing-pin plate.
2. Formed shim stock on the rear bearing shoulder of the Barrel Collar.
3. Adjustment of the Breech Block Locking Screws.
PROCEDURE:
USE OF PISTON HOLE GAUGES

Pressure barrel piston hole size should be checked periodically with piston hole gauges to determine whether or not erosion is present. Piston hole erosion can cause high or erratic pressure readings and low velocity readings.

Three piston hole gauges for each piston hole size (0.146” diameter, 0.206” diameter) constitute a set: 1) plug gauge, 2) longitudinal gauge and, 3) transverse gauge. Each gauge is double-sided, “go” and “no go”. The gauges are used as described below:

1. Attempt to insert the appropriate “no go” plug gauge into the top of the piston hole.

2. Insert the appropriate “no go” longitudinal gauge through the chamber, align it with the bottom of the piston hole, and attempt to insert the gauge upward into the hole.

3. Attempt to insert the appropriate “no go” transverse gauge into the bottom of the piston hole in the same manner as described above for the longitudinal gauge.

4. If the piston hole accepts any of the “no go” gauges, the hole diameter is larger than the maximum acceptable.

The probable cause of extreme piston hole erosion is poor gas sealing (improper use of gas checks and/or insufficient oiling).

In some cases, minor erosion does not seem to affect pressure and velocity readings. An analysis of test results will indicate whether or not repair is necessary.
PROCEDURE:
PIEZOELECTRIC TRANSDUCER CALIBRATION

I. SCOPE
A. This procedure covers the calibration of piezoelectric pressure transducers (“transducers”) for use in the measurement of ballistic pressures.

II. TEST EQUIPMENT
A. ITEM TYPE ALTERNATE
1. Digital Voltmeter Fluke, Model 8440 or equivalent
2. Charge Amplifier PCB, Model 443B02 or equivalent
3. Transducer Calibrator PCB Group; The Modal Shop, Inc.; Model K9905D or equivalent
4. Insulation Tester Kistler, Model 5491 or equivalent
5. Transducer PCB, Model 117BXXX or equivalent
6. Low Noise Cable PCB, Model 003CXX or equivalent
7. Calibration Adapter PCB, Model 090B Series or equivalent

III. EQUIPMENT PREPARATION
A. All instruments should be operational and calibrated per manufacturer specification.
B. The transducer calibrator and instruments used to calibrate the charge amplifier and digital voltmeter should have a certified calibration traceable to the National Institute of Standards and Technology.
C. Transducers should be properly maintained per manufacturer recommendations or stored in a desiccator when not in use.

CAUTION: When not in use, the cable, transducers, and instrument connectors should be stored with plastic caps to prevent contamination.

D. Measure the internal resistance of the transducer and low noise cable. If the resistance is less than 10^{12} ohms, follow the steps detailed in paragraph IV, Transducer Initialization. If the resistance is in the 10^{12} to 10^{14} ohm range, proceed to paragraph V, Transducer Calibration.

IV. TRANSDUCER INITIALIZATION
A. Clean transducer and low noise cable connectors using an acceptable solvent per the manufacturer’s recommendations.
B. Bake-out transducer and low noise cable in a temperature controlled oven for 24 to 48 hours at 250°F (121°C).
C. Allow oven to return to ambient temperature at a slow rate.
D. After removing the transducer and cable from the oven, check the internal resistance of the transducer. The resistance should be in the 10^{12} to 10^{14} ohm range.
E. Place protective caps on transducer and cable connectors to prevent contamination.
V. TRANSDUCER CALIBRATION

A. INITIAL SET-UP

1. Turn on the electronic equipment and allow it to stabilize as recommended by the manufacturer.
2. Inspect the transducer mounting cavity to assure that the seal seat is free of dirt and any other foreign matter.
3. Mount transducer with steel spacer rings into calibration fixture as described in PCB Operating Instructions Manual.
4. Loosen, but do not remove, the slotted clamp.
5. Thread the transducer into the mounting port. Adjust the slotted clamp to allow guide pin to enter guide hole. Continue to turn transducer nut into the mounting port. When transducer bottoms, tighten the slotted clamp and torque the transducer as recommended by the manufacturer.
6. It is essential that the sensing surface of the transducer be flush with the chamber inside diameter. Care must be exercised to obtain correct depth as well as exact rotational alignment. Depth adjustment is accomplished by the use of various thickness spacers. In order to set the depth exactly it may be necessary to hone the spacers to the desired thickness.
7. Mount calibration adapter with transducer on the calibrator.
8. Insert the cartridge case with an inert or fired primer into calibration adapter and complete fixture assembly as per PCB instruction manual. If the sample cartridge is a loaded round, it may be disassembled, the powder removed, and the primer in the empty case then fired. An optional procedure is to deprime the case and use the O-ring/plug seal shown in Section III - page 135. Cycle this case to the appropriate maximum pressure in order to “seat” the transducer.
9. Connect transducer and instrumentation as indicated in Figure 2 on page 88.
10. Set the charge amplifier sensitivity to 0.999 and set the time constant switch to LONG.
11. Set DVM to 10-volt range.

B. CALIBRATION

1. Adjust pressure readout indicator of the transducer calibrator to 0 psi with no pressure on hydraulic lines.
2. Insert a new cartridge case.
3. Reset charge amplifier and digital voltmeter (DVM) to obtain zero volts output.
4. Apply pressure in increments as indicated in Section II, pages 86-87. Calibration pressure range should cover the pressure ranges shown in Section II, pages 86-87. DO NOT exceed the maximum pressure established by the manufacturer for the fixture.
5. Record DVM reading after the pressure readout indicator is exactly at desired pressure level. Do not release the pressure until the highest pressure level, for the cartridge under test, has been reached. Read the pressure at each increment. Do not overshoot the pressure points!
6. After reaching the highest calibration pressure level, release the pressure slowly.
7. Replace the cartridge case in calibration adapter.
8. Repeat steps 1 through 7 until a minimum of ten valid data points are obtained.
SECTION II – PROCEDURES
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROCEDURE:
PIEZOELECTRIC TRANSDUCER CALIBRATION

**CAUTION:** Always **INCREASE** pressure to desired level, never decrease pressure to desired level.

9. Transducers need to be re-calibrated when changing brands of ammunition or if there have been changes in cartridge case processes and/or material.

**C. DATA REDUCTION**

1. Calculate the average value for the output voltages recorded at each pressure increment. Multiply these average values by the charge amplifier sensitivity (pC/V) to obtain the transducer charge output (Q) at these pressure increments (P).

2. Obtain a least square line equation using the transducer charge output (Q) as the dependent variable and pressure (P) as the independent variable. \( Q = mP \pm q \).

3. A manual method of calculating the least square line equation is given in tabular form on page 89. It is recommended that when using this technique, all numbers be carried to the third decimal place.

4. Obtain the pressure (P) offset value when Q in the line equation is zero. Refer to Figure 4, page 90.

**VI. CALIBRATION CHECK**

A. When the calibration calculations are complete, the sensitivity should be set on the charge amplifier. The digital voltmeter is set at zero. A new sample cartridge case is put in the calibration fixture and the hydraulic pressure increased to the highest pressure reached in the calibration. The digital voltmeter reading plus the offset should equal the hydraulic gauge reading. Check calibration again by inserting a second cartridge case. As a guideline, these values should agree within ±1.5% of the gauge reading. If the transducer does not meet this guideline then recheck the calculations and/or recalibrate.

**VII. TRANSDUCER RECORDS**

A. Date of calibration
B. The number of rounds to which the transducer has been exposed during test firing.
C. Calibration pressure (P), charge amplifier voltage output (V), and transducer charge output (Q).
D. Charge amplifier sensitivity.
E. Least square line equation.
F. Pressure offset, and transducer sensitivity (slope = m).
G. Transducer identification.
H. Date of next calibration.
### TRANSDUCER CALIBRATION: INCREMENTS AND RANGES

The following increments and ranges are to be used for the calibration of transducers:

<table>
<thead>
<tr>
<th>Caliber</th>
<th>MAP (psi/100)</th>
<th>Pressure Increments (psi)</th>
<th>Pressure Range (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9mm Luger (1)</td>
<td>350</td>
<td>5,000</td>
<td>20,000 – 45,000 (1)</td>
</tr>
<tr>
<td>9mm Luger +P (1)</td>
<td>385</td>
<td>5,000</td>
<td>20,000 – 45,000 (1)</td>
</tr>
<tr>
<td>9 x 18 Makarov</td>
<td>241</td>
<td>3,000</td>
<td>18,000 – 30,000</td>
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<tr>
<td>9 x 23 Winchester</td>
<td>550</td>
<td>5,000</td>
<td>35,000 – 60,000</td>
</tr>
<tr>
<td>10mm Automatic</td>
<td>375</td>
<td>5,000</td>
<td>20,000 – 45,000</td>
</tr>
<tr>
<td>221 Remington Fireball</td>
<td>600</td>
<td>5,000</td>
<td>35,000 – 60,000</td>
</tr>
<tr>
<td>25 Automatic</td>
<td>250</td>
<td>3,000</td>
<td>18,000 – 30,000</td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>239</td>
<td>3,000</td>
<td>18,000 – 30,000</td>
</tr>
<tr>
<td>30 Luger (7.65mm)</td>
<td>280</td>
<td>3,000</td>
<td>20,000 – 35,000</td>
</tr>
<tr>
<td>32 Automatic</td>
<td>205</td>
<td>2,000</td>
<td>15,000 – 25,000</td>
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<tr>
<td>32 H&amp;R Magnum</td>
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<td>N/E</td>
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<td>10,000 – 18,000</td>
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<tr>
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<td>20,000 – 45,000</td>
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<tr>
<td>357 Sig.</td>
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(1) The calibration range for regular/+P cartridges is selected to provide a single useful band for both pressure levels.

(2) N/E = Not Established.
<table>
<thead>
<tr>
<th>Caliber</th>
<th>MAP (psi/100)</th>
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<td>20,000 – 45,000</td>
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</table>

(1) The calibration range for regular/+P cartridges is selected to provide a single useful band for both pressure levels.

(2) N/E = Not Established.
TRANSUDUCER CALIBRATION: 
EQUIPMENT INTERCONNECTION

Figure 2
TRANSDUCER CALIBRATION:
LEAST SQUARE LINE COMPUTATION

\[ Q = mP + q \]

\[ m = \frac{\sum (PQ) - \frac{\sum P \sum Q}{n}}{\sum P^2 - \frac{(\sum P)^2}{n}} \]

\[ q = \frac{\sum P \sum (PQ) - \sum (P^2) \sum Q}{(\sum P)^2 - n \sum P^2} \]

Where:

\( n \) = Number of data points.

\( Q \) = Charge, in picocoulombs, pC.

\( m \) = Slope (\( \Delta Q/\Delta P \)); transducer sensitivity in pC/psi.

\( P \) = Pressure, in pounds per square inch, psi.

\( q \) = Charge intercept, in picocoulombs, pC.

\( V \) = Average output voltage at the indicated pressure, in volts, v.

\( S \) = Charge amplifier sensitivity.

\[ \text{Offset} = \frac{q}{m} \]

<table>
<thead>
<tr>
<th>P</th>
<th>S</th>
<th>V</th>
<th>( Q ) (SV)</th>
<th>(PQ)</th>
<th>( P^2 )</th>
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<td></td>
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</table>

\( \Sigma P = \)

\( \Sigma Q = \)

\( \Sigma (PQ) = \)

\( \Sigma (P^2) = \)

**Figure 3**
SECTION II – PROCEDURES
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

TRANSODER CALIBRATION:
LEAST SQUARE LINE COMPUTATION

OUTPUT vs. PRESSURE

Figure 4

Sensitivity
($\Delta Q/\Delta P$)

Offset
Configuration 1

![Diagram showing equipment interconnection]

Figure 5
Configuration 2

---

Figure 6
REFERENCE AMMUNITION: USE

A. PURPOSE
Reference Ammunition is for the purpose of relating pressure and velocity test results at all ranges.

B. PROCUREMENT
Reference Ammunition is procured as noted in Section III – page 128.

C. USE
The use and usefulness of Reference Ammunition in connection with the testing of ammunition for velocity and pressure is predicated upon two basic assumptions as follows:

1. Associated with a given batch of Reference Ammunition at a given time is an assessed average velocity, an assessed average pressure, as well as upper and lower limits for each, which the averages of any ten round test may be expected to fall within when:
   a. The reference ammunition manufacturer has applied appropriate safeguards to assure homogeneity of the lot.
   b. The ammunition is tested only after being conditioned under controlled temperature and humidity.
   c. The ammunition is tested in equipment compliant with Section III recommendations.
   d. The ammunition is handled in strict accordance with Section II recommendations.
   e. All auxiliary measuring equipment has been set up in accordance with Section II recommendations and is in proper working condition.

2. Although there will be changes over time in the velocity and pressure assessments, the changes occur sufficiently slowly to be detected by periodic reassessments before they have achieved a magnitude sufficient to impair the usefulness of the reference rounds. In other words, the velocity and pressure assessments are reasonably stable with time.

The average velocity and pressure that may be developed by a sample of Reference Ammunition in any given standard test barrel under given test conditions may be different from the results obtained under the test conditions referred to above in assumption 1 due to minor equipment variations and statistical sampling error. Such values may be perfectly real, providing the auxiliary equipment introduces no errors.

In order to realize the benefits of Reference Ammunition, some rules must be adhered to. Nevertheless, each individual user must make the final judgments concerning how often it is used and the use of the data. It is important, therefore, that there be a clear realization of what it can and what it cannot tell the ammunition tester.

Reference Ammunition cannot guarantee the absolute accuracy of any test system. It does, however, provide simple and direct data from any given ammunition test equipment to determine how closely it relates to the acceptable, average system as used by SAAMI members.
In line with the preceding discussion, the following recommendations are made for the use of Reference ammunition:

A. Each Reference Lot should be conditioned before use.

B. How often Reference Ammunition is used shall be determined by the user's internal practices, taking into account such factors as historical knowledge of barrel life.

C. The recommended minimum sample shall be ten rounds.

D. In the event the observed average velocity and pressure of the sample falls within the *Inclusion Limits*, a correction may or may not be applied according to the procedure given in Step G at the discretion of the user.

E. If one average is outside of the *Inclusion Limits* and the other within, the average that exceeds the limits shall be corrected according to the procedure given in Step G.

F. If both averages are outside of the *Inclusion Limits*, both the velocity and pressure shall be corrected according to the procedure in Step G.

G. If the correction is to be applied, the correction shall be the difference between the assessed value and the observed average of the test.
Occasionally, a test station will have a need for an inordinately large supply of Reference Ammunition in considerable excess to the usual volume. In order to minimize the premature exhaustion of any particular lot, it is suggested that the station create its own secondary reference lot to fill the special need.

A secondary reference lot should consist of a supply of off-the-shelf ammunition, each box bearing the same manufacturer’s code name. The secondary reference lot should be approximately equivalent in bullet weight, average velocity, and average pressure to the Reference Ammunition that it replaces.
I. GENERAL

Reference Ammunition lots have been established for those lots or loads designated by the Technical Committee. Responsibility for production of each of the selected lots is assigned to a member company that is responsible for maintaining a supply. A five-year supply is recommended. It is desirable that Reference Ammunition be consistent with Standard values for that particular round.

When a producer has prepared a new lot, it shall be his responsibility to announce the lot to the SAAMI Technical Office\(^2\), giving a tentative assessment and other data. (An example of the recommended format for this announcement appears later in this section.)

The producer shall supply, at the time of the announcement of the new lot, to each member of the Reference Ammunition Group that has the capability to test that cartridge, one box of the new lot for immediate test. A current list of the testing capabilities of the Reference Ammunition Group is available from the SAAMI Technical Office on request.

The SAAMI Technical Office will announce the availability of the new lot to the participating ranges, giving the tentative assessment and other pertinent data. (An example of the recommended format for this announcement appears later in this section.)

II. METHOD OF ASSESSMENT

Before announcing a new lot of reference ammunition to the SAAMI Technical Office, the manufacturer should make sufficient tests to determine Tentative Values of pressure and velocity for the new lot.

1. The test barrels shall conform to the SAAMI specifications for internal dimensions, length and piston / piezo gauge location. (Refer to Section III.)

2. Counter-chronographs and photoelectric screens shall be used in velocity measurements. (See Section III.)

3. Ammunition shall be conditioned for a minimum of 24 hours at 70° ± 2°F (21.1° ± 1.1°C) with relative humidity of 60% ± 5% before firing.

4. For copper crusher assessments, only an approved crusher lot shall be used in pressure measurements. (See Section III – page 109 for proper crusher sizes.)

\(^2\) Refer to Section III - page 130, for current contact information for the SAAMI Technical Office.
NEW REFERENCE LOT REPORTING FORM AND INSTRUCTIONS

These instructions pertain to the form shown in Section II, which is used for a Reference Ammunition producer to announce new lots to the SAAMI Technical Office, as well as for the SAAMI Technical Office to announce the new lot to participating ranges.

SUBJECT: T-4025 Reference Ammunition – Centerfire Pistol & Revolver
New Reference Lot

TO: When used by a producer:
SAAMI Technical Office

When used by SAAMI Technical Office to notify test stations:
Current address of all stations and personnel.

(1) Name and address of source for procurement as shown in Section III

SIGNED: Authorized Person
Producer Company Name
Address (including zip code)

DATE:

---

3 Refer to Section III - page 130, for current contact information for the SAAMI Technical Office.
ANNOUNCEMENT OF NEW REFERENCE AMMUNITION LOT

SUBJECT:  T-4025 Reference Ammunition – Centerfire Pistol & Revolver
New Reference Lot

TO:

CARTRIDGE ____________________________  Lot No. ________________
Order Symbol ________________

- TENTATIVE ASSESSMENT -

<table>
<thead>
<tr>
<th>VELOCITY (ft/s)</th>
<th>PRESSURE (CUP in units of 100)</th>
<th>PRESSURE (psi in units of 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AVERAGE: S.D.:</td>
<td>AVERAGE: S.D.:</td>
</tr>
</tbody>
</table>

Lot number this lot replaces ________________

Please test the ammunition and report the results to the SAAMI Technical Office on the proper form (CF Section II) as soon as possible.

SIGNED:

DATE:
REFERENCE AMMUNITION:  
IDENTIFICATION PROTOCOL

SAAMI Reference Ammunition

This ammunition is to be used only for calibration of test gauges for velocity and pressure.

LOT NUMBERING SYSTEM
(Typical numbers)

C.F. LOT 38SPL-130-2 WW

CALIBER
BULLET WEIGHT
LOT NUMBER
PRODUCER CODE

PRODUCER CODES

A = A-Square
B = Blount (ATK Ammunition Accessories) - OBSOLETE
CB = Cor-Bon / Glaser
CS = CCI/Speer
F = Federal Cartridge Co.
H = Hornady Manufacturing
R = Remington Arms Company, LLC
WW = Winchester Division, Olin Corporation

NOTE
BLACK LETTERING
REFERENCE AMMUNITION:
PERIODIC ASSESSMENT

I. PROCUREMENT
Reference ammunition is procured as noted in Section III.

II. PERIODIC TESTS

A. STATIONS

1. All test conditions should conform as closely as possible to those prescribed in this Standard, and the following conditions should be met:

   a) Tests should consist of ten (10) rounds for velocity and pressure fired during a single day.

   b) Test barrels shall conform to SAAMI specifications for internal dimensions, length, and piston/transducer location.

   c) Counter-chronographs and photoelectric screens (or equivalents) shall be used in velocity measurements. (See Section III.)

   d) Ammunition shall be conditioned for 72 hours at 70° ± 2°F (21.1° ± 1.1°C) with relative humidity of 60% ± 5% before firing.

   e) Only an approved crusher lot shall be used in pressure measurements. (See Section III, page 109 for proper crusher sizes.)

2. Each station should report results of its firing in the test on approved forms to the SAAMI Technical Office\(^1\). A sample of this report form is presented later in this section.

B. CLEARING HOUSE

1. The SAAMI Technical Office serves as the clearinghouse for all Reference Ammunition ballistics and related information. It shall be the responsibility of the SAAMI Technical Office to schedule testing and to assemble and distribute results of periodic tests. This should be done on the proper Reference Ammunition report form. (Sample, Section II.)

2. The Reference Ammunition Report shall contain the average pressure, velocity, and related standard deviations as reported by each station for that lot. From this data, the SAAMI Technical Office will calculate and report the Raw Average, Corrected Average, Standard Deviation Averages, and Inclusion Limits.

3. To obtain the Raw Averages, the SAAMI Technical Office shall include the 10-round averages for the pressure and velocity of all reporting stations and the first and second previous assessment value. If the 10-round average from any station

---

\(^1\) Refer to Section III - page 130, for current contact information for the SAAMI Technical Office.
varies from the Raw Average by more than plus or minus 35 fps in velocity OR plus or minus 2,500 CUP/psi in pressure, the pressure or velocity data from that (those) station(s) should be discarded. The mean pressure and velocity data should be recalculated omitting the discarded data. The new mean is the “Corrected Average”. If the mean pressure value of a station is outside of the limits as defined above, but the velocity is in, the pressure data should be dropped and the velocity data retained. The converse is true as well. Using the Corrected Averages, the Inclusion Limits are determined as follows:

**VELOCITY:**
- **MEAN** = Same as Corrected Average
- **HIGH** = MEAN + 35 fps
- **LOW** = MEAN - 35 fps

**PRESSURE:**
- **MEAN** = Same as Corrected Average
- **HIGH** = MEAN + 2,500 CUP/psi
- **LOW** = MEAN – 2,500 CUP/psi
### T-4025 STATION REPORT
REFERENCE AMMUNITION – PERIODIC ASSESSMENT
CENTERFIRE PISTOL & REVOLVER

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<table>
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## TECHNICAL SERVICES REPORT – REFERENCE AMMUNITION

### PERIODIC ASSESSMENT – CF P&R

**APRIL – 2015**

**LOT NO:** 357MAG-158-16WW  
**GAGE:** CRUSHER

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**1st Previous Average** 1572 292  
**2nd Previous Average** 1575 295

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**Inclusion Limits @ 99.95%**

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**ASSESSMENT** 1574 299
PROCEDURE: FRANGIBILITY TESTING

NOTE: Refer to Section III for equipment recommendations and nomenclature.

(1) The collection box shall be thoroughly cleaned of residue from previous test.

(2) The impact plate shall be at an angle of 45° ± 5° to the line of fire.

(3) The collection box shall be positioned to provide a point of impact within ± 2” (51 mm) of the center of the impact plate.

(4) A new retention board shall be positioned on the front of the collection box.

(5) A sample size of ten (10) rounds shall be fired.

(6) The retention board shall be examined for evidence of penetration completely through the board by bullet fragments coming out of the collection box. If any such penetrations are present, the bullet being tested fails to meet the qualification for “frangible”.

NOTE: Fragments that are captured in the retention board, even though they have penetrated both panels of the board, shall not be considered a failure, but the fragments shall be added to the collected debris for evaluation against other standards.

(7) Bullet fragments and debris from the test shall be carefully collected to ensure the greatest possible recovery of bullet particles.

(8) The debris collected shall be examined and foreign matter unrelated to the bullet breakup carefully removed.

(9) The collected debris shall be weighed and the weight recorded.

(10) The debris shall be carefully inspected and the largest individual pieces removed and separately weighed, with each weight being separately recorded.

(11) The weights of the individual fragments and collected debris shall be compared to the characteristics presented in Section I.
EQUIPMENT: VELOCITY & COPPER CRUSHER PRESSURE TESTING

NOTE: Refer to Section III – page 130, Supplier Contact Information, for detailed information on contacting the manufacturers of listed products and the SAAMI Technical Office.

1. Electronic Counter Chronograph – 100 kilohertz, minimum
   a) Oehler Research
   b) Electronic Counters, Inc.
   c) Other equivalent.

2. Table of velocity vs. time of flight or electronic calculator.
   NOTE: Items (1) and (2) may be replaced by a direct-reading velocity chronograph or integrated ballistic instrumentation system with equivalent accuracy and precision.

3. Photoelectric screens
   a) Oehler Research
   b) Electronic Counters, Inc.
   c) Other equivalent.

4. Universal Receiver
   a) Ulysses Machine Company
   b) H-S Precision, Inc.
   c) Other equivalent.

5. Test Barrel (Drawings of test barrels are presented in Section III).
   a) H-S Precision, Inc.
   b) Wiseman
   c) Wilson Arms Company
   d) Hart Rifle Barrels, Inc.
   e) Krieger Barrels, Inc.
   f) Or equivalent.

6. Piston (Section III)
7. Piston and piston hole gauges (Section III)
8. Oil, SAE 30
9. Gas check (Section III)
10. Gas check tools – seating and knockout (Section III)
11. Gas check wax (Section III)
12. Copper crushers
    0.146” x 0.400”
    0.225” x 0.400”
    Manufactured (Section III)
    Winchester Division, Olin Corporation.
13. Tarage table (supplied with each lot of purchased crushers; see Section III, page 110 for sample table)
0.146” x 0.400” when used with 0.146” piston
0.146” x 0.400” when used with 0.206” piston
0.225” x 0.400” when used with 0.206” piston

14. Measuring device for compressed crushers
   a) Micrometer, 1” capacity, minimum, 0.0005” precision.
   b) Platform dial indicator, 1” capacity, minimum, 0.0005” precision.
   c) Other device capable of measuring lengths up to 0.500” with a minimum precision of 0.0005”

15. Reference ammunition. (Refer to Section III – page 127 for supply sources.)
1. Electronic Counter Chronograph – 100 kilohertz, minimum
   a) Oehler Research, Electronic Counters, Inc.
   b) Other equivalent.
2. Table of velocity vs. time of flight or electronic calculator.
   NOTE: Items (1) and (2) may be replaced by a direct-reading velocity chronograph or
   integrated ballistic instrumentation system with equivalent accuracy and precision.
3. Photoelectric screens
   a) Oehler Research
   b) Electronic Counters, Inc.
   c) Other equivalent.
4. Universal Receiver
   a) Ulysses Machine Company
   b) H-S Precision, Inc.
   c) Other equivalent.
5. Test Barrel (Drawings of test barrels are presented in Section III).
   a) H-S Precision, Inc.
   b) Wiseman
   c) Wilson Arms Company
   d) Hart Rifle Barrels, Inc.
   e) Krieger Barrels, Inc.
   f) Or equivalent.
6. Digital voltmeter
   a) Fluke model 8440
   b) Other equivalent
7. Charge amplifier with 20KHz low pass filter
   a) PCB Piezotronics, Inc. model 443B02
   b) Other equivalent
8. Peak meter
   a) PCB Piezotronics, Inc. model 444A152
   b) Other equivalent
   NOTE: Items (6) and (8) or (6), (7), and (8) may be replaced by an integrated ballistic
   instrumentation system of equivalent accuracy and precision.
9. Piezoelectric transducer
   a) PCB Piezotronics, Inc. model 117Bxx
   b) Other equivalent

NOTE: Refer to Section III – page 130, Supplier Contact Information, for detailed information on
contacting the manufacturers of listed products and the SAAMI Technical Office.
10. Low noise cable
   a) PCB Piezotronics, Inc. model 003Cxx
   b) Other equivalent

11. Transducer calibrator
   a) PCB Group; The Modal Shop, Inc.; Model K9905D
   b) Other equivalent

12. Calibration adapter
   a) PCB Piezotronics, Inc. model 090B series
   b) Other equivalent

13. Reference ammunition
   Refer to Section III – page 127 for supply sources.
Copper crusher cylinders of the nominal sizes listed below shall be used for pressure tests of centerfire pistol and revolver cartridges.

Crusher cylinders shall not be pre-compressed before use.

A sample tarage table is shown on page 110 for illustrative purposes; only the tarage table furnished with the particular lot of cylinders should be used.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Nominal Size</th>
<th>PISTON</th>
<th>Average Pressure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Diameter</td>
<td>Area</td>
</tr>
<tr>
<td>A</td>
<td>0.146” x 0.400”</td>
<td>0.146”</td>
<td>1/60 inch²</td>
</tr>
<tr>
<td>A</td>
<td>0.146” x 0.400”</td>
<td>0.206”</td>
<td>1/30 inch²</td>
</tr>
<tr>
<td>C</td>
<td>0.225” x 0.400”</td>
<td>0.206”</td>
<td>1/30 inch²</td>
</tr>
</tbody>
</table>

It is recommended that pressures be recorded in “Copper Units of Pressure”, or “CUP”.

* The designation “Copper Units of Pressure” (“CUP”) was adopted in 1969, to replace the previous designation of “pounds per square inch.” Advances in the art of pressure-sensing devices had shown that pressures recorded by deformation of copper crushe cylinders are not necessarily a true measure of pounds per square inch for the transient phenomena encountered in sporting arms ammunition.
### SAMPLE TARAGE TABLE

**COPPER CRUSHER CYLINDERS**  
0.225" DIAMETER, 0.400" LONG  
FOR USE WITH 0.206" DIAMETER PISTON  
AREA = 1/30 SQUARE INCH

<table>
<thead>
<tr>
<th>Final Pressure</th>
<th>Final Pressure</th>
<th>Final Pressure</th>
<th>Final Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>CUP* Length</td>
<td>Pressure</td>
<td>CUP* Length</td>
</tr>
<tr>
<td>0.399</td>
<td>30</td>
<td>0.398</td>
<td>60</td>
</tr>
<tr>
<td>0.397</td>
<td>78</td>
<td>0.396</td>
<td>96</td>
</tr>
<tr>
<td>0.395</td>
<td>106</td>
<td>0.394</td>
<td>117</td>
</tr>
<tr>
<td>0.393</td>
<td>127</td>
<td>0.392</td>
<td>138</td>
</tr>
<tr>
<td>0.391</td>
<td>150</td>
<td>0.390</td>
<td>158</td>
</tr>
<tr>
<td>0.389</td>
<td>167</td>
<td>0.388</td>
<td>175</td>
</tr>
<tr>
<td>0.387</td>
<td>184</td>
<td>0.386</td>
<td>193</td>
</tr>
<tr>
<td>0.385</td>
<td>202</td>
<td>0.384</td>
<td>211</td>
</tr>
<tr>
<td>0.383</td>
<td>219</td>
<td>0.382</td>
<td>226</td>
</tr>
<tr>
<td>0.381</td>
<td>234</td>
<td>0.380</td>
<td>241</td>
</tr>
<tr>
<td>0.379</td>
<td>248</td>
<td>0.378</td>
<td>255</td>
</tr>
<tr>
<td>0.377</td>
<td>263</td>
<td>0.376</td>
<td>270</td>
</tr>
<tr>
<td>0.375</td>
<td>277</td>
<td>0.374</td>
<td>284</td>
</tr>
<tr>
<td>0.373</td>
<td>290</td>
<td>0.372</td>
<td>297</td>
</tr>
<tr>
<td>0.371</td>
<td>304</td>
<td>0.370</td>
<td>311</td>
</tr>
<tr>
<td>0.369</td>
<td>318</td>
<td>0.368</td>
<td>325</td>
</tr>
<tr>
<td>0.367</td>
<td>332</td>
<td>0.366</td>
<td>339</td>
</tr>
<tr>
<td>0.365</td>
<td>345</td>
<td>0.364</td>
<td>351</td>
</tr>
<tr>
<td>0.363</td>
<td>358</td>
<td>0.362</td>
<td>364</td>
</tr>
<tr>
<td>0.361</td>
<td>370</td>
<td>0.360</td>
<td>376</td>
</tr>
</tbody>
</table>

*NOTE: Tarage tables are established for each lot of cylinders. Only the table furnished by the manufacturer with each shipment of cylinders should be used.*
CRUSHER CYLINDERS:
DIMENSIONS – 0.146” x 0.400”

NOTES:

1. Material: Copper Development Association Alloy 102
2. (XX.XX) = Millimeters
CRUSHER CYLINDERS:
DIMENSIONS – 0.225” x 0.400”

NOTES:

1. Material: Copper Development Association Alloy 102
2. (XX.XX) = Millimeters
EQUIPMENT:
0.146” AND 0.206” GAS CHECKS

0.146” Gas Check
Material thickness
0.0095 – 0.0105 (0.241 – 0.267)

0.206” Gas Check
Material thickness
0.0110 – 0.0115 (0.279 – 0.292)

NOTES
1. Material – Copper Development Association Alloy 210
   Grain size – 0.015 – 0.030mm

2. (X.XXX) = Millimeters
SEATING TOOL

0.750 ± 0.010
(19.05 ± 0.25)

0.500
(12.70)

3.000
(76.20)

ONE-HALF DEPTH OF PISTON HOLE

0.140
(3.56)

KNOCKOUT TOOL

0.750 ± 0.010
(19.05 ± 0.25)

0.500
(12.70)

3.000
(76.20)

DEPTH OF PISTON HOLE +0.050 (1.27)

0.140
(3.56)

NOTES

1. Material – Copper Development Association Alloy 260
2. Unless otherwise noted, all tolerances ± 0.002 (0.05)
3. (XX.XX) = Millimeters
EQUIPMENT:
GAS CHECK WAX

INGREDIENTS

1. Beeswax ................................................................. 234.0 grams
2. Paraffin ................................................................. 6.0 grams
3. Vaseline .................................................................. 6.0 grams
4. Castor Oil .............................................................. 14.4 grams
5. Lead oxide (red lead) ................................................. 72.0 grams
6. Iron oxide (Ferric oxide) ........................................... 24.0 grams
7. Rosin ...................................................................... 5% by volume

PREPARATION

The ingredients are weighed out in a vessel and heated in a steam bath until the waxes are melted. The mixture is then removed from the steam bath and stirred vigorously until slightly warm. The wax is then rolled out on a flat surface into sticks.
NOTES:


2. Pistons to be suction fit in piston holes.

3. (XX.XX) = Millimeters.
4. Due to the variation in the distance from the chamber wall to the outside edge of the test barrel caused by variation in cartridge diameters, “short” (pressure measurement) pistons for different cartridges are required to be different lengths. This table presents the appropriate short piston lengths for test barrels made in accordance with the drawings and other requirements in Section III.

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Piston Diameter, (inches)</th>
<th>Piston Length, (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9mm Luger</td>
<td>0.206</td>
<td>0.671</td>
</tr>
<tr>
<td>9mm Luger +P</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>9x18 Makarov</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>9x23 Winchester</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>10mm Automatic</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>221 Remington Fireball</td>
<td>0.206</td>
<td>0.665</td>
</tr>
<tr>
<td>25 Automatic</td>
<td>0.146</td>
<td>0.731</td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>30 Luger (7.65mm)</td>
<td>0.206</td>
<td>0.684</td>
</tr>
<tr>
<td>32 Automatic</td>
<td>0.206</td>
<td>0.680</td>
</tr>
<tr>
<td>32 H&amp;R Magnum</td>
<td>0.206</td>
<td>0.681</td>
</tr>
<tr>
<td>32 North American Arms</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>32 Short Colt</td>
<td>0.206</td>
<td>0.690</td>
</tr>
<tr>
<td>32 Smith &amp;Wesson</td>
<td>0.206</td>
<td>0.681</td>
</tr>
<tr>
<td>32 Smith &amp;Wesson Long</td>
<td>0.206</td>
<td>0.681</td>
</tr>
<tr>
<td>327 Federal Magnum</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>356 TSW</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>357 Magnum</td>
<td>0.206</td>
<td>0.660</td>
</tr>
<tr>
<td>357 Sig</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>38 Automatic</td>
<td>0.206</td>
<td>0.656</td>
</tr>
<tr>
<td>38 Smith &amp;Wesson</td>
<td>0.206</td>
<td>0.657</td>
</tr>
<tr>
<td>38 Special / 38 Special +P</td>
<td>0.206</td>
<td>0.660</td>
</tr>
<tr>
<td>38 Super Automatic +P</td>
<td>0.206</td>
<td>0.656</td>
</tr>
<tr>
<td>380 Automatic</td>
<td>0.206</td>
<td>0.670</td>
</tr>
<tr>
<td>40 Smith &amp;Wesson</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>400 Cor-Bon</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>Cartridge</td>
<td>Piston Diameter, inches</td>
<td>Piston Length, inches</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>41 Remington Magnum</td>
<td>0.206</td>
<td>0.632</td>
</tr>
<tr>
<td>44 Remington Magnum</td>
<td>0.206</td>
<td>0.621</td>
</tr>
<tr>
<td>44 S&amp;W Special</td>
<td>0.206</td>
<td>0.621</td>
</tr>
<tr>
<td>45 Automatic</td>
<td>0.206</td>
<td>0.624</td>
</tr>
<tr>
<td>45 Automatic +P</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>45 Auto Rim</td>
<td>0.206</td>
<td>0.610</td>
</tr>
<tr>
<td>45 Colt</td>
<td>0.206</td>
<td>0.610</td>
</tr>
<tr>
<td>45 Glock Automatic Pistol</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>45 Winchester Magnum</td>
<td>0.206</td>
<td>0.611</td>
</tr>
<tr>
<td>454 Casull</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>460 S&amp;W Magnum</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>475 Linebaugh</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>480 Ruger</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>50 Action Express</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>500 S&amp;W Magnum</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>500 Special</td>
<td>Not established</td>
<td></td>
</tr>
</tbody>
</table>
**EQUIPMENT: PISTON HOLE GAUGES**

**PLUG GAUGE**

MARK GO = .1460

MARK NO GO = .1466

- .1460 + 0.0001
  - (3.708 + 0.003)

- .125 (3.18)
- .300 (7.62)

- .125 (3.18)
- .300 (7.62)

- .1460 - 0.0001
  - (3.724 - 0.003)

**LONGITUDINAL GAUGE**

MARK GO = .1460

MARK NO GO = .1466

- .094 (2.39)

- .1460 + 0.0001
  - (3.708 + 0.003)

- .125 (3.18)
- .031 (0.79)
- .062 (1.57)

- .1466 - 0.0001
  - (3.724 - 0.003)

- .094 (2.39)

- .094 (2.39)

- .094 (2.39)

**TRANSVERSE GAUGE**

MARK GO = .1460

MARK NO GO = .1466

- .094 (2.39)

- .1460 + 0.0001
  - (3.708 + 0.003)

- .094 (2.39)

- .125 (3.18)
- .031 (0.79)
- .062 (1.57)

- .1466 - 0.0001
  - (3.724 - 0.003)

- .094 (2.39)

- .094 (2.39)

- .094 (2.39)

**NOTES:**

1. General tolerance ±0.005 (0.13)
2. Material – Oil hard drill rod AISI -O1 R c 61-63
3. (XX.XX) = Millimeters
PLUG GAUGE

MARK GO = .2060

MARK NO GO = .2066

.2060 + .0001
(5.232 + 0.003)

.188 (4.78)

.300 (7.62)

.2066 - .0001
(5.248 - 0.003)

.188 (4.78)

.300 (7.62)

NOTES:
1. General tolerance ±.005 (0.13)
2. Material – Oil hard drill rod AISI -O1 Ṙc 61-63
3. (XX.XX) = Millimeters
PISTON OIL – PISTON AND GAS CHECK

It is recommended that pistons and gas checks (other than those filled with gas check wax) be lubricated with the following oil:

SAE 30 or equivalent

Viscosity at 210°F (98.9°C)
58 Saybolt seconds universal, minimum
70 Saybolt seconds universal, maximum

The oil should be of non-detergent type.
### HEADSPACE GAUGES

**SECTION III – EQUIPMENT**

**CENTERFIRE PISTOL & REVOLVER**

**SAAMI VOLUNTARY PERFORMANCE STANDARDS**

---

**HEADSPACE GAUGES**

**FIGURE I**

**SHOULDER-BREECHING CENTERFIRE PISTOL & REVOLVER HEADSPACE GAUGES**

**MATERIAL:** AISI-06 STEEL OR EQUIVALENT HEAT TREAT TO Rc 60-64

ALL DIA + .002 (0.05) UNLESS OTHERWISE SPECIFIED.

ALL TOLERANCES ± .005 (0.127)

SURFACE FINISH **32** EXCEPT AS NOTED.

---

**CARTRIDGE NAME**

<table>
<thead>
<tr>
<th>Cartridge Name</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E1</th>
<th>E2</th>
<th>F</th>
<th>Basics</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>221 Remington Fireball</td>
<td>0.378</td>
<td>0.045</td>
<td>0.332</td>
<td>0.2000</td>
<td>0.3768</td>
<td>0.3629</td>
<td>1.1038</td>
<td>1.1138</td>
<td>23°</td>
<td>0.8000</td>
<td>25°</td>
<td>0.030</td>
<td>0.025</td>
<td>0.3300</td>
</tr>
<tr>
<td></td>
<td>(9.60)</td>
<td>(1.14)</td>
<td>(8.43)</td>
<td>(5.080)</td>
<td>(9.5707)</td>
<td>(9.2177)</td>
<td>(28.037)</td>
<td>(28.291)</td>
<td></td>
<td>(20.320)</td>
<td></td>
<td>(0.76)</td>
<td>(0.64)</td>
<td>(8.382)</td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>0.337</td>
<td>0.046</td>
<td>0.297</td>
<td>0.2000</td>
<td>0.3369</td>
<td>0.3339</td>
<td>0.5792</td>
<td>0.5692</td>
<td>30°</td>
<td>0.2600</td>
<td>20°</td>
<td>0.025</td>
<td>0.060</td>
<td>0.3000</td>
</tr>
<tr>
<td></td>
<td>(8.56)</td>
<td>(1.17)</td>
<td>(7.54)</td>
<td>(5.080)</td>
<td>(8.557)</td>
<td>(8.532)</td>
<td>(14.712)</td>
<td>(14.458)</td>
<td></td>
<td>(6.804)</td>
<td></td>
<td>(0.64)</td>
<td>(1.52)</td>
<td>(7.620)</td>
</tr>
<tr>
<td>32 North American Arms</td>
<td>0.374</td>
<td>0.045</td>
<td>0.329</td>
<td>0.2000</td>
<td>0.3739</td>
<td>0.3731</td>
<td>0.5411</td>
<td>0.5511</td>
<td>23°</td>
<td>0.2600</td>
<td>20°</td>
<td>0.025</td>
<td>0.060</td>
<td>0.3550</td>
</tr>
<tr>
<td></td>
<td>(9.50)</td>
<td>(1.14)</td>
<td>(8.36)</td>
<td>(5.080)</td>
<td>(9.497)</td>
<td>(9.477)</td>
<td>(13.744)</td>
<td>(13.998)</td>
<td></td>
<td>(6.804)</td>
<td></td>
<td>(0.64)</td>
<td>(1.52)</td>
<td>(9.017)</td>
</tr>
<tr>
<td>30 Luger</td>
<td>0.394</td>
<td>0.050</td>
<td>0.347</td>
<td>0.2000</td>
<td>0.3917</td>
<td>0.3817</td>
<td>0.6618</td>
<td>0.6718</td>
<td>18°</td>
<td>0.3750</td>
<td>35°</td>
<td>0.035</td>
<td>0.030</td>
<td>0.3550</td>
</tr>
<tr>
<td></td>
<td>(10.01)</td>
<td>(1.27)</td>
<td>(8.81)</td>
<td>(5.080)</td>
<td>(9.949)</td>
<td>(9.959)</td>
<td>(16.810)</td>
<td>(17.064)</td>
<td></td>
<td>(9.525)</td>
<td></td>
<td>(0.89)</td>
<td>(0.76)</td>
<td>(9.017)</td>
</tr>
<tr>
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**NOTE:** (XX.XX) = MILLIMETERS

XXX = BASIC

---

**PARTIAL VIEW EXTRACTOR CLEARANCE (OPTIONAL)**

**CENTERS TYPICAL BOTH ENDS (OPTIONAL)**

---

**FIGURE I**

**SHOULDER-BREECHING CENTERFIRE PISTOL & REVOLVER HEADSPACE GAUGES**

---

**Radius L – .010 (0.25)**

**E1 – .0002 (0.005)**

**E2 – .0002 (0.005)**

**F – .0002 (0.005) MIN**

**F – .0002 (0.005) MAX**

---

**B – .010 (0.25)**

**K + .010 (0.25)**

**G**

**J**

---

**C – .010 (0.25)**

**D – .020 (0.51)**

---

**45° X .020 (0.51)**

---

**M**

---

**.025 + .000 – .125**

---

**6.35 ± .000 – 3.17**

---

122
II. GAUGES FOR RIM-BREECHING CARTRIDGES

**FIGURE II**
RIM-BREECHING CENTERFIRE PISTOL & REVOLVER HEADSPACE GAUGES

**HEADSPACE GAUGES**

<table>
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<th>B</th>
<th>C</th>
<th>D</th>
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<td>0.0550</td>
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MATERIAL: AISI-06 STEEL OR EQUIVALENT
HEAT TREAT TO Rc 60-64
ALL DIA UNLESS OTHERWISE SPECIFIED:
ALL TOLERANCES ± .002 (.05)
SURFACE FINISH 32" EXCEPT AS NOTED.

NOTE: (XX.XX) = MILLIMETERS
XXX = BASIC

PARTIAL VIEW
EXTRACTOR CLEARANCE (OPTIONAL)

CENTERS TYPICAL BOTH ENDS (OPTIONAL)

SHARP CORNER; NO RADIUS
GRINDING RECESS OPTIONAL

45° x .020 (0.51)
OR .020 R (0.51) OPTIONAL

45° x .050 (1.27)
OR .050 R (1.27) OPTIONAL

A - .002 (0.05)
B

0.002 (0.05) A

B + .0002 (0.005) MIN
B - .0002 (0.005) MAX

16

D MAX

30°
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III. GAUGES FOR MOUTH-BREECHING CARTRIDGES

FIGURE III
MOUTH-BREECHING CENTERFIRE PISTOL & REVOLVER HEADSPACE GAUGES

<table>
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<th>CARTRIDGE NAME</th>
<th>A</th>
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<th>C</th>
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<th>E2</th>
<th>MIN</th>
<th>MAX</th>
<th>F</th>
<th>MAX</th>
<th>BASIC</th>
<th>G</th>
<th>H</th>
<th>J</th>
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<td>0.347</td>
<td>0.2000</td>
<td>0.3912</td>
<td>0.3819</td>
<td>0.7540</td>
<td>0.7760</td>
<td>0.010</td>
<td>0.002</td>
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<td>35</td>
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<td>0.035</td>
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<td>(10.01)</td>
<td>(1.27 )</td>
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<td>(5.080)</td>
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<td>0.2000</td>
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<td>0.3819</td>
<td>0.7540</td>
<td>0.7760</td>
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CARTRIDGE NAME: 9mm Luger, 9mm Luger +P, 9x18 Makarov, 9x23 Winchester, 10mm Automatic, 38 Super Auto +P, 38 Automatic, 356 TSW

REMARKS:

- MATERIAL: AISI-06 STEEL OR EQUIVALENT
- HEAT TREAT TO Rc 60-64
- ALL DIA UNLESS OTHERWISE SPECIFIED
- ALL TOLERANCES ±.005 (0.127)
- SURFACE FINISH 32" EXCEPT AS NOTED.

NOTE: (XX.XX) = MILLIMETERS

X.XXX = BASIC
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<tr>
<th>CARTRIDGE NAME</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>BASIC D</th>
<th>E1</th>
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<th>F MIN</th>
<th>F MAX</th>
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<td>(12.172)</td>
<td>(12.047)</td>
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<td>45 Winchester Magnum</td>
<td>0.480</td>
<td>0.049</td>
<td>0.415</td>
<td>0.2000</td>
<td>0.4806</td>
<td>0.4741</td>
<td>1.1980</td>
<td>1.2100</td>
<td>32</td>
<td>0.9650</td>
<td>0.035</td>
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<td></td>
<td>(12.19)</td>
<td>(1.24)</td>
<td>(10.54)</td>
<td>(5.080)</td>
<td>(12.207)</td>
<td>(12.042)</td>
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<td>50 Action Express</td>
<td>0.515</td>
<td>0.060</td>
<td>0.460</td>
<td>0.2000</td>
<td>0.5439</td>
<td>0.5310</td>
<td>1.2850</td>
<td>1.2970</td>
<td>30</td>
<td>1.0000</td>
<td>0.038</td>
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<tr>
<td></td>
<td>(13.08)</td>
<td>(1.52)</td>
<td>(11.68)</td>
<td>(5.080)</td>
<td>(13.815)</td>
<td>(13.487)</td>
<td></td>
<td></td>
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</tbody>
</table>
Centerfire pistol and revolver reference ammunition for the verification of ranges, barrels, and other equipment may be obtained from the manufacturer. Contact the SAAMI Technical Office or see website for detailed information.

The SAAMI Technical Office maintains current assessment data. SAAMI policy does not allow the release of assessment values by the manufacturer of reference ammunition. All assessments are to be supplied by the SAAMI Technical Office.
Each order should contain the following information, in the following order:

1. Number of rounds desired. (See NOTE, below.)

2. Appropriate order symbol, when given.

3. Designation “SAAMI Reference Ammunition”.

4. Cartridge name.

5. SAAMI lot number. (Current lot numbers are given on latest assessment value sheets issued by the SAAMI Technical Office.)

**EXAMPLE:**
200 rounds, Order symbol SA9LP
SAAMI Reference Ammunition
9mm Luger
SAAMI Lot 9MM-115-16WW

**NOTE:** Recommended maximum order = 200 rounds. If an individual user has requirements for larger quantities, refer to Section II - page 95.

Manufacturers of SAAMI reference ammunition may limit the order quantities honored to the recommended maximum in order to prevent premature consumption of a lot.

It is up to the discretion of the manufacturer to produce lots of sufficient size to reasonably provide a five-year supply.
SECTION III – EQUIPMENT CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

EQUIPMENT:
FRANGIBILITY TESTING

EQUIPMENT:
FRANGIBILITY TESTING

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RETENTION BOARD
CORRUGATED CARDBOARD, “200# MINIMUM” (as defined by American Paper Institute ["API"]), ARRANGED TO CONFINE BULLET DEBRIS WITHIN THE COLLECTION BOX

IMPACT PLATE
AR500 STEEL, 0.50" (12.7mm) THICK

COLLECTION BOX
MILD STEEL, .25" (6.4mm) BOTTOM, .125" (3.2mm) THICK SIDES & TOP;
12" X 12" (305mm X 305mm) W X H MIN; 24" X 24" (610mm X 610mm) W X H MAX, LENGTH OPTIONAL.

* - For cartridges commonly in use by Law Enforcement in pistols, a standard V&P test barrel shall be used. For cartridges commonly in use by Law Enforcement in revolvers, a standard vented V&P test barrel shall be used.

SCHEMATIC FRANGIBILITY TEST LAYOUT
SUPPLIER CONTACT INFORMATION

Contact the SAAMI Technical Office using the information below or visit www.saami.org for a current list of supplier contact information.

SAAMI Technical Office
11 Mile Hill Road
Newtown, CT 06470
Phone: 203-426-4358
E-mail:
Website: www.saami.org
EQUIPMENT: SCHEMATIC LAYOUT OF VELOCITY SCREENS

SCHEMATIC VELOCITY TEST LAYOUT FOR INSTRUMENTAL VELOCITY AT 15 FEET (4.572) OVER 20 FEET (6.096)

NOTE
(X.XXX) = METERS

Signal line
Line of fire
Chronograph
Photoelectric cells (2)
Midpoint
Light sources (2)
Test action and barrel
Amplifier
EQUIPMENT: UNIVERSAL RECEIVER COLLAR & TEST BARREL

FOR DETAIL INFORMATION SEE FOLLOWING PAGE

NOTE: (XX.XX) = Millimeters
MATERIAL: RESULFURIZED 4140 STEEL HEAT TREAT PRIOR TO MACHINING TO BRINELL HARDNESS 277 TO 321 (Rc 29 TO 35)
ACCEPTABLE ALTERNATE: 416 STAINLESS STEEL

NOTE: (XX.XX) = MILLIMETERS
UNIVERSAL RECEIVER TEST BARREL: INSTALLATION OF PRESSURE TRANSDUCERS

1. LARGE [.250 (6.35)] DIAMETER GAUGES

Refer to the appropriate test barrel drawing for dimension.

- .375-24 UNF-2B
- .236 ± .002
  (5.99 ± 0.05)
- .276 (7.01)
- .565 ± .025
  (14.35 ± 0.64)
- .375-24 UNF-2B
- .386 (9.80)
- .388 (9.86)
- 2.000 (50.80)
- 2.010 (51.05)
- BARREL FACE

For collar data not shown, see page 132ff.

NOTE
(XX.XX) = MILLIMETERS
2. **“SMALL” [.196 (4.98)] DIAMETER GAUGES**

Refer to appropriate test barrel drawing for dimension.

- **5/16-24 UNF-2B**
  - .085 + .002
  - (2.16 ± 0.05)
- **.335 (8.51)**
- **PILOT DRILL** .177 (4.50) DIA X .500 (12.70) DEEP MIN
- **REAM** .1875 (4.763) DIA X .500 (12.70) DEEP

- **.386 (9.80)**
- **.388 (9.86)**
- **2.000 (50.80)**
- **2.010 (51.05)**

As specified on test barrel drawing.

Barrel face.

For collar data not shown see pages 132ff.

**FLAT**

**NOTE**

(XX.XX) = MILLIMETERS


declaration
EQUIPMENT: TRANSUDCER CALIBRATION FIXTURE PLUG WITH O-RING SEAL (OPTIONAL)*

NOTES

MATERIAL: ¾-16 UNF X 1½ LONG R.H. (GRADE 8) STEEL HEX BOLT
ALL DIA. TO BE CONCENTRIC WITHIN .001 T.I.R.
UNLESS OTHERWISE NOTED ALL TOLERANCES ARE ± .005 (0.13)
* NOT TO EXCEED 65,000 PSI.
TRANSDUCER LOCATION CRITERIA

I. Transducer Location
   The following criteria for transducer location positioning should be followed when designing new cartridges. In those cases where following the criteria will cause the transducer to be located over current or projected bullet heel locations, case cannelures, or other undesirable areas, the best alternate location should be chosen. In general, the location should be as close to the bullet heel as practical.

   A. Straight-walled Cartridge Cases
      The centerline of the transducer shall be located behind the heel of the bullet by an amount equal to one-half the transducer diameter plus 0.005” – 0.010” (0.13 mm – 0.25 mm). This criterion applies to both large diameter [0.250” (6.35 mm)] and small diameter [0.194” (4.93 mm)] transducers.

   B. Bottleneck Cartridge Cases
      The centerline of the transducer shall be located behind the shell case shoulder intersection by an amount of 0.175” (4.44 mm) for large diameter [0.250” (6.35 mm)] transducers and by 0.150” (3.80 mm) for small diameter [0.194” (4.93 mm)] transducers.

II. Transducer Diameter

   A. Large Diameter [0.250” (6.35 mm)] Transducers
      This size is selected when the chamber diameter at transducer centerline is equal to or greater than 0.350” (8.89 mm).

   B. Small Diameter [0.194” (4.93 mm)] Transducers
      This size is selected when the chamber diameter at transducer centerline is less than 0.350” (8.89 mm).
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

EQUIPMENT:
VENTED TEST BARREL - GENERAL

FOR REVOLVER CARTRIDGES ONLY

PISTON
GAS CHECK
CYLINDER
SPACER

BARREL

4 CAP SCREWS EQUALLY SPACED SHOWN
ROTATED 45° FROM TRUE POSITION
Chamber and bore dimensions of velocity and pressure test barrels shall conform to the dimensions of the chamber and bore at Maximum Material Condition (MMC) for each cartridge as originally introduced. Fabrication tolerances, however, are much reduced.

It is recognized that changes may be made to cartridge or chamber dimensions in order to improve the velocity-pressure relationship, accuracy or functioning in pistols or revolvers as production experience indicates. However, none of these changes should be of such nature that they would cause a significant increase in pressure level of a given lot of ammunition.

No changes shall be made to velocity and pressure barrel dimensions which would result in a reduction of the recorded pressure level of any given lot of ammunition. This would result in the possibility of future lots of ammunition being loaded with increased powder charges, which would cause increased pressure in existing pistols and revolvers.

Production barrels may be adapted for velocity and pressure testing provided that they conform to all dimensions shown on the appropriate test barrel drawing.
Centerfire pistol and revolver solid test barrels are measured by inserting a rod down the bore from the muzzle until it touches the breech face with the action closed and the firing pin retracted.

Vented test barrels for revolver ammunition are measured by inserting a rod down the bore from the muzzle to the rear end of the barrel.

A stop collar or other means is utilized to mark the point on the rod adjacent to the most forward part of the barrel or the bottom of the counterbore in barrels having a counterbore recess at the muzzle.

The rod is removed and the distance from the mark to the end of the rod is measured. This measurement is recorded as the barrel length.
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

9mm Luger / 9mm Luger +P V&P Test Barrel

Issued: 11/06/1979
Revised: 08/09/2015

PISTON HOLE CL
.3913 (9.939)
.3580 (9.093) ∆
.3820 (9.703)
.3810 (9.677) ∆
.354 (8.99) B
.346 (8.79) Bore Dia.
.355 (9.02) Groove Dia.

TRANSUDER CL
.425 - .010 (10.80 - 0.25)
.7540 + .0005 (19.152 + 0.013)
.8113 (20.607)
.9258 (23.515) ∆

.500 (12.70) B
.200 B (5.08)

.3950 (10.033) ∆

BREECH BOLT FACE

2° B

4.000 ± .010 (101.60 ± 0.25) ∆

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .100 + .002 (2.54 + 0.05)
TWIST RATE: 10 (254) R.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE + .005 (.13)

NOTE:
B = BASIC ∆ = REFERENCE DIMENSION ⊙ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
**9 x 18 Makarov V&P Test Barrel**

**Issued:** 07/28/1993

**Revised:** 08/09/2015

---

**NUMBER OF GROOVES:** 4

**WIDTH OF GROOVES:** .177 + .002 (4.50 + 0.05)

**TWIST RATE:** 9.45 (240) R.H.

**DIAMETER OF PISTON HOLE:** Crusher pressures not established.

**TRANSODUCER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**UNLESS OTHERWISE NOTED, ALL DIAMETERS +0.005 (0.013) LENGTH TOLERANCE +0.005 (0.13)**

**NOTE:**

- **B = BASIC**
- **Δ = REFERENCE DIMENSION**
- **⊗ = HEADSPACE DIMENSION**
- **★ DIMENSIONS ARE TO INTERSECTIONS OF LINES**
- **(XX.XX) = MILLIMETERS**
- **ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)**

---

**DO NOT SCALE FROM DRAWING**
**NUMBER OF GROOVES:** 6  
**WIDTH OF GROOVES:** .100 + .002 (2.54 + 0.05)  
**TWIST RATE:** 16.00 (406.4) L.H.  
**DIAMETER OF PISTON HOLE:** Crusher pressures not established.  
**TRANSDUCER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**UNLESS OTHERWISE NOTED,**  
ALL DIAMETERS +.005 (0.013)  
LENGTH TOLERANCE + .005 (0.13)

**NOTE:**  
B = BASIC  
Δ = REFERENCE DIMENSION  
⊗ = HEADSPACE DIMENSION  
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
10mm Automatic V&P Test Barrel

**Issuer:** 04/10/1989  
**Revised:** 08/09/2015

**Number of Grooves:** 6  
**Width of Grooves:** .120 + .002 (3.05 + 0.05)  
**Twist Rate:** 16 (406.4) L.H.  
**Diameter of Piston Hole:** Crusher pressures not established.  
**Transducer Diameter:** .250 (6.35)

**Note:**  
B = Basic  
Δ = Reference Dimension  
⊗ = Headspace Dimension  
* Dimensions are to intersections of lines  
(XX.XX) = Millimeters  
All calculations apply at maximum material condition (MMC)

---

**Land and Groove Dimensions**  
**Within Tolerances Throughout Length of Barrel.**  
**Unless Otherwise Noted,**  
**All Diameters** + .005 (0.013)  
**Length Tolerance** + .005 (0.13)

---

**Diagram Details:**
- Breech Bolt Face
- Transducer
- Bore Diameter
- Groove Diameter
- Length Tolerance
- Land and Groove Dimensions

---

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SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

221 Remington Fireball V&P Test Barrel

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .080 + .002 (2.03 + 0.05)
TWIST RATE: 12.00 (304.8) R.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS + .0005 (0.013) LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC  \Delta = REFERENCE DIMENSION  \circ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
25 Automatic V&P Test Barrel

Issued: 11/06/1979
Revised: 08/09/2015

PISTON HOLE

.698 ± .005
(17.73 ± 0.13)

.2798 (7.107)

.360 - .010
(9.14 - 0.25)

.2562 (6.507) Δ

.2792 (7.092) Δ

.252 (6.40) B

.250 (6.35)

Bore Dia.

.243 (6.17)

Groove Dia.

.2828 (7.183)

.0430+.0005
(1.092+0.013)

.0921 (2.34)

.309 (7.85)

3° B

.365 B (9.27)

.638 (16.21)

.678 (17.22)

.7639 (19.403) Δ

2.000 ± .010 (50.80 ± 0.25) Δ

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .086 + .002 (2.18 ± 0.05)
TWIST RATE: 16.00 (406.4) L.H.
DIAMETER OF PISTON HOLE: .146 (3.71)
TRANSUCER DIAMETER: .194 (4.93)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE +.005 (0.13)

NOTE:
B = BASIC Δ = REFERENCE DIMENSION ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
25 North American Arms V&P Test Barrel

Issued: 06/22/2005
Revised: 08/09/2015

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .086 + .002 (2.18 + 0.05)
TWIST RATE: 16.00 (406.4) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSUCER DIAMETER: .194 (4.93)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS + .005 (0.013)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  ☒ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
30 Luger (7.65mm) V&P Test Barrel

Issued: 11/06/1979
Revised: 08/09/2015

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES
(XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

NUMBER OF GROOVES: 4
WIDTH OF GROOVES: .120 + .002 (3.05 + 0.05)
TWIST RATE: 11 (279.4) R.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE + .005 (0.13)

DO NOT SCALE FROM DRAWING
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

32 Automatic V&P Test Barrel
Issued: 11/06/1979 Revised: 08/09/2015

PISTON HOLE $^\text{C}$

TRANSDUCER $^\text{C}$

.793 ± .005
(20.14 ± 0.13)

.304 (7.72)

.3397 (8.628)

Bore Dia.

.3390 (8.611) Δ

.311 (7.90)

Groove Dia.

.3215 (8.166) B

.693 (17.60) Δ

.7256 (18.430)

.7583 (19.261) Δ

4.000 ± .010 (101.60 ± 0.25) Δ

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .106 ± .002 (2.69 ± 0.05)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .194 (4.93)

UNLESS OTHERWISE NOTED, ALL DIAMETERS ±.005 (0.013)
LENGTH TOLERANCE ± .005 (0.13)

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  $^\text{X}$ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

DO NOT SCALE FROM DRAWING

4.000 ± .010 (101.60 ± 0.25) Δ

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .106 ± .002 (2.69 ± 0.05)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .194 (4.93)

UNLESS OTHERWISE NOTED, ALL DIAMETERS ±.005 (0.013)
LENGTH TOLERANCE ± .005 (0.13)

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  $^\text{X}$ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

32 H&R Magnum V&P Test Barrel
Issued: 09/17/1984
Revised: 08/09/2015

PISTON HOLE C

.3412 (8.666)
.0550 + .0005
(1.397 + 0.013)

BREECH BOLT FACE

.200 B
(5.08)

.379 (9.63)

TRANSCLUDER C

.946 - .010
(24.03 - 0.25)

.3393 (8.618)

.310 B
(7.87)

.312 (7.92)
Groove Dia.

.303 (7.70)
Bore Dia.

12°30' B

4°35' B

1.187 ± .005
(30.15 ± 0.13)

.3392 (8.616) Δ

.325 (8.26) B

1.0960 (27.838) Δ

1.1280 (28.651)

1.1528 (29.281) Δ

1.466 (37.24)

1.4909 (37.869)

1.5346 (38.979)

5.000 ± .010 (127.00 ± 0.25) Δ

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 5
WIDTH OF GROOVES: .095 + .002 (2.41 + 0.05)
TWIST RATE: 16 (406.40) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)

TRANSDUCER DIAMETER: .194 (4.93)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL. UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
32 North American Arms V&P Test Barrel

Issued: 08/02/2003
Revised: 08/10/2015

**TRANSUDER C**

- \(0.327 - 0.010\) (8.30 - 0.25)
- \(0.3799\) (9.649)
- \(0.3809\) (9.675)
- \(0.3817\) (9.694)

**BREECH BOLT FACE**

- \(0.200\) B (5.08)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**NUMBER OF GROOVES:** 6

**WIDTH OF GROOVES:** \(0.106 + 0.002\) (2.69 + 0.05)

**TWIST RATE:** 16 (406.4) R.H.

**DIAMETER OF PISTON HOLE:** Crusher pressures not established

**TRANSDUCER DIAMETER:** \(0.250\) (6.35)

**DO NOT SCALE FROM DRAWING**

**NOTE:**

- \(B = \text{BASIC}\)
- \(\Delta = \text{REFERENCE DIMENSION}\)
- \(\Theta = \text{HEADSPACE DIMENSION}\)
- \(* \text{DIMENSIONS ARE TO INTERSECTIONS OF LINES}\)
- \((XX.XX) = \text{MILLIMETERS}\)
- \(\text{ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)}\)
### 32 Short Colt V&P Test Barrel

**Issued:** 11/06/1979  
**Revised:** 08/10/2015

**VENTED & SOLID**

- **Bore Dia.:** 1.303 (33.10) ± .010  
- **Groove Dia.:** 1.311 (33.30) \( \Delta \)
- **Twist Rate:** 16 (406.4) L.H.

**NOTE:**
- **B** = BASIC  
- **\( \Delta \)** = REFERENCE DIMENSION  
- **\( \varnothing \)** = HEADSPACE DIMENSION  
- **\(^\ast\)** = DIMENSIONS ARE TO INTERSECTIONS OF LINES  
- **\( XX.XX \)** = MILLIMETERS  
- **ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)**

**NUMBER OF GROOVES:** 6  
**WIDTH OF GROOVES:** .106 + .002 (2.69 + 0.05)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**UNLESS OTHERWISE NOTED,**  
- **ALL DIAMETERS** + .0005 (0.013)  
- **LENGTH TOLERANCE** + .005 (0.13)

---

**Diagram**

- **PISTON HOLE LOC.**  
- **TRANSDUCER LOC.**  
- **BREECH BOLT FACE**  
- **.385 (9.78)**

---

**DO NOT SCALE FROM DRAWING**
32 Smith & Wesson V&P Test Barrel

Issued: 11/06/1979
Revised: 08/16/2015

Vented & Solid

Piston Hole C

Transducer C

.3400 (8.636)

.382 (9.70)

.200 B (5.08)

.350 B (8.89)

.6090 (15.469) Δ

.6417 (16.299)

.6665 (16.929) Δ

.3402Δ (8.641)

Breech Bolt Face

12°30' B

4°45' B

1.303 (33.10) *Vented Barrels Only*

1.311 (33.30) Δ

1.335 (33.91)

1.3771 (34.978) Δ

3.910 ± .010 (99.31 ± 0.25) Δ One-Piece/Unvented

5.311 ± .010 (134.90 ± 0.25) Δ Vented

Do Not Scale From Drawing

Number of Grooves: 5

Width of Grooves: .095 + .002 (2.41 + 0.05)

Twist Rate: 18.75 (476.3) R.H.

Diameter of Piston Hole: .206 (5.23)

Transducer Diameter: .194 (4.93)

Land and Groove Dimensions to Be Within Tolerances Throughout Length of Barrel.

Unless Otherwise Noted, All Diameters +.0005 (0.013)

Length Tolerance +.005 (0.13)

Note:

B = Basic

Δ = Reference Dimension

⊗ = Headspace Dimension

* Dimensions Are to Intersections of Lines (XX.XX) = Millimeters

All Calculations Apply at Maximum Material Condition (MMC)
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

32 Smith & Wesson Long V&P Test Barrel
Issued: 11/06/1979 Revised: 08/16/2015

Vented & Solid
Piston Hole C

Transducer C

34.15 (8.674)

.0550 + .0005
(1.397 + 0.013)

.379 (9.63)

.200 B
(5.08)

.3412 (8.666)

.700 B
(17.78)

.9410 (23.901) Δ

.9737 (24.732)

.9985 (25.362) Δ

1.303 (33.10) *Vented Barrels Only*

1.311 (33.30) Δ

1.3359 (33.932)

1.3796 (35.042) Δ

5.320 ± .010 (135.13 ± 0.25) Δ One-Piece/Unvented

5.311 ± .010 (134.90 ± 0.25) Δ Vented

Bore Dia.

.3140 (7.976)

.310 (7.87) B

4°35' B

4.000 ± .010

(101.60 ± 0.25)

.008 GAP

(0.20)

VENTED BARRELS ONLY

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 5
WIDTH OF GROOVES: .095 + .002 (2.41 + 0.05)
TWIST RATE: 18.75 (476.3) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .194 (4.93)

LAND AND GROOVE DIMENSIONS TO BE UNLESS OTHERWISE NOTED,
WITHIN TOLERANCES THROUGHOUT ALL DIAMETERS+.0005 (0.013)
LENGTH OF BARREL. LENGTH TOLERANCE+.005 (0.13)

NOTE:
B = BASIC Δ = REFERENCE DIMENSION ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

327 Federal Magnum V&P Test Barrel
Issued: 01/31/2008
Revised: 08/11/2015

VENTED & SOLID

BREECH BOLT FACE

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 5
WIDTH OF GROOVES: .095 + .002 (2.41 + 0.05)
TWIST RATE: 16.00 (406.4) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established.
TRANSUDCER DIAMETER: .194 (4.93)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS +.005 (0.013)
LENGTH TOLERANCE +.005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES
(XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

356 TSW V&P Test Barrel

Issued: 01/12/1994
Revised: 08/15/2015

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .100 + .002 (2.54 + 0.05)
TWIST RATE: 10.00 (254.0) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established.
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE
WITHIN TOLERANCES THROUGHOUT
LENGTH OF BARREL.

LENGHT TOLERANCE + .005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES
(XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
357 Magnum V&P Test Barrel

**VENTED & SOLID**

**PISTON HOLE**

- \(0.370 (9.40) B\)
- \(0.380 (9.65)\)
- \(0.3809 (9.675)\)

**TRANSUDER**

- \(0.665 - 0.010\)
- \(0.350 (8.89) B\)

**BORE DIAMETER**

- \(0.3459 (8.79)\)
- \(0.355 (9.02)\)

**GROOVE DIAMETER**

- \(0.0600 + 0.0005\)
- (1.524 + 0.013)

**BREECH BOLT FACE**

- \(0.444 (11.28)\)

**LAND AND GROOVE DIMENSIONS**

- \(10.000 \pm 0.010 (254.00 \pm 0.25) \Delta\) ONE-PIECE/UNVENTED
- \(5.643 \pm 0.010 (143.33 \pm 0.25) \Delta\) VENTED

**TRANSDUCER DIAMETER**

- \(0.008 GAP\)
- \(4.000 \pm 0.10\)
- (101.60 \pm 0.25)

**NUMBER OF GROOVES:** 6

**WIDTH OF GROOVES:** 0.1058 + 0.0020 (2.687 + 0.051)

**TWIST RATE:** 18.75 (476.3) R.H.

**DIAMETER OF PISTON HOLE:** 0.206 (5.23)

**NUMBER OF GROOVES:** UNLESS OTHERWISE NOTED.

**WIDTH OF GROOVES:** ALL DIAMETERS + 0.005 (0.13)

**TWIST RATE:** LENGTH TOLERANCE + 0.005 (0.13)

**DIAMETER OF PISTON HOLE:**

**TRANSDUCER DIAMETER:**

**NOTE:**

- \(B = \text{BASIC}\)
- \(\Delta = \text{REFERENCE DIMENSION}\)
- \(\otimes = \text{HEADSPACE DIMENSION}\)
- \(* = \text{DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS}\)
- \(\text{ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)}\)
NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .1058 + .002 (2.687 + 0.05)
TWIST RATE: 16 (406.4) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSDUCER DIAMETER: .250 (6.35)
38 Automatic / 38 Super Automatic +P V&P Test Barrel

Issued: 11/06/1979
Revised: 08/10/2015

PISTON HOLE C
1.013 ± .005 (25.73 ± 0.13)
TRANSUDER C
.3870 (9.830) Δ
.3872 (9.835) Δ
.367 (9.32) B
.550 - .010 (13.97 - 0.25)
.346 (8.79) Bore Dia.
.355 (9.02) Groove Dia.

.0500 + .0005 (1.270 + 0.013)
.3890 Δ (9.881)
.3887 (9.873)
.650 (16.51) B
.9179 (23.315) Δ
.9767 (24.808)
1.0325 (26.226) Δ
5.000 ± .010 (127.00 ± 0.25) Δ

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .121 + .002 (3.07 + 0.05)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS + .0005 (0.013) LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC Δ = REFERENCE DIMENSION ☼ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION II – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

38 Smith & Wesson V&P Test Barrel

Issued: 11/06/1979 Revised: 08/11/2015

VENTED & SOLID
PISTON HOLE Ø
TRANSDUCER Ø
.390 - .010
(9.95 - 0.25)

Bore Dia.
 Ø .388 (9.860) ± .005
(22.26 ± 0.13)

Groove Dia.
Ø .3882 (9.855) Δ

.355 (9.02) B

.370 (9.40) B

.3595 (9.131) Groove Dia.

.3886 (9.860)

.444 (11.28)

.500 (12.70) B

.7738 (19.655) Δ

.8144 (20.686)

.8324 (21.143) Δ

12.30° B

1.631 (41.43)

1.6747 (42.537)

1.7059 (43.330) Δ

VVENTED BARRELS ONLY

5.330 ± .010 (135.38 ± 0.25) Δ ONE-PIECE/UNVENTED

5.631 ± .010 (143.03 ± 0.25) Δ VENTED

.008 (0.20)

.4000 ± .010 (101.60 ± 0.25)

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 5
WIDTH OF GROOVES: .114 + .002 (2.90 + 0.05)
TWIST RATE: 18.75 (476.3) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL. UNLESS OTHERWISE NOTED, ALL DIAMETERS ±.0005 (0.013) LENGTH TOLERANCE ±.005 (0.13)

NOTE:
B = BASIC Δ = REFERENCE DIMENSION ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
### 38 Special / 38 Special +P / 38 Special Match V&P Test Barrel

**Issued:** 11/06/1979  
**Revised:** 08/10/2015

#### VENTED & SOLID

**PISTON HOLE C:**

- **Bore Dia.:** .3800 (9.652)
- **Groove Dia.:** .3809 (9.675)
- **.600 - .010 (15.24 - 0.25)**
- **.370 (9.40) B**
- **.3800 (9.652) Δ**
- **.3801 (9.655)**
- **.355 (9.02) B**
- **.355 (9.02)**

**TRANSDUCER C:**

- **.0590 + .0005 (1.499 + 0.013)**
- **.3810 (9.677) Δ**
- **.200 B (5.08)**
- **.850 (21.59) B**
- **1.2596 (31.994) Δ**
- **1.623 (41.22)**
- **1.631 (41.43) Δ**
- **1.6491 (41.887)**
- **1.7033 (43.264) Δ**
- **7.710 ± .010 (195.83 ± 0.25) Δ ONE-PIECE/UNVENTED**
- **5.631 ± .010 (143.03 ± 0.25) Δ VENTED**

**BREECH BOLT FACE:**

- **.444 (11.28)**
- **.444 (11.28)**

**VENTED BARRELS ONLY:**

- **.008 GAP (0.20)**
- **4.000 ± .010 (101.60 ± 0.25)**

---

**DO NOT SCALE FROM DRAWING**

**NUMBER OF GROOVES:** 6  
**WIDTH OF GROOVES:** .105 + .002 (2.67 + 0.05)

**TWIST RATE:** 18.75 (476.3) R.H.

**DIAMETER OF PISTON HOLE:** .206 (5.23)

**TRANSDUCER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**NOTE:**

- **B = BASIC**
- **Δ = REFERENCE DIMENSION**
- **⊗ = HEADSPACE DIMENSION**
- *** = DIMENSIONS ARE TO INTERSECTIONS OF LINES**
- **(XX.XX) = MILLIMETERS**
- **ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)**

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**Issued:** 11/06/1979  
**Revised:** 08/10/2015
380 Automatic V&P Test Barrel

Issued: 11/06/1979
Revised: 08/15/2015

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .121 + .002 (3.07 + 0.05)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .120 + .002 (3.05 + 0.05)
TWIST RATE: 16 (406.4) R.H.
DIAMETER OF PISTON HOLE: Crusher pressure not established
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC Δ = REFERENCE DIMENSION ＠ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
400 Cor-Bon V&P Test Barrel

Issued: 02/08/2006
Revised: 08/15/2015

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .120 + .002 (3.05 + 0.05)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
※ DIMENSIONS ARE TO INTERSECTIONS OF LINES
(XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
41 Remington Magnum V&P Test Barrel

Issued: 11/06/1979
Revised: 08/11/2015

**DO NOT SCALE FROM DRAWING**

- **NUMBER OF GROOVES:** 6
- **WIDTH OF GROOVES:** .1054 + .0020 (2.677 + 0.051)
- **TWIST RATE:** 18.75 (476.3) R.H.
- **DIAMETER OF PISTON HOLE:** .206 (5.23)
- **TRANSDUCER DIAMETER:** .250 (6.35)

**NOTE:**
- **B** = BASIC
- **Δ** = REFERENCE DIMENSION
- **⊗** = HEADSPACE DIMENSION
- ***** = DIMENSIONS ARE TO INTERSECTIONS OF LINES
- **(XX.XX)** = MILLIMETERS
- **ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)**

**SAAMI VOLUNTARY PERFORMANCE STANDARDS**

**CENTERFIRE PISTOL & REVOLVER**

**STANDARD VELOCITY & PRESSURE TEST BARREL**

**SECTION I**

**EQUIPMENT CENTERFIRE PISTOL & REVOLVER**

165
**SECTION III – EQUIPMENT**
**CENTERFIRE PISTOL & REVOLVER**
**SAAMI VOLUNTARY PERFORMANCE STANDARDS**

---

**44 Remington Magnum V&P Test Barrel**

**Issued:** 11/06/1979  
**Revised:** 08/10/2015

**PISTON HOLE:**  
1.398 ± .005  
(35.15 ± 0.13)

**TRANSUDER:**  
.730 ± .010  
(18.54 ± 0.25)

**.4589 (11.656)**

**.4580 (11.633) Δ**

**.4581 (11.636)**

**11° 6’ B**

**.417 (10.59)**  
Bore Dia.

**.425 (10.80) B**

**.429 (10.90)**  
Groove Dia.

**VENTED & SOLID**

**.4590 Δ (11.659)**

**.519 (13.18)**

**BREECH BOLT FACE**

**VVENTED BARRELS ONLY**

4.000 ± .010  
(101.60 ± 0.25)

**.008 GAP (0.20)**

**DO NOT SCALE FROM DRAWING**

**NUMBER OF GROOVES:** 6

**WIDTH OF GROOVES:** .1076 ± .0020 (2.733 ± 0.051)

**TWIST RATE:** 20 (508) R.H.

**DIAMETER OF PISTON HOLE:** .206 (5.23)

**TRANSUDER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**NOTE:**

B = BASIC  
Δ = REFERENCE DIMENSION  
⊗ = HEADSPACE DIMENSION

* DIMENSIONS ARE TO INTERSECTIONS OF LINES  
(XX.XX) = MILLIMETERS

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

---

**DIMENSIONS ARE TO INTERSECTIONS OF LINES**

**(XX.XX) = MILLIMETERS**

**ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)**
44 Smith and Wesson Special V&P Test Barrel

Vented & Solid
Piston Hole C

Transducer C

.640 - .010
(16.26 - 0.25)

.445 (11.30) B

.4580 (11.633) Δ

.4581 (11.636)

.425 (10.80) B

.417 (10.59)

Do Not Scale From Drawing

Number of Grooves: 5
Width of Grooves: .1285 + .0020 (3.264 + 0.051)
Twist Rate: 20 (508) R.H.
Diameter of Piston Hole: .206 (5.23)
Transducer Diameter: .250 (6.35)

Land and Groove Dimensions to Be Within Tolerances Throughout Length of Barrel. Unless Otherwise Noted, All Diameters +.0005 (0.013) Length Tolerance +.005 (0.13)

Note:
B = Basic Δ = Reference Dimension ⊗ = Headspace Dimension
* Dimensions Are to Intersections of Lines (XX.XX) = Millimeters
All Calculations Apply at Maximum Material Condition (MMC)
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

45 Automatic / 45 Automatic +P / 45 Automatic Match V&P Test Barrel

Issued: 11/06/1979  Revised: 08/10/2015

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .147 + .002 (3.73 + 0.050)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDER DIAMETER: .250 (6.35)

DO NOT SCALE FROM DRAWING

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE +.005 (0.13)

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
45 Auto Rim V&P Test Barrel

 Issued: 11/06/1979  Revised: 08/10/2015

Vented & Solid

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<tr>
<th>Dimension</th>
<th>Value</th>
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<tbody>
<tr>
<td>Bore Dia.</td>
<td>.444 (11.28)</td>
</tr>
<tr>
<td>Groove Dia.</td>
<td>.451 (11.46)</td>
</tr>
<tr>
<td>PISTON HOLE C</td>
<td>1.011 ± .005 (25.88 ± 0.13)</td>
</tr>
<tr>
<td>TRANSDUCER C</td>
<td>.4730 (12.014) Δ</td>
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<td>.4734 (12.024)</td>
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<tr>
<td>.450 (11.43) B</td>
<td>.4555 (11.570)</td>
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<tr>
<td>.4794 Δ (12.177)</td>
<td>.520 (13.21)</td>
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<tr>
<td>.0900 ± .005 (2.286 ± 0.013)</td>
<td>.900 (2.286)</td>
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<tr>
<td>.645 (16.38) B</td>
<td>1.685 (42.80)</td>
</tr>
<tr>
<td>.693 (17.60)</td>
<td>1.7273 (43.873)</td>
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<td>1.7647 (44.823) Δ</td>
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<tr>
<td>.7180 ± .010 (182.37 ± 0.25) Δ ONE-PIECE/UNVENTED</td>
<td>5.693 ± .010 (144.60 ± 0.25) Δ VENTED</td>
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</tbody>
</table>

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .156 + .0020 (3.96 + 0.05)
TWIST RATE: 16.00 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  □ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
**45 Colt V&P Test Barrel**

**Issued:** 02/12/1987  
**Revised:** 08/10/2015

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**SECTION III – EQUIPMENT**  
**CENTERFIRE PISTOL & REVOLVER**  
**SAAMI VOLUNTARY PERFORMANCE STANDARDS**

---

**STANDARD VELOCITY & PRESSURE TEST BARREL**

---

**BREECH BOLT FACE**

---

**DO NOT SCALE FROM DRAWING**

**NUMBER OF GROOVES:** 6  
**WIDTH OF GROOVES:** .156 + .002 (3.96 ± 0.05)  
**TWIST RATE:** 16.00 (406.4) L.H.  
**DIAMETER OF PISTON HOLE:** .206 (5.23)  
**TRANSDUCER DIAMETER:** .250 (6.35)

---

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**  
**UNLESS OTHERWISE NOTED, ALL DIAMETERS +/- .005 (0.013) LENGTH TOLERANCE +/- .005 (0.13)**

---

**NOTE:**  
B = BASIC  
Δ = REFERENCE DIMENSION  
⊗ = HEADSPACE DIMENSION  
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
45 Glock Automatic Pistol V&P Test Barrel

Issued: 08/02/2003

Revised: 08/10/2015

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .147 + .002 (3.73 + 0.05)
TWIST RATE: 16.00 (406.4) L.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSDUCER DIAMETER: .250 (6.35)

DO NOT SCALE FROM DRAWING

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION III – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

45 Winchester Magnum V&P Test Barrel

Issued: 11/06/1979
Revised: 08/10/2015

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .147 + .002 (3.73 + 0.050)
TWIST RATE: 16 (406.4) L.H.
DIAMETER OF PISTON HOLE: .206 (5.23)
TRANSUDCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE
WITHIN TOLERANCES THROUGHOUT
LENGTH OF BARREL.

UNLESS OTHERWISE NOTED,
ALL DIAMETERS +.0005 (0.013)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
SECTION I – EQUIPMENT
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

STANDARD VELOCITY & PRESSURE
TEST BARREL

454 Casull V&P Test Barrel
Issued: 06/04/1997
Revised: 08/15/2015

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .160 + .002 (4.06 + 0.05)
TWIST RATE: 24.00 (609.6) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS ± .005 (0.13)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC Δ = REFERENCE DIMENSION ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
**460 S&W Magnum V&P Test Barrel**

**VENTED & SOLID**

---

**DO NOT SCALE FROM DRAWING**

**NUMBER OF GROOVES:** 5
**WIDTH OF GROOVES:** .144 + .003 (3.66 + 0.08)
**TWIST RATE:** 20.00 (508.0) R.H.
**DIAMETER OF PISTON HOLE:** Crusher pressures not established
**TRANSUCER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**NOTE:**
- B = BASIC
- Δ = REFERENCE DIMENSION
- ⊗ = HEADSPACE DIMENSION
- * DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
- ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

---

All dimensions are to intersections of lines.

---

**SAAMI VOLUNTARY PERFORMANCE STANDARDS CENTERFIRE PISTOL & REVOLVER SECTION I**

**TRANSDUCER DIAMETER**

**NUMBER OF GROOVES:** 5
**WIDTH OF GROOVES:** .144 + .003 (3.66 + 0.08)
**TWIST RATE:** 20.00 (508.0) R.H.
**DIAMETER OF PISTON HOLE:** Crusher pressures not established
**TRANSUCER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**NOTE:**
- B = BASIC
- Δ = REFERENCE DIMENSION
- ⊗ = HEADSPACE DIMENSION
- * DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
- ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
475 Linebaugh V&P Test Barrel

Issued: 05/17/2000
Revised: 08/15/2015

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .160 + .002 (4.06 + 0.05)
TWIST RATE: 18.00 (457.2) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.
UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013)
LENGTH TOLERANCE + .005 (0.13)

NOTE:
B = BASIC
Δ = REFERENCE DIMENSION
⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES
(XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
480 Ruger V&P Test Barrel

**VEHICLE & SOLID**

**BREECH**

**BOLT FACE**

**TRANSDUCER**

**.675 - .010**

**.5042 (12.807) Δ**

**.5044 (12.812) Δ**

**.008 GAP**

**.0710 + .0005 (1.803 + 0.013)**

**.020 B**

**.990 (25.15) B**

**.13080 (33.223) Δ**

**.13328 (33.854) Δ**

**.1689 (42.90)**

**.1697 (43.10) Δ**

**.17286 (43.906) Δ**

**.1829 (46.46)**

**7.500 ± .010 (190.50 ± 0.25) Δ ONE-PIECE/UNVENTED**

**9.197 ± .010 (233.60 ± 0.25) Δ VENTED**

**DO NOT SCALE FROM DRAWING**

**NUMBER OF GROOVES:** 6

**WIDTH OF GROOVES:** .160 + .002 (4.06 + 0.05)

**TWIST RATE:** 18.00 (457.2) R.H.

**DIAMETER OF PISTON HOLE:** Crusher pressures not established

**TRANSDUCER DIAMETER:** .250 (6.35)

**LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.**

**UNLESS OTHERWISE NOTED, ALL DIAMETERS +.0005 (0.013) LENGTH TOLERANCE + .005 (0.13)**

**NOTE:**

B = BASIC

Δ = REFERENCE DIMENSION

⊗ = HEADSPACE DIMENSION

* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
50 Action Express V&P Test Barrel

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .120 + .002 (3.05 + 0.050)
TWIST RATE: 20.00 (508.0) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSUDER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL.

DO NOT SCALE FROM DRAWING

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

Issued: 06/03/1992
Revised: 08/11/2015
**SECTION III – EQUIPMENT**
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

**STANDARD VELOCITY & PRESSURE TEST BARREL**

**500 S&W Magnum V&P Test Barrel**

Issued: 06/25/2003

**VENTED & SOLID**

**TRANSDUCER**

0.0590 + 0.0005 (1.499 + 0.013)

0.533 Δ (13.54)

0.200 B (5.08)

0.565 (14.35)

**BREECH BOLT FACE**

TRANSUDCER DIAMETER

1.300 (33.02) B

1.6453 (41.791) Δ

1.734 (44.04)

1.8226 (46.294) Δ

2.292 (58.22) "VENTED BARRELS ONLY"

2.300 (58.42) Δ

2.3312 (59.212)

2.3749 (60.321) Δ

10.000 ± 0.010 (254.00 ± 0.25) Δ ONE-PIECE/UNVENTED

10.675 ± 0.010 (271.15 ± 0.25) Δ VENTED

**DO NOT SCALE FROM DRAWING**

NUMBER OF GROOVES: 6

WIDTH OF GROOVES: .130 + .002 (3.30 + 0.05)

TWIST RATE: 18.75 (476.3) R.H.

DIAMETER OF PISTON HOLE: Crusher pressures not established

TRANSUDCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE UNLESS OTHERWISE NOTED,

WITHIN TOLERANCES THROUGHOUT ALL DIAMETERS +.0005 (0.013)

LENGTH OF BARREL.

LENGTH TOLERANCE + .005 (0.13)

**NOTE:**

B = BASIC

Δ = REFERENCE DIMENSION

⊗ = HEADSPACE DIMENSION

* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
500 Special V&P Test Barrel

DO NOT SCALE FROM DRAWING

NUMBER OF GROOVES: 6
WIDTH OF GROOVES: .130 ± .002 (3.30 ± 0.05)
TWIST RATE: 18.75 (476.3) R.H.
DIAMETER OF PISTON HOLE: Crusher pressures not established
TRANSDUCER DIAMETER: .250 (6.35)

LAND AND GROOVE DIMENSIONS TO BE WITHIN TOLERANCES THROUGHOUT LENGTH OF BARREL. UNLESS OTHERWISE NOTED, ALL DIAMETERS ±.0005 (0.013) LENGTH TOLERANCE ± .005 (0.13)

NOTE:
B = BASIC  Δ = REFERENCE DIMENSION  ⊗ = HEADSPACE DIMENSION
* DIMENSIONS ARE TO INTERSECTIONS OF LINES (XX.XX) = MILLIMETERS
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)
DEFINITION AND PURPOSE

SAAMI Definitive Proof cartridges are cartridges commercially loaded by SAAMI member companies which develop pressure substantially exceeding those developed by normal service loads. The pressure levels are designed to assure gun safety when using ammunition loaded to service pressures in accordance with accepted American practices.

Proof cartridges are designed to stress firearms components which contain the cartridge in order to assure safety in the recommended use of the firearm during its service life.

It is important from the safety standpoint that Definitive Proof cartridges be used only for the proof of firearms. Adequate precaution must be taken to protect personnel performing firearms proof testing.

Definitive Proof cartridges for revolvers should be loaded with the heaviest bullet for the particular cartridge except where jacketed bullets not more than 25% lighter than the heaviest lead bullet are available. An appropriate powder which will stress the revolver cylinder should be used.

The supply of Definitive Proof cartridges will be the responsibility of the company that first introduced that particular caliber to the Institute. Definitive Proof Cartridges should be loaded with the heaviest bullet used at the time of introduction and the slowest powder which will meet the pressure values indicated for that particular cartridge to maintain effective pressure-distance relationship. Once established, the bullet weight for the proof load does not change unless the bullet becomes obsolete. All changes in Definitive Proof cartridges bullet weight must be approved by the Joint Technical Committee.
The following specifications define the proof loads based on tests fired in standard test barrels with the ammunition at a temperature of 60°-80°F (15.6°-26.7°C). Tests shall be in accordance with the procedures and equipment shown in Sections II and III of this Standard.

Pressure values are given on the following pages in terms of minimum and maximum averages and extreme variations for 10-round tests in standard test barrels.

The Standard Deviations for Definitive Proof Cartridges are the same as the Standard Deviations for service loads.

The minimum and maximum average Definitive Proof Pressures are computed as follows:

- The Minimum Average Definitive Proof Pressure is calculated by multiplying the Maximum Probable Lot Mean (MPLM) service pressure by the appropriate proof multiplier listed in Table 1 and rounding **UP** to the nearest multiple of 500 psi.
- The Maximum Average Definitive Proof Pressure is calculated by multiplying the Maximum Probable Lot Mean (MPLM) service pressure by the appropriate proof multiplier listed in Table 1 and rounding **DOWN** to the nearest multiple of 500 psi.
- The Maximum Proof Extreme Variation (EV) is calculated by multiplying the Proof Standard Deviation (which in the case of Centerfire Pistol & Revolver is equal to the Service Standard Deviation) by the constant 5.16 and rounding **UP** to the next 100 psi.
- The Minimum Proof Individual (MPI) pressure is positioned three standard deviations (proof) below the Minimum Average Definitive Proof Pressure, with the calculated value being rounded **DOWN** to the next multiple of 100 psi.

**Table 1**

<table>
<thead>
<tr>
<th>When Maximum Average Pressure is</th>
<th>Definitive Proof Pressure Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>15,000 psi or less</td>
<td>Minimum 140%</td>
</tr>
<tr>
<td>15,100 psi to 18,000 psi</td>
<td>Minimum 135%</td>
</tr>
<tr>
<td>18,100 psi to 21,000 psi</td>
<td>Minimum 130%</td>
</tr>
<tr>
<td>21,100 psi and greater</td>
<td>Minimum 130%</td>
</tr>
</tbody>
</table>

Example:

Cartridge: 380 Auto  
MPLM Pressure = 22,200 psi  
S.D. = 1,075 psi

1. Min. Avg. Proof Pressure = Maximum Probable Lot Mean Pressure x 1.30  
i.e.: 22,200 psi x 1.30 = 28,860 psi rounded **up** to nearest 500 psi = 29,000 psi

2. Max. Avg. Proof Pressure = Maximum Probable Lot Mean Pressure x 1.40  
i.e.: 22,200 psi x 1.40 = 31,080 psi rounded **down** to nearest 500 psi = 31,000 psi

---

5 The Maximum Proof Pressure EV is a statistic derived from knowledge of the population standard deviation. Applying table figures from Relative Range Tables (Biometrika Tables for Statisticians), we calculate the maximum EV, or Range, equal to the population S.D. times the table constant 5.16 (for a sample of 10 at 99.0% confidence level).
i.e.: 1,075 psi x 5.16 = 5,547 psi rounded up to next 100 psi = 5,600 psi.
4. Minimum Proof Individual = Min. Avg. Proof Pressure – (3 x \( \sigma_{(\text{PROOF})} \))
i.e., 29,000 psi – (3 x 1,075 psi) = 25,775 psi rounded down to next 100 psi = 25,700 psi.
## PROOF PRESSURE DATA - CRUSHER

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (grains)</th>
<th>SERVICE Maximum Average Pressure (CUP/100)</th>
<th>Pressure Values of Proof Cartridges(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum Average</td>
<td>Maximum Average</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(CUP/100)</td>
<td>(CUP/100)</td>
</tr>
<tr>
<td>9mm Luger</td>
<td>115</td>
<td>N/E(2)</td>
<td>N/E</td>
</tr>
<tr>
<td>9mm Luger +P</td>
<td>115</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>9x18 Makarov</td>
<td>95</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>9x23 Winchester</td>
<td>125</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>10mm Automatic</td>
<td>200</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>221 Remington Fireball</td>
<td>50</td>
<td>520</td>
<td>700</td>
</tr>
<tr>
<td>25 Automatic</td>
<td>50</td>
<td>180</td>
<td>255</td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>35</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>30 Luger (7.65mm)</td>
<td>93</td>
<td>280</td>
<td>380</td>
</tr>
<tr>
<td>32 Automatic</td>
<td>71</td>
<td>150</td>
<td>220</td>
</tr>
<tr>
<td>32 H&amp;R Magnum</td>
<td>95</td>
<td>210</td>
<td>285</td>
</tr>
<tr>
<td>32 North American Arms</td>
<td>60</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>32 Short Colt</td>
<td>80</td>
<td>130</td>
<td>190</td>
</tr>
<tr>
<td>32 Smith &amp;Wesson</td>
<td>88</td>
<td>120</td>
<td>175</td>
</tr>
<tr>
<td>32 Smith &amp;Wesson Long</td>
<td>98</td>
<td>120</td>
<td>175</td>
</tr>
<tr>
<td>327 Federal Magnum</td>
<td>115</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>356 TSW</td>
<td>147</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>357 Magnum</td>
<td>158</td>
<td>450</td>
<td>605</td>
</tr>
<tr>
<td>357 Sig</td>
<td>125</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>38 Automatic</td>
<td>130</td>
<td>230</td>
<td>310</td>
</tr>
</tbody>
</table>

1 Based on sample size \( n=10 \).
2 N/E = Not Established.
### SERVICE Pressure Values of Maximum Proof Cartridges

<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (grains)</th>
<th>Average Pressure (CUP/100)</th>
<th>Minimum Average Pressure (CUP/100)</th>
<th>Maximum Average Pressure (CUP/100)</th>
<th>Maximum E.V. (CUP/100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 Special</td>
<td>146</td>
<td>130</td>
<td>190</td>
<td>205</td>
<td>34</td>
</tr>
<tr>
<td>38 Special Match</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38 Special +P</td>
<td>158</td>
<td>200</td>
<td>270</td>
<td>295</td>
<td>52</td>
</tr>
<tr>
<td>38 Super Automatic +P</td>
<td>130</td>
<td>330</td>
<td>445</td>
<td>475</td>
<td>86</td>
</tr>
<tr>
<td>380 Automatic</td>
<td>95</td>
<td>170</td>
<td>240</td>
<td>260</td>
<td>44</td>
</tr>
<tr>
<td>40 Smith &amp; Wesson</td>
<td>180</td>
<td>N/E(2)</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>400 Cor-Bon</td>
<td>165</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>41 Remington Magnum</td>
<td>210</td>
<td>400</td>
<td>540</td>
<td>575</td>
<td>104</td>
</tr>
<tr>
<td>44 Remington Magnum</td>
<td>240</td>
<td>400</td>
<td>540</td>
<td>575</td>
<td>104</td>
</tr>
<tr>
<td>44 S&amp;W Special</td>
<td>246</td>
<td>140</td>
<td>205</td>
<td>220</td>
<td>37</td>
</tr>
<tr>
<td>45 Automatic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 Automatic Match</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 Automatic +P</td>
<td>185</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>45 Auto Rim</td>
<td>230</td>
<td>150</td>
<td>220</td>
<td>240</td>
<td>39</td>
</tr>
<tr>
<td>45 Colt</td>
<td>255</td>
<td>140</td>
<td>205</td>
<td>220</td>
<td>37</td>
</tr>
<tr>
<td>45 Glock Automatic Pistol</td>
<td>200</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>45 Winchester Magnum</td>
<td>230</td>
<td>400</td>
<td>540</td>
<td>575</td>
<td>104</td>
</tr>
<tr>
<td>454 Casull</td>
<td>300</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>460 S&amp;W Mag</td>
<td>300</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>475 Linebaugh</td>
<td>400</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>480 Ruger</td>
<td>325</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>50 Action Express</td>
<td>325</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>500 S&amp;W Magnum</td>
<td>440</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>500 Special</td>
<td>350</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
</tbody>
</table>

1. Based on sample size $\eta=10$.
2. N/E = Not Established.
<table>
<thead>
<tr>
<th>Cartridge</th>
<th>Bullet Weight (grains)</th>
<th>SERVICE Maximum Pressure (psi/100)</th>
<th>Pressure Values of Proof Cartridges¹</th>
<th>Minimum Average (psi/100)</th>
<th>Maximum Average (psi/100)</th>
<th>Maximum E.V. (psi/100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9mm Luger</td>
<td></td>
<td>Obsolete, use 9mm Luger +P proof loads</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9mm Luger +P</td>
<td>115</td>
<td>385</td>
<td>520</td>
<td>555</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>9x18 Makarov</td>
<td>95</td>
<td>241</td>
<td>325</td>
<td>345</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>9x23 Winchester</td>
<td>125</td>
<td>550</td>
<td>740</td>
<td>790</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>10mm Automatic</td>
<td>200</td>
<td>375</td>
<td>505</td>
<td>540</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>221 Remington Fireball</td>
<td>50</td>
<td>600</td>
<td>805</td>
<td>865</td>
<td>155</td>
<td></td>
</tr>
<tr>
<td>25 Automatic</td>
<td>50</td>
<td>250</td>
<td>340</td>
<td>360</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>25 North American Arms</td>
<td>35</td>
<td>239</td>
<td>325</td>
<td>345</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>30 Luger (7.65mm)</td>
<td>93</td>
<td>N/E²</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>32 Automatic</td>
<td>71</td>
<td>205</td>
<td>275</td>
<td>305</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>32 H&amp;R Magnum</td>
<td>95</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>32 North American Arms</td>
<td>60</td>
<td>239</td>
<td>325</td>
<td>345</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>32 Short Colt</td>
<td>80</td>
<td>N/E</td>
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¹ Based on sample size η=10.
² N/E = Not Established.
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<th>Bullet Weight (grains)</th>
<th>SERVICE Maximum Average Pressure (psi/100)</th>
<th>Pressure Values of Proof Cartridges&lt;sup&gt;(3)&lt;/sup&gt;</th>
<th>Minimum Average (psi/100)</th>
<th>Maximum Average (psi/100)</th>
<th>Maximum E.V. (psi/100)</th>
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<sup>3</sup> Based on sample size η=10.

<sup>4</sup> N/E = Not Established.
Centerfire pistol and revolver Definitive Proof Loads should be used for one purpose only: the proof testing of Centerfire pistols and revolvers.

A list of current suppliers may be obtained from the SAAMI Technical Office.
PROOF CARTRIDGE IDENTIFICATION

- Cartridge head face
- Case finish - Matte surface
  tin plate or visual equivalent
- Red Lacquer
  (Cartridge head face only)
- Red Lacquer
  2/3 coverage, minimum reference
- Manufacturer’s typical headstamp

NOTE:
(XX.XX) = Millimeters
SECTION IV – DEFINITIVE PROOF LOADS
CENTERFIRE PISTOL & REVOLVER
SAAMI VOLUNTARY PERFORMANCE STANDARDS

DEFINITIVE PROOF PACKAGE IDENTIFICATION

HIGH PRESSURE PROOF LOADS

For Gun Manufacturers’ Proof Test Use Only: Fire only from fixed rest with operator properly protected from injury should the firearm be damaged. Purchaser should restrict proof loads to manufacturing premises. To dispose of proof loads, contact producer for instructions.

DO NOT reload or dispose of fired proof shells in a manner that may make them available for reloading. **Failure to follow the foregoing can result in a personal injury.**

Centerfire proof loads are identified by a tin-plated case (or visual equivalent) with red lacquer on the bullet and case head face.

For consistent results, proof loads should be stored for 2 weeks at 70°F± 5° (21.1° ± 2.8°C), and 60% relative humidity before use.

"**WARNING: KEEP OUT OF REACH OF CHILDREN**"

(Red lettering on white background)